



CHMURAECONOMICS&ANALYTICS

*The State of Workforce of Richmond Metropolitan Area*

***Prepared for:***

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## 1. Executive Summary

The state of the workforce in the Richmond metropolitan statistical area (MSA) is generally strong and closely resembles that of Virginia. Employment in the Richmond MSA grew an annual average 1.4% over the last ten years ending with the fourth quarter of 2004 compared with 1.7% in the state and 1.4% in the nation. The unemployment rate stood at 3.7% in August 2005—the same rate as in the state but lower than the 4.9% in the nation. Education levels are comparable to the state as are high school drop-out rates and Standards of Learning (SOL) scores.

The Richmond MSA is made up of a diverse mix of industries providing a wide breadth and depth of employment opportunities to job seekers and employees. The location of the state's capital in the City of Richmond provides a base of state jobs that pushes the overall percent of government sector jobs to 19.0% in the Richmond MSA compared with 18.3% in the state and 16.1% in the nation in 2004. Similar to the state and nation, retail firms employ about 11.6% of the region's workforce followed by the fast-growing health care sector.

The relatively low dependency of the Richmond MSA on manufacturing has spared the region the large losses other metro areas incurred as firms moved offshore or to new near-shore<sup>1</sup> locations. Even so, the Richmond MSA's manufacturing sector employed 45,830 or 8% of total employment in 2004, contributed \$2.28 billion in total wages to the region, and added an estimated \$136.8 million<sup>2</sup> in personal income taxes to the Commonwealth of Virginia.

The high-tech manufacturing sectors located in the MSA include paints, coatings, and adhesives manufacturing as well as pharmaceuticals and medicines manufacturing. Total high-tech industries (manufacturing and services) account for 9.6% of the working population. The total high-tech sector pays well—at \$65,764 it is 66% above the average wage in the MSA in 2004. Although employment in the high-tech industry dropped at an average annual rate of 3.0% for the past five years in the Richmond MSA, it rose by 1,130 jobs for the year ending with the fourth quarter of 2004.

Another important strength for the region lies in its competitively advantaged industry clusters in finance, chemical manufacturing, pharmaceuticals, and professional services. These four clusters are projected to add 29,181 jobs over the next 10 years to the Richmond MSA. Moreover, they pay better-than-average wages: \$74,201 in finance, \$53,634 in chemical manufacturing, \$63,032 in pharmaceuticals, and \$50,365 in professional services.

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<sup>1</sup> Moved to lower cost of living communities either within the state or out of state but have not moved out of the country.

<sup>2</sup> Assuming state income tax rate of 6%.



The occupations most in demand for the two top clusters are financial analysts, computer programmers, and chemical engineers, receiving annual average wages of \$60,230, \$61,400, and \$67,350 respectively. The Richmond MSA has an estimated 1,035 financial analysts, 2,169 computer programmers, and 136 chemical engineers as of the fourth quarter of 2004. The MSA also possesses a number of workers that can fill these three demand occupations with some training. Specifically, an estimated 5,868 workers can be trained as financial analysts, 7,914 as computer programmers, and 1,127 as chemical engineers.

Although the education averages for the Richmond MSA are strong, they vary dramatically by locality. It is clear at the county/city level that the state of the workforce for the Richmond MSA is weakened by a portion of its constituency that is dropping out of high school. Studies have shown that high school drop outs are more likely to be involved in violent crime, and low education levels are correlated with high poverty rates. Similar to other MSAs in the state, Richmond has a disparity in SOLs, particularly with eighth grade math SOLs ranging from a pass rate of 40% in Petersburg to 86% in Chesterfield County in 2004. Some of these students, who will be entering the Richmond MSA workforce in 4 to 8 years, will have trouble securing jobs in occupations demanded by the MSA's competitively advantaged clusters such as financial analysts, budget analysts, and chemical engineers that require high math skills with an index value of 70 to 80 out of a maximum of 100. Jobs with less math requirements, however, will be available in the lower-paying and fast-growing occupations in retail sales and customer services where, for example, the math requirement is about an index value of 40 for cashiers and retail salespersons.

The state of the workforce for the Richmond MSA has opportunities for continued expansion in finance and insurance; educational services; and professional, scientific, and technical services industry sectors. National forecasts indicate knowledge and skilled occupations are growing faster both in numbers and in wages than unskilled occupations. This sheds additional favorable light on the emerging workforce for the Richmond MSA with approximately 11,270 entering the marketplace each year through 2010 with high school degrees, 1,870 with associate degrees, and 5,700 with bachelor's degrees or higher.

Another strategic advantage for the Richmond MSA is the potential infusion of over 7,300 military and civilian jobs from base realignments at Fort Lee. Not only will this realignment add jobs to the region that support the increased workforce at Fort Lee, but military retirees will enter the civilian workforce with skills in such demand occupations of police officers and paramedics. Some of the exiting military personnel, however, will need training to be successful in civilian lives.

The state of the workforce for the Richmond MSA is facing threats due to current graduation rates that are insufficient for engineers, and degreed professionals in information technology and



computer engineering. On a broader scale, the largest demand gaps are in education, construction trade, and computer science. While the majority of the demand for construction trade programs is for 2-year or certificate programs, the majority demand for education and computer sciences are for bachelor's degree or higher.

Quality of life issues appear to be suppressing increases in population growth in localities where population growth is contracting such as the cities of Richmond and Petersburg and Sussex County. The strong parallel to lower education levels and higher proportions of crime suggest the internal threat for these localities of the MSA is tied to societal factors such as poverty and criminal outgrowths from low education attainment and the lack of meaningful job opportunities. The violent crime index for the Richmond MSA is 411 crimes per every 100,000 citizens compared to 276 for the state; furthermore, 53% of the violent crime in the Richmond MSA occurs in the City of Richmond. It follows that the drop-out rate for the City of Richmond was 15.3% in 2003-2004 academic year, which compares to 3.0% for the MSA and 2.1% for the state.<sup>3</sup>

An understanding of the state of the Richmond MSA workforce is important in several respects. First, workers are Richmond's most important asset. In today's economy, firms are attracted to regions that possess the skilled workers they need. To increase the probability of attracting firms, economic development officials need to understand the skills base of the Richmond MSA labor pool. Second, continued churn in the economy causes some skills to become obsolete and others to be in greater demand. Workforce officials, students, and incumbent and dislocated workers need to know which occupations will remain in demand and which will go away in order to make prudent decisions about investments in training and education. Finally, educators need to understand the required skills of the Richmond MSA industry base so that curriculum reform positions the emerging workforce for jobs that will keep them in the region.

With that as a backdrop, the Greater Richmond Chamber of Commerce, the Greater Richmond Partnership, J. Sargeant Reynolds Community College, and John Tyler Community College partnered to contract with Chmura Economics & Analytics (CEA) to prepare the "State of Workforce in the Richmond Metropolitan Area." The deliverables were designed to meet these objectives:

1. to benchmark the current industry and workforce base of the region, including their structure and trend;
2. to identify potential gaps in terms of workers and educational levels, thus providing directions for improvement;

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<sup>3</sup> Data for the 2004-2005 (spring-fall) will not be available until some time after November 1, 2005.



3. to propose policy implications; and
4. to provide a document that can be easily updated, from a process-platform perspective.

The state of the workforce for the Richmond MSA is investigated from the perspective of supply and demand by addressing the following four broad views: demographics, industries, occupations, and education. Section 3 describes the demographic trends of the region, including population growth, diversity, education attainment, and the emerging workforce. Section 4 looks at the industry clusters as well as the strengths and weaknesses of the region's industries. Sections 3 and 4 provide a general background that leads to Section 5 with an in-depth analysis of the region's workforce from a supply perspective. Section 6 considers if the region's educational system adequately meets the needs of the workforce. Section 7 presents a case study of the health care industry—a growing cluster in the MSA—including the benefit of training programs.

**HIGHLIGHTS: STATE OF THE WORKFORCE**

The following table provides a summary of findings that are detailed in the remainder of this report.

INDICATOR	RICHMOND MSA	STATE COMPARISON	NATIONAL COMPARISON	WHY IS IT IMPORTANT?
<b>DEMOGRAPHICS</b>				
Population	<ul style="list-style-type: none"> <li>• 3<sup>rd</sup> largest MSA in state with 1.15 million in 2004</li> <li>• 1.28% growth rate 2000-2004</li> </ul>	<ul style="list-style-type: none"> <li>• 12<sup>th</sup> largest state in nation; 7.46 million in 2004</li> <li>• 1.32% growth rate 2000-2004</li> </ul>	<ul style="list-style-type: none"> <li>• 293.7 million in 2004</li> <li>• 1.32% growth rate 2000-2004</li> </ul>	<ul style="list-style-type: none"> <li>• Overall healthy growth points to many workforce opportunities; however, inner cities are losing population while outer suburbs are seeing fastest growth</li> <li>• Continued sprawl may lead to increased traffic congestion</li> </ul>
Commuting Patterns*	<ul style="list-style-type: none"> <li>• Concentrations of jobs and residents are found in Chesterfield, Henrico and Richmond City</li> <li>• 0.8% of workers use public transportation to go to work in 2004</li> <li>• 23.5 minutes to get to work in 2004</li> </ul>	<ul style="list-style-type: none"> <li>• 3.5% of workers use public transportation to go to work in 2004</li> <li>• 26.5 minutes to get to work in 2004</li> </ul>	<ul style="list-style-type: none"> <li>• 4.6% of workers use public transportation to go to work in 2004</li> <li>• 24.4 minutes to get to work in 2004</li> </ul>	<ul style="list-style-type: none"> <li>• Limited service area of GRTC and PAT</li> <li>• Transportation services are not keeping up with expanding population and employment growth which reduces job opportunities for some and limits employer's access to labor</li> </ul>

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\* Data for the Richmond MSA are only available through 2000. Therefore, the former Richmond-Petersburg MSA, which is fully contained in the current definition of the Richmond MSA, is referenced here because data are available through 2004.

INDICATOR	RICHMOND MSA	STATE COMPARISON	NATIONAL COMPARISON	WHY IS IT IMPORTANT?
Diversity*	<ul style="list-style-type: none"> <li>• 2004 Census shows 65.6% White; 30.3% Black; 2.4% Asian; and 6.5% foreign born</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 Census shows 72.6% White; 19.3% Black; 4.5% Asian and 9.5% foreign born in 2004</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 Census shows 75.6% White; 12.2% Black; 4.2% Asian and 12% foreign born in 2004</li> </ul>	<ul style="list-style-type: none"> <li>• Strong diversity in MSA, but racial composition varies greatly by locality.</li> <li>• MSA shows little need for “English as a second language” courses; most immigrants are concentrated in Henrico, Chesterfield, and Richmond City.</li> </ul>
Aging Population*	<ul style="list-style-type: none"> <li>• 10.9% over 65 years in 2004; 17% by 2020</li> </ul>	<ul style="list-style-type: none"> <li>• 11.1% over 65 years in 2004; 16% by 2020</li> </ul>	<ul style="list-style-type: none"> <li>• 12.0% over 65 years in 2004; 16.3% by 2020</li> </ul>	<ul style="list-style-type: none"> <li>• Productivity growth may start to slow if young workers aren’t adequately trained to replace retirees.</li> <li>• Industries with highest percentage of age 55+ workers are in manufacturing and education (teachers)</li> </ul>
First-Time Workers	<ul style="list-style-type: none"> <li>• 1.1% decline from 2004 – 2010</li> <li>• About 18,900 new workers each year; 60% with high school diploma; 30% with 4-year degree in 2005</li> </ul>	<ul style="list-style-type: none"> <li>• 0.9% gain from 2004 - 2010</li> <li>• About 124,000 new workers each year; 55% with high school diploma; 33% with 4-year degree in 2005</li> </ul>		<ul style="list-style-type: none"> <li>• The forecast for a slight decline in the number of first-time workers could mean that employers will need to attract more people from outside the MSA for entry-level positions.</li> </ul>



INDICATOR	RICHMOND MSA	STATE COMPARISON	NATIONAL COMPARISON	WHY IS IT IMPORTANT?
Education Attainment*	<ul style="list-style-type: none"> <li>85.4% age 25 and over have high school degrees in 2004;</li> <li>32.5% with bachelor's degree</li> </ul>	<ul style="list-style-type: none"> <li>84.9% age 25 and over have high school degrees in 2004;</li> <li>32.7% with bachelor's degree</li> </ul>	<ul style="list-style-type: none"> <li>83.9% age 25 and over have high school degrees in 2004;</li> <li>27% with bachelor's degree</li> </ul>	<ul style="list-style-type: none"> <li>High education levels of residents will serve industries well as knowledge increases in importance in growing industries.</li> <li>Levels vary by locality with cities possessing higher percentage of lower educated.</li> </ul>
Poverty*	<ul style="list-style-type: none"> <li>7.1% in 2004</li> </ul>	<ul style="list-style-type: none"> <li>9.5% in 2004</li> </ul>	<ul style="list-style-type: none"> <li>13.1% in 2004</li> </ul>	<ul style="list-style-type: none"> <li>Relatively low rates.</li> <li>Correlated with education; highest levels in cities.</li> </ul>
Crime	<ul style="list-style-type: none"> <li>4,458 reported offenses per 100,000 in 2003</li> </ul>	<ul style="list-style-type: none"> <li>2,980 reported offenses per 100,000 in 2003</li> </ul>	<ul style="list-style-type: none"> <li>4,063 reported offenses per 100,000 in 2003</li> </ul>	<ul style="list-style-type: none"> <li>Studies have tied lower high school drop out rates to lower crime rates.</li> <li>53% of MSA violent crime occurred in Richmond City.</li> </ul>
<b>INDUSTRY AND CLUSTER ANALYSIS</b>				
Total Employment	<ul style="list-style-type: none"> <li>614,500 in August 2005; 3<sup>rd</sup> largest MSA;</li> <li>3.1% growth over last year</li> </ul>	<ul style="list-style-type: none"> <li>3.6 million in August 2005; 12<sup>th</sup> largest state;</li> <li>1.5% growth over last year</li> </ul>	<ul style="list-style-type: none"> <li>134.0 million in August 2005;</li> <li>1.7% growth over last year</li> </ul>	<ul style="list-style-type: none"> <li>Healthy growth providing increasing number of job opportunities</li> </ul>
Unemployment Rate	<ul style="list-style-type: none"> <li>3.7% in August 2005</li> </ul>	<ul style="list-style-type: none"> <li>3.7% in August 2005</li> </ul>	<ul style="list-style-type: none"> <li>4.9% in August 2005</li> </ul>	<ul style="list-style-type: none"> <li>Low unemployment rate suggests little mismatch between occupations and industry needs</li> </ul>



INDICATOR	RICHMOND MSA	STATE COMPARISON	NATIONAL COMPARISON	WHY IS IT IMPORTANT?
Major Industry Sectors	<ul style="list-style-type: none"> <li>• Diversified in 2004 with 12% retail; 9% health care; 9% local government; 8% manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Diversified in 2004 with 12% retail; 9% health care; 10% local government; 9% manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Diversified in 2004 with 11.4% retail; 9.2% health care; 10.5% local government; 10.6% manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively small percentage in declining manufacturing.</li> <li>• Only 5% in high paying and fast growing professional, scientific, technical compared with 9% in the state</li> </ul>
High-Tech Industry	<ul style="list-style-type: none"> <li>• 9.6% of all jobs were high tech in 2004</li> <li>• Average wages \$65,765 in 2004</li> <li>• Jobs expanded 2.1% in last year ending with 2004 quarter 4</li> </ul>	<ul style="list-style-type: none"> <li>• 12.5% of jobs were high tech in 2004</li> <li>• Average wages \$73,175 in 2004</li> <li>• Jobs expanded 4.4% in year ending 2004 quarter 4</li> </ul>		<ul style="list-style-type: none"> <li>• Jobs in high-tech industries generally require higher education and pay much better than the average job.</li> </ul>
Industry Clusters	<ul style="list-style-type: none"> <li>• Competitive advantage relative to nation in financial services and chemical manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Competitive advantage relative to the nation in the professional services cluster</li> </ul>		<ul style="list-style-type: none"> <li>• Financial services sector pays well (\$74,201 in 2004) and is expected to grow an average 1.0% a year from 2004-2014.</li> <li>• Chemical manufacturing also pays well (\$53,634 in 2004) but is expected to contract an average 0.5% a year from 2004-2014.</li> <li>• Annual average wages in the MSA were \$39,681 in 2004.</li> </ul>



INDICATOR	RICHMOND MSA	STATE COMPARISON	NATIONAL COMPARISON	WHY IS IT IMPORTANT?
Cluster Growth Trends by Industry	<ul style="list-style-type: none"> <li>• Education/health cluster gained 12,516 jobs from 1999 to 2004</li> <li>• Financial services cluster gained 4,903 jobs from 1999 to 2004</li> </ul>			<ul style="list-style-type: none"> <li>• Job creation is concentrated in services and new high-tech sectors that usually embody higher educated and skilled laborers.</li> </ul>
Largest Employers	<ul style="list-style-type: none"> <li>• Capital One (finance); Philip Morris (tobacco manufacturing); Wal-Mart (retail)</li> </ul>	<ul style="list-style-type: none"> <li>• Department of Defense; Wal-Mart (retail); Northrop Grumman (defense)</li> </ul>		<ul style="list-style-type: none"> <li>• Diversified—not too reliant on any one firm—with top 20 employers accounting for 11% of total employment</li> </ul>
Business Expansion, Relocation, and Retention	<ul style="list-style-type: none"> <li>• 2004-2005 received 10% of all jobs announced from VEDP</li> <li>• 68.4% of the firms with 10 or less employees that started in the first quarter of 2001 are still in business</li> </ul>	<ul style="list-style-type: none"> <li>• slightly less than its share of total employment in the state (15%).</li> <li>• 68.2% of the firms with 10 or less employees that started in the first quarter of 2001 are still in business</li> </ul>		<ul style="list-style-type: none"> <li>• One-third of the jobs from the VEDP announcements related to finance and insurance—building on an existing cluster in the MSA.</li> </ul>

INDICATOR	RICHMOND MSA	STATE COMPARISON	WHY IS IT IMPORTANT?
<b>OCCUPATION CLUSTER ANALYSIS<sup>4</sup></b>			
Career Training Ladders	<ul style="list-style-type: none"> <li>• 18.4% of employment is in the customer service cluster; and 12.2% is in the clerical cluster</li> </ul>	<ul style="list-style-type: none"> <li>• 18.8% of employment is in the customer service cluster; and 11.4% is in the clerical cluster</li> </ul>	<ul style="list-style-type: none"> <li>• Training ladders identify upward mobility of occupations within general backgrounds such as medical or construction</li> </ul>
Employment	<ul style="list-style-type: none"> <li>• Largest number of workers in customer service (18.1%); clerical (12.2%); and sales and marketing (8.8%)</li> </ul>	<ul style="list-style-type: none"> <li>• Largest number of workers in customer service (18.3%); clerical (11.4%); and sales and marketing (8.6%)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to state but MSA has more medical occupations (8.0% vs. 7.0%) and less computer and electronic related occupations (3.7% vs. 5.3%)</li> <li>• Strength of MSA is also high concentration in business occupations</li> </ul>
Unemployment	<ul style="list-style-type: none"> <li>• Over 3,000 in customer service occupations in June 2005 and over 2,400 in mechanical</li> </ul>	<ul style="list-style-type: none"> <li>• Over 16,700 in customer service occupations in June 2005, over 17,500 in mechanical, and about 11,000 in production</li> </ul>	<ul style="list-style-type: none"> <li>• Largest number of unemployed tend to have less skills</li> </ul>
Underemployed	<ul style="list-style-type: none"> <li>• Estimated 11,671 underemployed workers in 2004, 2% of total workforce</li> </ul>	<ul style="list-style-type: none"> <li>• Estimated 109,551 underemployed in 2004, 3.1% of total workforce</li> </ul>	<ul style="list-style-type: none"> <li>• Reflects a mismatch between a region's workers and its jobs.</li> </ul>

<sup>4</sup> National comparisons are not provided in this report for the industry and cluster analysis.



INDICATOR	RICHMOND MSA	STATE COMPARISON	WHY IS IT IMPORTANT?
Demand Occupations	<ul style="list-style-type: none"> <li>• Fastest projected growth from 2004-2013 is medical assistants; network systems and data communication analysts; physician assistants</li> </ul>	<ul style="list-style-type: none"> <li>• Fastest projected growth from 2004-2013 is medical assistants; network systems and data communication analysts; physician assistants</li> </ul>	<ul style="list-style-type: none"> <li>• Demand occupations associated with relatively higher skill and is also paid a relatively higher wage than the average.</li> </ul>
Occupation Gaps	<ul style="list-style-type: none"> <li>• Largest shortages in registered nurses, home health aids, teachers, and security guards</li> <li>• Largest surpluses in stock clerks, secretaries, team assemblers, book keepers</li> </ul>		<ul style="list-style-type: none"> <li>• Individuals should be encouraged to pursue careers in occupations with expected shortages while educators should increase class offerings.</li> <li>• Individuals in occupations with surpluses should consider alternative training to move up in training ladder maps to occupations in demand.</li> </ul>
BRAC 2005	<ul style="list-style-type: none"> <li>• Fort Lee is expected to double gaining more than 7,000 military and civilian workers</li> </ul>		<ul style="list-style-type: none"> <li>• Will create ripple effect of new jobs, particularly customer service industries.</li> <li>• Exiting military can fill some occupations gaps. 2002-2003, 13 exiting military located in the MSA with 'police and sheriff's patrol officers' skills</li> </ul>

INDICATOR	RICHMOND MSA	WHY IS IT IMPORTANT?
<b>EDUCATIONAL ATTAINMENT<sup>5</sup></b>		
Post Secondary Education Demand	<ul style="list-style-type: none"> <li>• Largest demand is health care services with an annual average of 1,385 from 2005 to 2013</li> <li>• Second largest demand is business, management, marketing and related with annual 1,353</li> <li>• Other disciplines with high demand are education, construction trades, and computer science</li> </ul>	<ul style="list-style-type: none"> <li>• 74% of health care services demand requires associate degrees and certificates; remainder for bachelors.</li> <li>• 90% of business, management, marketing, and related demand requires bachelor's degree.</li> </ul>
Post Secondary Education Capacity	<ul style="list-style-type: none"> <li>• 19% of degree award in 2002-2003 academic year were in health science programs, 15% in business, management, marketing and related</li> <li>• By degree awards, largest is business administration in 2002-2003 followed by nursing.</li> </ul>	<ul style="list-style-type: none"> <li>• 22 post-secondary institutions in the MSA offer a wide variety of educational options for residents and businesses</li> </ul>
Post Secondary Education Gaps	<ul style="list-style-type: none"> <li>• Shortages of graduates exist for (top 5) general construction trades, personal and culinary services, general mechanics and repairers, education, and engineering.</li> <li>• Surplus or a lack of jobs for (top 5) social science, visual and performing arts, computer and information sciences and support services, general health services, liberal arts and sciences</li> <li>• On average, there are 457 per year more graduates in social science than the MSA can absorb.</li> </ul>	<ul style="list-style-type: none"> <li>• Comparing market demand with degrees awarded in the MSA identifies disciplines whose needs are not met by institutions in the region as well as programs with no confirmed market demand for degree awards.</li> <li>• The region has strong needs for associate or vocational training programs such as construction trade, mechanics, and repair.</li> </ul>

<sup>5</sup> State comparisons are not provided in this report for educational demand, capacity, and gaps.



INDICATOR	RICHMOND MSA	WHY IS IT IMPORTANT?
K-12 Academic Performance	<ul style="list-style-type: none"> <li>• 77% of 8<sup>th</sup> graders passed math SOL in 2004 and 77% passed the writing SOL with great variation by locality.</li> <li>• High school drop-out rate was 3.0% in 2003-2004 academic year with great variation by locality.</li> </ul>	<ul style="list-style-type: none"> <li>• Skills of the emerging workforce can be gauged by the passing rates of student SOL tests.</li> <li>• Drop-out rate also reflects quality of workforce.</li> <li>• Adverse results in either indicator suggest more students will enter the lower skill and income end of the labor market less prepared and employers may need to invest in training.</li> </ul>

## 2. Introduction

As international trade remains an integral force in the national economy, knowledge—the long-standing competitive advantage of U.S. firms—is becoming more important to the workforce as it competes in a global labor market. However, the transformation of the U.S. economy toward higher-skilled jobs has led to significant job loss as firms have moved lower-skilled manufacturing jobs offshore to take advantage of much lower wages. These trends, which are also affecting the Richmond metropolitan area (MSA), will continue and most likely accelerate.

An understanding of the state of the Richmond MSA workforce is important in several respects. First, workers are Richmond's most important asset. In today's economy, firms are attracted to regions that possess the skilled workers they need. To increase the probability of attracting firms, economic development officials need to understand the skill sets of the Richmond MSA labor pool. Second, continued churn in the economy causes some skills to become obsolete and others to increase in demand. Workforce officials, students, and incumbent and dislocated workers will benefit from understanding occupational demand shifts, which can facilitate rational decision-making about potential investments in training and education. Finally, educators should understand the required skills of the Richmond MSA industry base so that they can select training programs that equip the workforce to support that base.

With that as a backdrop, the Greater Richmond Chamber of Commerce, the Greater Richmond Partnership, J. Sargeant Reynolds Community College, and John Tyler Community College contracted with Chmura Economics & Analytics (CEA) to prepare the "State of Workforce in the Richmond Metropolitan Area." The deliverables were designed to meet these objectives:

1. to benchmark the current industry and workforce base of the region, including their structure and trend;
2. to identify potential gaps in terms of workers and educational requirements, thus providing directions for improvement;
3. to propose policy implications; and
4. to provide a document that can be updated, from a process-platform perspective.

The state of the workforce for the Richmond MSA is investigated from the perspective of supply and demand by addressing the following four broad views: demographics, industries, occupations, and education. Section 3 describes the demographic trends of the region, including population growth, diversity, educational attainment, and the emerging workforce. Section 4 looks at the industry clusters as well as the strengths and weaknesses of the region's industries. Sections 3 and 4 provide a general background that leads to Section 5 with an in-depth analysis of the

region's workforce from a supply perspective. Finally, Section 6 analyzes whether the region's educational system adequately meets the needs of the workforce.

### **3. Demographics**

The Richmond MSA demographics reflect a workforce that is growing, diversified, and well-educated. The benefit of the well-educated population is evident in the relatively low poverty rate of the Richmond MSA when compared with the nation as well as the relatively high percentage of first-time workers who have earned a college degree. A weakness and potential threat to the Richmond MSA is its high crime rate when compared with the state. This crime is highly concentrated with about half of the MSA's violent crime occurring in the City of Richmond. Not surprisingly, crime and high school attainment are correlated; and the education levels of the residents in the City of Richmond are low compared with the rest of the Richmond MSA.

The lack of affordable, readily available public transportation in some of the suburbs that have become more populated has restricted the movement of the workforce in these geographical areas. Consequently, a barrier has been constructed that limits qualified applicant pools by restricting the ability of some low-income earners to travel to areas where job opportunities are greater. Providing a comprehensive public transportation system is an opportunity for the Richmond MSA to expand its workforce pool for individuals and firms.

Finally, the demographic section of this report shows that averages can be misleading. Population continues to grow most rapidly in the third tier around the central cities while population is declining in the cities of Richmond and Petersburg. Educational attainment is lower while poverty and crime are higher in the inner cities. Net immigration of foreigners is small in percentage terms when compared with the state; but Henrico, Chesterfield, and the City of Richmond see significant foreign-born net immigration each year that reveals a need for "English as a second language" and other cultural assimilation classes.

#### **3.1. Population Growth**

Population growth is an important indicator of an expanding economy and of vibrant communities. Population gains coupled with productivity growth causes an economy to grow and living standards to rise. The influx of population into an area stimulates the housing market, retail business, and overall consumption resulting in a larger tax base for the community.



As the third largest metro area in the state, the demographics in Richmond represent a growing and diverse region.<sup>6</sup> The population in the Richmond MSA reached 1.154 million in 2004 (50<sup>th</sup> largest in the nation) compared with 1.609 million in the Hampton Roads MSA and 2.362 million in the Northern Virginia MSA according to Weldon Cooper Center for Public Service. Over the ten years from 1990 through 2000, population in the Richmond MSA grew by 15.1%—faster than the state (14.4%) and nation (13.1%) over the same period. However, during the subsequent decade, from 2000 through 2004, the population growth in the Richmond MSA lagged slightly behind the state and national average (Table 3.1). By 2010, the Richmond MSA population is projected to grow to about 1.233 million people according to the Virginia Employment Commission—still 0.426 million below the projected size of Hampton Roads.

**Table 3.1: Richmond MSA Total Population and Growth**

	2000	2004 Estimate	Annual Growth '00-'04
Amelia	11,400	11,929	1.14%
Caroline	22,121	24,019	2.08%
Charles City	6,926	7,120	0.69%
Chesterfield	259,903	282,925	2.14%
Colonial Heights	16,897	17,511	0.90%
Cumberland	9,017	9,178	0.44%
Dinwiddie	24,533	25,173	0.65%
Goochland	16,863	18,753	2.69%
Hanover	86,320	96,054	2.71%
Henrico	262,300	276,479	1.32%
Hopewell	22,354	22,369	0.02%
King and Queen	6,630	6,775	0.54%
King William	13,146	14,334	2.19%
Louisa	25,627	28,802	2.96%
New Kent	13,462	15,552	3.67%
Petersburg	33,740	32,757	-0.74%
Powhatan	22,377	25,866	3.69%
Prince George	33,047	34,313	0.94%
Richmond	197,790	192,494	-0.68%
Sussex	12,504	11,914	-1.20%
Richmond MSA	1,096,957	1,154,317	1.28%
Virginia	7,078,515	7,459,827	1.32%
United States	281,421,906	285,691,501	1.52%

Source: US Census Bureau and Weldon Cooper Center for Public Service

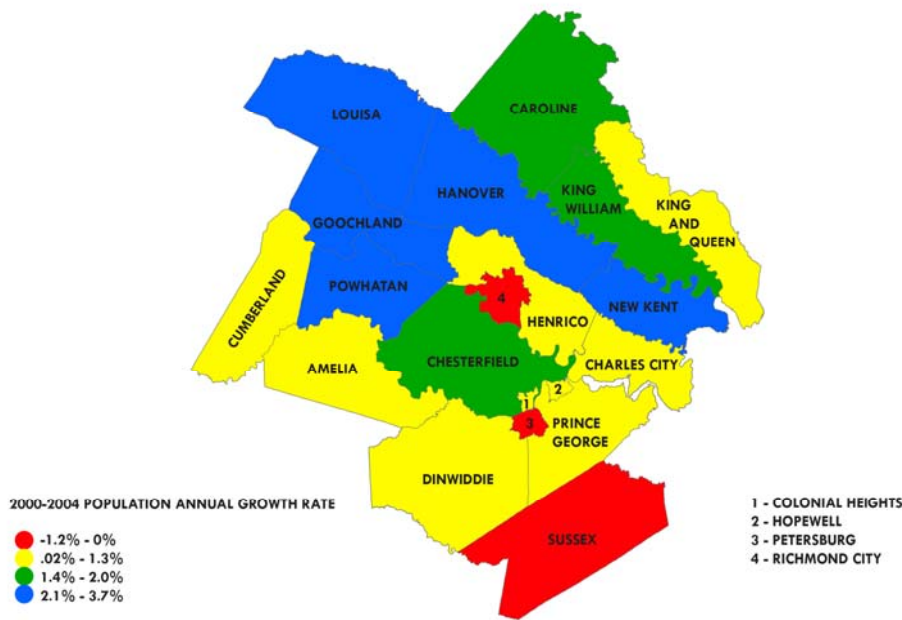
<sup>6</sup> Appendix 7 contains selected statistics that compare the Richmond MSA with the peer MSAs of the Greater Richmond Partnership: Jacksonville, Nashville-Gastonia-Rock Hill, and Charlotte.



