Data Snapshots

2:3

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REGIONAL ECONOMICS:

Life Science and Health Care

DELAWARE VALLEY data | DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals, and the public with a common vision of making a great region even greater. Shaping the way we live, work, and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region — leading the way to a better future.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources, including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA); the Pennsylvania and New Jersey departments of transportation; and DVRPC's state and local member governments. The authors, however, are solely responsible for the findings and conclusions herein, which may not represent the official views or policies of the funding agencies.

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As the region's metropolitan planning organization, DVRPC provides technical assistance and services to its member state and local governments. *Delaware Valley Data* is our periodic series of free data bulletins, analytical data reports, data reference guides, and data snapshots.

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Introduction

In 2014, DVRPC completed *Data Snapshot 2:2: A Regional Economic Cluster Analysis*. That analysis was based on the cluster definitions advanced in the U.S. Cluster Mapping Project, an initiative led by the Institute for Strategy and Competitiveness at the Harvard Business School and supported by the U.S. Commerce Department's Economic Development Administration (EDA). The U.S. Cluster Mapping Project separates all industries into two broad types: traded industries and local industries. Traded industries are concentrated in specific geographic areas and produce goods and/or services that are bought and sold across regions, and sometimes countries. Traded industries typically command higher wages and rates of innovation than do local industries and are considered the engines of regional economies. Local industries are present in most, if not all, regions, and generally do not compete across regions. They primarily serve the needs of the people living within the same region. Local industries include, for example, most health care services, utilities, and retail companies, as well as some goods-producing industries (such as newspapers, locally consumed food products, and soft drinks).

Data Snapshot 2:2 found that the Greater Philadelphia region is especially strong in the "education and knowledge creation" cluster. In addition, the region has long been known as a leader in life sciences, a broad categorization of related industries that include health care, pharmaceuticals, biotechnology, and their related support services. According to Select Greater Philadelphia, the Philadelphia region is the 5th largest life sciences research and development (R&D) hub in the nation, with over $10.5 billion invested annually. The region is home to 15 leading life science companies, and has almost 200 hospitals, three pharmaceutical schools, more than 15 major health systems, four National Cancer Institute-designated cancer treatment centers, four children's hospitals, and six medical schools.[1] A 2009 report by the Milken Institute concluded that Greater Philadelphia was second only to Boston in a composite index that considered the impact of the region's life science industries on employment and earnings, as well as innovation and small business vitality.[2]

Several of the traded industries included in the broader "life science" category were discussed in *Data Snapshot 2:2* as separate, individual clusters (including biopharmaceuticals and medical devices). Others were included as separate components of different clusters, including R&D related to life sciences or biotechnology (included in the education/knowledge creation cluster); teaching hospitals (also included in the education/knowledge creation cluster); and pharmaceutical wholesalers and distributors (included in the distribution and electronic commerce cluster).

Health care services (which include doctors, caregivers, and employees of businesses such as hospitals, medical laboratories, medical equipment companies, drugstores, and funeral service providers) are typically defined as local industries, and they were not included in the previous report on traded industries. Recent data indicates that over 360,000 employees worked in local health services in the Philadelphia region in 2012, amounting to over 25 percent of the region's total local

[1] See www.selectgreaterphiladelphia.com/industries/life-sciences-and-healthcare/.
[2] Milken Institute, *The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment*, May 2009.

employment.[3] The cluster is also growing in this region, with over 65,000 local health service jobs added between 1998 and 2012. Because many of the industries and services that together make up the life sciences are considered as separate components of other traded clusters, or they are considered to be local industries and, therefore, are not considered at all in *Data Snapshot 2:2*, the full combined extent and impact of the life science cluster on the regional economy are not readily apparent in DVRPC's initial analysis.

The purpose of the current data snapshot is to assess Greater Philadelphia's life science and health care cluster. The snapshot first considers the life science industrial cluster, using employment data available through the U.S. Census Bureau's Quarterly Census of Employment and Wages (QCEW). The location of life science employers within the Greater Philadelphia region is then described, based on data from the National Establishments Time Series (NETS) database. The report then shifts its focus to life science occupations as opposed to establishments, discussing the region's health care and medical sciences occupational cluster and characterizing its medical and health care employees.