Population size and growth within the Richmond MSA varies greatly by locality. With faster annual average population growth over the last four years, Chesterfield County recently surpassed Henrico County as the largest locality in the Richmond MSA. The next two largest localities are the City of Richmond with 192,494 residents and Hanover County with 96,054 residents.

The fastest population growth in the MSA is taking place in the second ring (shown in blue color on the accompanying map) around the City of Richmond, reflecting the urban sprawl that occurs as a region continues to grow while inner city population declines. From 2000 through 2004, the outlying and smaller suburban counties of New Kent, Louisa, Hanover, and Goochland grew the fastest. The growth for inner suburbs such as Henrico County moderated.

**Figure 1: Population Growth in Richmond MSA by Locality**



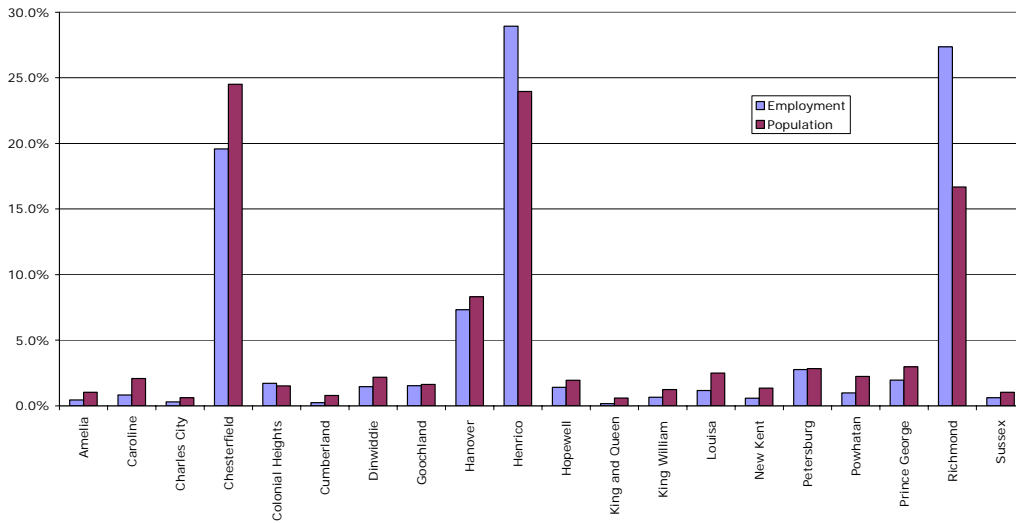
Source: Richmond Chamber of Commerce

The living and working patterns of growing metropolitan areas often lead to increased congestion and the need for public transportation as noted in the next section. In 2004, 65% of the people in the Richmond MSA lived in Henrico County, Chesterfield County, or the City of Richmond.



However, 76% of the workers in the MSA work at firms located in these same two counties and city.

Chart 3.1: Population By Place of Residence and Employment by Place of Work, 2004 Percentages of Total



Sources: U.S. Census and Virginia Employment Commission

### 3.2. Commuting Patterns

Commuting patterns shown in Chart 3.2 reflect the location of residents and businesses in the MSA. Jobs are concentrated in three locations: City of Richmond, Henrico County, and Chesterfield County. In terms of commuting patterns, at nearly 60%, the City of Richmond has the greatest percentage of people who work and live in the same locality. At 55%, Henrico is close behind, in terms of people who live and work in the same locality and is followed by Chesterfield at 46%. In the remaining counties and cities, more than half of the residents travel to other localities to work. This is particularly true of the counties furthest from the City of Richmond—most of these residents commute out of their counties to work as the job opportunities at hand are scarcer.

Well-designed public transit and road systems increase the mobility of the workforce and reduce commuting time. Although national data on public transportation and commuting times indicate that the population of the Richmond MSA is underserved regarding public transportation when compared to the nation, commuting times in the region are shorter by comparison.

An affordable, reliable, and far-reaching public transit system enables workers, particularly those who are in lower income jobs, to cost effectively travel further thereby increasing the scope



of job opportunities and holding down wage costs for employers who are able to access a larger pool of workers. The Richmond area is served by the Greater Richmond Transit Company (GRTC), which was incorporated in 1973.<sup>7</sup> Its purpose is to provide public transportation service in the greater Richmond area, and it does so through a fixed-route bus service to the City of Richmond and portions of Henrico and Chesterfield County via a fleet of approximately 180 buses. In addition, the Petersburg Area Transit (PAT) operates 9 routes in the City of Petersburg and partners with GRTC to provide service to John Tyler Community College and the City of Richmond twice daily Monday through Friday.

The limited service area of the GRTC and PAT is not keeping up with the expanding population and employment growth outside of the central cities and is thus restricting workforce opportunities for both individuals and firms. The concentration of the GRTC routes is apparent in the City of Richmond, where 16,218 or 8.2% of the population in 2000 used public transportation (excluding taxicabs) to get to work compared with 5.0% in the nation. In contrast, only about 2.7% of the workers in the Richmond-Petersburg MSA (due to data limitations, Richmond-Petersburg is defined here as the smaller MSA that predates the current MSA)<sup>8</sup> use public transportation when traveling to work;<sup>9</sup> about 84% drive alone, 8.3% carpool, and 2.7% use some other means such as walking, compared with 76.3%, 11.2%, and 4.3% in the nation respectively. The remaining 3.2% work from home in the Richmond-Petersburg MSA compared with 2.3% in the nation.

Commuting times indicate congestion in the Richmond MSA is not as severe as other places in the nation or state. Among those who commuted to work in 2004 in the Richmond-Petersburg MSA, it took an average 23.5 minutes to arrive at their destination, compared with an average 26.5 minutes in the state and 24.7 in the nation. Despite the short 2 minute difference between the national and Virginia travel time, Virginia ranks 8<sup>th</sup> worst out of all states in longest travel time

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<sup>7</sup> GRTC is a non-profit firm jointly owned by the City of Richmond and Chesterfield County. In fiscal year 2001, GRTC provided approximately 4.8 million miles of service annually via 56 separate routes and provided over 9.7 million trips.

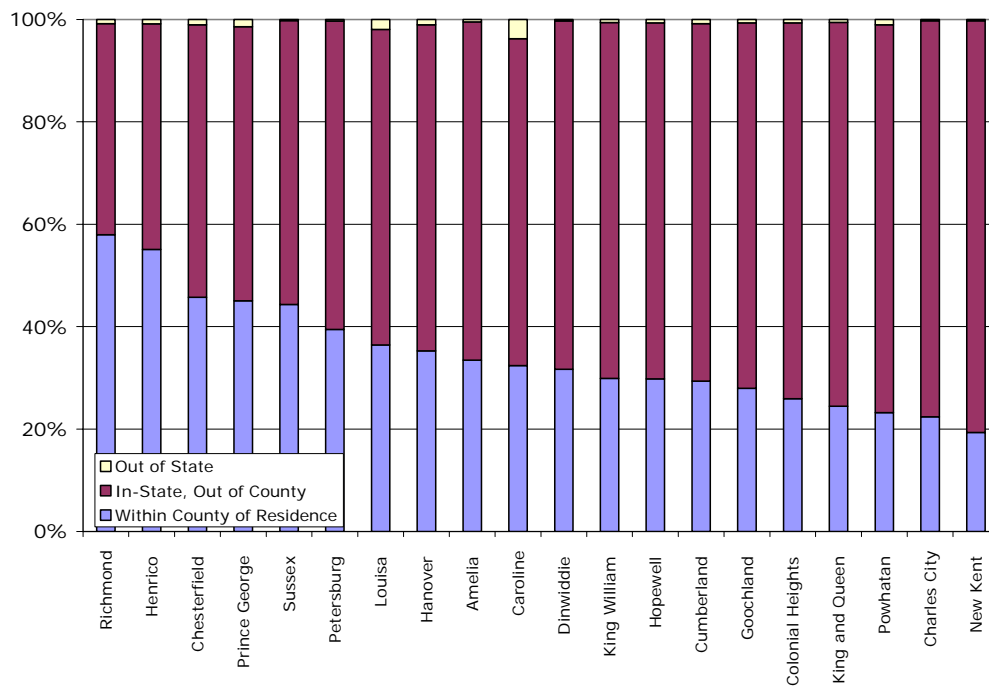
<sup>8</sup> Data for the current definition of the Richmond MSA are not available. The Richmond-Petersburg MSA is fully contained in the current definition of the Richmond MSA. In 2004, the Richmond-Petersburg MSA accounted for approximately 88% of the Richmond MSA population and 96% of its employment. Furthermore, the demographic patterns for the excluded counties are comparable. The following additional counties are found in the broader MSA: Amelia, Caroline, Cumberland, King and Queen, King William, Louisa, Sussex. The source of the Richmond-Petersburg MSA data are the US Census 2004 Community Survey.

<sup>9</sup> 2004 data are not available for the City of Richmond regarding the percentage of the population using public transportation (excluding taxis). However, that figure for the Richmond-Petersburg MSA is 0.8% in 2004 compared with 4.6% in the nation and 3.5% in the state.



to work.<sup>10</sup> Traffic congestion in the Richmond region has not risen to the level of Northern Virginia, where it can seriously undermine the quality of life. The average time to work in 2004 for Prince William County and Fairfax County residents are 39.4 and 30.1 minutes respectively.<sup>11</sup> In fact, Prince William County ranked 4<sup>th</sup> worst in the nation in terms of commuting time. (Appendix 1 identifies the goals, in terms of transportation spending, of the two regional transportation planning groups that serve the Richmond MSA.)

**Chart 3.2: Commuting Patterns, 2000**



Source: U.S. Census

<sup>10</sup> Some of the most populated states such as New York, California, Florida, and Georgia are all in the top 10; only 11 other states are worse than the national average, which is weighted by population.

<sup>11</sup> Source: US Census 2004 Community Survey—this survey provides data on selected cities and counties.



### 3.3. Diversity

The Richmond MSA possesses a diversified population by race. In 2004, 65.6% of the Richmond-Petersburg<sup>12</sup> MSA residents were White; 30.3% were Black; 2.4% were Asian; 0.07% were American Indian and Alaska Native; and 1.3% were some other race.<sup>13</sup> By comparison, 73.8% of Virginia's population was White in 2004 and 19.6% was Black. In the United States, a larger 77.1% of the population were White in 2004 and 12.4% were Black.

While the Richmond-Petersburg MSA had a higher concentration of Blacks than the state in 2004, only 3.1% of its inhabitants were Hispanic<sup>14</sup>—much lower than the 5.8% for the state, and the 14.2% for the nation. By comparison, an estimated 4.0% of the population was Hispanic in Hampton Roads and 6.4% in Northern Virginia. The implication for education is that the need for teaching English as a second language in elementary school is not as great in the Richmond MSA as in some other parts of the state. It is most often in the South and West, especially along the border with Mexico, where the proportion of Hispanics within an MSA exceeds the national level and where teaching English as a second language might be of concern—for example, the San Diego MSA had a 27% Hispanic population, and San Antonio over half, at 52%.

The racial composition of the Richmond MSA population varies greatly by locality as shown in Chart 3.3 (the latest available data at the county and city level is 2000). Colonial Heights possesses the largest proportion of White population while Petersburg contains the lowest.

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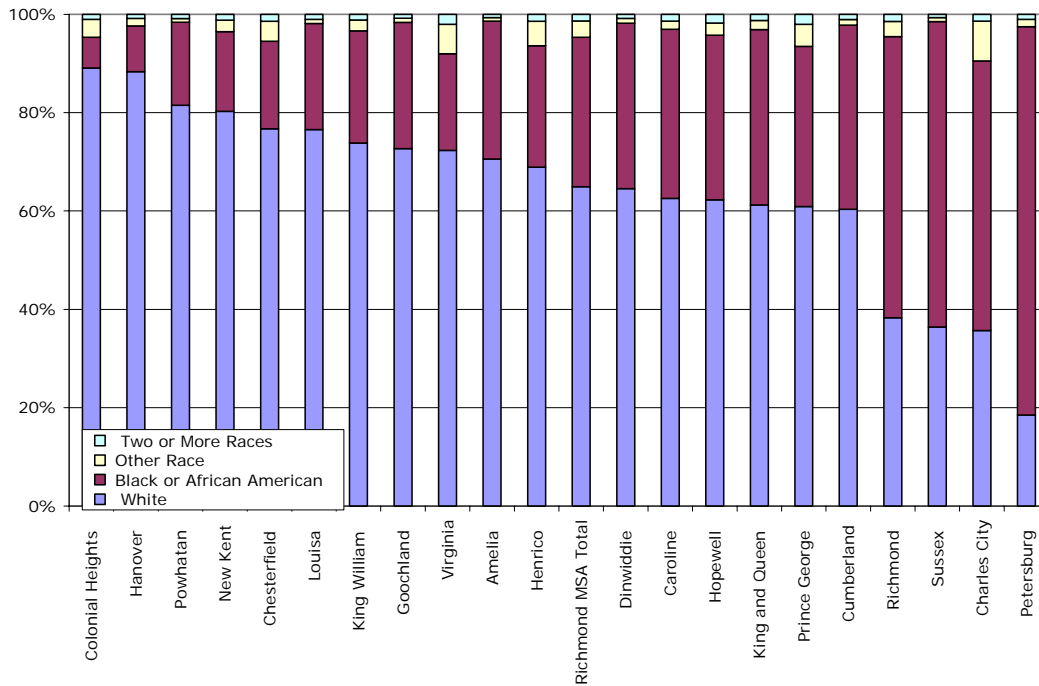
<sup>12</sup> These data for the current definition of the Richmond MSA are not available. Please refer to footnote three.

<sup>13</sup> 2004 data are available for the previous definition of the Richmond-Petersburg MSA, which account for 88% of the population of the new Richmond MSA. Data for the current Richmond MSA indicate the following mix in 2000: 65.8% White, 30.8% Black, 1.9% Asian. 2000 estimates for Virginia show 74.7% White and 19.6% Black.

<sup>14</sup> Hispanics may be of any race and are included in one of the other racial categories.



Chart 3.3: Richmond MSA Race Distribution, 2000



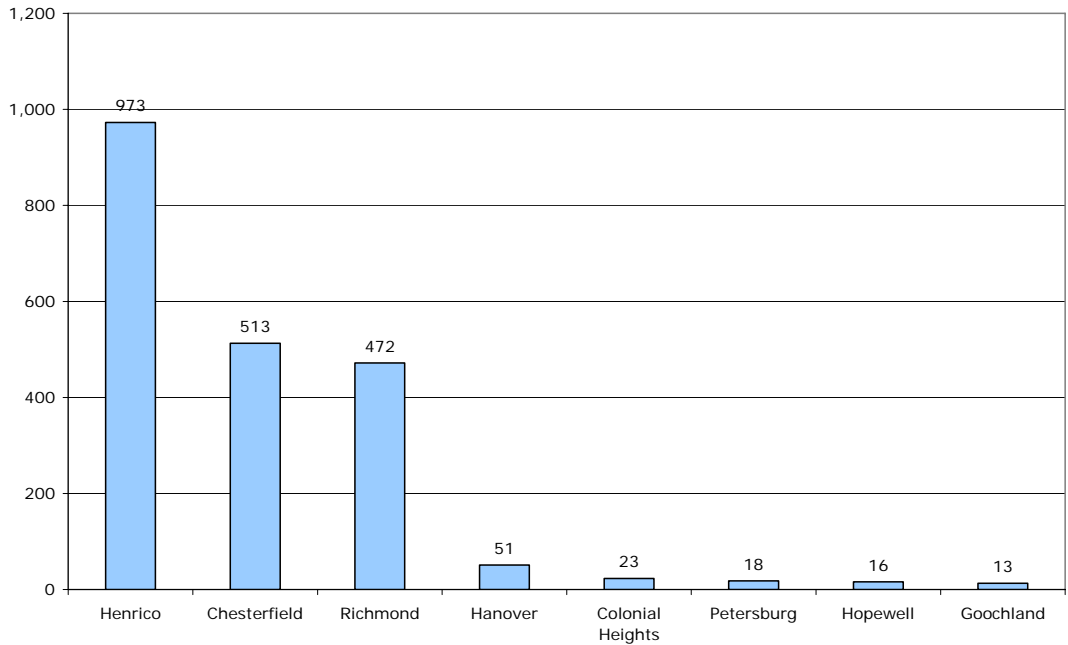
Source: U.S. Census

The number of foreign-born residents in the Richmond MSA also indicates a relatively small need for 'English as a second language' courses in the MSA as a whole but the need for such courses does exist in a few localities according to net immigration figures. Only about 46,000 (4.2%) of the people living in the Richmond MSA in 2000 were foreign born. The percentage of foreign born in the Hampton Roads MSA was 4.5% while a much larger 12.9% in Northern Virginia were foreign born in 2000. The state averaged 8.1% of its population as foreign born in 2000 compared with 11.1% in the nation. More updated information for the smaller Richmond-Petersburg MSA estimates 66,258 foreign born in 2004 or 6.5% of the total population compared with 9.5% in the state and 12.0% in the nation.

Despite the small percentage of foreign-born population in the metropolitan area, Henrico and Chesterfield counties as well as the City of Richmond—the three most populous localities—saw

an average net international migration<sup>15</sup> from 2001 through 2004 of between 472 and 973 people each year. Hindered by stricter national immigration laws, however, net international migration into the Richmond MSA decreased slightly over the last few years from 2,170 in 2001 to 2,097 in 2004. Chart 3.4 shows net international migration for localities in the MSA that had an average net change of 13 or more people per year from 2001 through 2004.

**Chart 3.4: 2001-2004 Average Net International Migration**



Source: U.S. Census

The implications of the immigration into the Richmond labor market are tales of two extremes. Large employers of the region such as Capital One bring to Richmond many well-educated, highly-skilled professional immigrants increasing the skills and wage levels of the region. On the other hand, there are also immigrants who perform low-skill jobs such as landscaping,

<sup>15</sup> In its simplest form, net international migration is defined as any movement across U.S. borders. The net international component combines three parts: (1) net migration of the foreign-born, (2) emigration of natives, and (3) net movement from Puerto Rico to the United States.



construction, and consumer services. Some immigrants do not speak English very well and may need additional help in language and skills training from the region's public schools and community colleges. As noted earlier, this issue is not as pronounced in the Richmond MSA as in other parts of the state. In 2004, only 2.9% of the Richmond-Petersburg MSA population was estimated to speak English 'less than very well,' compared to 5.4% statewide and 8.4% nationally.<sup>16</sup> In Northern Virginia, where many of the immigrants first locate in the state, 6.8% of the population speaks English 'less than very well' in 2004.<sup>17</sup>

### 3.4. Aging Population

The generational mix of the Richmond MSA is consistent with the nationwide trend representing an aging population. In 2000, 27.8% of the population were under 18 years old in the Richmond MSA and 11.4% were 65 years or older. More updated information for the smaller Richmond-Petersburg MSA estimates 10.9% of the population was 65 years or older in 2004, compared with 11.1% in the state and 12.0% in the nation. By 2020, the 65 and older population is expected to be 17% of the total population, and this percentage is projected to rise to 20% in 2030. In the nation, the 65 and older population is expected to account for 16.3% of the population by 2020 and 19.6% by 2030; the state projections are 15.8% and 18.8% respectively.

The aging population may have significant implications for businesses because of higher medical costs and potential slowdowns in productivity. As the workforce ages and retires, businesses will see their portion of healthcare costs and pensions increase significantly. In addition, productivity growth may slow if younger workers are not adequately trained to replace retirees.

Manufacturing industries in Virginia are expected to be impacted the most by the aging population as many of those industries have higher percentages of workers 55 years and older in 2002.<sup>18</sup> Education is another sector in our state with a high proportion of older workers—19.3% of the workers are 55 and older. As older teachers retire, local governments will likely see overall teaching expenses drop initially as younger and less experienced teachers replace the retirees.

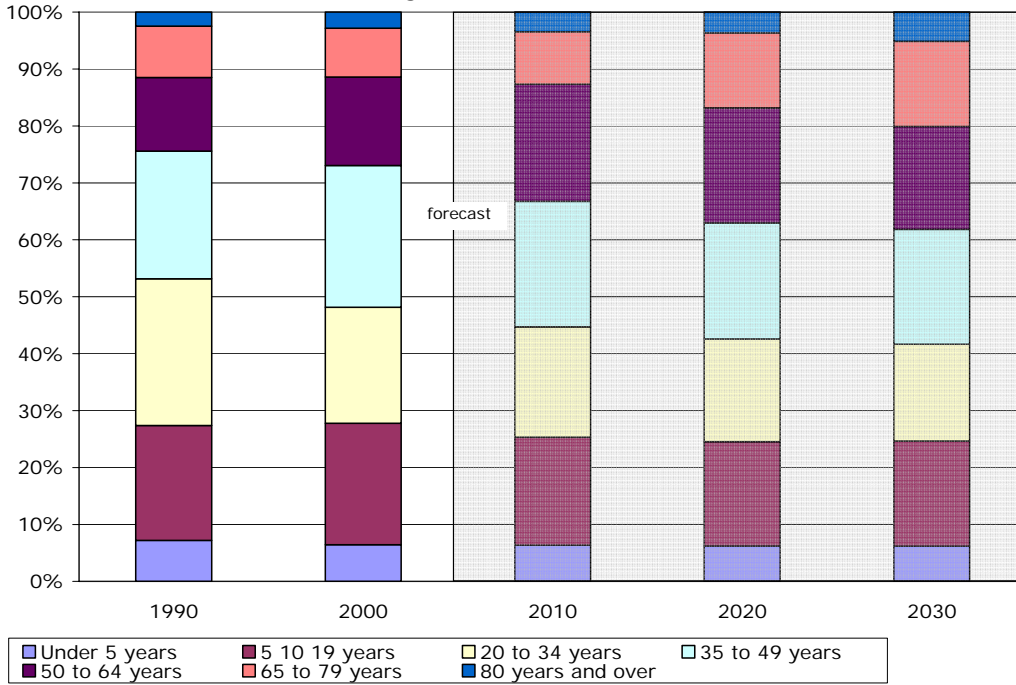
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<sup>16</sup> County data are only available for 2000. At that time, 2.8% of the population in the City of Richmond said they spoke English 'less than very well,' compared with 2.9% in Chesterfield, 3.7% in Henrico, and 4.6% in the state.

<sup>17</sup> Responses on the ability to speak English represent the person's own perception of his or her ability. In addition, because Census questionnaires are usually completed by one household member, the responses may represent the perception of another household member.

<sup>18</sup> Source: *A Profile of Older Workers in Virginia*, U.S. Census Bureau. This study, based on 2002 data, indicates that 8 of the top 10 industries employing older workers are the following manufacturing industries: textile mill products, apparel, paper/allied product, fabricated metal products, chemicals, primary metals, measuring/analyzing instruments, and furniture/fixtures.

**Chart 3.5: Age Distribution, Richmond MSA**

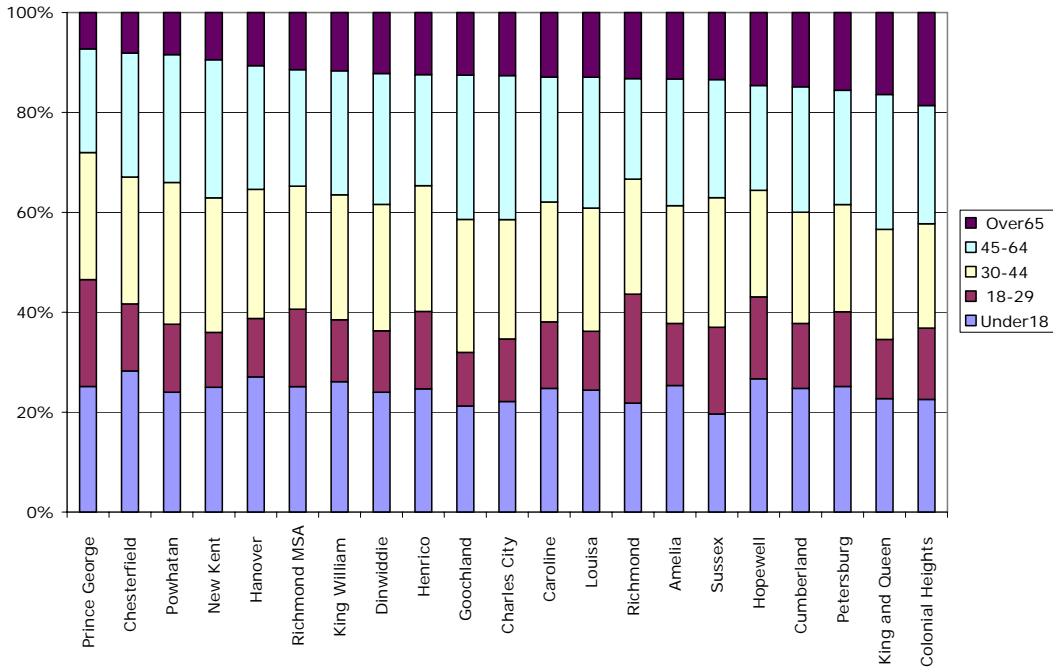


Source: U.S. Census

Communities within the Richmond MSA will face the challenges of an aging population to differing degrees. (See Chart 3.6 where the latest county and city data available are from Census 2000). In the cities of Colonial Heights and Petersburg and King and Queen County the aging population is already a reality—between 16% and 19% of residents were aged 65 and older in 2000 compared with 11.4% in the Richmond MSA. To the extent that this is the result of an exodus of young people due to the lack of job opportunity, it can make those localities less competitive in their current economic development efforts. Instead, for counties like Chesterfield, where 28% of its population was under 18 in 2000, the opportunity is to adequately prepare the emerging workforce for future demand occupations.



Chart 3.6: Age Distribution by Localities, 2000



Source: U.S. Census

### 3.5. First-Time Workers

The emerging workforce is the projected number of workers expected to enter the labor force for the first time. The three major pipelines that yield emerging workers are individuals graduating from high school,<sup>19</sup> 2-year colleges or post-secondary vocational programs, and colleges and universities.<sup>20</sup> CEA estimates that almost 18,900 workers will enter the Richmond MSA labor

<sup>19</sup> People with less than high school diploma are included in the high school pipeline.

<sup>20</sup> Population growth is the main driver of the high school pipeline and the 2-year diploma numbers. However, the algorithm to identify the number with a 4-year diploma is more complicated, including, for example, net migration of first-time workers with college degrees. Specifically, the first-time workforce figures incorporate a projection of the number of high school aged population who will enroll in two-year colleges, four-year universities, or work immediately. Those who enrolled in 4-year colleges but do not graduate are grouped in the 2-year category. Students who enroll in 2-year colleges but do not graduate are grouped in the high school diploma category. Recent 2-year and 4-year graduation rates are used to calculate the number of graduates: 45% for



market each year through 2010. In contrast, the total emerging workforce in the Richmond MSA is expected to decrease slightly every year through 2010, opposite the gradual increase expected in the entire state. At the same time, an average of about 12,300<sup>21</sup> people in the Richmond MSA will turn 65 and potentially retire each year through 2010. Consequently, the Richmond MSA is expected to experience a net increase of about 6,600 workers each year through 2010, or more if those currently 65 and older postpone retirement.

Table 3.2: Estimated First-Time Workers by Education Attainment Levels								
	2004	2005	2006	2007	2008	2009	2010	Change '04-'10
<b>Totals</b>								
<b>Richmond MSA</b>								
High School	11,368	11,331	11,296	11,267	11,240	11,208	11,178	-190
2-year Diploma	1,888	1,879	1,871	1,865	1,859	1,852	1,845	-43
4-year Diploma	5,734	5,736	5,738	5,742	5,745	5,750	5,757	23
Total	18,990	18,946	18,905	18,874	18,843	18,810	18,780	-210
<b>% change</b>								
<b>Richmond MSA</b>								
High School	NA	-0.3%	-0.3%	-0.3%	-0.2%	-0.3%	-0.3%	-1.7%
2-year Diploma	NA	-0.5%	-0.4%	-0.3%	-0.3%	-0.4%	-0.4%	-2.3%
4-year Diploma	NA	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.4%
Total	NA	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-1.1%
<b>% change</b>								
<b>Virginia</b>								
High School	NA	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.1%	-0.2%
2-year Diploma	NA	-0.5%	-0.5%	-0.4%	-0.4%	-0.3%	-0.3%	-2.3%
4-year Diploma	NA	0.6%	0.6%	0.7%	0.7%	0.7%	0.7%	4.0%
Total	NA	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.9%

Source: JobsEQ™, Patent Pending

As is noted in the next section on educational attainment, the educational level of Richmond MSA first-time workers is consistent with that of the state.<sup>22</sup> This fact serves the region well in attracting high-tech firms that add wealth to the area. About 59.8% of the 2005 projected emerging workforce is expected to have obtained only high school diplomas, while 30.3% are expected to possess four-year degrees. These ratios are expected to be fairly consistent into the foreseeable future. Overall, the emerging workforce is expected to decrease by 1.1% in Richmond through 2010, while it is expected to increase by 0.9% at the state level. The percentage of the

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2-year colleges (Virginia Community College System Report) and 60% for four-year institutions (National College Association of America 2003 estimate).

<sup>21</sup> In 2000 40,690 people were aged 60-64, while in 2010, 73,425 are estimated to be 60-64 years old. The number of people potentially entering retirement assumes a uniform distribution between ages, and a constant (linear) growth rate, i.e. 8,138 aged 64 in 2000, 8,633 in 2001, etc.

<sup>22</sup> Data are not available at the national level.



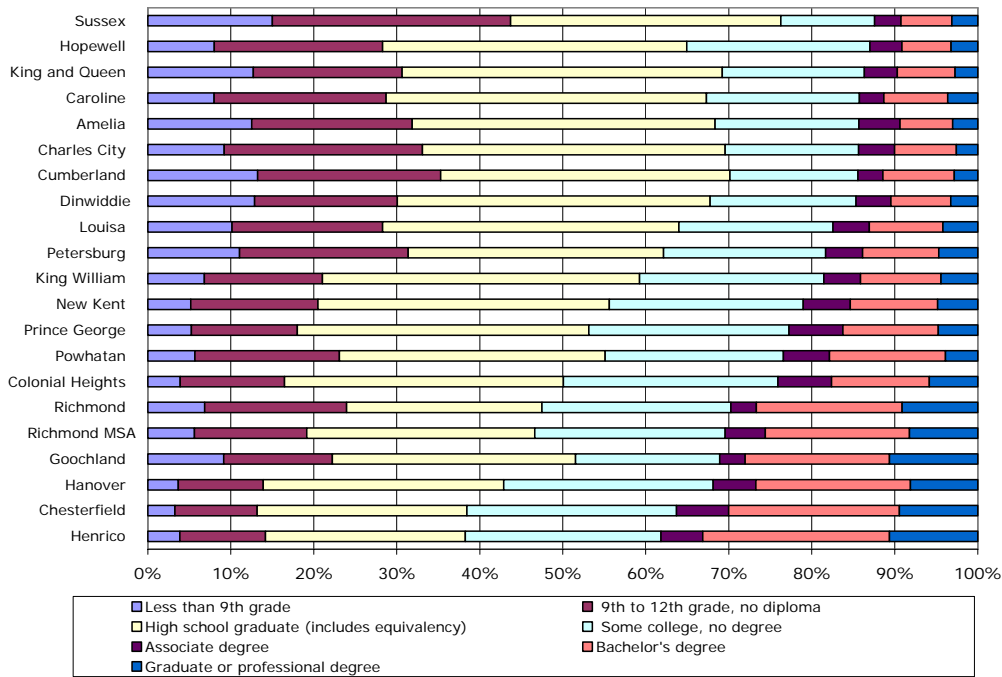
emerging workforce with a 4-year degree is expected to rise by 0.4% in the Richmond MSA from 2004 through 2010, this pace is small compared with the 4.0% expected increase in the state.

### 3.6. Educational Attainment

Educational attainment of the Richmond-Petersburg MSA population is similar to the state average. Eighty-five percent of the Richmond-Petersburg MSA residents aged 25 and over in 2004 had at least a high school diploma or equivalent compared with 85% in the state, and 84% in the nation; 33% had a bachelor's degree or higher (33% state, 27% U.S.). Among those 16 to 19 years old, 9% in the Richmond MSA did not complete high school (7% in the state, 8% U.S.).

The localities with the highest percentage of people with more than high school degrees are Henrico, Chesterfield, and Hanover. The least educated, based on the percentage of the population who did not finish high school are Cumberland, Charles City, and Amelia (see Chart 3.7 where latest data by locality are for 2000).

**Chart 3.7: Education Attainment Distribution for People 18 years or Older, 2000**



Source: U.S. Census



### 3.7. Poverty

Poverty rates<sup>23</sup> are negatively correlated with educational attainment.<sup>24</sup> Since 1997, the poverty rates of the Richmond MSA, along with those of Virginia and the nation, steadily decreased but inched up in 2001 and 2002 due to the 2001 recession. In 2004, the Census Bureau estimated that 7.1% of all people<sup>25</sup> in the Richmond-Petersburg MSA were living in poverty compared with 9.5% in Virginia and 13.1% in the United States.

	1997	1998	1999	2000	2001	2002	2003	2004
Richmond MSA	12.0%	10.6%	9.1%	8.6%	8.7%	9.8%	9.5%*	7.1%*
Virginia	11.6%	10.2%	9.0%	9.2%	9.3%	9.9%	9.0%	9.5%
US	13.3%	12.7%	11.9%	12.2%	12.1%	12.4%	12.7%	13.1%

Source: US Census Note: \* indicates Richmond-Petersburg estimate, all others are current Richmond MSA

As with other indicators, there are large disparities in poverty among the localities in the Richmond MSA. In 2002 (latest data Census provides for poverty at the county level), the cities of Richmond, Petersburg, and Hopewell as well as the county of Sussex had the highest poverty rates in the region—well above the state average of 9.6%. In contrast, poverty does not appear to be a serious issue for the counties of Hanover, Powhatan and New Kent where the poverty rates hovered around 5%.

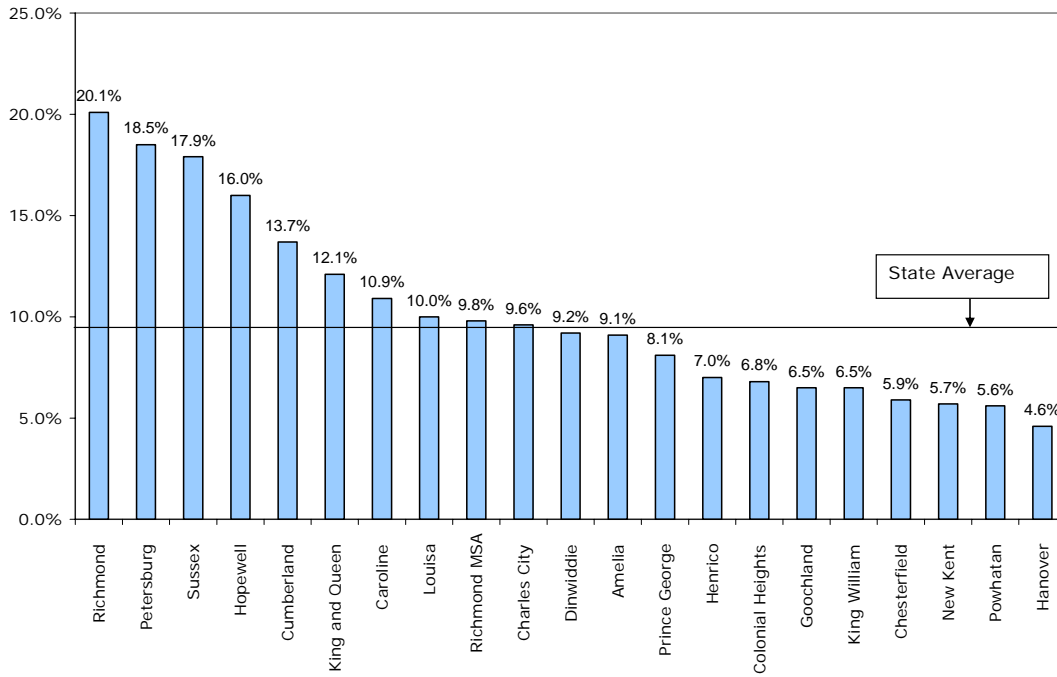
<sup>23</sup> The Census Bureau uses a set of money income thresholds that vary by family size and composition to define poverty. If the total income for a family or unrelated individuals living together falls below the relevant poverty threshold, then the family or unrelated individuals are classified as being "below the poverty level." Unless otherwise noted, the poverty rate is defined in this study as the percentage of population living under poverty rather than the percentage of households. Census does not account for cost of living differences when identifying the poverty level by geographic region.

<sup>24</sup> Poverty rates are negatively correlated with the education attainment of a locality, especially the percentage of population with high school degrees. Based on 2000 data, the correlation coefficient is -0.21 for all Virginia localities.

<sup>25</sup> This excludes the population living in institutions, college dormitories, and other group quarters.



**Chart 3.8: Poverty Rates, 2002**

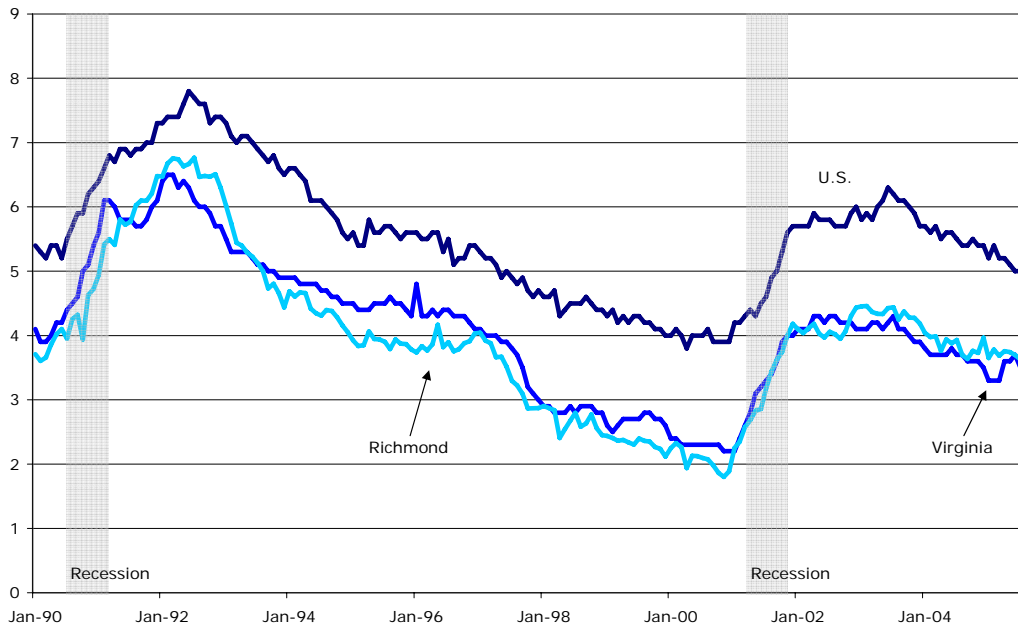


Source: U.S. Census

### 3.8. Unemployment Rate

The unemployment rate in the Richmond MSA has remained relatively low since 1990 and has followed the same pattern as the state. As of August 2005, the seasonally adjusted unemployment rate for both the Richmond MSA and the state was 3.7%. The national unemployment rate in August 2005 stood at 4.9%.

Chart 3.9 Unemployment Rate



Source: Bureau of Labor Statistics.

By locality, the unemployment rates in the Richmond MSA for July 2005 ranged from 2.8% (not seasonally adjusted) in Goochland, Hanover, New Kent, and Powhatan to 6.8% in Petersburg (see Table 3.4). By comparison, the unemployment rate for Virginia was 3.5% (not seasonally adjusted). The unemployment rate of roughly half of the counties and cities in the Richmond MSA were below the state rate in July.



**Table 3.4: Unemployment Rates, July 2005**

County/City	Unemployment Rate
Amelia	3.4
Caroline	3.8
Charles City	3.8
Chesterfield	3.0
Cumberland	3.6
Dinwiddie	4.0
Goochland	2.8
Hanover	2.8
Henrico	3.3
King and Queen	4.1
King William	3.2
Louisa	3.3
New Kent	2.8
Powhatan	2.8
Prince George	4.2
Sussex	6.1
Colonial Heights	3.8
Hopewell	5.5
Petersburg	6.8
Richmond	5.3
Virginia	3.5
Note: These rates are not seasonally adjusted.	
Source: Bureau of Labor Statistics	

### 3.9. Crime

Crime rates can be a deterrent to business expansion and can influence workers decisions to work or live in particular localities. In addition, some studies show that increased education is also tied to lower crime rates.<sup>26</sup> Based on a cursory review of the educational levels in the Richmond MSA and its localities, the same correlation holds true for this region. According to the Federal

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<sup>26</sup> One study found, for example, that completing high school reduces the probability of incarceration by about 0.76 percentage points for whites and 3.4 percentage points for blacks. Source: Lance Lochner and Enrico Moretti, November 2001, "The Effect of Education on Crime: Evidence from Prison Inmates Arrests, and Self-Reports," National Bureau of Economic Research Working Paper Number 8605.

Bureau of Investigation (FBI) Uniform Crime Reports, the overall crime index (number of total reported violent crimes and property crimes per 100,000 inhabitants) in 2003 (latest data available) was 4,458 in the Richmond MSA<sup>27</sup> compared with 2,989 in the entire state. That year, 4,666 violent crimes were reported in the Richmond MSA<sup>28</sup> (index of 410), of which 155 were murders and non-negligent manslaughter, 280 forcible rapes, 1,922 robberies, and 2,309 aggravated assaults. Also, there were over 42,000 property crimes, of which 7,341 were burglaries (about 650 per every 100,000 residents), 4,538 were motor vehicle thefts, and the rest were larceny or theft.

Fifty-three percent of the total MSA violent crimes occurred in the City of Richmond where high school attainment is lower and dropouts more prevalent, as shown in Section 6.4. In 2003, there were 2,474 violent crimes in Richmond (1,237 violent crimes per every 100,000 residents), of which 93 were murders or non-negligent manslaughter, 98 forcible rapes, 1,174 robberies, and 1,109 aggravated assaults. Richmond City's property crimes accounted for about 36% of the MSA total.

Although data by metro area are only available through 2003, the FBI released preliminary 2004 data for large cities in the nation, including the City of Richmond. The preliminary report shows that the City of Richmond 2004 crime index dropped 14.7% to 7,816 crimes per 100,000 residents consisting of 46 murder and manslaughter, 49 forcible rapes, 664 robberies, 573 aggravated assaults, 1354 burglaries, 3954 larceny-thefts, and 1,181 motor vehicle thefts. By comparison, the preliminary national index fell 1.8% to 3,991 in 2004.

As shown in table 3.5, the Richmond MSA experienced more crime on a per capita basis than the Hampton Roads MSA. The table also shows crime data for the four cities of the MSA; it is clear that the City of Richmond has the most reported incidents of violent crime. Counties are safer in terms of violent crimes.<sup>29</sup>

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<sup>27</sup> The FBI uniform crime report for 2004 is expected to be released on October 17. However, the FBI provides a preliminary nationwide report for 2004 with data only on large cities.

<sup>28</sup> Data reported represents 99% of the MSA by population. The FBI provides estimates for the total area, but the number of crimes increased only very slightly. In addition to 2003, 2002 data were also available but there were no significant differences in the two years.

<sup>29</sup> County level data are more limited, as not all report their data to the FBI. The latest county level crime indexes available are from 2000 and only for the following counties in the Richmond MSA: Chesterfield County with 2,945 crimes per 100,000; Hanover County with 583 crimes per 100,000; and Henrico County with 4,197 crimes per 100,000.



**Table 3.5: Crime Rates in 2003, Offenses per 100,000 inhabitants**

	Crime Index	Violent crime				Property crime		
		Murder and man-slaughter	Forcible rape	Robbery	Aggravated assault	Burglary	Larceny-theft	Motor vehicle theft
Virginia	2,979.8	5.6	24.0	90.3	155.9	391.5	2,070.0	242.5
Richmond MSA	4,457.8	13.6	24.7	169.0	203.6	646.3	3,001.1*	399.5
Hampton Roads MSA	4,213.9	8.0	34.3	162.0	230.7	655.6*	2,799.5	323.8
Richmond	8,964.9	46.5	49.0	587.1	554.6	1,408.2	4963.8*	1,355.7
Petersburg	7,708.1	26.8	65.6	265.4	503.9	1,711.6	4,487.7	647.1
Hopewell	5,562.9	8.8	70.1	140.3	438.4	1,407.2	3,103.6	394.5
Colonial Heights	5,202.5	5.8	23.1	104.2	162.0	451.4	4,299.8	156.3
U.S.	4,063.4	5.7	32.1	142.2	295	740.5	2,414.5	433.4

Source: FBI Uniform Crime Report \*Reflects 2002 data because 2003 data are not available

#### 4. Industry and Cluster Analysis

The type of industries in the Richmond MSA shapes the workforce needs. Consequently, this section on the industries and clusters in the Richmond MSA lays the foundation for the next two sections that analyze the occupational and educational needs of the Richmond MSA.

One of the most important factors driving the Richmond MSA's growth is the composition and cluster of industries. A region comprised of industries producing goods and services that are in demand, will likely grow faster than the average region in terms of employment. Moreover, in an increasingly knowledge-oriented economy, regions whose workforce enables it to attract industries that require high-leveled skill sets will also see strong wage growth.

Employment in the Richmond MSA grew an annual average 1.4% over the last ten years ending with the fourth quarter of 2004—slightly slower than the 1.8% pace of the state and at the same 1.4% as the nation. At \$39,681, annualized average wages in the fourth quarter of 2004 in the Richmond MSA are comparable to those of the state (\$40,592). Furthermore, when Northern Virginia is excluded the average wage of the Richmond MSA is higher than that of the state (\$34,242).

Out of 21 clusters identified in the Richmond MSA, 13 of them are expected to see employment growth averaging 19% or more over the next 10 years. However, those industry clusters in the Richmond MSA vary by employment growth and by the wages they pay. The clusters that are poised to offer the most economic support to the region over the next decade are financial services, chemical, pharmaceutical, and professional services. Although the chemical cluster is

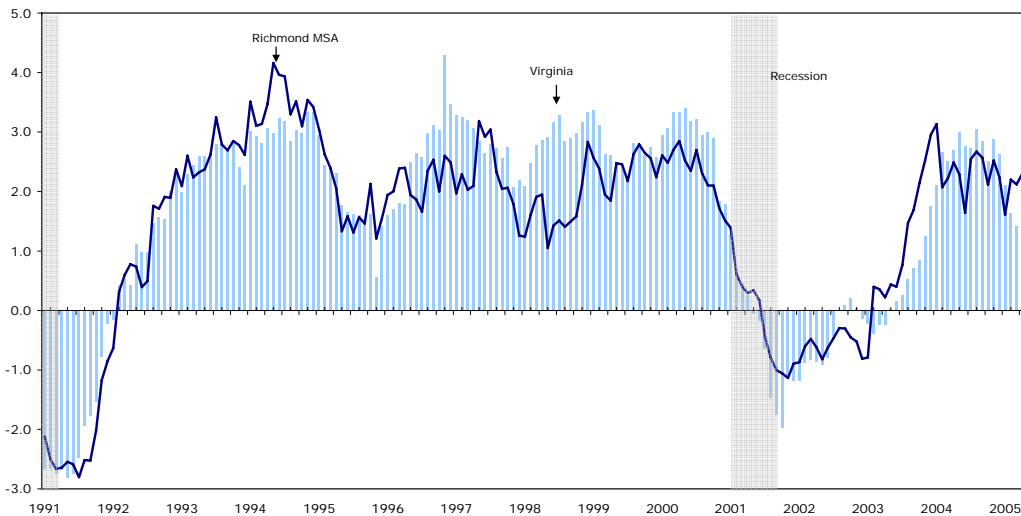


expected to experience a slight decline in employment, output (sales) is expected to grow. By contrast, the only cluster in the Richmond MSA expected to shed more than 1,000 jobs over the next ten years is food manufacturing.

### 4.1. Total Employment

With an estimated nonfarm employment in the Richmond MSA of 614,500 in August 2005, the region ranks as the 3rd largest in the state behind Northern Virginia and Hampton Roads, and the 42<sup>nd</sup> largest MSA in the nation. Employment in the Richmond MSA grew 3.1% over the year ending with August 2005 compared with 1.4% in the state and 1.7% in the nation. Over the last ten years, the Richmond MSA grew at an annual average rate of 1.5% per year and added 88,800 jobs (see Chart 4.1). By comparison, the state grew at an annual average pace of 1.8% (Northern Virginia grew an average 3.1% a year) and the nation advanced 1.3% a year over the same period.

Chart 4.1: Employment Growth in Richmond MSA  
Percentage Change From a Year Ago



Sources: Chmura Economics & Analytics and Virginia Employment Commission



In the remainder of this study, Quarterly Census of Employment and Wages (QCEW)<sup>30</sup> data are used instead of the nonfarm data because of the increased detail that is available for the MSA and particularly the counties and cities.<sup>31</sup> The nonfarm data only include major sectors, such as manufacturing and retail, which are inadequate for an in-depth industry cluster analysis that needs to be performed at the 4-digit North American Industry Classification System (NAICS) level. In addition, occupation gaps and the ensuing education gap analysis also requires 4-digits NAICS codes. The drawback with the QCEW data are that they are generally 6 to 9 months older than the nonfarm data—the latest QCEW data in this report are fourth quarter 2004.

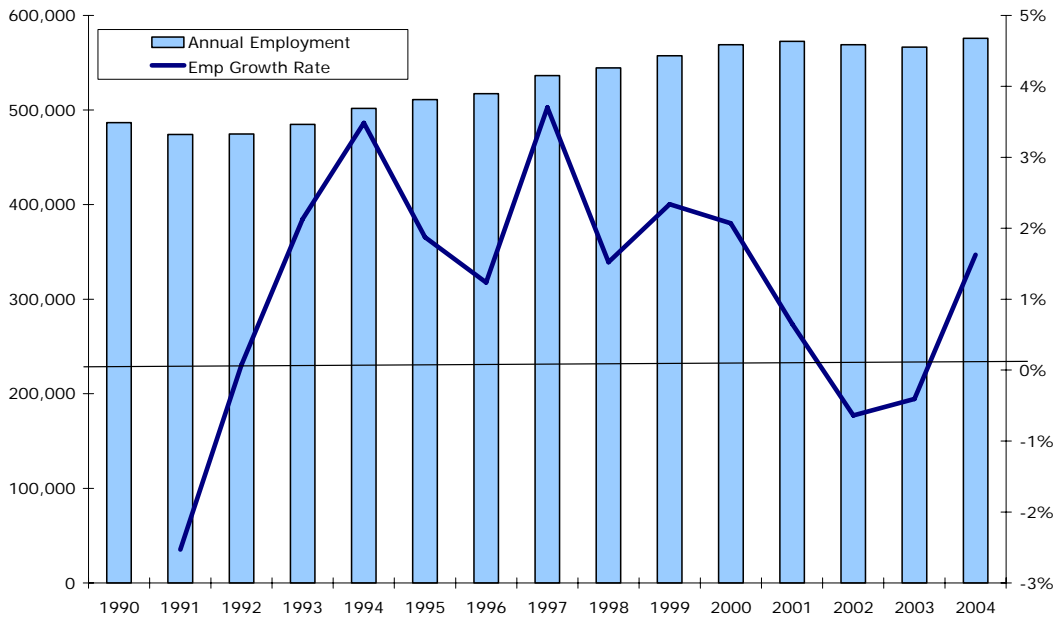
In the fourth quarter of 2004, employment in the Richmond MSA totaled 583,556 according to QCEW. The growth rates of employment with this measure are very similar to those calculated with nonfarm data. Similar to most of the nation, overall employment in the Richmond MSA grew each year from 1990 through 2004, except for periods around the 1991 and 2001 recessions. In the 10 years from 1994 through 2004, the Richmond MSA averaged a 1.4% annual average increase in employment, compared with the state annual average of 1.8% and the 1.4% national growth. The faster pace of growth in the state is driven mostly by Northern Virginia (3.1% per year). Excluding Northern Virginia, Richmond employment outpaced the state average of 1.1% over the last ten years.

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<sup>30</sup> Also known as ES-202 data, which are collected from unemployment insurance filings made by employers on a quarterly basis to the state.

<sup>31</sup> Comparing historic QCEW and nonfarm employment data for the Richmond MSA, the QCEW is consistently around 97% to 98% of the nonfarm numbers. This is not surprising because QCEW does not include most proprietors as well as partners. However, the difference between the two series is small enough to justify using QCEW data to conduct in-depth analysis. Moreover, the QCEW series is used to 'benchmark' the nonfarm data on an annual basis. The nonfarm data are a survey that represents about 30% of the employment in the state.

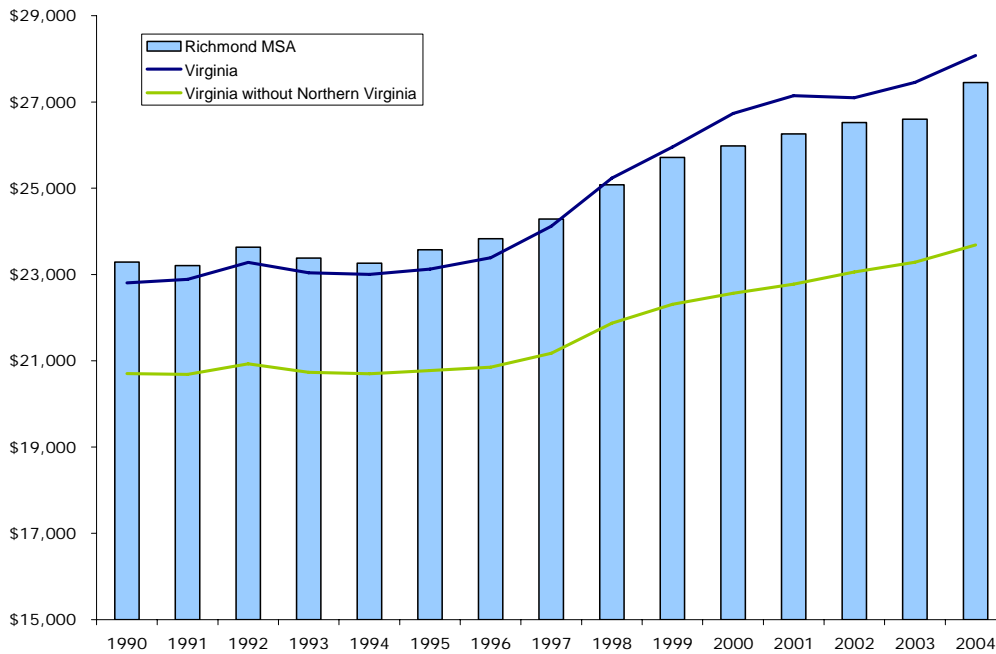
**Chart 4.2: Richmond MSA Employment and its Growth**



Source: Chmura Economics & Analytics and Virginia Employment Commission

Annual average wages for the Richmond MSA are slightly less than the state average and have been steadily increasing in real terms over the last decade. In 2004, the annual average wage was \$39,681, slightly less than the state average of \$40,592. Once again, the state average was strongly influenced by the performance by Northern Virginia (\$53,057). Richmond's average annual wages are higher than that of the state when Northern Virginia wages are excluded (\$34,242). Chart 4.3 shows that real wage growth was fairly flat in the MSA and state from 1990 through 1994 when the nation underwent a recession in 1991 and a slow recovery in terms of job growth. Real annual average wages, which includes some stock options that were exercised, started to grow in 1994 and increased an annual average 4.2% in the Richmond MSA from 1994 through 2004 compared with 4.5% in the state and 3.8% in the nation.

**Chart 4.3: Richmond MSA Real Annual Average Wages**



Sources: Chmura Economics & Analytic, Virginia Employment Commission, and Bureau of Labor Statistics

Chart 4.3 also shows that real annual wages in the Richmond MSA were slightly higher than those of the state until 1998. Wages in the state surpassed those of the Richmond MSA mainly because of the high-tech explosion that was more predominant in Northern Virginia than in the Richmond MSA. Table 4.1 shows that when Northern Virginia is excluded from the state average, the Richmond MSA wages have been 14% to 16% higher than those of the state since 1990.

The consistent growth of real wages in the Richmond MSA is attributed to its favorable industry mix. The Richmond MSA were not as severely affected by the continuous declines in manufacturing that plagued the rural Southside and Southwest regions of Virginia because of their concentration in textiles and apparel. In addition, the relatively stable government sector in the Richmond MSA as well as the strength of the financial services sector, which was supported by historically low interest rates, contributed to the overall growth of wages.



Year	Richmond MSA / Virginia Wages	Richmond MSA / Virginia Excluding Northern Virginia Wages
1990	1.02	1.12
1991	1.01	1.12
1992	1.01	1.13
1993	1.01	1.13
1994	1.01	1.12
1995	1.02	1.13
1996	1.02	1.14
1997	1.01	1.15
1998	0.99	1.15
1999	0.99	1.15
2000	0.97	1.15
2001	0.97	1.15
2002	0.98	1.15
2003	0.97	1.14
2004	0.98	1.16

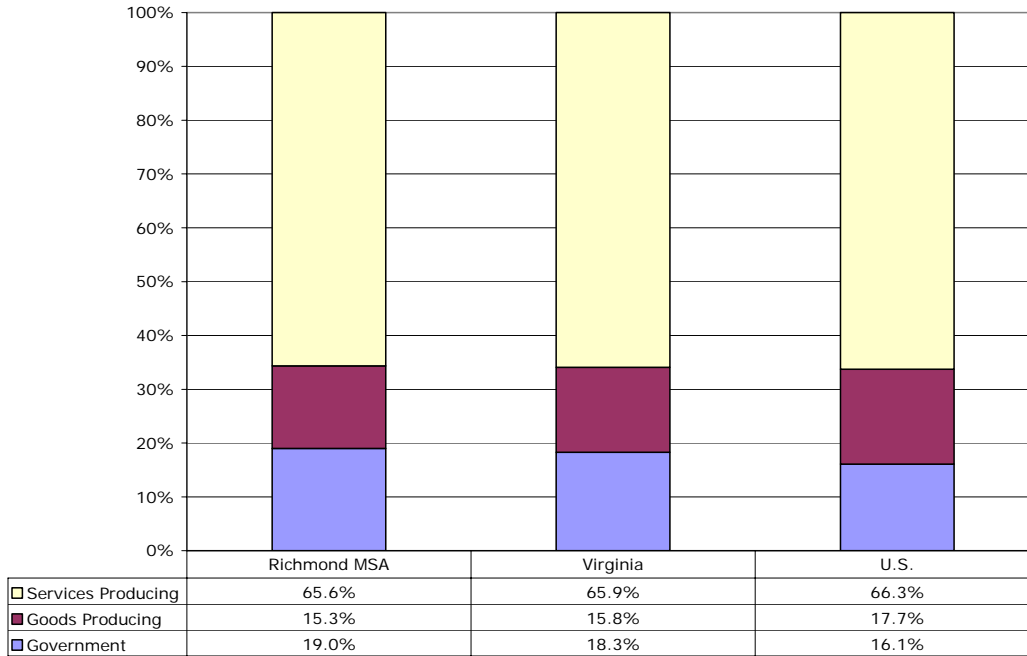
Sources: Chmura Economics & Analytics and Virginia Employment Commission.

#### 4.2. Major Industry Sectors

In the broadest view, industries can be categorized as goods producing, services providing, and government.<sup>32</sup> From this perspective, the Richmond MSA possesses a higher percentage of government jobs than the state or the nation and a lower percentage of goods-producing jobs, which have generally declined over the last decade.

<sup>32</sup>Goods producing is defined as manufacturing; construction; mining; and agriculture, forestry, and hunting. Services providing is transportation and warehousing, utilities, wholesale and retail trade, finance and insurance, real estate, information, professional and business services, management of companies and enterprises, administration and support and waste, education and health services, arts and entertainment, leisure and hospitality, and other services. Government can be divided into national, state, and local.

**Chart 4.4: Industry Sector Mix in Richmond MSA, 2004**



Source: Chmura Economics & Analytics, Bureau of Labor Statistics and Virginia Employment Commission

Table 4.2, which shows the percentage of employment by major industry sector in the Richmond MSA, state, and nation indicates the MSA industry mix is diverse and fairly closely resembles that of the state and nation with a few exceptions. In fact, diversity contributed to the region's ability to weather the 2001 recession. From its pre-recession peak to its post-recession trough, the Richmond MSA lost 1.78% of its employment, compared with 2.15% in the state, 2.31% in Northern Virginia, and 2.05% in the nation.

The Richmond MSA, state, and nation are similar in their distribution of employment in that retail makes up a smaller percentage of total employment in 2004 compared with ten years ago. It is the largest sector in the Richmond MSA and the state behind the government sector. In the nation, however, health care is the major sector that employs the greatest percentage of workers while it is third in the Richmond MSA and state. Finance and insurance is a major sector that stands out in the Richmond MSA with 6.5% of all employment compared with 3.7% in the state



and 4.5% in the nation. Management of companies and enterprises, which is partly attributed to corporate headquarters, is also more predominant in the Richmond MSA with 3.6% of employment compared with 1.8% in the state and 1.3% in the nation. In contrast, the Richmond MSA has only 5.0% of employment in the fast-growing professional, scientific, and technical sector compared with 8.8% in the state and 5.3% in the nation.

**Table 4.2: Percentage of Employment by Industry Sector**

Industry	Richmond MSA			Virginia			United States		
	1994	2004	change	1994	2004	change	1994	2004	change
Agriculture, Forestry, Fishing and Hunting	0.3%	0.2%	0.0%	0.4%	0.4%	-0.1%	1.0%	0.9%	-0.1%
Mining	0.1%	0.1%	0.0%	0.4%	0.2%	-0.2%	0.5%	0.4%	-0.1%
Utilities	0.5%	0.5%	0.0%	0.5%	0.3%	-0.1%	0.8%	0.6%	-0.2%
Construction	5.6%	6.9%	1.4%	5.3%	6.6%	1.3%	4.6%	5.5%	0.9%
Manufacturing	11.3%	8.0%	-3.3%	12.8%	8.5%	-4.3%	15.2%	11.1%	-4.1%
Wholesale Trade	4.4%	4.1%	-0.3%	3.7%	3.3%	-0.4%	4.5%	4.4%	-0.1%
Retail Trade	12.1%	11.6%	-0.5%	12.3%	11.9%	-0.4%	12.0%	11.7%	-0.4%
Transportation and Warehousing	2.9%	2.9%	-0.1%	2.7%	2.9%	0.2%	4.1%	4.0%	-0.1%
Information	2.1%	1.9%	-0.1%	2.8%	2.9%	0.0%	2.6%	2.5%	-0.1%
Finance and Insurance	5.8%	6.5%	0.7%	3.2%	3.7%	0.5%	4.5%	4.5%	0.0%
Real Estate and Rental and Leasing	1.5%	1.4%	0.0%	1.7%	1.6%	0.0%	1.6%	1.6%	0.0%
Professional, Scientific, Technical Services	3.6%	5.0%	1.4%	6.1%	8.8%	2.7%	4.7%	5.3%	0.7%
Management of Companies and Enterprises	4.2%	3.6%	-0.5%	1.8%	2.0%	0.2%	1.3%	1.3%	0.0%
Administrative and Support and Waste Management and Remediation Services	5.3%	6.0%	0.7%	4.9%	5.7%	0.9%	5.0%	6.1%	1.1%
Educational Services	0.8%	1.1%	0.4%	1.0%	1.4%	0.3%	8.1%	8.8%	0.8%
Health Care and Social Assistance	7.6%	9.3%	1.8%	7.9%	8.8%	0.8%	11.2%	12.2%	0.9%
Arts, Entertainment, and Recreation	1.4%	1.5%	0.1%	1.1%	1.2%	0.1%	1.5%	1.7%	0.2%
Accommodation and Food Services	6.4%	6.9%	0.4%	7.5%	7.9%	0.4%	7.7%	8.3%	0.6%
Other Services	2.9%	3.2%	0.3%	3.1%	3.2%	0.2%	3.3%	3.4%	0.1%
Government	20.4%	19.0%	-1.4%	19.7%	18.3%	-1.4%	5.8%	5.5%	-0.3%

Sources: Chmura Economics & Analytics, Bureau of Labor Statistics, and Virginia Employment Commission



### 4.3. Industry Clusters

Industry clusters are groups of industries that tend to locate within close proximity to each other to take advantage of similar buyer-supply relationships, labor pools, trade associations, and training providers. Clusters of industries tend to attract similar growth industries, taking advantage of synergies and shared labor markets leading to faster economic growth. Accordingly, economic developers often target their marketing to a region's clusters because the existing firms in the region give the candidate firms a natural affinity for the region.

With respect to the number of people employed, government is the largest cluster in the Richmond MSA with 109,565 employees in 2004. The professional services<sup>33</sup> and retail clusters, are second and third largest, each accounting for 16% of the region's workforce. These two are followed by the education/health (12%) and consumer services (11%) clusters.<sup>34</sup> Manufacturing-intensive clusters only accounted for 7% of the Richmond MSA workforce in 2004.

Compared with the industry mix of Virginia, the Richmond MSA has a significantly higher percentage of workers in three clusters: construction, financial services, and chemical manufacturing. Its advantage in financial services comes as no surprise as Richmond has been known as a regional financial center because of the Fifth District Federal Reserve Bank of Richmond. Although the Richmond MSA no longer boasts the headquarters of any multi-state bank, 6.5% of the region's workforce is in finance, compared with 3.7% in the state. Five of the top 20 employers in the Richmond MSA are in the financial services cluster, including Capital One (1<sup>st</sup>), Bank of America (9<sup>th</sup>), SunTrust (12<sup>th</sup>), and Wachovia (18<sup>th</sup>).

With respect to wages, the highest paying clusters in the Richmond MSA are the coal/oil/power cluster with 2004 average wages of \$82,700, followed by the financial services cluster (\$74,201), and the pharmaceutical cluster (\$63,032). On the other end of the spectrum, the clusters with the lowest annual average wages are consumer services (\$17,725), agriculture (\$25,477), textile/leather (\$26,485), and retail (\$30,743). Because retail and consumer services are two of the largest clusters in terms of employment, the region's economic challenge is to create strategies that lead to increased average wages in the MSA that lift the total income distribution thereby raising the earnings for the low-skilled workers within those two clusters.

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<sup>33</sup> The professional services sector includes industries such as management of companies, legal, accounting, advertising, and consulting.

<sup>34</sup> Firms in the consumer services include restaurants, hotels, amusements, recreation, dry-cleaning and personal care.



Clusters having specializations in a region are identified using location quotients<sup>35</sup> that compare the cluster concentration of the local economy to the national economy. A region with a location quotient greater than 1.0 indicates the cluster is more concentrated in the region than in the nation. Regional economists typically identify clusters with a location quotient of 1.25 or greater as those possessing a competitive advantage relative to other regions in the nation. By this definition, the Richmond MSA possesses competitive advantages in the following clusters<sup>36</sup> that are highlighted in green in Table 4.3: construction, financial service, and chemical manufacturing.<sup>37</sup> The next three clusters, highlighted in yellow, should also be considered to have a potential competitive advantage because their location quotients are 1.2 or greater and employment in the cluster is expected to continue to grow: pharmaceutical manufacturing, government, and professional services.

Not all clusters are equally attractive for economic development. First, clusters that are made up of basic industries are targeted over nonbasic (secondary) industries because basic industries tend to sell their goods and services to customers outside of the region thereby bringing new dollars into the region. These new dollars provide additional income to the region through the expansion of support clusters that are often made up of secondary industries. Second, efforts are usually centered on clusters that are expected to grow. Growth is defined in terms of both employment and output. Some industries experiencing flat to slightly declining employment growth may be experiencing gains in output (sales) due to productivity gains. These industries are most likely adding wealth to the region in terms of profits to the owners and/or increased earnings to the remaining employees. From that perspective, a cluster with modest expected employment declines may be targeted if sales growth is expected to continue.

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<sup>35</sup> The location quotient measures the degree to which an industry is concentrated or specialized in a region relative to the nation, by computing the ratio of the share of industry i's employment in region j to the same industry's share of employment in the nation.

$$LQ = \frac{\text{Employment in industry } i \text{ in area } j / \text{Total employment in area } j}{\text{Total U.S. employment in industry } i / \text{Total U.S. employment}}$$

<sup>36</sup> Identified by CEA cluster methodology.

<sup>37</sup> The targeted business clusters of the Greater Richmond Partnership are: corporate and division headquarters; finance, securities, and insurance; information technologies; advanced manufacturing; professional, scientific and Technical services, logistics, health care; hospitality and tourism; and construction.



**Table 4.3: Richmond Industry Clusters, 2004 Average**

	Richmond MSA				
	Number Employment	% of Total Employment (RIC)	Average Wages	Location Quotient	% of Total Employment (VA)
Construction	41,112	7.1%	\$37,544	1.48	6.8%
Financial Service	37,698	6.5%	\$74,201	1.43	3.7%
Chemical	10,242	1.8%	\$53,634	1.37	1.1%
Pharmaceutical	1,623	0.3%	\$63,032	1.24	0.1%
Government	109,565	19.0%	\$38,665	1.21	18.3%
Professional Service	92,750	16.1%	\$50,365	1.20	18.6%
Food Manufacturing	8,110	1.4%	\$56,794	1.11	1.2%
Freight Transportation	10,691	1.9%	\$35,922	1.09	1.7%
Wood/Paper	8,290	1.4%	\$41,964	1.09	1.5%
Utilities	1,603	0.3%	\$40,922	1.08	0.2%
Retail	90,218	15.7%	\$30,743	1.01	15.2%
Education/Health	66,398	11.5%	\$34,045	0.97	11.4%
Consumer Service	65,370	11.4%	\$17,725	0.88	12.5%
Coal/Oil/Power	3,878	0.7%	\$82,700	0.75	0.6%
Media	7,442	1.3%	\$40,751	0.74	1.6%
Auto/Auto-related	6,862	1.2%	\$37,916	0.64	1.5%
Metal and Metal Product	3,509	0.6%	\$47,773	0.62	0.6%
Machinery Manufacturing	4,739	0.8%	\$42,246	0.43	1.5%
Textile/Leather	1,152	0.2%	\$26,485	0.34	0.6%
Agriculture	1,263	0.2%	\$25,477		0.4%
Electric/Electronics	3,227	0.6%	\$55,788		0.8%
Total	575,741		\$39,680		

Sources: Chmura Economics & Analytics, JobsEQ™, Patent Pending

The Richmond MSA's greatest competitive advantage relative to the nation lies in the construction (1.47 location quotient), financial services (1.43 location quotient), chemical (1.37 location quotient), pharmaceutical (1.24 location quotient), government (1.21 location quotient), and professional services (1.20 location quotient) clusters. From an economic development perspective, the construction cluster is not a viable target cluster because it is a secondary or support industry rather than a driver of growth. That is, construction currently has a large location quotient because the region is growing and creating a need for office and residential building. From that perspective, it is a transitory industry. Government can also be considered a secondary cluster to the degree that it is made up of local government such as school systems that 'support' the rest of the economy. In contrast, financial services, chemical manufacturing, pharmaceutical manufacturing, and professional services clusters may be targeted clusters because they are more permanent to the industry mix of the region—dependent on national rather than regional growth trends.



#### 4.5. Cluster Growth Trends

Each industry cluster experienced varying degrees of growth in the Richmond MSA over the past 5 years (Table 4.4). Similar to the rest of the state and nation, employment in manufacturing clusters declined in the Richmond MSA from 1999 through 2004 as outsourcing has moved jobs to countries where wages are significantly lower. For example, total jobs in the electric/electronics, textile/leather and wood/paper, and machinery manufacturing clusters fell by 2,167 (10%), 482 (6.4%), 2,762 (5.4%), and 1,149 (4.3%) respectively.

Employment in industry clusters such as education/health, financial services, and construction registered the fastest growth. Notably, the education/health cluster gained 12,516 jobs from 1999 through 2004 and the financial service cluster gained 4,903 jobs over the same period. The trends in the Richmond MSA are consistent with the national trend where job creation is concentrated in services and new high-tech sectors that usually embody higher educated and skilled laborers.

The next 5 years will generally see a continuation of the trends of the last five years. Based on national employment projections published by the BLS, the major growth sectors are industries that make up clusters in education/healthcare, utilities, professional services, and transportation. Of the 97,743 jobs expected to be created in the next 10 years, 25.8% of them are in professional services, 24.7% in education/health, 13.1% in government, and 12.5% in consumer services.

The recent announcement of the Philip Morris Research Center in Virginia's BioTechnology Research Park will bring 500 highly-skilled scientists, engineers, and support staff to the City of Richmond with an estimated investment of \$300 million. When it is complete in 2007, this facility should enhance the region's competitiveness in the chemical and biotechnical field. Analysis of the top 20 occupations in a research facility similar to that of Philip Morris, revealed an estimated 60% of the jobs in the research and development center are expected to require a bachelor's degree.<sup>38</sup>

In contrast, employment in manufacturing and agriculture is projected to shrink further. Aside from the chemical cluster, the Richmond MSA is not competitive in manufacturing clusters such as automobile manufacturing and related (0.64 location quotient), textile/leather (0.34 location quotient), machinery manufacturing (0.43 location quotient), and metal and metal product (0.62 location quotient). Consequently, the continued decline of manufacturing employment will not be a serious threat to the Richmond economy.

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<sup>38</sup> For example, the 20 largest occupations for this facility will add 172 jobs—101 of them require at least bachelor's degree and many of them require advanced degrees.

In terms of forecasted output growth, according to Bureau of Labor Statistics projections the electric and electronics cluster is projected to increase output by 11.2% annually through 2012, even though it is expected to lose jobs. The increase in output with less manpower is made possible through increases in productivity. The professional services cluster as well as the retail cluster are expected to increase output by over 4% annually through 2012—both will use more employees to do so. Only the textile/leather cluster's output is expected to decline, and coal/oil/power will see relatively small growth.

The clusters that are poised to offer the most economic support to the region over the next decade are financial services, chemical, pharmaceutical, and professional services. Although the chemical cluster is expected to experience a slight decline in employment, output (sales) is expected to grow. By contrast, the only cluster in the Richmond MSA expected to shed more than 1,000 jobs over the next ten years is food manufacturing. Overall, output in the Richmond MSA is expected to grow by 3.2% annually through 2012.

**Table 4.4: Richmond MSA Industry Cluster Growth Trends**

	2004 Employment	1999-2004 Annual Year Growth Rate	1999-2004 Job Changes	Projected Annual Job Growth Rate through 2012	2004-2014 Job Change	2004-2014 Projected Annual Output Growth Rate
Agriculture	1,263	-1.40%	-92	-0.30%	-35	1.7%
Auto/Auto-related	6,862	-0.30%	-119	1.20%	848	3.3%
Chemical	10,242	-1.50%	-777	-0.50%	-530	1.6%
Coal/Oil/Power	3,878	6.40%	1,037	-0.70%	-250	0.9%
Construction	41,112	2.20%	4,268	1.50%	6,559	1.7%
Consumer Service	65,370	1.50%	4,769	1.70%	12,230	3.0%
Education/Health	66,398	4.30%	12,516	3.10%	24,165	2.6%
Electric/Electronics	3,227	-9.80%	-2,167	-1.10%	-346	11.2%
Financial Service	37,698	2.80%	4,903	1.00%	4,135	3.1%
Food Manufacturing	8,110	-2.70%	-1,210	-2.20%	-1,565	1.4%
Freight Transportation	10,691	-1.40%	-780	2.40%	2,794	3.3%
Machinery Mfg.	4,739	-4.30%	-1,149	0.60%	310	2.6%
Media	7,442	-4.00%	-1,707	0.70%	495	3.9%
Metal/Metal Products	3,509	-0.10%	-17	0.00%	2	2.4%
Pharmaceutical	1,623	-0.30%	-23	2.10%	376	3.5%
Professional Services	92,750	-0.70%	-3,211	2.40%	25,200	4.4%
Government	109,565	0.80%	4,424	1.10%	12,838	1.5%
Retail	90,218	0.30%	1,167	1.20%	11,709	4.1%
Textile/Leather	1,152	-6.70%	-482	-4.50%	-427	-3.7%
Utilities	1,603	-1.60%	-131	2.60%	466	3.0%
Wood/Paper	8,290	-5.50%	-2,726	-0.30%	-210	1.6%
Total	575,741	0.60%	15,749	1.60%	97,743	3.2%

Sources: Chmura Economics & Analytics, JobsEQ™, Patent Pending



#### 4.5. Forecasted Trends for Growing and Declining Industries

In terms of industry performance, Table 4.5 shows the fastest growing and declining industries by 4–digit NAICS code. The top growth industries with respect to the annual average pace of employment are concentrated in the professional services (one of the Richmond MSA competitive clusters) and education/health clusters. National projections suggest employment in software publishing industries is expected to grow by 5.3% per year through 2014, followed by internet service providers (5.1%), and other residential care services (4.7%) sectors. The fast growth in health-care related industries is in part due to the aging population.

Table 4.5: Top 10 Fastest Growing and Declining Industries				
NAICS Code	Cluster	Industry	Projected Annual Growth (2004-2014)	Richmond MSA Employment (2004)
<b>10 Fastest Growing Industries</b>				
5112	Media	Software Publishers	5.32%	232
5181	Professional Service	Internet Service Providers and Web Search Portals	5.08%	178
6239	Education/Health	Other Residential Care Facilities	4.73%	1,254
6216	Education/Health	Home Health Care Services	4.53%	3,711
5416	Professional Service	Management, Scientific, and Technical Consulting Services	4.51%	2,981
5415	Professional Service	Computer Systems Design and Related Services	4.45%	4,581
5613	Professional Service	Employment Services	4.43%	13,403
6233	Education/Health	Community Care Facilities for the Elderly	4.40%	4,245
5172	Professional Service	Wireless Telecommunications Carriers (except Satellite)	4.17%	1,461
6243	Education/Health	Vocational Rehabilitation Services	4.10%	468
<b>10 Fastest Declining Industries</b>				
3259	Chemical	Other Chemical Product and Preparation Manufacturing	-3.42%	404
4247	Retail	Petroleum and Petroleum Products Merchant Wholesalers	-3.63%	187
3169	Textile/Leather	Other Leather and Allied Product Manufacturing	-4.02%	180
2122	Metal/Metal Product	Metal Ore Mining	-4.79%	112
3122	Food Manufacturing	Tobacco Manufacturing	-4.85%	4,598
3131	Textile/Leather	Fiber, Yarn, and Thread Mills	-5.31%	14
3159	Textile/Leather	Apparel Accessories and Other Apparel Manufacturing	-5.36%	96
3132	Textile/Leather	Fabric Mills	-5.92%	110
3133	Textile/Leather	Textile and Fabric Finishing and Fabric Coating Mills	-6.95%	125
3152	Textile/Leather	Cut and Sew Apparel Manufacturing	-12.16%	243

Sources: Chmura Economics & Analytics, JobsEQ™, Patent Pending



At the other end of the spectrum, the fastest declining industries are expected to be concentrated in manufacturing clusters, especially the textile/leather cluster. Six of the ten declining industries in the Richmond MSA belong to the textile/leather cluster. Fortunately for the Richmond MSA, all 6 of those industries only employed 768 workers in 2004, an insignificant share of the total workforce. Tobacco manufacturing, with 4,598 workers in 2004, is the only one of the top ten industries that may have a significant impact on the Richmond MSA. Philip Morris USA is headquartered in Richmond, and it is also the second largest private employer of the Richmond MSA. Although not anticipated, continuous decline in this industry would have a widespread effect on the Richmond labor market.

**Table 4.6: Top 10 Industries in Number of Job Gains/Losses**

NAICS Code	Cluster	Industry	Jobs Changes (2004-2014)	Richmond MSA Employment (2004)
<b>Top 10 Industries in Job Gains</b>				
5613	Professional Service	Employment Services	7,275	13,403
9290	Pubic Administration	Miscellaneous Government	4,586	40,551
6221	Education/Health	General Medical and Surgical Hospitals	4,534	13,990
6211	Education/Health	Offices of Physicians	3,352	8,629
7221	Consumer Service	Full-Service Restaurants	2,915	18,150
2382	Construction	Building Equipment Contractors	2,850	12,143
9290	Pubic Administration	Misc. Government	2,610	23,079
5415	Professional Service	Computer Systems Design and Related Services	2,502	4,581
5617	Professional Service	Services to Buildings and Dwellings	2,398	10,002
5511	Professional Service	Management of Companies and Enterprises	2,386	20,983
<b>Top 10 Industries in Job Losses</b>				
3251	Chemical	Basic Chemical Manufacturing	-121	675
3311	Metal and Metal Product	Iron and Steel Mills and Ferroalloy Manufacturing	-130	449
3152	Textile/Leather	Cut and Sew Apparel Manufacturing	-176	243
2211	Coal/Oil/Power	Electric Power Generation, Transmission and Distribution	-214	3,011
3222	Wood/Paper	Converted Paper Product Manufacturing	-219	2,740
3344	Electric/Electronics	Semiconductor and Other Electronic Component Manufacturing	-287	1,918
3221	Wood/Paper	Pulp, Paper, and Paperboard Mills	-327	1,314
5171	Professional Service	Wired Telecommunications Carriers	-330	3,519
3252	Chemical	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	-974	4,313
3122	Food Manufacturing	Tobacco Manufacturing	-1,801	4,598

Sources: Chmura Economics & Analytics, JobsEQ™, Patent Pending



With respect to absolute number of job losses, the Richmond MSA industry that is expected to experience the largest job loss is tobacco manufacturing (Table 4.6). Based on national industry growth trends, 1,801 jobs could be lost in the next 10 years. Chemical industries in the Richmond MSA are estimated to lose 1,095 jobs in 10 years (974 in resin, synthetic rubber, and artificial synthetic fibers and 121 in basic chemical manufacturing). The implication is that those displaced manufacturing workers are expected to seek alternative employment opportunities in the region. The challenge will be to identify other jobs opportunities for those workers, and to prepare those workers for jobs in other industries. Such opportunities can be identified by crossing the occupations of the displaced workers to those of the growing industries in the Richmond MSA.

#### 4.5. Largest Employers

The largest private employer in the Richmond MSA is Capital One (finance), followed by Philip Morris (tobacco manufacturing), Wal-Mart (retail), and Ukrop's (retail). The top 20 employers account for about 11% of the total employment in the Richmond MSA, with the top 10 employers accounting for about 7.5%. The small percentage indicates that the MSA is diversified enough that employment losses from one or two big employers will not cause significant stress to the economy.

Table 4.7: Richmond MSA Largest Private Employers
Capital One Service Inc
Philip Morris USA Inc
Wal Mart Associates Inc
Ukrop's Super Markets Inc.
E.I. DuPont De Nemours & Co., Inc.
Food Lion LLC
The Anthem Companies Inc
Circuit City Stores Inc
Bank of America, N.A.
Bon Secours Richmond Health System
VA Electric & Power Co Inc
SunTrust Bank
HCA Health Service of Virginia, Inc
Dominion Resources
United Parcel Service, Inc
Infineon Technologies, Inc
Chippenham & Johnston Willis, Inc
Wachovia Bank
University of Richmond
Federal Reserve Bank Richmond
Sources: Chmura Economics & Analytics and Virginia Employment Commission



#### 4.6. Business Expansion, Relocation, and Retention

Expansions and relocations provide one measure of the appeal of a region to businesses. Despite a few high-profile announcements such as the Philip Morris research and development facility in Richmond and Infineon Technology in Henrico County, the region as a whole does not exhibit a strong competitive advantage as a destination for expansion and relocation relative to the rest of the state based on Virginia Economic Development Partnership (VEDP) data. From 2000 to 2005, the Richmond MSA accounted for 14% of the total jobs created by announced expansions and relocations according to VEDP, slightly less than its share of total employment in the state (15%).

In terms of the type of expanded or relocated firms, the Richmond MSA is most competitive relative to other regions in the state for firms that do businesses in finance and insurance as well as utilities. For example, the Richmond MSA received 60% of all jobs created in the finance and insurance sector in the state from 2000 through 2005 and 34% of all jobs created in the utilities sector according to the VEDP data. The recent addition of new companies in the finance and insurance sector is not surprising given the region's existing clusters—the recent gains will continue to solidify the role of the Richmond MSA as a financial center. In contrast, Richmond attracted only 4% of the 66,570 professional and technical services employment created in the state according to VEDP. Richmond is comparable to the state in attracting manufacturing companies.

Table 4.8: Jobs Created by Relocating/Expanding Firms, 2000-2005			
	Richmond	Virginia	Richmond Percentage
Administrative & Waste Service	2,082	13,825	15%
Agriculture, Forestry, Fishing, and Hunting	10	10	100%
Arts, Entertainment, and Recreation	0	75	0%
Construction	215	1,009	21%
Finance and Insurance	10,469	17,468	60%
Information	1,320	24,297	5%
Management of Companies	724	5,451	13%
Manufacturing	5,666	46,525	12%
Mining	0	4	0%
Other Services	0	387	0%
Professional, Scientific, and Technical Services	2,609	66,570	4%
Real Estate	5	304	2%
Retail Trade	0	425	0%
Transportation and Warehousing	592	2,968	20%
Utilities	110	328	34%
Wholesale Trade	2,605	13,739	19%
Grand Total	26,407	193,385	14%

Source: Virginia Economic Development Partnership



The VEDP announcements only capture part of all the expansion and contraction activities in the Richmond MSA. Many start-ups, especially small business start-ups and expansions, are not announced or collected by the VEDP. An alternative measure of business retention is the number of firms in the Richmond MSA that have remained in business for over three years. A large percentage of sustained businesses points to a favorable macro and regional business climate.

Table 4.9 indicates that small businesses (those with 10 or less employees) in the Richmond MSA have a smaller percentage of sustained business than businesses that are larger than 10 employees. Essentially the same differential exists at the state level. Overall 68% of small businesses in both the Richmond MSA and the state have stayed in business over a three-year period, compared with 82% for bigger businesses in the Richmond MSA and 83% in the state. As shown in the table, the percentage of sustained businesses varies greatly by industry.

<b>Table 4.9: Percentage Sustained Business of Current Businesses, 2001-2004</b>				
Cluster	Richmond MSA		Virginia	
	Firm Size > 10	Firm Size 1-10	Firm Size > 10	Firm Size 1-10
Agriculture	93%	74%	86%	76%
Auto/Auto-related	83%	70%	85%	72%
Chemical	84%	75%	86%	66%
Coal/Oil/Power	79%	62%	72%	62%
Construction	95%	70%	93%	70%
Consumer Service	80%	68%	83%	68%
Education/Health	84%	76%	86%	76%
Electric/Electronics	76%	72%	75%	67%
Financial Service	80%	73%	90%	73%
Food Manufacturing	69%	76%	81%	76%
Freight Transportation	77%	59%	82%	62%
Machinery Manufacturing	88%	75%	87%	73%
Media	77%	73%	75%	71%
Metal and Metal Product	88%	73%	85%	76%
Pharmaceutical	100%	0%	91%	64%
Professional Service	81%	65%	84%	64%
Retail	87%	68%	86%	67%
Textile/Leather	67%	67%	66%	69%
Utilities	61%	58%	43%	60%
Wood/Paper	73%	76%	82%	74%
Total	82%	68%	83%	68%

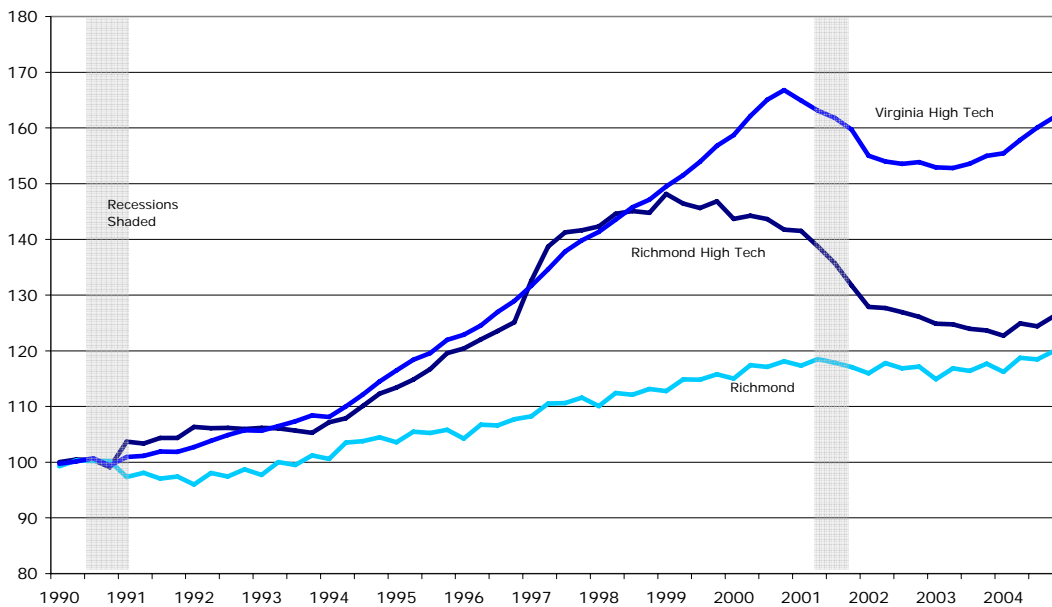
Sources: Chmura Economics & Analytics, JobsEQ™, Patent Pending



### 4.7 High-Tech Industries

Throughout most of the 1990's, high-tech employment in the Richmond MSA increased at a rate similar to that of the state. However, high-tech employment growth in the Richmond MSA has fallen behind the state pace with employment contracting from 1999 through 2004 (Chart 4.4). For the past 5 years, high-tech employment in the Richmond MSA dropped at an annual average rate of 3.0% compared with 0.6% in the state. High-tech employment in the Richmond MSA has begun to turn upward and rose by 2.1% (1,130 jobs) in the year ending with the fourth quarter of 2004 compared with 4.4% in the state. Compared with employment in other industries in the Richmond MSA, high-tech industries grew much faster in the 1990s, yet employment dropped dramatically since 1999 while the overall employment in the MSA grew at a steady pace.

**Chart 4.5: Employment in Richmond MSA (Index 1990=100)**



Note: Government owned operations are not included.

Source: Chmura Economics & Analytics and Virginia Employment Commission

In the fourth quarter of 2004, four high-tech industries in Richmond had employment gains over 300 jobs when compared with a year ago: architectural and engineering services; computer



systems design and related services; management, scientific, and technical consulting services; and management of companies and enterprises (Table 4.10). As shown in Chart 4.5, these four industries make up 37% of the total high-tech employment in the Richmond MSA. In contrast, the largest job loss occurred in the resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing sector (-283). Other job losses occurred in machinery manufacturing (-58).

Based on the number employed within the high-tech industries, the strength of the Richmond MSA remains in corporate management, rather than information technology-related industries that tend to be heavily concentrated in Northern Virginia.

**Table 4.10: High-Tech Employment by Industry in Richmond MSA**

NAICS	Industry	2003Q4	2004Q4	Change	%Change
	<b>Total Employment</b>	<b>572,404</b>	<b>583,556</b>	<b>11,152</b>	<b>1.9</b>
	<b>Total High Technology</b>	<b>54,999</b>	<b>56,128</b>	<b>1,130</b>	<b>2.1</b>
3251	Basic Chemical Manufacturing	729	650	-79	-10.9
3252	Resin, Synthetic Rubber/Synthetic Fibers Filaments Mfg	4,499	4,216	-283	-6.3
3253	Pesticide, Fertilizer, Other Agricultural Chemical Mfg	55	60	5	8.5
3254	Pharmaceutical and Medicine Manufacturing	1,593	1,615	21	1.3
3255	Paint, Coating, and Adhesive Manufacturing	107	107	0	-0.3
3256	Soap, Cleaning Compound, Toilet Preparation Mfg	526	522	-5	-0.9
3259	Other Chemical Product and Preparation Manufacturing	389	411	22	5.7
3331	Agriculture, Construction, and Mining Machinery Mfg	56	65	9	16.7
3332	Industrial Machinery Manufacturing	696	638	-58	-8.4
3333	Commercial and Service Industry Machinery Mfg	74	83	9	12.1
3334	Ventilation, Heating, A/C, Commercial Refrigeration Mfg	1,062	1,086	23	2.2
3335	Metalworking Machinery Manufacturing	90	86	-4	-4.1
3339	Other General Purpose Machinery Manufacturing	475	486	11	2.4
3345	Navigational, Measuring, Electromedical, Instr. Mfg	179	82	-96	-53.9
3363	Motor Vehicle Parts Manufacturing	97	133	35	36.3
4234	Professional/Commercial Equipment/Supplies Wholesale	2,544	2,513	-31	-1.2
4236	Electrical and Electronic Goods Merchant Wholesalers	1,294	1,279	-15	-1.2
4431	Electronics and Appliance Stores	1,741	1,783	42	2.4
5112	Software Publishers	247	226	-22	-8.8
5161	Internet Publishing and Broadcasting	24	34	10	41.7
5181	Internet Service Providers and Web Search Portals	153	195	42	27.2
5182	Data Processing, Hosting, and Related Services	1,475	1,422	-53	-3.6
5191	Other Information Services	101	88	-13	-12.9
5413	Architectural, Engineering, and Related Services	4,714	5,107	393	8.3
5414	Specialized Design Services	457	429	-27	-6.0
5415	Computer Systems Design and Related Services	4,345	4,761	416	9.6
5416	Management, Scientific, Technical Consulting Services	2,816	3,132	316	11.2
5417	Scientific Research and Development Services	983	951	-32	-3.3
5511	Management of Companies and Enterprises	20,690	21,043	354	1.7

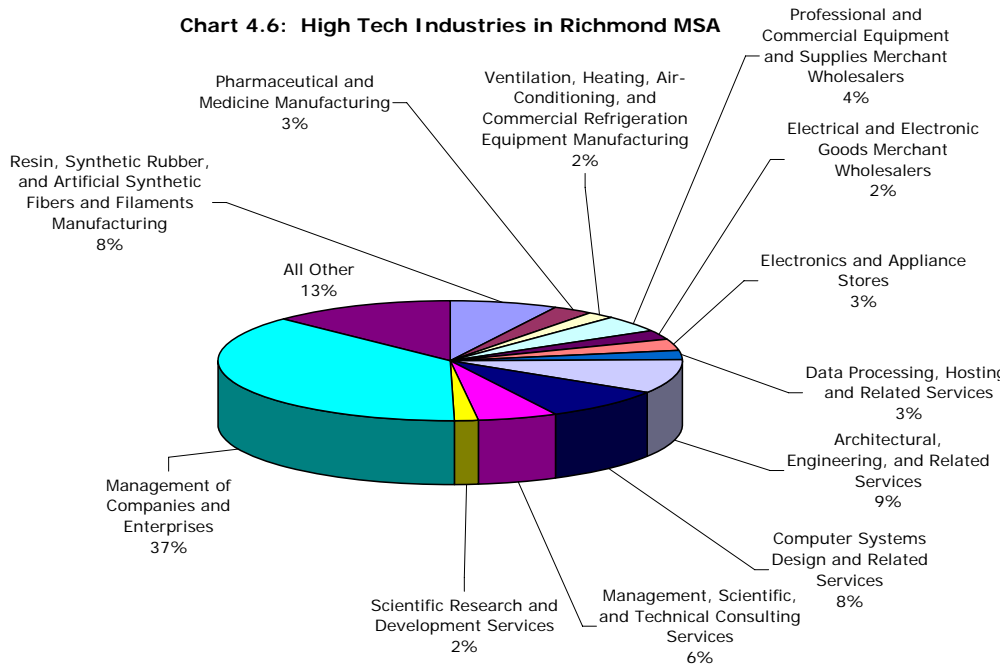
Note: Government owned institutions are not included.

Source: Chmura Economics & Analytics and Virginia Employment Commission



Annual average wages for high-tech industries are considerably higher than average wages in the Richmond MSA. As of the fourth quarter of 2004, high-tech jobs paid an annual average of \$65,764 in the Richmond MSA and \$73,175 in the state while the average wage for all jobs in the Richmond MSA was \$39,681. For the year ending with the fourth quarter of 2004, the average high-tech wage in Richmond rose by 6.2% compared with a 5.4% gain for the state.

**Chart 4.6: High Tech Industries in Richmond MSA**



Note: Government owned operations are not included.  
 Source: Chmura Economics & Analytics & Virginia Employment Commission

## 5. Occupation Cluster Analysis

The occupation structure and trends of the Richmond MSA are favorable, mimicking its industry structure and trends. For example, because the strength of the Richmond MSA is in the finance cluster, the region also boasts a large number of quality workers in the occupations of finance and management. In addition, the region’s workforce has a high concentration of health



care workers, which can be leveraged to attract medical research firms. Both of these clusters are expected to grow in the next 10 years, thus providing a consistent source of jobs for the region.

The Richmond MSA also has a relatively low reliance on manufacturing, which is expected to contract further in terms of employment. However, one threat is the expected decline in tobacco manufacturing. With Philip Morris USA headquartered in Richmond MSA, and as the second largest private employer in the region, any job losses in that industry could negatively affect the region's image, even though its workers would likely find alternative jobs in the Richmond MSA.

In light of its favorable mix of clusters, the Richmond MSA's biggest challenges for workforce development are not to find employment for displaced manufacturing workers but to raise the skills and earnings of its workers.

### 5.1. Career Training Ladders

Career training ladders<sup>39</sup> provide an overview of the current labor inventory of workers in terms of vertical and horizontal relationships among occupations. Occupations in the same career families require similar knowledge and skills. People in low-skilled occupations can move to higher-skilled positions (with presumably higher wages) with the help of adequate training and accrued experience. The career training ladders can also provide direction for displaced workers regarding the occupations in which they can obtain new employment.

The occupation groups that make up the 'general business' group are shown below as an example. The entry level position, loan clerks, can be filled by a person with a high school diploma. With some training, this individual can move up to a personal financial advisor, which may also require an associate's degree. If this individual obtains a bachelor's degree, he or she can advance to a loan counselor or loan officer. Further up the career path, this person can move to positions such as cost estimators or financial managers. The full set of 21 occupations groups and their estimated workers by occupation is in Appendix 2.

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<sup>39</sup> Career training ladders are an output of Chmura Economics & Analytics proprietary software JobsEQ™, Patent Pending. It is visual tool that organizes all occupations in a region into 21 occupation groups and up to 5 levels. This tool can be used by workforce development professionals to provide career advice and to plan training needs.



Table 5.1: Career Training Ladders- General Business, Richmond MSA	
Actuaries	72
Economists	84



Accountants and Auditors	5,209
Agents and Business Managers of Artists, Performers, and Athletes	503
Appraisers and Assessors of Real Estate	341
Chief Executives	1,986
Claims Adjusters, Examiners, and Investigators	942
Cost Estimators	863
Financial Analysts	1,044
Financial Managers	2,003
General and Operations Managers	9,051
Insurance Appraisers, Auto Damage	93
Insurance Underwriters	978
Market Research Analysts	671
Operations Research Analysts	475
Survey Researchers	120



Budget Analysts	503
Business Operations Specialists, All Other	5,581
Compensation, Benefits, and Job Analysis Specialists	285
Credit Analysts	288
Emergency Management Specialists	109
Financial Examiners	211
Financial Specialists, All Other	889
Human Resources Managers	700
Loan Counselors	170
Loan Officers	2,107
Management Analysts	3,876
Managers, All Other	2,426
Property, Real Estate, and Community Association Managers	521
Tax Examiners, Collectors, and Revenue Agents	137
Training and Development Specialists	1,035



Employment, Recruitment, and Placement Specialists	628
Personal Financial Advisors	574
Securities, Commodities, and Financial Services Sales Agents	1,529
Tax Preparers	650



Bookkeeping, Accounting, and Auditing Clerks	7,741
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Table 5.1: Career Training Ladders- General Business, Richmond MSA	
Brokerage Clerks	351
Loan Interviewers and Clerks	1,120
Tellers	4,184

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

## 5.2. Occupation Employment and Unemployment

Based on CEA clustering methodology, nearly 800 occupations are grouped into 21 groups. In the fourth quarter of 2004, the top three occupational groups in terms of employment in the Richmond MSA are the same as in the state. The largest number of workers is in customer service occupations, accounting for 18.1% of the Richmond MSA workforce, compared with 18.3% statewide. This is followed by clerical occupations (12.2% vs. 11.4% statewide) and sales and marketing occupations (8.8% vs. 8.6% statewide). Even though the occupation structure of the Richmond MSA is similar to that of the state when viewed in these broad categories, there are some exceptions. For example, Richmond has a greater concentration of medical occupations (8.0% vs. 7.0%) and a smaller concentration of computer and electronics-related occupations (3.7% vs. 5.3%).

The differences between Richmond and the state highlight the strength as well as the potential future direction of the economic development efforts of the Richmond MSA. For example, the higher state percentage in computer and electronics occupations reflects the concentration of high-tech clusters in Northern Virginia. In that case, the Richmond MSA is at a disadvantage in competing with Northern Virginia in attracting firms in information technology or telecommunications.

On the other hand, the Richmond MSA is more concentrated in healthcare occupations. From this perspective, the Richmond MSA can leverage the presence of VCU medical school and its medical health center to further build its competitive advantage into a center for medical practice (hospitals and clinics) and research. Related industries such as medical equipment and drug manufacturing can also be targeted.

Another strength of the region is its high concentration of workforce in business occupations—including financial and management occupations. This workforce should make the Richmond MSA an attractive place for the relocation and expansions of banks, financial services



companies, and corporate headquarters. In the past two years (2004 through 2005), more than a third of the jobs created in the state by expanding finance firms located in Richmond MSA.<sup>40</sup>

**Table 5.2: Richmond MSA Occupation Structure**

Occupation Groups	2004 Qtr 4 Employment	% Total (Richmond)	% Total (Virginia)
Agriculture and Food	2,879	0.5%	0.6%
Arts, Design and Sports	3,011	0.5%	0.6%
Clerical	71,018	12.2%	11.4%
Communication	4,729	0.8%	0.8%
Computer and Electronics	21,809	3.7%	5.3%
Construction Trade	30,438	5.2%	5.2%
Customer Service	105,363	18.1%	18.3%
Education	34,997	6.0%	6.4%
Engineering and Technology	11,667	2.0%	2.3%
General Business	60,987	10.5%	9.9%
Language and Social Science	2,546	0.4%	0.5%
Law and Government	6,237	1.1%	0.8%
Mechanical	46,312	7.9%	8.2%
Medical	46,816	8.0%	7.0%
Production	29,220	5.0%	5.0%
Psychology and Counseling	7,839	1.3%	1.2%
Public Safety and Security	11,861	2.0%	2.0%
Sales and Marketing	51,187	8.8%	8.6%
Science & Math	5,726	1.0%	0.9%
Transportation	28,887	5.0%	4.9%
Total	583,531		

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

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As one would expect in a diversified economy, the unemployed come from a variety of occupations and are not concentrated in any particular groups. Based on June 2005 unemployment data, customer service workers have the greatest number unemployed, accounting for 16% of the total unemployment in the Richmond MSA. Other occupations with a high number of unemployed include mechanical and clerical occupations. In terms of the unemployment rates, production occupations and mechanical occupations are the highest.<sup>41</sup>

<sup>40</sup> See Table 4.6.

<sup>41</sup> The actual unemployment rates are not presented here because June 2005 occupation employment number is not available. This comparison on the percentage of unemployment is made based on June 2005 unemployment number and the average employment number in 2004.



<b>Table 5.3: Richmond MSA Unemployment by Major Occupation Group</b>		
	Unemployment June-2005	% Total Unemployment
Customer Service	3,209	16
Mechanical	2,415	12
Clerical	2,406	12
General Business	2,267	11
Sales and Marketing	1,861	9
Production	1,750	9
Computer and Electronics	1,246	6
Construction Trade	1,063	5
Transportation	975	5
Medical	935	5
Education	416	2
Engineering and Technology	357	2
Public Safety and Security	278	1
Psychology and Counseling	203	1
Law and Government	152	1
Communication	142	1
Arts, Design and Sports	117	1
Science & Math	90	0
Agriculture and Food	61	0
Language and Social Science	52	0
Total	19,995	100

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

### 5.3. Underemployed Workers

In general, underemployment reflects a mismatch between a region's workers and its jobs. A worker is classified as underemployed when the skills he or she possesses are higher than that required by his or her job. To calculate underemployment in the Richmond MSA, CEA uses educational attainment of the region as a measure of the supply of skills and uses total occupation of the region to approximate the demand for skills.<sup>42</sup>

Based on the Census estimate, various occupations require different levels of highly-skilled workers. For example, 63% of education occupations need a college degree, and 45% of general business occupations need a college degree. On average, 25.6% of all jobs in the Richmond MSA require college degrees, while 27.6% of Richmond MSA residents possess a bachelor's degree or

<sup>42</sup> This method was used to estimate national underemployment by Sean Moore, See "Tapping the Skills Surplus in Rural America," *Main Street Economist* February 2005, Federal Reserve Bank of Kansas City.



higher. The imbalance is about 2.0% of the overall workforce, translating into an estimated 11,671 under-employed workers in the Richmond MSA.<sup>43</sup> This suggests that underemployment and skill surpluses in the region can be tapped to attract industries requiring a highly-educated and skilled workforce.

### 5.4. Demand Occupations

The following table ranks the occupations with the greatest annual demand growth through 2012 based on BLS projections. Occupations in the health care industry and in information technology have the highest demand. For example, jobs in medical assistant occupations are expected to grow by 4.7% annually to 2013. Other high-growth and high-demand occupations in the health care field include physician assistants, home health aides, and physical therapist aides. For information technology-related fields, network system and data communication analysts are expected to grow by 4.6% per year, followed by computer software engineers—expected to grow by 3.8% per year.

<b>Occupations</b>	<b>Projected Annual Growth Rate 2004-2013</b>
Medical Assistants	4.7%
Network Systems and Data Communications Analysts	4.6%
Physician Assistants	4.1%
Social and Human Service Assistants	4.1%
Home Health Aides	4.0%
Medical Records and Health Information Technicians	3.9%
Physical Therapist Aides	3.9%
Computer Software Engineers, Applications	3.8%
Computer Software Engineers, Systems Software	3.8%
Physical Therapist Assistants	3.8%

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

### 5.5. Occupation Gaps

Occupation gap analysis combines the projections for the labor demand and supply to identify occupational needs and surpluses in the future.<sup>44</sup> Not only does it take into account the

<sup>43</sup> Current employment of 586,351 \* 0.04 = 2,305.

<sup>44</sup> Labor supply projection begins with current employment in each occupation and applies the normal rate of supply growth based on emerging workforce and retirement statistics developed by



need for workers by industries but it also accounts for the emerging workers. This tool can help policymakers devote their resources to areas with the largest labor shortage and prepare to retrain individuals in occupations that are in decline.

Of all the occupation groups, the largest shortage is in the medical occupation groups. It is projected that demand in the Richmond MSA exceeds supply by an average 709 annually in 2013 for all positions in medical occupations—including nurses, medical assistants, and dental hygienists. Other occupation groups with the largest annual occupation shortages are education (330), computer and electronics (163), public safety and security (142), customer service (125), and psychology and counseling (107).

Four occupation groups are forecast to have surplus of workers where the annual supply of workers exceeds the demand. They are clerical occupations (-596), mechanical occupations (-357), production occupations (-314), and sales and marketing occupations (-164). For the remainder of the occupations groups, demand and supply are fairly balanced.

**Table 5.5: Richmond MSA Projected Annual Gap 2013**

Occupation Group	Occupation Shortage
Medical	709
Education	330
Computer and Electronics	163
Public Safety and Security	142
Customer Service	125
Psychology and Counseling	107
Law and Government	8
Agriculture and Food	2
Transportation	0
Science & Math	-9
Arts, Design and Sports	-10
Language and Social Science	-13
General Business	-12
Engineering and Technology	-21
Communication	-36
Construction Trade	-36
Sales and Marketing	-164
Production	-314
Mechanical	-357
Clerical	-596
Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending	

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CEA. Projected demand is calculated by CEA and the algorithms applied include occupation projections by the Bureau of Labor Statistics.





## 5.6. BRAC 2005 and Workforce Implications

Compared with Norfolk and Northern Virginia, the military presence in the Richmond MSA is relatively small. Fort AP Hill and Fort Pickett are located at the edge of the Richmond MSA, and Fort Lee is located outside of Petersburg. Fort Lee currently supports 7,800 military and civilian jobs. However, this could soon change as the Base Realignment and Closure Commission (BRAC) recently recommended doubling Fort Lee in size. When the BRAC recommendation is implemented, another 7,344 jobs will be added to the base (6,139 military, 1,149 civilian, and 56 contractors).

The implications of this move on the area's workforce are twofold. First, new jobs on the military base will have a ripple effect and create more jobs outside the base. It is estimated that another 4,425 non-government support and service industry jobs can be created due to this move.<sup>45</sup> Those additional non-government jobs will mainly lead to expansions in industries such as restaurants, doctor's offices, retail, and grocery stores.<sup>46</sup> Considering that job and population growth in the Tri-cities<sup>47</sup> area has lagged behind other localities in the region such as Chesterfield and Henrico, the additional 4,425 jobs should produce a significant boost to the local economy.

Another implication of the enhanced military presence on the Richmond MSA labor market is the impact of retired military personnel. Based on a 2002 Congressional Budget Office study, the average service length of active duty is 10 years, which implies that the majority of the military personal retiring from active service will eventually enter the civilian labor force. Some of those individuals are highly-skilled and can fill the local labor shortage while others will require training to be successful in finding civilian jobs.

Table 5.7 identifies the annual number of military personnel who exited the military and retired in the Richmond MSA and compares them with the occupation gaps of the area. In the 2002-2003 fiscal year,<sup>48</sup> there were 389 personnel exiting the military that resided in the Richmond MSA. Some of them can immediately fill the occupation gaps of the area. For example, the region needs an additional 21 police officers per year and 13 individuals exited the military with such skills. Similarly, paramedics can also easily find jobs in the area. In contrast, many of the exiting military personnel, such as those with occupations such as stock clerks and first line managers of office workers, will have a harder time finding suitable employment as those occupations have a surplus of workers in the region. By working with the military retirees and providing adequate

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<sup>45</sup> Source: *Richmond Times-Dispatch*, May 13, 2005.

<sup>46</sup> This result is based on the IMPLANPro model used by CEA.

<sup>47</sup> Tri-cities is defined as the Cities of Petersburg, Hopewell, and Colonial Heights.

<sup>48</sup> A fiscal year runs from October 1<sup>st</sup> 2002 to September 30, 2003.



training and advice, workforce development organizations can help the retired military transition successfully to the civilian labor force.



**Table 5. 7 Annual Military Exits by Occupation in Richmond MSA, Fiscal Year 2002-2003**

SOC Code	Description	Military Exits	Estimated Annual Gaps (Richmond MSA)
43-5081	Stock Clerks and Order Fillers	19	-140
51-8093	Petroleum Pump System Operators, Refinery Operation	16	-1
33-3051	Police and Sheriff's Patrol Officers	13	21
35-2012	Cooks, Institution and Cafeteria	13	-29
49-1011	First-Line Supervisors/Managers of Mechanics,	13	4
13-1081	Logisticians	10	N/A
29-2041	Emergency Medical Technicians and Paramedics	8	9
43-1011	First-Line Supervisors/Managers of Office and	8	-51
43-4161	Human Resources Assistants, Except Payroll an	8	-9
49-2094	Electrical and Electronics Repairers	7	-2

Source: Department of Defense

## 6. Education Analysis

The Richmond MSA possesses a number of educational institutions that have been playing important roles in training and educating the region's workforce. Compared with market demands and current education capacities, the key imbalances occur in the following areas:

- 1) 2-year institutions should focus on the vocational programs such as construction trade, and play a more important role in training workers in construction, mechanics and repairs, personal and culinary services, because market demand is strong for these trades.
- 2) Currently, 2-year institutions produce more graduates in business and computer sciences than businesses in the Richmond MSA need. In contrast, demand exists in the Richmond MSA for such graduates with 4-year college degrees.
- 3) Students in social sciences and visual and performing arts programs are more likely to have difficulty finding qualified jobs, thus becoming a source of the underemployed workforce.

In this section, CEA first analyzes the market demand for degree programs and then compares them with the current education capacity of the region to evaluate whether gaps exist for each program. This section also discusses academic performance of K-12 schools and their implications for the workforce.

## 6.1. Post Secondary Education Demand

Education demand is estimated as the market demand for degree programs.<sup>49</sup> Only post-secondary education demand is estimated—which includes associate degrees, demand for post-secondary vocational training (certificate programs), as well as bachelor’s or higher degrees. Market demand is based on the current industry and occupation structure of the Richmond MSA, as well as the projected growth for each industry. This estimate also incorporates the current unemployment situation of the region. For example, if the region needs a certain number of CEOs over the next 5 years and there are already several unemployed CEOs, the education training need for CEOs will be less because some of the demand can be met by recruiting unemployed CEOs.

Based on the current industry and occupation mix of the Richmond MSA, the demand for degree programs in the major disciplines are listed in Table 6.1.<sup>50</sup> A complete list of the demand for all programs is in Appendix 4.

The discipline with the largest demand is health care service and related programs, with an annual average demand of 1,385 from 2005 to 2013.<sup>51</sup> Fifty-two percent (726) of the demand for those disciplines are for associate degrees and certificates, while the remaining 48% is for bachelor’s degree or higher. The discipline with the second largest demand is business, management, marketing, and related support programs with an annual demand of 1,353. Sixty-five percent are for bachelor’s or higher degrees. Other disciplines with the largest demand are education, construction trade, and computer science. While the majority of demand for construction trade programs is for 2-year or certificate programs, the majority demand for education and computer sciences are for bachelor’s degree or higher.

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<sup>49</sup> This is different from student demand, which is based on student interests. This demand does not take into account students’ preferences, which can only be addressed by student surveys

<sup>50</sup> The major disciplines are defined by the first two digits of the Classification of Instructional Programs (CIP) code.

<sup>51</sup> The demand in Section 6.1 is the usual degree demand, not the extra demand beyond normal demand.



**Table 6.1: Estimated Richmond MSA Annual Degree Demand by Disciplines, 2005 -2013**

Discipline	Associates or Certificate	Bachelor or Higher	Total
Agriculture, General	28	17	45
Architecture and related services.	1	10	11
Biological and biomedical sciences.	1	29	30
Business, management, marketing, and related support services.	472	880	1,353
Communication, journalism, and related programs.	14	53	68
Communications technologies/technicians and support services.	18	8	27
Computer and information sciences and support services.	117	286	403
Construction Trades, General	536	123	659
Education.	187	543	730
Engineering Technology, General	100	31	131
Engineering.	35	180	215
English language and literature/letters.	4	34	38
Health Services/Allied Health/Health Sciences, General	726	659	1,385
History (new) instructional programs that focus on the study and interpretation of past events, institutions, issues, and cultures.	0	4	5
Human Services, General	18	58	77
Legal Studies, General	49	118	167
Library science.	7	16	23
Mathematics and statistics.	1	9	10
Mechanics and Repairers, General	196	28	224
Medicine (Doctor)	2	82	84
Multi/interdisciplinary studies.	5	13	18
Natural resources and conservation.	2	11	13
Parks, recreation, leisure, and fitness studies.	17	29	45
Personal and culinary services.	185	63	247
Physical sciences.	1	28	29
Precision Production Trades, General	56	5	62
Psychology.	1	20	21
Science technologies/technicians.	14	17	30
Security and protective services.	57	33	90
Social sciences.	6	37	44
Theology and religious vocations.	1	5	6
Transportation and materials moving.	81	28	109
Visual and performing arts.	13	34	48
Work and Family Studies	34	30	64
Total	2,987	3,521	6,508

Sources: Chmura Economics & Analytics and JobsEQ, Patent Pending

Table 6.2 indicates that the degree program in the Richmond MSA with the highest demand is registered nurses training, estimated to be 386 per year. That is followed by degrees in business administration, 337 per year. Demands for accounting, finance, and operations management are



also robust. Demand for graduates in computer and information science is strong too, mostly for graduates with bachelor's degrees (208 per year), and some with associate degrees (96 per year). Other high demand programs are various education programs, law, and criminal justice programs.

**Table 6.2: Top 20 Programs with Largest Annual Degree Demand for Richmond MSA, 2005-2013**

CIP Code	CIP Description	Associate or Certificate	Bachelor or Higher	Total
51.1601	Nursing - Registered Nurse Training (RN, ASN, BSN, MSN)	157	230	386
52.0201	Business Administration and Management, General	108	229	337
11.0101	Computer and Information Sciences, General	96	208	304
52.0801	Finance, General	60	147	207
13.1314	Physical Education Teaching and Coaching	30	137	167
52.0301	Accounting	32	116	148
52.0101	Business/Commerce, General	47	99	146
13.1202	Elementary Education and Teaching	7	119	126
51.1613	Licensed Practical /Vocational Nurse Training (LPN, LVN, Cert, Dipl, AAS)	113	8	121
46.0412	Building/Construction Site Management/Manager (NEW)	96	24	120
52.0205	Operations Management and Supervision	88	31	119
14.0901	Computer Engineering, General	18	93	110
46.0302	Electrician	93	14	106
22.0101	Law (LL.B., J.D.)	3	87	90
46.0201	Carpentry/Carpenter	70	17	86
43.0111	Criminalistics and Criminal Science (NEW)	49	29	78
52.1701	Insurance	31	45	76
12.0500	Cooking and Related Culinary Arts, General (NEW)	54	20	74
49.0205	Truck and Bus Driver/Commercial Vehicle Operation	57	14	71
13.1501	Teacher Assistant/Aide	47	19	66

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

## 6.2. Post Secondary Education Capacity

This section identifies the programs offered at the existing colleges and other post-secondary training facilities in the Richmond MSA and compares them with the market demands. In addition, this section identifies the programs where needs are not met and identifies the programs with excess capacity.

There are 22 post-secondary institutions in the Richmond MSA, representing a wide variety of educational options for residents and businesses of the Richmond area. They include public research universities (VCU), private liberal arts colleges (University of Richmond, Randolph-Macon), public 2-year colleges (J. Sargeant Reynolds, John Tyler), and private for-profit colleges (Strayer University, ECPI College of Technology, etc). Table 6.3 lists these institutions and their



degree awards for the 2002-2003 academic year. Of the 9,627 total post-secondary awards, VCU accounted for 43% of them (4,152), followed by the University of Richmond (1,179), Virginia State University (762), J. Sargeant Reynolds Community College (869), and John Tyler Community College (649). For private for-profit institutions, ECPI College of Technology graduated the most students (587) followed by Beta Tech (210).

Table 6.3: Richmond MSA Post-secondary Education Institutions		
College Name	Location	2002-03 Awards
John Tyler Community College	Chesterfield County	649
Strayer University-Chesterfield Campus	Chesterfield County	N/A
Colonial Heights Beauty Academy	Colonial Heights City	22
Randolph-Macon College	Hanover County	235
Henrico County-Saint Mary's Hospital School of Nursing	Henrico County	35
Strayer University-Henrico Campus	Henrico County	N/A
Richard Bland the College of William And Mary	Petersburg City	205
Southside Regional Medical Center	Petersburg City	37
Virginia State University	Petersburg City	762
Baptist Theological Seminary at Richmond	Richmond City	62
Beta Tech	Richmond City	210
Bon Secours Memorial School of Nursing	Richmond City	35
Braxton School of Business	Richmond City	57
Bryant and Stratton College-Richmond	Richmond City	68
ECPI Technical College	Richmond City	587
ITT Technical Institute	Richmond City	81
J Sargeant Reynolds Community College	Richmond City	869 <sup>52</sup>
Union Theological Seminary and Presbyterian School	Richmond City	77
University of Richmond	Richmond City	1,179
Virginia Commonwealth University	Richmond City	4,152
Virginia School of Technology-Richmond	Richmond City	82
Virginia Union University	Richmond City	223
Source: National Center for Education Statistics		

Table 6.4 lists the current higher education capacity of the Richmond MSA in various broad disciplines<sup>53</sup> measured by the number of post-secondary awards in the 2002-2003 academic year.<sup>54</sup> Of all the degree and certificate awards, 19% of them are in health science programs. Fifteen

<sup>52</sup> The most recent data provided by Ron Laux of J. Sargeant Reynolds Community College report 941 graduates for J. Sargeant Reynolds Community College, and 446 for John Tyler Community College for 2004-2005 academic year. CEA uses 2002-03 academic year data to be consistent with other 4-year colleges as well as private colleges.

<sup>53</sup> Broad programs are identified by the first two digits of the CIP code, while individual programs are identified by 6-digit CIP code.

<sup>54</sup> Only programs with 3 or more degree awards are listed in this table.



percent of degrees and certificates are in business, management, marketing, and related support service programs. Institutions in the Richmond MSA also award significant numbers of degrees and certificates in the following programs: computer and information sciences and support services (8%), education (7%), and social sciences (6%), visual and performing arts (5%).

**Table 6.4: Richmond MSA Post-Secondary Degree Award, 2002-2003 Academic Year**

Academic Programs	Associate Degree and Certificates	Bachelors Degree or Higher	Total	Percent
Agriculture, General	8	5	13	0
Area, ethnic, cultural, and gender studies.		22	22	0
Biological and biomedical sciences.		293	293	3
Business, management, marketing, and related support services.	381	1,111	1,492	15
Communication, journalism, and related programs.		214	214	2
Communications technologies/technicians and support services	23		23	0
Computer and information sciences and support services	541	247	788	8
Education	87	539	626	7
Engineering Technology, General	271	13	284	3
Engineering	8	103	111	1
English language and literature/letters		232	232	2
Foreign languages, literatures, and linguistics		60	60	1
Health Services/Allied Health/Health Sciences, General	989	865	1,854	19
History		110	110	1
Human Services, General	12	313	325	3
Legal Studies, General	62	164	226	2
Liberal arts and sciences, general studies and humanities	214	127	341	4
Mathematics and statistics		63	63	1
Mechanics and Repairers, General	26		26	0
Multi/interdisciplinary studies	29	127	156	2
Natural resources and conservation		10	10	0
Parks, recreation, leisure, and fitness studies		81	81	1
Personal and culinary services	22		22	0
Philosophy and religious studies		45	45	0
Physical sciences	173	64	237	2
Psychology		390	390	4
Security and protective services	54	183	237	2
Social sciences	79	496	575	6
Theology and religious vocations		222	222	2
Visual and performing arts	2	520	522	5
Work and Family Studies		27	27	0
<b>Total</b>	<b>2,981</b>	<b>6,646</b>	<b>9,627</b>	<b>100</b>

Source: National Center for Education Statistics

In terms of individual degree awards, Table 6.5 lists the top 20 degrees with the most awards in the 2002-03 academic year. The largest program in the Richmond MSA is business



administration, with 727 awards—640 of them are degrees of bachelor's or higher. Nursing programs in Richmond also turn out a large number of graduates each year. In 2002-03, the number of graduates in nursing amounted to 466, with 255 with associate degrees, and 211 with bachelor's degrees or higher. Other demand programs with notable numbers of graduates include mental and social health services (424), computer and information sciences (392), and psychology (390). See Appendix 5 for a complete list of degree awards from all programs in the 2002-03 academic year.

**Table 6.5: Richmond MSA Top 20 Post-Secondary Degree Award, 2002-03 Academic Year**

Program Description	Associate Degree and Certificates	Bachelors Degree or Higher	Total
52.0201 Business Administration and Management, General	87	640	727
51.1601 Nursing/Registered Nurse (RN, ASN, BSN, MSN)	235 <sup>55</sup>	211	466
51.1599 Mental and Social Health Services and Allied Professions, Other	424		424
11.0101 Computer and Information Sciences, General	322	70	392
42.0101 Psychology, General		390	390
44.0701 Social Work		231	231
26.0101 Biology/Biological Sciences, General		200	200
23.0101 English Language and Literature, General		192	192
9.0102 Mass Communication/Media Studies		189	189
11.0401 Information Science/Studies	12	171	183
Computer Technology/Computer Systems			
15.1202 Technology	177		177
45.1101 Sociology		175	175
40.0101 Physical Sciences	173		173
45.1001 Political Science and Government, General		169	169
52.0301 Accounting	7	159	166
22.0101 Law (LLB, JD)		163	163
51.1201 Medicine (MD)		163	163
Liberal Arts and Sciences, General Studies and			
24.0199 Humanities, Other	162		162
43.0103 Criminal Justice/Law Enforcement Administration		155	155
52.1201 Management Information Systems, General	82	63	145

Source: National Center for Education Statistics

<sup>55</sup> This number includes corporative programs J. Sargeant Reynolds has with Southside Community College (29) and Rappahannock Community College (4). Those numbers will not be counted as Richmond MSA supply in education gap analysis, as those students are likely to return to their county of residence when they finish the program.



### 6.3. Post Secondary Education Gaps

Comparing the market demand with the current degrees awarded in the Richmond MSA, CEA identifies several disciplines whose needs are not being met by the institutions in the region. Additionally, CEA identifies several programs where there is no confirmed market demand for degrees awarded. The estimated education gaps are listed in Table 6.6.

To estimate the labor supply, CEA evaluates the number of the degree awards expected to enter the Richmond MSA labor market. For a school like the University of Richmond, over two thirds of its students are from out of state. As a result, a significant number of them will go back to their home state after graduation. Another school with a higher proportion of out-of-state students is Virginia State University in Petersburg. In contrast, 41% of the incoming freshmen for VCU are residents of the Richmond MSA. Moreover, 88% of the students in John Tyler Community College, and 83% of students from J. Sargeant Reynolds Community College are from the Richmond MSA.<sup>56</sup> This study assumes that all graduates with associate degrees or certificates will remain in the Richmond labor market. In other words, the number of people entering the Richmond MSA labor market is estimated to be 85% of total number of degree awards.<sup>57</sup>

Table 6.6 presents the education gaps for the Richmond MSA. In this table, a positive gap indicates degree demand exceeds the number of graduates with that degree, while a negative gap indicates the number of graduates exceeds demand for that program.<sup>58</sup> The region has strong needs for associate or vocational training programs such as construction trade, mechanics, and repair. A significant number of those trades are not being met.

For certain disciplines, there is an imbalance in associate and college degrees. The computer science discipline is the area where the Richmond MSA lacks graduates with bachelor's degrees but has a surplus of graduates with 2-year degrees or certificates. Education disciplines will see gaps in both associate and bachelor's level graduates. For business disciplines, the

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<sup>56</sup> One complicating issue is that not all those students will stay in Richmond MSA after graduation, especially for graduates from University of Richmond. Another complicating issue is Richmond students who go to college in other regions or states and come back after graduation. There are no available data on the number as well as the degrees for those students.

<sup>57</sup> This percentage equals total number of emerging workforce with bachelors degrees (about 5,700) divided by total number of awards (about 6,700). This is a net result, including out-of-state students from Richmond colleges who stay in the area, as well as students who graduate from out of the area colleges. The education gaps estimated in this case is the most likely one. If total degree award (100%) of the region is used, the gap estimate can be under-stated because many of graduates will not stay in the area. If CEA only uses student who come from the region (40%), the gap estimate will be over-stated because students from other region do move and work here.

<sup>58</sup> This positive gap means the extra demand beyond local institutions can provide.



shortage of graduates occurs in areas of associate degrees, while the Richmond MSA has a surplus of business graduates with business degrees or higher.

**Table 6.6: Annual Education Gap in Richmond MSA, 2005-2013**

Academic Programs	Associate Degree or Certificate	Bachelor's or Higher Degree	Total Degrees
Construction Trades, General	536	123	659
Personal and culinary services.	163	63	225
Mechanics and Repairers, General	170	28	198
Education.	100	82	182
Engineering.	27	93	120
Transportation and materials moving.	81	28	109
Precision Production Trades, General	56	5	62
Work and Family Studies	34	7	41
Agriculture, General	20	13	33
Science technologies/technicians.	14	17	30
Business, management, marketing, and related support services.	91	-64	27
Library science.	7	16	23
Architecture and related services.	1	10	11
Natural resources and conservation.	2	3	5
Communications technologies/technicians and support services.	-5	8	4
Area, ethnic, cultural, and gender studies.	0	-18	-18
Parks, recreation, leisure, and fitness studies.	17	-40	-24
Legal Studies, General	-13	-21	-35
Philosophy and religious studies.	0	-37	-37
Mathematics and statistics.	1	-45	-44
Foreign languages, literatures, and linguistics.	0	-51	-51
History (new) instructional programs that focus on the study and interpretation of past events, institutions, issues, and cultures.	0	-89	-89
Communication, journalism, and related programs.	14	-129	-114
Multi/interdisciplinary studies.	-24	-95	-119
Security and protective services.	3	-122	-119
Engineering Technology, General	-171	19	-151
English language and literature/letters.	4	-163	-159
Theology and religious vocations.	1	-184	-183
Physical sciences.	-172	-26	-198
Human Services, General	6	-208	-201
Biological and biomedical sciences.	1	-220	-219
Health Services/Allied Health/Health Sciences, General	-208	5	-203
Psychology.	1	-311	-311
Liberal arts and sciences, general studies and humanities.	-214	-108	-322
Computer and information sciences and support services.	-424	76	-348
Visual and performing arts.	11	-408	-396



Table 6.6: Annual Education Gap in Richmond MSA, 2005-2013			
Social sciences.	-73	-384	-457
Grand Total	6	-2,129	-2,123

Sources: Chmura Economics & Analytics and JobsEQ™, Patent Pending

On the other side of the spectrum, the degree programs with surplus graduates are social sciences. On average, there are 457 per year more graduates in social science than the market can absorb. Some of those students may pursue graduate degrees in demand fields such as law and business. Additionally, some of those students will not find employment in their own fields, thus becoming a potential source for the underemployed workforce. Other disciplines with surpluses are liberal arts and science, visual and performing arts, psychology, theology, and physical sciences.

The gaps for computer and information sciences are slightly different. The CEA model shows that the surplus of graduates hold associate degrees while demand for students with bachelor or higher degrees exceeds the number of graduates. Those imbalances stress the need to look into more granular level of degree demand and supply.

Table 6.7 gives an example of the detailed gaps for individual education programs in the business field.<sup>59</sup> The total gap of the region (27) seems to suggest that the demand and supply for business degrees are relatively equal in the next 8 years. However, they are unevenly distributed at the program level. The Richmond MSA needs an extra 202 finance graduates per year, 119 operation management and supervision graduates, and 76 insurance graduates. All of those require bachelors or higher degrees. Other relatively small training programs that the region is lacking include hotel management, financial planning and services, and procurement management. None of the institutions in the region offer these degrees or certificates.

Most of the surplus graduates occur at the associate degree level in the next 8 years, such as an associate degree in data entry (16 per year), bookkeeping (20 per year), business administration (87 per year), and management information system (82 per year). Since demand exceeds supply for college graduates, those surplus associate degree holders should be encouraged to pursue a 4-year degree in related high demand programs. For example, bookkeeping students can study toward an accounting bachelor's degree; business management associate degree holders can pursue an operations management bachelor's degree. A complete list of education gaps for individual programs in all major disciplines is in Appendix 5.

<sup>59</sup> For a detailed list of other programs, such as health care, education, engineering, social science, and computer science, please see Appendix 6.



**Table 6.7: Annual Education Gaps by Instructional Programs, 2005-2013  
Business, Management, Marketing and Related**

CIP	Program Description	Associate or Certificate			Bachelor's or Higher			Total Gap
		Supply	Demand	Gap	Supply	Demand	Gap	
52.0801	Finance, General		60	60	5	147	142	202
52.0205	Operations Management and Supervision		88	88	0	31	31	119
52.1701	Insurance		31	31	0	45	45	76
52.0101	Business/Commerce, General	67	47	-20	26	99	74	54
52.1801	Sales, Distribution, and Marketing Operations, General		13	13	0	14	14	27
52.1501	Real Estate		12	12	4	16	12	25
52.0904	Hotel/Motel Administration/Management (NEW)		12	12		7	7	18
52.0202	Purchasing, Procurement/Acquisitions and Contracts Management		4	4		11	11	14
52.0804	Financial Planning and Services		3	3		10	10	12
52.0807	Investments and Securities		3	3		9	9	12
52.1908	Business and Personal/Financial Services Marketing Operations (NEW)	0	3	3		9	9	12
52.0299	Business Administration, Management and Operations, Other	12		-12			0	-12
52.0407	Business/Office Automation/Technology/Data Entry	16		-16			0	-16
52.0302	Accounting Technology/Technician and Bookkeeping	20		-20			0	-20
52.1003	Organizational Behavior Studies	6	7	1	39	13	-26	-26
52.0601	Business/Managerial Economics		1	1	37	4	-33	-32
52.1401	Marketing/Marketing Management, General		6	6	71	18	-54	-48
52.1201	Management Information Systems, General	82	15	-67	54	47	-6	-73
52.0401	Administrative Assistant and Secretarial Science, General	73		-73				-73
52.0201	Business Administration and Management, General	87	108	21	544	229	-315	-294

Source: Chmura Economics & Analytics, JobsEO™, Patent Pending

#### 6.4. K-12 Academic Performance Indicators

Post-secondary education is only one area that can affect the quality of the Richmond MSA labor force. Another important component in workforce development is K-12 public schools. Indicators such as Standards of Learning (SOL) scores and drop-out statistics are good measures of the skill levels of people who fill low-skill jobs in the Richmond MSA as well as those who successfully complete their secondary education.



Student enrollment in the Richmond MSA public schools has been increasing in recent years. In the fall of 2000, total enrollment in K-12 public schools amounted to 178,498. That number increased to 191,622 in 2004—a 7.4% gain in 5 years (Table 6.8). In Richmond, high school enrollment grew by 15.9% between fall 2000 and fall 2004, compared with 10.9% statewide and only 7.3% nationally. Growth in K-8 enrollment in the Richmond MSA was 4.0% over the same period, 2.1% statewide.

<b>Table 6.8: Public School Enrollment</b>						
	Fall 1995		Fall 2000		Fall 2004	
	K-8 <sup>th</sup> grade	High School	K-8 <sup>th</sup> grade	High School	K-8 <sup>th</sup> grade	High School
Richmond MSA	120,693	45,143	128,429	50,069	133,511	58,041
State	755,549	291,792	804,070	329,146	821,117	364,961
Nation	32,341,000	12,500,000	33,709,000	13,514,000	33,669,000	14,506,000

Source: Virginia Department of Education, U.S. Department of Education, National Center for Education Statistics

The skills of the emerging workforce can be gauged by the passing rates of student Standards of Learning (SOL) tests in mathematics and writing. Table 6.9 lists the performance of 8<sup>th</sup> graders in the Richmond MSA by county and city. The overall SOL passing rates of the Richmond MSA are very close to the state average even though test scores of the cities of Richmond and Petersburg are significantly lower than other localities. While the passing rates for mathematics tests have been increasing since 2000, the passing rates for writing show no increasing trend.



**Table 6.9: Richmond MSA Standard of Learning (SOL) Tests Passing Percentage**

	Grade 8 Mathematics					Grade 8 Writing				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
Amelia	43%	58%	64%	66%	71%	71%	71%	75%	64%	79%
Caroline	38%	60%	48%	52%	60%	75%	70%	73%	57%	74%
Charles City	19%	27%	35%	61%	60%	56%	57%	63%	39%	63%
Chesterfield	74%	82%	85%	82%	86%	84%	84%	84%	84%	83%
Colonial Heights City	75%	76%	72%	76%	75%	81%	70%	70%	71%	76%
Cumberland	34%	61%	72%	77%	78%	58%	45%	65%	66%	68%
Dinwiddie	32%	34%	63%	66%	70%	75%	47%	61%	61%	68%
Goochland	59%	74%	82%	77%	81%	83%	83%	85%	75%	85%
Hanover	71%	78%	79%	80%	84%	86%	84%	83%	81%	80%
Henrico	67%	75%	80%	80%	76%	85%	80%	83%	81%	78%
Hopewell City	72%	73%	72%	72%	66%	70%	64%	59%	61%	62%
King And Queen	61%	72%	57%	65%	61%	74%	47%	53%	58%	59%
King William	80%	81%	81%	68%	76%	94%	79%	77%	80%	98%
Louisa	57%	66%	67%	68%	78%	77%	74%	71%	70%	77%
New Kent	71%	69%	69%	61%	68%	80%	70%	72%	73%	72%
Petersburg City	16%	23%	27%	40%	40%	52%	55%	47%	41%	52%
Powhatan	69%	71%	76%	75%	75%	81%	78%	73%	78%	72%
Prince George	65%	79%	82%	87%	85%	74%	76%	79%	73%	79%
Richmond City	31%	38%	42%	56%	65%	54%	49%	56%	56%	74%
Sussex	48%	65%	61%	53%	55%	58%	61%	61%	54%	54%
Richmond MSA	61%	69%	73%	74%	77%	78%	74%	76%	75%	77%
State Average	61%	68%	71%	72%	78%	76%	75%	76%	74%	77%

Source: Virginia Department of Education. Note: Assessment scores are for Spring of the indicated year.

The drop-out rate is another academic indicator that will impact the quality of the workforce. An elevated high school drop-out rate indicates that more students will enter the lower skill and income end of the labor market less prepared. As a result, area employers will need to invest more on remedial skill training. The drop-out rates<sup>60</sup> of the Richmond MSA were 2.6% in 2000, increasing to 3.0% in 2004. During the same time, the state average decreased from 2.5% to 2.1%. However, the increase in drop-out rates for the Richmond MSA was caused by a dramatic jump in the City of Richmond from 3.5% in 2000 to 15.3% in 2004.<sup>61</sup> In all other localities (except Petersburg), drop-out rates fell or remained unchanged from 2000 through 2004.

<sup>60</sup> High school dropouts are defined as those students who withdraw from high schools for any reason other than graduation, promotion, or death. The drop-out rate does not include students who are categorized as transfers. Drop-outs are defined by the Virginia Department of Education as the number of drop-outs in an academic year divided by fall membership.

<sup>61</sup> City of Richmond officials were contacted to verify that the jump in drop-out rate noted here is correct and reflect the official figures.



<b>Table 6.10: Richmond MSA High School Drop-Out Rates</b>		
	2000	2004
Amelia	3.0%	2.3%
Caroline	2.8%	0.6%
Charles City	2.2%	0.5%
Chesterfield	2.9%	1.0%
Colonial Heights	3.6%	0.7%
Cumberland	5.0%	1.0%
Dinwiddie	3.3%	2.3%
Goochland	3.0%	0.3%
Hanover	0.3%	0.4%
Henrico	1.9%	1.9%
Hopewell	2.8%	2.6%
King & Queen	1.5%	1.6%
King William	1.0%	0.0%
Louisa	3.2%	2.3%
New Kent	2.2%	0.4%
Petersburg	5.3%	6.1%
Powhatan	2.9%	1.2%
Prince George	2.3%	1.0%
Richmond City	3.5%	15.3%
Sussex	3.8%	2.9%
Richmond MSA	2.6%	3.0%
State Average	2.5%	2.1%

Source: Virginia Department of Education. Note: Year 2004 indicates 2003-2004 academic year, same for year 2000.

In summary, the K-12 academic performance measures indicate that the Richmond MSA is keeping pace with the state average in terms of SOL testing and drop outs. However, there are substantial performance gap between inner city school districts such as those of Petersburg and Richmond and suburban school districts.

## 7. Program Implications

The CEA analysis of the state of the workforce of the Richmond MSA points to several challenges and opportunities that can be met by effective workforce and educational policies.

1. One of the biggest challenges influenced by demographic trends is increasing health care costs. With an aging population, rising healthcare costs could prevent some small businesses from starting up and big businesses from expanding. This is especially true for small businesses, as they lack the bargaining power of large companies. An organized consortium of small businesses should be able to help them contain health care costs.



2. It is estimated that around 13,000 Richmond MSA workers are classified as underemployed; their education and skills levels exceed those required by their current jobs. Strategies to identify the underemployed and steer them toward higher-skill level positions (which can be found within the career ladders of this report) will benefit these individuals—often with higher paying positions—as well as benefit the Richmond MSA by possessing a better-aligned and higher quality workforce.
3. Continuing expanding the coverage area of the transit system with reduced cycle times for wait and travel times will increase jobs opportunities for workers who lack other means of transportation. Greater opportunities for workers should lead to lower unemployment rates.
4. Educational institutions not currently participating in 2+2 programs or transfer programs to the region's 4-year should begin this practice. The study shows that there are imbalances between 2-year and 4-year colleges. The area produces too many associate degrees in business and computer sciences programs, while there are insufficient graduates with bachelor's or higher degrees in business and computer sciences programs. A 2+2 or transfer program can successfully reduce the imbalances and satisfy the needs of the Richmond economy.
5. For 2-year colleges, there are demands for training or certificate programs for vocational trainings in construction trade and personal and culinary services. It is suggested that these programs should be a priority for resources, rather than expanding capacities in 2-year business or information science programs.
6. Another challenge for policymakers is the disparity among localities in the Richmond MSA. Localities such as the cities of Richmond and Petersburg suffer population loss, high poverty rates, low test scores, and high drop-out rates. Tutoring programs for city schools, investment in public transit so that city residents can access jobs in the suburbs are some options to improve standards of living and income distributions throughout the area. Implementing those policies, however, requires the participation and cooperation of all localities. A metropolitan area with a vibrant city and prosperous suburbs has greater appeal to well-educated residents, as well as companies employing them.

## Appendix 1: Regional Transportation Planning Groups

The following two regional transportation planning groups serve the Richmond MSA: the Richmond Area Metropolitan Planning Organization<sup>62</sup> (MPO) and the Tri-cities Area MPO.<sup>63</sup> Along with the Virginia Department of Transportation, these two federally designated regional transportation planning agencies are required to develop an agreement and assure the development of an overall transportation plan for the entire Richmond and Tri-Cities region. The Richmond Area MPO included improvements in mass transit as one of its top five goals, along with road expansions that should continue to hold down commuting time. The five priority transportation projects are as follows:

1. Richmond International Airport expansion and access improvements
2. Main Street Station, High-Speed Intercity Rail, GRTC improvements
3. Routes 360 (East of I-295 in Hanover and West of Swift Creek in Chesterfield)
4. Parham Road/Patterson Avenue Urban Interchange (Henrico)
5. Huguenot bridge reconstruction

In addition to its top five priority projects, the MPO's other regional priority projects are as follows:

- I-64 corridor and rail improvements from Richmond to Hampton Roads
- Route 10 widening (Chesterfield)
- Route 250 widening from Routes 623 to 621 (Goochland)
- RMA and Powhite Parkway extension toll removal
- Widening of I-64 between I-295 at Short Pump and Route 288 to six lanes

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<sup>62</sup> The MPO includes elected officials from the nine surrounding local governments, Virginia Department of Transportation (VDOT), and other area transportation agencies. The MPO is charged under Section 134 of the Federal Aid Highway Act of 1973, as amended, for maintaining and conducting a "continuing, cooperative and comprehensive" (i.e., "3C") transportation planning process that results in plans and programs consistent with the comprehensively planned development of the Richmond urbanized area. The MPO and the VDOT annually certify the MPO's compliance with federal requirements for the "3C" process, and other federal rules and regulations, as a condition for the Richmond area receiving federal capital and operating assistance funds. Various federally funded highway and transit projects that are located within the MPO study are must be approved by the MPO prior to their becoming eligible for federal funds.

<sup>63</sup> The Tri-Cities Area MPO is in charge of transportation planning for the cities of Petersburg, Colonial Heights and Hopewell and portions of Prince George, Dinwiddie and southern Chesterfield counties. A portion of Chesterfield County is included in the Richmond Area MPO, as the maps below will show.



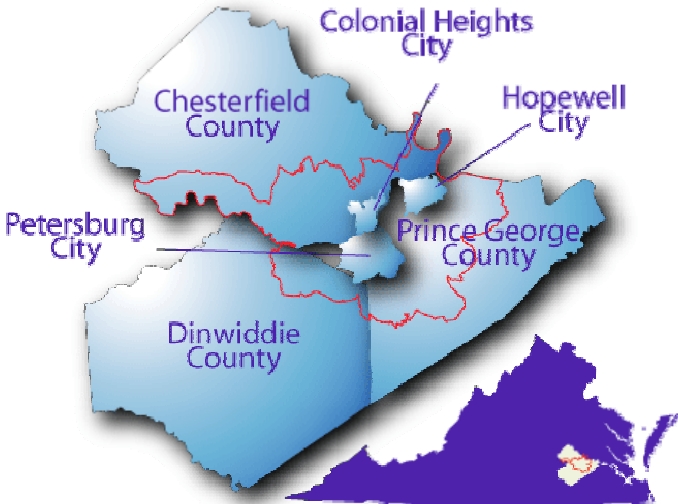
The top priority transportation project for the Tri-Cities Area MPO is improvement along the U.S. Route 460 corridor between the I-295 interchange in Prince George and Route 58 in Suffolk<sup>64</sup>. This project is also one of the regional priority projects for the Hampton Roads MPO. Other regional priority projects in the Tri-Cities include improvements to the I-95 & Temple Avenue interchange, Higher-Speed Passenger Rail Service between Richmond and South Hampton Roads using existing rail facilities parallel to U.S. Route 460 and the Petersburg Area Transit Multi-Modal Center. Also, a project receiving increasing attention at this time because of pending BRAC related expansion proposals for Fort Lee is improvement to the Route 144 interchange at Route 36.

**Map A.1: Richmond Metropolitan Planning Organization Study Area**



<sup>64</sup> This paragraph summary of the Tri-Cities Area transportation priorities was provided by Mr. Joe Vinsh, Secretary of the Crater Planning District Commission and voting member of the Tri-Cities MPO Committee.

Map A.2: Tri-Cities Metropolitan Planning Organization Study Area



## Appendix 2: Richmond MSA Career Training Ladders

Construction	
All other architects, surveyors, and cartographers	3
Architects, Except Landscape and Naval	155
Carpet Installers	142
Construction Managers	1,259
Painters, Construction and Maintenance	2,390
Plasterers and Stucco Masons	143
Stonemasons	121



First-Line Supervisors/Managers of Construction Trades and Extraction Workers	3,595
First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	502



All other construction trades and related workers	589
Brickmasons and Blockmasons	615
Cabinetmakers and Bench Carpenters	310
Carpenters	4,320
Cement Masons and Concrete Finishers	832
Construction and Building Inspectors	369
Drywall and Ceiling Tile Installers	680
Floor Layers, Except Carpet, Wood, and Hard Tiles	70
Glaziers	187
Insulation Workers	296
Maintenance and Repair Workers, General	4,561
Reinforcing Iron and Rebar Workers	149
Roofers	590
Structural Iron and Steel Workers	524
Tank Car, Truck, and Ship Loaders	20
Terrazzo Workers and Finishers	21
Upholsterers	37



All other building and grounds cleaning and maintenance workers	393
Construction Laborers	4,023
Fence Erectors	132
Foundry Mold and Coremakers	1
Manufactured Building and Mobile Home Installers	36
Paperhangers	43
Pile-Driver Operators	70
Recreational Vehicle Service Technicians	27
Segmental Pavers	7



<b>Construction</b>	
Tapers	50
Tile and Marble Setters	93



Helpers, Construction Trades, All Other	363
Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	598
Helpers--Carpenters	839
Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	198
Helpers--Roofers	199
Highway Maintenance Workers	478
Rail-Track Laying and Maintenance Equipment Operators	1
Refractory Materials Repairers, Except Brickmasons	19

<b>Clerical</b>	
Administrative Services Managers	991
Executive Secretaries and Administrative Assistants	5,097



Court, Municipal, and License Clerks	242
First-Line Supervisors/Managers of Office and Administrative Support Workers	6,752
Legal Secretaries	1,004
Medical Secretaries	1,315



All other financial, information, and record clerks	1,800
All other material recording, scheduling, dispatching, and distributing workers	66
All other secretaries, administrative assistants, and other office support workers	1,207
Bill and Account Collectors	1,870
Billing and Posting Clerks and Machine Operators	2,189
Cargo and Freight Agents	147
Correspondence Clerks	140
Human Resources Assistants, Except Payroll and Timekeeping	736
Insurance Claims and Policy Processing Clerks	1,539
Library Technicians	402
New Accounts Clerks	492
Order Clerks	1,448
Payroll and Timekeeping Clerks	634
Postal Service Clerks	275
Postal Service Mail Sorters, Processors, and Processing Machine Operators	629
Production, Planning, and Expediting Clerks	800
Secretaries, Except Legal, Medical, and Executive	8,336
Word Processors and Typists	507



**Clerical**

Credit Authorizers, Checkers, and Clerks	583
File Clerks	832
Interviewers, Except Eligibility and Loan	741
Library Assistants, Clerical	423
Meter Readers, Utilities	250
Office Clerks, General	13,556
Office Machine Operators, Except Computer	438
Parking Enforcement Workers	14
Procurement Clerks	305
Receptionists and Information Clerks	5,392
Stock Clerks and Order Fillers	7,300
Switchboard Operators, Including Answering Service	995
Weighers, Measurers, Checkers, and Samplers, Recordkeeping	425

**Computers and Electronics**

Computer and Information Systems Managers	1,213
Computer Science Teachers, Postsecondary	280
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	170



Avionics Technicians	13
Computer and Information Scientists, Research	191
Computer Hardware Engineers	166
Computer Programmers	2,265
Computer Software Engineers, Applications	1,518
Computer Software Engineers, Systems Software	1,514
Computer Specialists, All Other	814
Computer Support Specialists	2,163
Database Administrators	697
Desktop Publishers	114
Graphic Designers	512
Network and Computer Systems Administrators	1,235
Network Systems and Data Communications Analysts	690



Computer Operators	1,091
Computer Systems Analysts	3,252
Computer, Automated Teller, and Office Machine Repairers	576
Electrical and Electronic Equipment Assemblers	490
Electrical and Electronics Installers and Repairers, Transportation Equipment	37
Electronic Equipment Installers and Repairers, Motor Vehicles	20
Electronic Home Entertainment Equipment Installers and Repairers	108
Numerical Tool and Process Control Programmers	42
Radio Mechanics	56

**Computers and Electronics**



Data Entry Keyers 1,928

**Customer Service**

Chefs and Head Cooks	374	Funeral Directors	47
Food Service Managers	1,023	Medical and Health Services Managers	712
		Meeting and Convention Planners	124
		Social and Community Service Managers	351



Bakers	351	Barbers	128
Butchers and Meat Cutters	503	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	1,193
Cooks, Restaurant	3,344	First-Line Supervisors/Managers of Personal Service Workers	575
First-Line Supervisors/Managers of Food Preparation and Serving Workers	3,511	Hairdressers, Hairstylists, and Cosmetologists	1,741
		Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	1,415
		Lodging Managers	128
		Recreation Workers	945
		Residential Advisors	444
		Tailors, Dressmakers, and Custom Sewers	170



All other food processing workers	161	All other gaming workers	80
Cooks, Fast Food	3,187	Customer Service Representatives	10,739
Cooks, Institution and Cafeteria	1,723	Flight Attendants	418
Food Preparation and Serving Related Workers, All Other	643	Floral Designers	204
		Gaming and Sports Book Writers and Runners	13
		Gaming Dealers	2
		Hotel, Motel, and Resort Desk Clerks	527
		Laundry and Dry-Cleaning Workers	1,046
		Personal Care and Service Workers, All Other	263
		Reservation and Transportation Ticket Agents and Travel Clerks	338
		Travel Agents	220
		Travel Guides	28



**Customer Service**

Combined Food Preparation and Serving Workers, Including Fast Food	8,826	Amusement and Recreation Attendants	1,650
Cooks, Short Order	438	Baggage Porters and Bellhops	152
Food Preparation Workers	3,800	Bartenders	984
		Cashiers	17,283
		Child Care Workers	1,376
		Concierges	80
		Counter and Rental Clerks	1,976
		Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	1,715
		Dining Room and Cafeteria Attendants and Bartender Helpers	1,498
		Dishwashers	1,690
		Food Servers, Nonrestaurant	721
		Funeral Attendants	195
		Janitors and Cleaners, Except Maids and Housekeeping Cleaners	10,504
		Locker Room, Coatroom, and Dressing Room Attendants	65
		Maids and Housekeeping Cleaners	4,458
		Manicurists and Pedicurists	139
		Parking Lot Attendants	286
		Pressers, Textile, Garment, and Related Materials	356
		Service Station Attendants	439
		Shampooers	332
		Skin Care Specialists	94
		Tour Guides and Escorts	152
		Transportation Attendants, Except Flight Attendants and Baggage Porters	77
		Ushers, Lobby Attendants, and Ticket Takers	302
		Waiters and Waitresses	8,482



**Education**

Education Administrators, Postsecondary	505		
Agricultural Sciences Teachers, Postsecondary	36	Directors, Religious Activities and Education	49
Anthropology and Archeology Teachers, Postsecondary	31	Instructional Coordinators	355
Architecture Teachers, Postsecondary	16		
Area, Ethnic, and Cultural Studies Teachers, Postsecondary	7		
Art, Drama, and Music Teachers, Postsecondary	279		
Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	32		
Biological Science Teachers, Postsecondary	167		
Business Teachers, Postsecondary	407		
Communications Teachers, Postsecondary	52		
Criminal Justice and Law Enforcement Teachers, Postsecondary	32		
Economics Teachers, Postsecondary	66		
Education Teachers, Postsecondary	189		
Engineering Teachers, Postsecondary	167		
English Language and Literature Teachers, Postsecondary	282		
Environmental Science Teachers, Postsecondary	26		
Foreign Language and Literature Teachers, Postsecondary	121		
Forestry and Conservation Science Teachers, Postsecondary	9		
Geography Teachers, Postsecondary	13		
Graduate Teaching Assistants	408		
Health Educators	175		
Health Specialties Teachers, Postsecondary	343		
History Teachers, Postsecondary	127		
Home Economics Teachers, Postsecondary	4		
Law Teachers, Postsecondary	102		



**Education**

Library Science Teachers, Postsecondary	10
Mathematical Science Teachers, Postsecondary	194
Nursing Instructors and Teachers, Postsecondary	119
Philosophy and Religion Teachers, Postsecondary	80
Political Science Teachers, Postsecondary	80
Postsecondary Teachers, All Other	462
Psychology Teachers, Postsecondary	154
Recreation and Fitness Studies Teachers, Postsecondary	85
Social Work Teachers, Postsecondary	48
Sociology Teachers, Postsecondary	52



Adult Literacy, Remedial Education, and GED Teachers and Instructors	198	Library, museum, training, and other education workers, all other	357
All other teachers, primary, secondary, and adult	4,017	Self-Enrichment Education Teachers	563
Education Administrators, Elementary and Secondary School	818		
Education Administrators, Preschool and Child Care Center/Program	274		
Elementary School Teachers, Except Special Education	5,617		
Kindergarten Teachers, Except Special Education	943		
Middle School Teachers, Except Special and Vocational Education	2,690		
Preschool Teachers, Except Special Education	1,852		
Secondary School Teachers, Except Special and Vocational Education	3,812		
Special Education Teachers, Middle School	403		
Special Education Teachers, Preschool, Kindergarten, and Elementary School	1,281		
Special Education Teachers, Secondary School	475		

**Education**

Vocational Education Teachers Postsecondary	238
Vocational Education Teachers, Middle School	164
Vocational Education Teachers, Secondary School	559



Teacher Assistants	4,355	Animal Trainers	19
		Fitness Trainers and Aerobics Instructors	946

**Science and Mathematics**

Environmental Scientists and Specialists, Including Health	272	Mathematicians	41
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Biochemists and Biophysicists	35	Chemical Engineers	137	Astronomers	2	Mathematical Science Occupations, All Other	3
Biomedical Engineers	21	Chemistry Teachers, Postsecondary	69	Geoscientists, Except Hydrologists and Geographers	37	Mathematical Technicians	2
Conservation Scientists	29			Hydrologists	19	Statisticians	77
Life Scientists, All Other	291			Physical Scientists, All Other	211	Traffic Technicians	3
Microbiologists	52			Physicists	101		
Natural Sciences Managers	213			Physics Teachers, Postsecondary	74		
Zoologists and Wildlife Biologists	41			Surveying and Mapping Technicians	88		
				Surveyors	119		

Embalmers	105	Chemists	580	Atmospheric and Space Scientists	12
		Forensic Science Technicians	4	Cartographers and Photogrammetrists	54
				Geographers	5



Science and Mathematics			
Environmental Science and Protection Technicians, Including Health	49	Chemical Technicians	424
Forest and Conservation Technicians	43		
Life, Physical, and Social Science Technicians, All Other	497	Geological and Petroleum Technicians	23
		Nuclear Technicians	43
		Log Graders and Scalers	26
		Statistical Assistants	88

Biological Technicians	128	Chemical Equipment Operators and Tenders	501
Water and Liquid Waste Treatment Plant and System Operators	431	Pest Control Workers, Pesticide Handlers, Sprayers, and Applicators, Vegetation	431
			77

Mechanical			
Boilermakers	93	Aircraft Mechanics and Service Technicians	277
Electro-Mechanical Technicians	107	Mobile Heavy Equipment Mechanics, Except Engines	474
Elevator Installers and Repairers	50	Service Unit Operators, Oil, Gas, and Mining	5
First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	2,489	Structural Metal Fabricators and Fitters	323
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,481	Camera and Photographic Equipment Repairers	11
Machinists	809	Electrical Power-Line Installers and Repairers	847
Millwrights	324	Power Distributors and Dispatchers	116
Ship Engineers	92	Signal and Track Switch Repairers	2
Tool and Die Makers	69		



Mechanical									
Control and Valve Installers and Repairers, Except Mechanical Door	132	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	4	Motorboat Mechanics	86	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	29	All other electrical and electronic equipment mechanics, installers, and repairers	129
Gas Compressor and Gas Pumping Station Operators	7	All other vehicle and mobile equipment mechanics, installers, and repairers	122	Petroleum Pump System Operators, Refinery Operators, and Gaugers	19	Textile Cutting Machine Setters, Operators, and Tenders	78	Electric Motor, Power Tool, and Related Repairers	142
Home Appliance Repairers	126	Automotive Body and Related Repairers	883	Rail Car Repairers	2	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	77	Electrical and Electronics Repairers, Commercial and Industrial Equipment	424
Industrial Machinery Mechanics	1,038	Bus and Truck Mechanics and Diesel Engine Specialists	970	Rotary Drill Operators, Oil and Gas	62	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	60 8	Electromechanical Equipment Assemblers	30
Inspectors, Testers, Sorters, Samplers, and Weighers	1,465	Engine and Other Machine Assemblers	124					Outdoor Power Equipment and Other Small Engine Mechanics	134
Jewelers and Precious Stone and Metal Workers	151	Farm Equipment Mechanics	164					Plant and System Operators, All Other	134
Mechanical Door Repairers	69							Power Plant Operators	134
Medical Equipment Repairers	65							Security and Fire Alarm Systems Installers	176
Musical Instrument Repairers and Tuners	6								
Ophthalmic Laboratory Technicians	79								
Plumbers, Pipefitters, and Steamfitters	2,663								



Mechanical	
Precision Instrument and Equipment Repairers, All Other	20
Riggers	86
Watch Repairers	65



Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	189	Automotive Service Technicians and Mechanics	3,947	Earth Drillers, Except Oil and Gas	94	Woodworkers, All Other	13
Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	219			Extraction Workers, All Other	25		
Installation, Maintenance, and Repair Workers, All Other	1,513			Gas Plant Operators	15		
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	112						
Operating Engineers and Other Construction Equipment Operators	1,257						
Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	95						
Stationary Engineers and Boiler Operators	139						



Assemblers and Fabricators, All Other	1,095	Automotive Glass Installers and Repairers	76	Continuous Mining Machine Operators	84	Paper Goods Machine Setters, Operators, and Tenders	83	Computer-Controlled Machine Tool Operators, Metal and Plastic	343
Coil Winders, Tapers, and Finishers	104	Bicycle Repairers	47	Crane and Tower Operators	217	Sawing Machine Setters, Operators, and Tenders, Wood	25		



Mechanical							
Coin, Vending, and Amusement Machine Servicers and Repairers	48	Motorcycle Mechanics	95	Derrick Operators, Oil and Gas	6	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	43
Commercial Divers	11	Painters, Transportation Equipment	117	Dredge Operators	5		
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	468			Excavating and Loading Machine and Dragline Operators	608		
Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	144			Helpers-- Pipelayers, Plumbers, Pipefitters, and Steamfitters	526		
Fiberglass Laminators and Fabricators	50			Loading Machine Operators, Underground Mining	8		
Floor Sanders and Finishers	62			Mine Cutting and Channeling Machine Operators	5		
Forging Machine Setters, Operators, and Tenders, Metal and Plastic	99			Mining Machine Operators, All Other	24		
Logging Equipment Operators	185			Paving, Surfacing, and Tamping Equipment Operators	220		
Medical Appliance Technicians	6			Pipelayers	299		
Medical Equipment Preparers	207			Rock Splitters, Quarry	2		
Metal-Refining Furnace Operators and Tenders	25			Roustabouts, Oil and Gas	9		
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	329			Septic Tank Servicers and Sewer Pipe Cleaners	42		
Pump Operators, Except Wellhead Pumpers	5						



Mechanical	
Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	282
Team Assemblers	3,194
Welders, Cutters, Solderers, and Brazers	1,112
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	71



Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	156	Cleaners of Vehicles and Equipment	1,340	Cementing and Gluing Machine Operators and Tenders	89
Cooling and Freezing Equipment Operators and Tenders	20	Tire Repairers and Changers	325	Helpers--Extraction Workers	48
Cutters and Trimmers, Hand Cutting and Slicing Machine Setters, Operators, and Tenders	62			Landscaping and Groundskeeping Workers	3492
Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	176				
Fallers	65				
Grinding and Polishing Workers, Hand	57				
Helpers--Installation, Maintenance, and Repair Workers	901				
Hoist and Winch Operators	31				
Maintenance Workers, Machinery	281				
Pourers and Casters, Metal	7				
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	129				



Medical							
Anesthesiologists	146	Dentists	382	Athletic Trainers	55	Occupational Health and Safety Specialists and Technicians	132
Family and General Practitioners	613			Chiropractors	40		
Internists, General	156						
Obstetricians and Gynecologists	61						
Pediatricians, General	150						
Physicians and Surgeons, All Other	1,136						
Psychiatrists	106						
Surgeons	243						
Veterinarians	255						



Audiologists	27	Dietitians and Nutritionists	147	Diagnostic Medical Sonographers	141
Epidemiologists	3	Occupational Therapists	335	Dietetic Technicians	73
Health Diagnosing and Treating Practitioners, All Other	469	Physical Therapists	673	Health professionals and technicians, all other	829
Optometrists	142	Radiation Therapists	58	Medical and Clinical Laboratory Technologists	779
Pharmacists	922	Recreational Therapists	85	Medical Scientists, Except Epidemiologists	226
Physician Assistants	121	Registered Nurses	10,840	Nuclear Medicine Technologists	69
Podiatrists	26	Speech-Language Pathologists	390	Opticians, Dispensing	205
				Radiologic Technologists and Technicians	913



Healthcare Support Workers, All Other	745	Dental Assistants	1,169	Licensed Practical and Licensed Vocational Nurses	3,878	Cardiovascular Technologists and Technicians	235
Medical Assistants	1,422	Dental Hygienists	636	Massage Therapists	90	Dental Laboratory Technicians	106
Pharmacy Aides	196			Orthotists and Prosthetists	6	Medical Records and Health Information Technicians	695
Veterinary Assistants and Laboratory Animal Caretakers	511			Respiratory Therapists	371	Medical Transcriptionists	555
						Psychiatric Technicians	160



Respiratory Therapy Technicians	99
Surgical Technologists	254
Veterinary Technologists and Technicians	251



Nursing Aides, Orderlies, and Attendants	6,584	Emergency Medical Technicians and Paramedics	457
Occupational Therapist Aides	17	Medical and Clinical Laboratory Technicians	571
Occupational Therapist Assistants	82	Pharmacy Technicians	964
Personal and Home Care Aides	2,294		
Physical Therapist Aides	183		
Physical Therapist Assistants	236		
Psychiatric Aides	154		



Ambulance Drivers and Attendants, Except Emergency Medical Technicians	77
Home Health Aides	2,542

Production			
Industrial Production Managers	430	Bookbinders	34
		Job Printers	146
		Prepress Technicians and Workers	506



Aircraft Cargo Handling Supervisors	38	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	863
First-Line Supervisors/Managers of Production and Operating Workers	2,487		



Production			
Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	90	Printing Machine Operators	906
Lay-Out Workers, Metal and Plastic	40		
Molders, Shapers, and Casters, Except Metal and Plastic	128		
Semiconductor Processors	342		
Sheet Metal Workers	1,147		



Chemical Plant and System Operators	189	Hazardous Materials Removal Workers	285	All other printing workers	66
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	396			Bindery Workers	431
Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	274			Photographic Processing Machine Operators	662
Furniture Finishers	115				
Metal Workers and Plastic Workers, All Other	212				
Production Workers, All Other	1,440				
Shoe Machine Operators and Tenders	24				
Textile, Apparel, and Furnishings Workers, All Other	127				



Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	21	Laborers and Freight, Stock, and Material Movers, Hand	8,310
Conveyor Operators and Tenders	130	Packaging and Filling Machine Operators and Tenders	1,389
Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	94	Packers and Packagers, Hand	3,158
Fabric Menders, Except Garment	4		
Food Cooking Machine Operators and Tenders	92		
Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	126		
Graders and Sorters, Agricultural Products	30		
Helpers--Production Workers	1,687		
Machine Feeders and Offbearers	587		
Mail Clerks and Mail Machine Operators, Except Postal Service	780		
Mixing and Blending Machine Setters, Operators, and Tenders	511		
Painting, Coating, and Decorating Workers	66		
Sewers, Hand	64		
Sewing Machine Operators	511		



Production	
Textile Bleaching and Dyeing Machine Operators and Tenders	8
Tire Builders	21

Sales and Marketing	
Sales Engineers	300

Purchasing Agents, Except Wholesale, Retail, and Farm Products	1,124	Advertising and Promotions Managers	188
Purchasing Managers	310	Marketing Managers	606
Sales Managers	915	Public Relations Specialists	686
Wholesale and Retail Buyers, Except Farm Products	455		

First-Line Supervisors/Managers of Non-Retail Sales Workers	1,377	Advertising Sales Agents	644	Insurance Sales Agents	2,062
First-Line Supervisors/Managers of Retail Sales Workers	6,142				
Merchandise Displayers and Window Trimmers	193				
Purchasing Agents and Buyers, Farm Products	34				
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	1,132				

Parts Salespersons	1,302	Real Estate Brokers	139
Retail Salespersons	19,551	Real Estate Sales Agents	738
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	6,331		

Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	121	Demonstrators and Product Promoters	301
Driver/Sales Workers	1,969		
Sales and Related Workers, All Other	2,100		
Telemarketers	1,681		



Transportation			
Locomotive Engineers	18	Captains, Mates, and Pilots of Water Vessels	102
Postmasters and Mail Superintendents	85		Air Traffic Controllers
Railroad Conductors and Yardmasters	13		Airfield Operations Specialists
Transportation, Storage, and Distribution Managers	383		Airline Pilots, Copilots, and Flight Engineers
			Commercial Pilots



First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	915
Rail Transportation Workers, All Other	1
Transportation Workers, All Other	304



Bus Drivers, School	2,755	Sailors and Marine Oilers	161	All other air transportation workers	1
Material Moving Workers, All Other	266				
Rail Yard Engineers, Dinkey Operators, and Hostlers	2				
Subway and Streetcar Operators	5				



Bus Drivers, Transit and Intercity	580
Couriers and Messengers	437
Industrial Truck and Tractor Operators	2,595
Motor Vehicle Operators, All Other	426
Postal Service Mail Carriers	1,001
Railroad Brake, Signal, and Switch Operators	6
Refuse and Recyclable Material Collectors	753
Shipping, Receiving, and Traffic Clerks	3,353
Taxi Drivers and Chauffeurs	670
Truck Drivers, Heavy and Tractor-Trailer	6,648
Truck Drivers, Light or Delivery Services	6,500



Agriculture and Food	
Agricultural and Food Scientists	22
Agricultural Inspectors	20
Farm and Home Management Advisors	84
Farm, Ranch, and Other Agricultural Managers	7
Foresters	31

Food Batchmakers	83	Animal Breeders	7
		First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	52
		Fish and Game Wardens	27
		Gaming Supervisors	1



Agricultural and Food Science Technicians	19	Animal Control Workers	33
Agricultural Equipment Operators	16	Farming, fishing, and forestry workers, all other	75
Tree Trimmers and Pruners	397	Slaughterers and Meat Packers	151



Farmworkers and Laborers, Crop, Nursery, and Greenhouse	145	Farmworkers, Farm and Ranch Animals	53
Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	176	Meat, Poultry, and Fish Cutters and Trimmers	458
Forest and Conservation Workers	27	Nonfarm Animal Caretakers	888

Communication			
Audio-Visual Collections Specialists	29	Audio and Video Equipment Technicians	177
Film and Video Editors	29	Broadcast Technicians	116
News Analysts, Reporters and Correspondents	229	Nuclear Power Reactor Operators	34
Producers and Directors	201		
Public Relations Managers	221		

Court Reporters	32	Media and Communication Equipment Workers, All Other	134
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Communication	
Media and Communication Workers, All Other	164
Radio Operators	2
Telecommunications Equipment Installers and Repairers, Except Line Installers	762
Telecommunications Line Installers and Repairers	848

Announcers	167
Dispatchers, Except Police, Fire, and Ambulance	730
Police, Fire, and Ambulance Dispatchers	276
Motion Picture Projectionists	12

Telephone Operators	240
Communications Equipment Operators, All Other	143

Arts, Design, and Sport	
Landscape Architects	47
Set and Exhibit Designers	37
Choreographers	45
Music Directors and Composers	21

Art Directors	28	Archivists, Curators, and Museum Technicians	68	Entertainers and Performers, Sports and Related Workers, All Other	103
Commercial and Industrial Designers	70	Camera Operators, Television, Video, and Motion Picture	98		
Costume Attendants	5	Dancers	59		
Interior Designers	89	Fine Artists, Including Painters, Sculptors, and Illustrators	21		
Mechanical Drafters	120				
Model Makers, Wood	6				
Multi-Media Artists and Animators	103				
Patternmakers, Metal and Plastic	2				
Patternmakers, Wood	4				
Urban and Regional Planners	121				

All other art and design workers	100	Musicians and Singers	213	Coaches and Scouts	500
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**Arts, Design, and Sport**

Architectural and Civil Drafters	143
Electrical and Electronics Drafters	83



Fashion Designers	8	Actors	126	Athletes and Sports Competitors	36
Tool Grinders, Filers, and Sharpeners	37	Photographers	256	Umpires, Referees, and Other Sports Officials	29
		Photographic Process Workers	105		



Fabric and Apparel Patternmakers	6	Etchers and Engravers	11
Shoe and Leather Workers and Repairers	30	Makeup Artists, Theatrical and Performance	1
		Models	6

**Engineering and Technology**

Aerospace Engineers	162
Agricultural Engineers	8
Electrical Engineers	668
Electronics Engineers, Except Computer	539
Engineering Managers	692
Engineers, All Other	578
Environmental Engineers	312
Industrial Engineers	476
Marine Engineers and Naval Architects	36
Materials Engineers	25
Mechanical Engineers	629
Nuclear Engineers	160
Petroleum Engineers	2



Aerospace Engineering and Operations Technicians	7
All other drafters, engineering, and mapping technicians	590
Civil Engineering Technicians	121
Civil Engineers	669
Electrical and Electronic Engineering Technicians	708
Environmental Engineering Technicians	120
Materials Scientists	13
Mechanical Engineering Technicians	123
Mining and Geological Engineers, Including Mining Safety Engineers	15
Model Makers, Metal and Plastic	24



**Engineering and Technology**

Electricians	3,264
Helpers--Electricians	673
Industrial Engineering Technicians	163
Locksmiths and Safe Repairers	108
Sound Engineering Technicians	26

**Law and Government**

Administrative Law Judges, Adjudicators, and Hearing Officers	515
Arbitrators, Mediators, and Conciliators	12
Lawyers	2,586
Legislators	132
Political Scientists	60



All other legal and related workers	225
First-Line Supervisors/Managers of Correctional Officers	191
Law Clerks	113
Paralegals and Legal Assistants	1,324



Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	747
Title Examiners, Abstractors, and Searchers	234

**Language and Social Sciences**

Technical Writers	164	Clergy	107
Editors	358	Anthropologists and Archeologists	10
Librarians	754	Historians	11
Writers and Authors	178	Social Scientists and Related Workers, All Other	340



Interpreters and Translators	62	Sociologists	27
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Eligibility Interviewers, Government Programs	345
Proofreaders and Copy Markers	63



**Public Safety and Security**

Bailiffs	55	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	204
First-Line Supervisors/Managers of Police and Detectives	305		
First-Line Supervisors/Managers, Protective Service Workers, All Other	273		
Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	125		
		Fire Inspectors and Investigators	10
Detectives and Criminal Investigators	271		
Transportation Inspectors	35		
		Explosives Workers, Ordnance Handling Experts, and Blasters	6
Correctional Officers and Jailers	1,495	Fire Fighters	841
Police and Sheriff's Patrol Officers	1,982		
Private Detectives and Investigators	122		
Transit and Railroad Police	5		
Crossing Guards	83		
Protective Service Workers, All Other	827		
Security Guards	5,080		

### Appendix 3: Richmond MSA Occupation Gaps

Richmond MSA Detailed Occupation Gaps (Annual Gaps 2013)	
<b>Mechanical Occupation</b>	<b>Gap</b>
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	24
Landscaping and Groundskeeping Workers	13
Electrical Power-Line Installers and Repairers	-10
Cleaners of Vehicles and Equipment	-11
Operating Engineers and Other Construction Equipment Operators	-13
Paper Goods Machine Setters, Operators, and Tenders	-13
Assemblers and Fabricators, All Other	-13
Industrial Machinery Mechanics	-14
Inspectors, Testers, Sorters, Samplers, and Weighers	-25
Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	-28
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	-36
Team Assemblers	-109
<b>Production Occupation</b>	<b>Gap</b>
Mixing and Blending Machine Setters, Operators, and Tenders	-11
Bindery Workers	-11
Prepress Technicians and Workers	-13
Machine Feeders and Offbearers	-13
First-Line Supervisors/Managers of Production and Operating Workers	-13
Industrial Production Managers	-15
Packers and Packagers, Hand	-15
Printing Machine Operators	-16
Mail Clerks and Mail Machine Operators, Except Postal Service	-19
Sewing Machine Operators	-26
Helpers--Production Workers	-60
Laborers and Freight, Stock, and Material Movers, Hand	-79
<b>Clerical Occupation</b>	<b>Gap</b>
Receptionists and Information Clerks	71
Bill and Account Collectors	12
Credit Authorizers, Checkers, and Clerks	-12
Switchboard Operators, Including Answering Service	-13
Postal Service Mail Sorters, Processors, and Processing Machine Operators	-15
All other secretaries, administrative assistants, and other office support workers	-16
File Clerks	-17
Billing and Posting Clerks and Machine Operators	-19
Insurance Claims and Policy Processing Clerks	-19
All other financial, information, and record clerks	-20
Word Processors and Typists	-29
Order Clerks	-32
First-Line Supervisors/Managers of Office and Administrative Support Workers	-51
Executive Secretaries and Administrative Assistants	-60
Office Clerks, General	-61

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<b>Richmond MSA Detailed Occupation Gaps (Annual Gaps 2013)</b>	
Secretaries, Except Legal, Medical, and Executive	-132
Stock Clerks and Order Fillers	-140
<b>Medical Occupation</b>	<b>Gap</b>
Registered Nurses	151
Home Health Aides	87
Medical Assistants	59
Personal and Home Care Aides	57
Nursing Aides, Orderlies, and Attendants	45
Dental Assistants	32
Licensed Practical and Licensed Vocational Nurses	26
Medical Records and Health Information Technicians	23
Dental Hygienists	19
Pharmacists	16
Physicians and Surgeons, All Other	16
Physical Therapists	16
Health professionals and technicians, all other	13
Healthcare Support Workers, All Other	11
Pharmacy Technicians	11
Radiologic Technologists and Technicians	10
<b>Customer and Personal Service Occupation</b>	<b>Gap</b>
Combined Food Preparation and Serving Workers, Including Fast Food	82
Customer Service Representatives	66
Waiters and Waitresses	35
Food Preparation Workers	26
Counter and Rental Clerks	25
Amusement and Recreation Attendants	20
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	19
Medical and Health Services Managers	10
Dishwashers	-10
Cooks, Restaurant	-11
Cashiers	-16
Food Service Managers	-19
Maids and Housekeeping Cleaners	-25
Cooks, Fast Food	-25
Cooks, Institution and Cafeteria	-29
<b>Education and Training Occupation</b>	<b>Gap</b>
All other teachers, primary, secondary, and adult	86
Teacher Assistants	43
Preschool Teachers, Except Special Education	38
Fitness Trainers and Aerobics Instructors	30
Secondary School Teachers, Except Special and Vocational Education	22
Self-Enrichment Education Teachers	15
Kindergarten Teachers, Except Special Education	14
<b>Computer and Electronics Occupation</b>	<b>Gap</b>
Computer Systems Analysts	73
Computer Software Engineers, Applications	51

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**Richmond MSA Detailed Occupation Gaps (Annual Gaps 2013)**

Construction Laborers	-16
Carpenters	-31

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## Appendix 4: Complete List of Annual Degree Demand

Annual Degree Demand for Richmond MSA				
CIP Code	CIP Description	Associate or Certificate	Bachelor or Higher	Grand Total
01.0106	Agricultural Business Technology (NEW)	5	4	9
01.0205	Agricultural Mechanics and Equipment/Machine Technology (NEW)	7	1	8
01.0603	Ornamental Horticulture	3	2	6
01.0605	Landscaping and Groundskeeping	3	2	6
01.0607	Turf and Turfgrass Management	3	2	6
03.0103	Environmental Studies (NEW)	0	5	5
03.0104	Environmental Science (NEW)	0	5	5
04.0201	Architecture (BArch, BA/BS, MArch, MA/MS, PhD)	1	5	5
09.0101	Communication Studies/Speech Communication and Rhetoric	5	26	31
09.0401	Journalism	1	6	7
09.0902	Public Relations/Image Management (NEW)	2	6	8
09.0903	Advertising	5	9	14
09.9999	Communication, Journalism, and Related Programs, Other	2	5	7
10.0303	Prepress/Desktop Publishing and Digital Imaging Design	4	1	5
11.0101	Computer and Information Sciences, General	96	208	304
11.0401	Information Science/Studies	16	48	64
11.0701	Computer Science	6	29	35
12.0401	Cosmetology/Cosmetologist, General	5	1	6
12.0404	Electrolysis/Electrology and Electrolysis Technician	5	1	6
12.0406	Make-Up Artist/Specialist	5	1	6
12.0407	Hair Styling/Stylist and Hair Design (NEW)	6	1	7
12.0411	Permanent Cosmetics/Makeup and Tattooing (NEW)	5	1	6
12.0412	Salon/Beauty Salon Management/Manager (NEW)	6	1	7
12.0413	Cosmetology, Barber/Styling, and Nail Instructor (NEW)	6	1	7
12.0499	Cosmetology and Related Personal Grooming Arts, Other	5	1	6
12.0500	Cooking and Related Culinary Arts, General (NEW)	54	20	74
12.0501	Baking and Pastry Arts/Baker/Pastry Chef	5	1	6
12.0503	Culinary Arts/Chef Training	32	11	43
12.0504	Restaurant, Culinary, and Catering Management/Manager	21	9	30
12.0507	Food Service, Waiter/Waitress, and Dining Room Management/Manager	26	16	42
13.0301	Curriculum and Instruction	1	11	12
13.0401	Educational Leadership and Administration, General	8	31	39
13.0499	Educational Administration and Supervision, Other	2	10	12
13.1001	Special Education and Teaching, General	2	23	25
13.1101	Counselor Education/School Counseling and Guidance Services	4	15	19
13.1202	Elementary Education and Teaching	7	119	126
13.1205	Secondary Education and Teaching	0	12	12
13.1209	Kindergarten/Preschool Education and Teaching (NEW)	16	25	41
13.1210	Early Childhood Education and Teaching (NEW)	16	24	40
13.1302	Art Teacher Education	0	8	8



Annual Degree Demand for Richmond MSA				
13.1307	Health Teacher Education	1	13	14
13.1309	Technology Teacher Education/Industrial Arts Teacher Education	1	13	13
13.1314	Physical Education Teaching and Coaching	30	137	167
13.1315	Reading Teacher Education	0	9	9
13.1334	School Librarian/School Library Media Specialist (NEW)	1	5	6
13.1399	Teacher Education and Professional Development, Specific Subject Areas, Other	1	18	19
13.1501	Teacher Assistant/Aide	47	19	66
13.1599	Teaching Assistants/Aides, Other (NEW)	47	19	66
14.0801	Civil Engineering, General	1	12	14
14.0901	Computer Engineering, General	18	93	110
14.1001	Electrical, Electronics and Communications Engineering	4	20	24
14.1401	Environmental/Environmental Health Engineering	2	17	20
14.1901	Mechanical Engineering	3	10	13
14.2701	Systems Engineering	1	5	6
14.3501	Industrial Engineering (NEW)	3	8	11
15.0399	Electrical and Electronic Engineering Technologies/Technicians, Other Heating, Air Conditioning and Refrigeration Technology/Technician (ACH/ACR/ACHR/HRAC/HVAC/AC Technology)	9	3	12
15.0501	Solar Energy Technology/Technician	18	2	20
15.0505	Quality Control Technology/Technician	17	2	19
15.0702	Automotive Engineering Technology/Technician	10	4	14
15.0803	Computer Hardware Technology/Technician (NEW)	18	2	20
15.1203	Computer Software Technology/Technician (NEW)	5	5	10
15.1204	Computer Software Technology/Technician (NEW)	5	5	10
19.0501	Foods, Nutrition, and Wellness Studies, General	2	3	5
19.0505	Foodservice Systems Administration/Management	21	9	30
19.0708	Child Care and Support Services Management (NEW)	10	15	25
22.0101	Law (LL.B., J.D.)	3	87	90
22.0301	Legal Administrative Assistant/Secretary	22	8	30
22.0302	Legal Assistant/Paralegal	23	23	46
23.0501	Creative Writing	1	17	19
23.1101	Technical and Business Writing	3	16	19
25.0101	Library Science/Librarianship	1	5	5
25.0301	Library Assistant/Technician	5	6	12
25.9999	Library Science, Other	1	5	5
26.0101	Biology/Biological Sciences, General	0	13	13
26.0202	Biochemistry	0	13	14
27.0101	Mathematics, General	1	8	9
30.1601	Accounting and Computer Science (NEW)	5	5	10
31.0101	Parks, Recreation and Leisure Studies	11	18	29
31.0501	Health and Physical Education, General	4	8	13
40.0501	Chemistry, General	1	18	18
40.0801	Physics, General	0	5	5
41.0301	Chemical Technology/Technician	5	3	7
41.0399	Physical Science Technologies/Technicians, Other	4	5	9



Annual Degree Demand for Richmond MSA				
41.9999	Science Technologies/Technicians, Other	4	5	9
42.0101	Psychology, General	1	20	20
43.0111	Criminalistics and Criminal Science (NEW)	49	29	78
44.0401	Public Administration	6	11	17
44.0701	Social Work	12	47	59
45.0601	Economics, General	4	24	28
46.0101	Mason/Masonry	17	5	22
46.0201	Carpentry/Carpenter	70	17	86
46.0301	Electrical and Power Transmission Installation/Installer, General	7	2	9
46.0302	Electrician	93	14	106
46.0303	Lineworker	7	2	9
46.0399	Electrical and Power Transmission Installers, Other	7	2	9
46.0402	Concrete Finishing/Concrete Finisher (NEW)	27	5	32
46.0403	Building/Home/Construction Inspection/Inspector	9	4	14
46.0404	Drywall Installation/Drywaller (NEW)	22	4	26
46.0406	Glazier (NEW)	8	2	10
46.0408	Painting/Painter and Wall Coverer	47	16	63
46.0410	Roofer (NEW)	16	5	20
46.0411	Metal Building Assembly/Assembler (NEW)	5	0	6
46.0412	Building/Construction Site Management/Manager (NEW)	96	24	120
46.0499	Building/Construction Finishing, Management, and Inspection, Other	5	2	6
46.0502	Pipefitting/Pipefitter and Sprinkler Fitter (NEW)	22	3	26
46.0503	Plumbing Technology/Plumber (NEW)	26	5	30
46.0504	Well Drilling/Driller (NEW)	5	2	7
46.0505	Blasting/Blaster (NEW)	4	2	6
46.0599	Plumbing and Related Water Supply Services, Other (NEW)	22	3	25
46.9999	Construction Trades, Other	19	5	24
47.0102	Business Machine Repair	5	2	7
47.0103	Communications Systems Installation and Repair Technology	25	3	29
47.0104	Computer Installation and Repair Technology/Technician	9	2	11
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician (HAC, HACR, HVAC, HVACR)	17	2	19
47.0302	Heavy Equipment Maintenance Technology/Technician	5	1	5
47.0399	Heavy/Industrial Equipment Maintenance Technologies, Other	8	1	9
47.0603	Autobody/Collision and Repair Technology/Technician	18	4	21
47.0604	Automobile/Automotive Mechanics Technology/Technician	19	2	21
47.0605	Diesel Mechanics Technology/Technician	10	1	12
47.0606	Small Engine Mechanics and Repair Technology/Technician	5	0	5
47.0612	Vehicle Emissions Inspection and Maintenance Technology/Technician (NEW)	18	2	20
47.0613	Medium/Heavy Vehicle and Truck Technology/Technician (NEW)	28	3	31
47.0614	Alternative Fuel Vehicle Technology/Technician (NEW)	18	2	20
48.0501	Machine Tool Technology/Machinist	7	1	7



Annual Degree Demand for Richmond MSA				
48.0503	Machine Shop Technology/Assistant	13	1	14
48.0506	Sheet Metal Technology/Sheetworking	33	2	35
48.0703	Cabinetmaking and Millwork/Millwright	6	2	8
49.0102	Airline/Commercial/Professional Pilot and Flight Crew	1	4	5
49.0108	Flight Instructor (NEW)	1	4	5
49.0202	Construction/Heavy Equipment/Earthmoving Equipment Operation	11	2	12
49.0205	Truck and Bus Driver/Commercial Vehicle Operation	57	14	71
49.0206	Mobil Crane Operation/Operator (NEW)	9	1	10
50.0401	Design and Visual Communications, General	6	13	19
50.0501	Drama and Dramatics/Theatre Arts, General	2	5	7
50.0704	Arts Management	2	8	10
51.0203	Speech-Language Pathology/Pathologist	0	6	6
51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	0	8	8
51.0601	Dental Assisting/Assistant	49	7	56
51.0602	Dental Hygiene/Hygienist	21	12	33
51.0701	Health/Health Care Administration/Management	6	12	19
51.0705	Medical Office Management/Administration	6	2	8
51.0707	Health Information/Medical Records Technology/Technician	27	9	36
51.0708	Medical Transcription/Transcriptionist	15	4	19
51.0709	Medical Office Computer Specialist/Assistant (NEW)	5	5	10
51.0710	Medical Office Assistant/Specialist (NEW)	15	5	20
51.0712	Medical Reception/Receptionist (NEW)	6	2	8
51.0713	Medical Insurance Coding Specialist/Coder (NEW)	6	2	8
51.0714	Medical Insurance Specialist/Medical Biller (NEW)	9	3	12
51.0715	Health/Medical Claims Examiner (NEW)	5	6	11
51.0716	Medical Administrative/Executive Assistant and Medical Secretary	15	5	20
51.0805	Pharmacy Technician/Assistant	32	7	39
51.0806	Physical Therapist Assistant	9	3	12
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary Assistant	26	7	33
51.0809	Anesthesiologist Assistant (NEW)	6	2	8
51.0813	Chiropractic Assistant/Technician (NEW)	6	2	8
51.0899	Allied Health and Medical Assisting Services, Other	6	2	8
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	16	4	21
51.0907	Medical Radiologic Technology/Science - Radiation Therapist	20	9	29
51.0908	Respiratory Care Therapy/Therapist	15	6	22
51.0909	Surgical Technology/Technologist	7	2	9
51.0912	Physician Assistant	2	4	6
51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions, Other	8	3	11
51.1004	Clinical/Medical Laboratory Technician	7	10	17
51.1005	Clinical Laboratory Science/Medical Technology/Technologist	9	14	23
51.1201	Medicine (MD)	0	8	8



Annual Degree Demand for Richmond MSA				
51.1503	Clinical/Medical Social Work Mental and Social Health Services and Allied Professions, Other	8	31	39
51.1599		8	21	29
51.1601	Nursing - Registered Nurse Training (RN, ASN, BSN, MSN) Licensed Practical /Vocational Nurse Training (LPN, LVN, Cert, Dipl, AAS)	157	230	386
51.1613		113	8	121
51.1699	Nursing, Other	6	9	15
51.1801	Opticianry/Ophthalmic Dispensing Optician	4	1	5
51.1803	Ophthalmic Technician/Technologist	6	2	8
51.1804	Orthoptics/Orthoptist	6	2	8
51.1901	Osteopathic Medicine/Osteopathy (DO)	0	8	8
51.2001	Pharmacy (PharmD [USA] PharmD, BS/BPharm [Canada])	1	33	35
51.2201	Public Health, General (MPH, DPH)	3	6	8
51.2306	Occupational Therapy/Therapist	2	13	15
51.2308	Physical Therapy/Therapist	2	29	31
51.2310	Vocational Rehabilitation Counseling/Counselor	8	31	39
51.2401	Veterinary Medicine (DVM)	0	8	8
51.3701	Aromatherapy (NEW)	3	2	5
51.3702	Herbalism/Herbalist (NEW)	3	2	5
52.0101	Business/Commerce, General	47	99	146
52.0201	Business Administration and Management, General Purchasing, Procurement/Acquisitions and Contracts Management	108	229	337
52.0202		4	11	14
52.0205	Operations Management and Supervision	88	31	119
52.0301	Accounting	32	116	148
52.0408	General Office Occupations and Clerical Services	5	1	6
52.0801	Finance, General	60	147	207
52.0804	Financial Planning and Services	3	10	12
52.0807	Investments and Securities	3	9	12
52.0899	Finance and Financial Management Services, Other	2	4	6
52.0904	Hotel/Motel Administration/Management (NEW) Human Resources Management/Personnel Administration, General	12	7	18
52.1001		10	20	30
52.1002	Labor and Industrial Relations	2	4	6
52.1003	Organizational Behavior Studies	7	13	19
52.1201	Management Information Systems, General	15	47	63
52.1301	Management Science, General	3	6	9
52.1401	Marketing/Marketing Management, General	6	18	24
52.1501	Real Estate	12	16	29
52.1701	Insurance	31	45	76
52.1801	Sales, Distribution, and Marketing Operations, General	13	14	27
52.1804	Selling Skills and Sales Operations Business and Personal/Financial Services Marketing Operations (NEW)	1	6	8
52.1908		3	9	12
60.0218	Family Medicine	0	8	8



## Appendix 5: Complete List of Annual Degree Award

Richmond MSA Post-Secondary Degree Award (2002-03 Academic Year)				
		Associate Degree and Certificates	Bachelors Degree or Higher	Total
1	Agriculture, General		5	5
1.0101	Agricultural Business and Management, General	8		8
3.0188	Environmental Science/Studies		10	10
5.0101	African Studies		2	2
5.0102	American/United States Studies/Civilization		8	8
5.0103	Asian Studies/Civilization		3	3
5.0106	European Studies/Civilization		3	3
5.0107	Latin American Studies		3	3
5.0207	Women's Studies		2	2
5.9999	Area, Ethnic, Cultural, and Gender Studies, Other		1	1
9.0102	Mass Communication/Media Studies		189	189
9.0401	Journalism		25	25
10.0202	Radio and Television Broadcasting Technology/Technician	7		7
10.0305	Graphic and Printing Equipment Operator, General Production	16		16
11.0101	Computer and Information Sciences, General	322	70	392
11.0103	Information Technology	30		30
11.0199	Computer and Information Sciences, Other	30		30
11.0201	Computer Programming/Programmer, General	6		6
11.0401	Information Science/Studies	12	171	183
11.0601	Data Entry/Microcomputer Applications, General	3		3
11.0701	Computer Science		6	6
11.0801	Web Page, Digital/Multimedia and Information Resources Design	20		20
11.0901	Computer Systems Networking and Telecommunications	79	0	79
11.1099	Computer/Info Tech Services Administration & Management, Other	20		20
11.9999	Computer and Information Sciences and Support Services, Other	19		19
12.0301	Funeral Service and Mortuary Science, General	22		22
13.0101	Education, General		91	91
13.0301	Curriculum and Instruction		46	46
13.0401	Educational Leadership and Administration, General		97	97
13.1001	Special Education and Teaching, General		27	27
13.1011	Education/Teaching Individuals - Specific Learning Disabilities		0	0
13.1099	Special Education and Teaching, Other	65		65
13.1101	Counselor Education/School Counseling and Guidance Services		50	50
13.1201	Adult and Continuing Education and Teaching		13	13
13.1299	Teacher Education/Profess Development, Levels & Methods, Other		34	34
13.1302	Art Teacher Education		44	44
13.1303	Business Teacher Education		6	6
13.1305	English/Language Arts Teacher Education		1	1
13.1307	Health Teacher Education		28	28
13.1311	Mathematics Teacher Education		1	1



Richmond MSA Post-Secondary Degree Award (2002-03 Academic Year)				
13.1314	Physical Education Teaching and Coaching		63	63
13.1315	Reading Teacher Education		7	7
13.132	Trade and Industrial Teacher Education	22	27	49
13.1322	Biology Teacher Education		2	2
13.1328	History Teacher Education		2	2
14.0101	Engineering, General	8	7	15
14.0501	Biomedical/Medical Engineering		33	33
14.0701	Chemical Engineering		14	14
14.1001	Electrical, Electronics and Communications Engineering		23	23
14.1901	Mechanical Engineering		26	26
15.0101	Architectural Engineering Technology/Technician	14		14
15.0201	Civil Engineering Technology/Technician	1		1
15.0303	Electrical/Electronic/Communications Engr Technology/Technician	51	0	51
15.0399	Electrical/Electronic Engineering Technologies/Technicians, Other	20		20
15.0688	Industrial/Manufacturing Technology/Technician	2		2
15.0899	Mechanical Engineering Related Technologies/Technicians, Other	2		2
15.1202	Computer Technology/Computer Systems Technology	177		177
15.9999	Engineering Technologies/Technicians, Other	4	13	17
16.0101	Foreign Languages and Literatures, General		24	24
16.0501	German Language and Literature		2	2
16.0901	French Language and Literature		8	8
16.0905	Spanish Language and Literature		25	25
16.12	Classics/Classical Languages, Lit & Linguistics, General		1	1
19.0499	Family and Consumer Economics and Related Services, Other		9	9
19.0702	Adult Development and Aging		18	18
22.0101	Law (LLB, JD)		163	163
22.0301	Legal Administrative Assistant/Secretary	16		16
22.0302	Legal Assistant/Paralegal	41	1	42
22.0303	Court Reporting/Court Reporter	5		5
23.0101	English Language and Literature, General		192	192
23.0501	Creative Writing		6	6
23.1001	Speech and Rhetorical Studies		34	34
24.0101	Liberal Arts and Sciences/Liberal Studies	52	77	129
24.0102	General Studies		50	50
24.0199	Liberal Arts and Sciences, General Studies and Humanities, Other	162		162
26.0101	Biology/Biological Sciences, General		200	200
26.0202	Biochemistry		10	10
26.0403	Anatomy		23	23
26.0503	Medical Microbiology and Bacteriology		11	11
26.0707	Animal Physiology		28	28
26.0806	Human/Medical Genetics		6	6
26.091	Pathology/Experimental Pathology		2	2
26.1001	Pharmacology		8	8
26.1102	Biostatistics		5	5
27.0101	Mathematics, General		63	63
30.0101	Biological and Physical Sciences	29	19	48



Richmond MSA Post-Secondary Degree Award (2002-03 Academic Year)				
30.0801	Mathematics and Computer Science		1	1
30.9999	Multi-/Interdisciplinary Studies, Other		107	107
31.0101	Parks, Recreation and Leisure Studies		81	81
38.0101	Philosophy		12	12
38.0201	Religion/Religious Studies		33	33
39.0401	Religious Education		32	32
39.0601	Theology/Theological Studies		80	80
39.0602	Divinity/Ministry (BD, MDiv)		110	110
40.0101	Physical Sciences	173		173
40.0501	Chemistry, General		47	47
40.0801	Physics, General		17	17
42.0101	Psychology, General		390	390
43.0103	Criminal Justice/Law Enforcement Administration		155	155
43.0104	Criminal Justice/Safety Studies		17	17
43.0106	Forensic Science and Technology		11	11
43.9999	Security and Protective Services, Other	54		54
44.0201	Community Organization and Advocacy		4	4
44.0401	Public Administration		78	78
44.0701	Social Work		231	231
44.9999	Public Administration and Social Service Professions, Other	12		12
45.0101	Social Sciences, General	79		79
45.0401	Criminology		29	29
45.0601	Economics, General		20	20
45.0605	International Economics		8	8
45.0699	Economics, Other		46	46
45.0901	International Relations and Affairs		17	17
45.1001	Political Science and Government, General		169	169
45.1101	Sociology		175	175
45.1201	Urban Studies/Affairs		32	32
47.0699	Vehicle Maintenance and Repair Technologies, Other	26		26
50.0101	Visual and Performing Arts, General		11	11
50.0201	Crafts/Craft Design, Folk Art and Artisanry		16	16
50.0301	Dance, General		10	10
50.0401	Design and Visual Communications, General		113	113
50.0407	Fashion/Apparel Design		57	57
50.0408	Interior Design		32	32
50.0501	Drama and Dramatics/Theatre Arts, General		63	63
50.0605	Photography		22	22
50.0702	Fine/Studio Arts, General		10	10
50.0703	Art History, Criticism and Conservation		38	38
50.0704	Arts Management		2	2
50.0708	Painting		31	31
50.0709	Sculpture		32	32
50.0799	Fine Arts and Art Studies, Other		18	18
50.0901	Music, General		10	10
50.0903	Music Performance, General		55	55



Richmond MSA Post-Secondary Degree Award (2002-03 Academic Year)			
50.9999	Visual and Performing Arts, Other	2	2
51.0401	Dentistry (DDS, DMD)		80
51.0501	Dental Clinical Sciences, General (MS, PhD)		16
51.0602	Dental Hygiene/Hygienist	7	16
51.0603	Dental Laboratory Technology/Technician	6	6
51.0701	Health/Health Care Administration/Management		33
51.0716	Medical Administrative/Executive Assistant and Medical Secretary	9	9
51.0799	Health and Medical Administrative Services, Other	0	2
51.0801	Medical/Clinical Assistant	121	121
51.0803	Occupational Therapist Assistant	7	7
51.0907	Medical Radiologic Technology/Science - Radiation Therapist	11	11
51.0908	Respiratory Care Therapy/Therapist	15	15
51.0911	Radiologic Technology/Science - Radiographer		12
51.1004	Clinical/Medical Laboratory Technician	8	8
51.1005	Clinical Laboratory Science/Medical Technology/Technologist		20
51.1201	Medicine (MD)		163
51.1506	Clinical Pastoral Counseling/Patient Counseling		9
51.1509	Genetic Counseling/Counselor		5
51.1599	Mental and Social Health Services and Allied Professions, Other	424	424
51.1601	Nursing/Registered Nurse (RN, ASN, BSN, MSN)	255	211
51.1604	Nurse Anesthetist		21
51.1608	Nursing Science (MS, PhD)		3
51.1613	Licensed Practical/Vocational Nurse Training	35	35
51.1699	Nursing, Other		70
51.1802	Optometric Technician/Assistant	13	13
51.2001	Pharmacy (PharmD [USA], PharmD or BS/BPharm [Canada])		105
51.2099	Pharmacy, Pharmaceutical Sciences, and Administration, Other		13
51.2201	Public Health, General (MPH, DPH)		18
51.2306	Occupational Therapy/Therapist		24
51.2308	Physical Therapy/Therapist	10	5
51.231	Vocational Rehabilitation Counseling/Counselor		37
51.3501	Massage Therapy/Therapeutic Massage	68	68
51.9999	Health Professions and Related Clinical Sciences, Other		2
52.0101	Business/Commerce, General	67	30
52.0201	Business Administration and Management, General	87	640
52.0299	Business Administration, Management and Operations, Other	12	0
52.0301	Accounting	7	159
52.0302	Accounting Technology/Technician and Bookkeeping	20	20
52.0401	Administrative Assistant and Secretarial Science, General	73	73
52.0407	Business/Office Automation/Technology/Data Entry	16	16
52.0601	Business/Managerial Economics		43
52.0801	Finance, General	0	6
52.0901	Hospitality Administration/Management, General		4
52.0988	Hotel/Motel and Restaurant Management		1
52.1001	Human Resources Management/Personnel Administration, General	8	21
52.1003	Organizational Behavior Studies	6	46



Richmond MSA Post-Secondary Degree Award (2002-03 Academic Year)			
52.1101	International Business/Trade/Commerce	2	2
52.1201	Management Information Systems, General	82	145
52.1401	Marketing/Marketing Management, General		84
52.1501	Real Estate	0	5
52.1601	Taxation		5
52.1803	Retailing and Retail Operations	1	1
52.1899	General Merchandising/Sales/Related Marketing Operations, Other		4
54.0101	History, General		110
	Total	2,981	9,627



**Appendix 6: Education Gap of Detailed Programs**

Richmond MSA Education Gaps by Instructional Programs (2005-2013)								
Business, Management, Marketing and related								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
52.0801	Finance, General		60	60	5	147	142	202
52.0205	Operations Management and Supervision		88	88	0	31	31	119
52.1701	Insurance		31	31	0	45	45	76
52.0101	Business/Commerce, General	67	47	-20	26	99	74	54
52.1801	Sales, Distribution, and Marketing Operations, General		13	13	0	14	14	27
52.1501	Real Estate		12	12	4	16	12	25
52.0904	Hotel/Motel Administration/Management (NEW)		12	12		7	7	18
52.0202	Purchasing, Procurement/Acquisitions and Contracts Management		4	4		11	11	14
52.0804	Financial Planning and Services		3	3		10	10	12
52.0807	Investments and Securities		3	3		9	9	12
52.1908	Business and Personal/Financial Services Marketing Operations (NEW)	0	3	3		9	9	12
52.0299	Business Administration, Management and Operations, Other	12		-12			0	-12
52.0407	Business/Office Automation/Technology/Data Entry	16		-16			0	-16
52.0302	Accounting Technology/Technician and Bookkeeping	20		-20			0	-20
52.1003	Organizational Behavior Studies	6	7	1	39	13	-26	-26
52.0601	Business/Managerial Economics		1	1	37	4	-33	-32
52.1401	Marketing/Marketing Management, General		6	6	71	18	-54	-48
52.1201	Management Information Systems, General	82	15	-67	54	47	-6	-73
52.0401	Administrative Assistant and Secretarial Science, General	73		-73				-73
52.0201	Business Administration and Management, General	87	108	21	544	229	315	-294
Construction Trade, General								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
46.0412	Building/Construction Site Management/Manager (NEW)		96	96	0	24	24	120
46.0302	Electrician		93	93	0	14	14	106
46.0201	Carpentry/Carpenter		70	70	0	17	17	86
46.0408	Painting/Painter and Wall Coverer		47	47	0	16	16	63
46.0402	Concrete Finishing/Concrete Finisher (NEW)		27	27	0	5	5	32
46.0503	Plumbing Technology/Plumber (NEW)		26	26	0	5	5	30
46.0404	Drywall Installation/Drywall (NEW)		22	22	0	4	4	26
46.0502	Pipefitting/Pipefitter and Sprinkler Fitter (NEW)		22	22	0	3	3	26
46.0599	Plumbing and Related Water Supply Services, Other (NEW)		22	22	0	3	3	25
46.9999	Construction Trades, Other		19	19	0	5	5	24
46.0101	Mason/Masonry		17	17	0	5	5	22
46.041	Roofer (NEW)		16	16	0	5	5	20
46.0403	Building/Home/Construction Inspection/Inspector		9	9	0	4	4	14
46.0406	Glazier (NEW)		8	8	0	2	2	10
Education								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total



**Richmond MSA Education Gaps by Instructional Programs (2005-2013)**

							Gap
13.1202	Elementary Education and Teaching	7	7	0	119	119	126
13.1314	Physical Education Teaching and Coaching	30	30	54	137	83	113
13.1501	Teacher Assistant/Aide	47	47	0	19	19	66
13.1599	Teaching Assistants/Aides, Other (NEW)	47	47	0	19	19	66
13.1209	Kindergarten/Preschool Education and Teaching (NEW)	16	16	0	25	25	41
13.121	Early Childhood Education and Teaching (NEW)	16	16	0	24	24	40
13.1399	Teacher Education and Professional Development, Specific Subject Areas, Other	1	1	0	18	18	19
13.1309	Technology Teacher Education/Industrial Arts Teacher Education	1	1	0	13	13	13
13.1205	Secondary Education and Teaching	0	0	0	12	12	12
13.0499	Educational Administration and Supervision, Other	2	2	0	10	10	12
13.1307	Health Teacher Education	1	1	24	13	-11	-10
13.1101	Counselor Education/School Counseling and Guidance Services	4	4	43	15	-28	-24
13.0301	Curriculum and Instruction	1	1	39	11	-28	-27
13.1299	Teacher Education/Profess Development, Levels & Methods, Other		0	29		-29	-29
13.1302	Art Teacher Education	0	0	37	8	-29	-29
13.0401	Educational Leadership and Administration, General	8	8	82	31	-51	-43
13.132	Trade and Industrial Teacher Education	22	-22	23		-23	-45
13.1099	Special Education and Teaching, Other	65	0	-65	0	3	-62
13.0101	Education, General		0	77		-77	-77

**Engineering**

		Associate or Certificate			Bachelor's or Higher			Total Gap
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
14.0901	Computer Engineering, General		18	18	0	93	93	110
14.1401	Environmental/Environmental Health Engineering		2	2	0	17	17	20
14.0801	Civil Engineering, General		1	1	0	12	12	14
14.3501	Industrial Engineering (NEW)		3	3	0	8	8	11
14.0701	Chemical Engineering		0	0	12	1	-10	-10
14.0501	Biomedical/Medical Engineering		0	0	28	1	-27	-27

**Engineering Technology**

		Associate or Certificate			Bachelor's or Higher			Total Gap
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
15.0803	Automotive Engineering Technology/Technician		18	18	0	2	2	20
15.0501	Heating, Air Conditioning and Refrigeration Technology/Technician (ACH/ACR/ACHR/HRAC/HVAC/AC Technology)		18	18	0	2	2	20
15.0505	Solar Energy Technology/Technician		17	17	0	2	2	19
15.0702	Quality Control Technology/Technician		10	10	0	4	4	14
15.1203	Computer Hardware Technology/Technician (NEW)		5	5	0	5	5	10
15.1204	Computer Software Technology/Technician (NEW)		5	5	0	5	5	10
15.9999	Engineering Technologies/Technicians, Other	4	2	-2	11	1	-10	-12
15.0101	Architectural Engineering Technology/Technician	14		-14	0		0	-14
15.0303	Electrical/Electronic/Communications Engr Technology/Technician	51	0	-51	0	0	0	-51
15.1202	Computer Technology/Computer Systems Technology	177		-	0		0	-177

**Health Services/Allied Health/Health Sciences**

		Associate or Certificate			Bachelor's or Higher			Total Gap
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap



Richmond MSA Education Gaps by Instructional Programs (2005-2013)								
51.1613	Licensed Practical/Vocational Nurse Training	55	113	58	0	8	8	66
51.0601	Dental Assisting/Assistant		49	49	0	7	7	56
51.1503	Clinical/Medical Social Work		8	8	0	31	31	39
51.0805	Pharmacy Technician/Assistant		32	32	0	7	7	39
51.0707	Health Information/Medical Records Technology/Technician Veterinary/Animal Health Technology/Technician and Veterinary Assistant		27	27	0	9	9	36
51.0808			26	26	0	7	7	33
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)		16	16	0	4	4	21
51.071	Medical Office Assistant/Specialist (NEW)		15	15	0	5	5	20
51.0708	Medical Transcription/Transcriptionist Medical Radiologic Technology/Science - Radiation Therapist		15	15	0	4	4	19
51.0907		11	20	9	0	9	9	18
51.2308	Physical Therapy/Therapist	10	2	-8	4	29	25	17
51.0602	Dental Hygiene/Hygienist	7	21	14	14	12	-2	12
51.0806	Physical Therapist Assistant		9	9	0	3	3	12
51.0714	Medical Insurance Specialist/Medical Biller (NEW) Allied Health Diagnostic, Intervention, and Treatment Professions, Other		9	9	0	3	3	12
51.0999			8	8	0	3	3	11
51.0715	Health/Medical Claims Examiner (NEW) Medical Administrative/Executive Assistant and Medical Secretary		5	5	0	6	6	11
51.0716		9	15	6	0	5	5	11
51.0709	Medical Office Computer Specialist/Assistant (NEW)		5	5	0	5	5	10
51.0701	Health/Health Care Administration/Management		6	6	28	12	-16	-10
51.0911	Radiologic Technology/Science - Radiographer			0	10		-10	-10
51.1802	Optometric Technician/Assistant	13		-13	0		0	-13
51.0501	Dental Clinical Sciences, General (MS, PhD)		0	0	14	0	-13	-13
51.1604	Nurse Anesthetist		1	1	18	2	-16	-14
51.1699	Nursing, Other		6	6	60	9	-50	-44
51.1601	Nursing/Registered Nurse (RN, ASN, BSN, MSN)	202	157	-45 <sup>65</sup>	179	230	50	-2
51.2001	Pharmacy (PharmD [USA], PharmD or BS/BPharm [Canada])		1	1	89	33	-56	-55
51.3501	Massage Therapy/Therapeutic Massage	68	1	-67	0	0	0	-67
51.0401	Dentistry (DDS, DMD)		0	0	68	0	-68	-68
51.0801	Medical/Clinical Assistant	121		-121	0		0	-121
51.1201	Medicine (MD) Mental and Social Health Services and Allied Professions, Other		0	0	139	8	-130	-130
51.1599		424	8	-416	0	21	21	-395

<sup>65</sup> There are several possible reasons that the demand for nurses may be under-estimated. Firstly, though the model considers the retirement replacement demand, it does not take into account the replacement demand due to turn-over. Based on Census LEHD data, the turn-over ratio for the health care industry in the Richmond MSA is 13.4%, higher than the Virginia average of 11.7%. The turnover could result in higher demand for nurse. However, occupation level turn-over was not available at the time of study. Secondly, the national occupation growth rate from 2002-2012 is used to project the demand. The retirement and demographic trend of the Richmond region can be different thereby making this estimate conservative. For example, the mid-Atlantic region has become an attractive retirement destination, which could push demand for nurses higher than the national average.



**Richmond MSA Education Gaps by Instructional Programs (2005-2013)**

<b>Personal &amp; Culinary Services</b>								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
12.05	Cooking and Related Culinary Arts, General (NEW)		54	54	0	20	20	74
12.0503	Culinary Arts/Chef Training		32	32	0	11	11	43
12.0507	Food Service, Waiter/Waitress, and Dining Room Management/Manager		26	26	0	16	16	42
12.0504	Restaurant, Culinary, and Catering Management/Manager		21	21	0	9	9	30
12.0301	Funeral Service and Mortuary Science, General	22	2	-20	0	1	1	-20
<b>Social Sciences</b>								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
45.0601	Economics, General		4	4	17	24	7	11
45.0901	International Relations and Affairs			0	14		-14	-14
45.0401	Criminology		0	0	25	0	-25	-25
45.1201	Urban Studies/Affairs			0	27		-27	-27
45.0699	Economics, Other			0	39		-39	-39
45.0101	Social Sciences, General	79	0	-79	0	2	2	-77
45.1001	Political Science and Government, General		0	0	144	3	140	-140
45.1101	Sociology		0	0	149	2	146	-146
<b>Transportation and Materials Moving</b>								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
49.0205	Truck and Bus Driver/Commercial Vehicle Operation		57	57	0	14	14	71
49.0202	Construction/Heavy Equipment/Earthmoving Equipment Operation		11	11	0	2	2	12
49.0206	Mobil Crane Operation/Operator (NEW)		9	9	0	1	1	10
<b>Visual and Performing Arts</b>								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
50.0201	Crafts/Craft Design, Folk Art and Artisanry			0	14		-14	-14
50.0799	Fine Arts and Art Studies, Other			0	15		-15	-15
50.0605	Photography			0	19		-19	-19
50.0708	Painting		1	1	26	3	-24	-23
50.0408	Interior Design		1	1	27	2	-25	-25
50.0709	Sculpture			0	27		-27	-27
50.0703	Art History, Criticism and Conservation		0	0	32	0	-32	-32
50.0903	Music Performance, General		0	0	47	0	-46	-46
50.0501	Drama and Dramatics/Theatre Arts, General		2	2	54	5	-48	-46
50.0407	Fashion/Apparel Design		0	0	48	0	-48	-48
50.0401	Design and Visual Communications, General		6	6	96	13	-83	-77
<b>Computer and Information Science and Support</b>								
			Associate or Certificate			Bachelor's or Higher		
CIP	Program Description	Supply	Demand	Gap	Supply	Demand	Gap	Total Gap
11.0701	Computer Science		6	6	5	29	24	30
11.9999	Computer and Information Sciences and Support Services, Other	19	0	-19	0	0	0	-19
11.0801	Web Page, Digital/Multimedia and Information	20		-20	0		0	-20



**Richmond MSA Education Gaps by Instructional Programs (2005-2013)**

	Resources Design							
11.1099	Computer/Info Tech Services Administration & Management, Other	20	-20	0	0	0	0	-20
11.0103	Information Technology	30	-30	0	0	0	0	-30
11.0199	Computer and Information Sciences, Other	30	-30	0	0	0	0	-30
11.0101	Computer and Information Sciences, General	322	96	226	60	208	149	-77
	Computer Systems Networking and Telecommunications	79	-79	0	0	0	0	-79
11.0401	Information Science/Studies	12	16	4	145	48	-97	-94

Source: CEA



## Appendix 7: Richmond MSA's Peers

How Richmond Compares to its Peers							
	Population 2000 *	Avg. Annual Pop Growth '90-'00	Employment 2004*	Avg. Annual Emp Growth '94-'04*	Annual Wages 2004 Avg*	COLA Wages**, Base=Richmond	Avg. Annual Wages Growth '01-'04
Richmond MSA	1.097 M	1.5%	602 K	1.5%	\$39,652	\$39,652	3.7%
Nashville- Davidson- Murfreesboro MSA	1.232 M	2.3%	713 K	1.9%	\$37,389	\$41,517	3.5%
Jacksonville MSA	1.100 M	2.0%	581 K	2.3%	\$36,809	\$40,657	4.5%
Charlotte- Gastonia-Concord MSA	1.335 M	1.4%	773 K	2.5%	\$41,887	\$44,022	3.4%

Sources: U.S. Census, Bureau of Labor Statistics \*Based on ES202 Monthly Employment Figures \*\*COL index data by ACCRA  
 \*The Census uses old MSA definitions; population data reflect figures for Charlotte-Gastonia-Rock Hill MSA and Nashville MSA

Percentage of Employment by Industry Sector, 2004					
Industry	U.S. TOTAL	Jacksonville MSA	Charlotte-Gastonia- Concord MSA	Nashville- Davidson- Murfreesboro MSA	Richmond MSA
Natural Resources and Mining	1.54%	0.50%	0.45%	0.19%	0.44%
Construction	6.37%	8.20%	7.46%	5.57%	8.55%
Manufacturing	13.14%	6.94%	12.98%	13.77%	9.87%
Trade, Transportation, and Utilities	23.29%	25.34%	25.08%	23.66%	23.50%
Information	2.86%	2.32%	3.45%	ND	2.39%
Financial Activities Professional and Business Services	7.27%	11.93%	10.19%	7.17%	9.83%
Education and Health Services	15.02%	15.65%	16.96%	15.15%	17.99%
Leisure and Hospitality	14.82%	13.67%	9.31%	15.80%	12.87%
Other Services	11.49%	11.66%	10.70%	12.12%	ND
Unclassified	3.95%	3.67%	3.17%	3.49%	ND
	0.24%	0.12%	0.26%	ND	ND

Source: Bureau of Labor Statistics, calculated from Quarterly Census of Employment and Wages Data  
 Notes: ND = not disclosable



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