Industry Cluster Analysis

Industry clusters are groups of businesses that share similar and complementary technologies, infrastructure, products, labor markets, and services.[4] Industry cluster analysis is used to identify and locate the clusters present in a region's economy and provides a way to gauge the clusters' strengths and weaknesses compared to other regions and the national economy. Such insights can assist in maintaining or increasing cluster strengths by strategic resource targeting. Industry cluster analysis can also help identify new and emerging clusters to replace old and fading ones. An analysis of industry clusters can help regional economic development planners to:

- Describe how industries in a region compare to each other;
- Identify growth trends through regional location quotient analysis;
- Reveal emerging industries in a region;
- Analyze the mix of clusters in a diverse region that might include both rural and urban areas;
- Rethink business expansion strategies;
- Reveal groups of industries that have similar workforce needs;
- Prioritize groups of firms that have growth potential;
- Create regional identities and improve marketing effectiveness.

This snapshot uses the industrial cluster analysis method, definitions, and data developed by a team of professionals led by the Purdue Center for Regional Development. Supported by the U.S. EDA, the team developed an industry cluster tool that focuses on 17 clusters across the United States, defined by six-digit North American Industrial Classification System (NAICS) codes.[5] One of the 17 clusters (manufacturing) was subsequently divided into six specialized sub-clusters.

[3] U.S. Cluster Mapping Project, at www.clustermapping.us/.
[4] See www.pcrd.purdue.edu/signature-programs/regional-decision-maker.php for more information on Purdue University's Center for Regional Development's Regional Decision Maker (RDM).
[5] Ibid.

Table 1 provides information on Greater Philadelphia's industry clusters in 2012. Included are each cluster's location quotients, which compare the relative concentration of a specific industry's establishments, employment, or wages in a regional economy to the concentration in a larger economy. The location quotient is calculated by dividing the percentage of each attribute (establishments, employment, and wages) in the regional economy by the percentage of the same attribute in the larger economy. In this case, the larger economy is the nation, so any location quotient over 1.00 indicates that the cluster's establishments, employment, and wages comprise a larger percentage of the region's economy than that of the nation as a whole.

Table 1: Greater Philadelphia's Industry Clusters, 2012

Industry Cluster	Establishments	Establishments Location Quotient	Employment	Employment Location Quotient	Total Annual Wages (millions)	Wages Location Quotient
Total All Industries	150,352	1.00	2,497,339	1.00	$141,461	1.00
Advanced Materials	2,355	***1.10***	93,465	***1.16***	$9,185	***1.32***
Agribusiness, Food Processing & Technology	1,058	0.47	29,378	0.51	$1,211	0.47
Apparel & Textiles	968	0.94	10,177	0.83	$582	0.86
Arts/Entertainment/Recreation/Visitation	3,427	0.78	71,271	0.72	$2,582	0.62
Biomedical/Biotechnical (Life Science)	7,165	***1.29***	362,975	***1.33***	$20,528	***1.31***
Business and Financial Services	24,855	***1.03***	286,203	***1.29***	$27,723	***1.23***
Chemicals and Chemical Based Products	982	0.93	39,126	***1.09***	$3,438	***1.26***
Defense and Security	5,310	0.92	151,429	***1.10***	$12,105	***1.03***
Education & Knowledge Creation	2,384	***1.11***	106,926	***1.13***	$6,633	***1.18***
Energy (Fossil & Renewable)	4,945	0.74	83,334	0.74	$7,045	0.69
Forest and Wood Products	657	0.64	14,629	0.63	$849	0.67
Glass and Ceramics	142	1.00	2,367	0.55	$139	0.57
Information Technology/ Telecommunications	6,044	***1.02***	107,223	***1.12***	$11,646	1.08
Manufacturing Super Cluster	1,782	0.96	60,706	0.65	$4,363	0.58
Computers and Electronic Products	355	***1.25***	16,826	0.86	$1,462	0.65
Electrical Equipment/Appliances/Components	132	***1.13***	3,360	0.49	$209	0.46
Fabricated Metal Products	853	0.96	16,802	0.71	$953	0.68
Machinery	302	0.90	8,209	0.51	$539	0.45
Primary Metals	47	0.90	2,504	0.68	$148	0.61
Transportation Equipment	93	0.53	13,005	0.55	$1,053	0.53
Mining	99	0.49	2,386	0.62	$194	0.65
Printing and Publishing	3,335	***1.06***	46,322	***1.19***	$3,221	***1.07***
Transportation and Logistics	2,763	0.76	65,387	0.86	$3,219	0.74

Sources: U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development (cluster definitions). Total wages are displayed in millions. ***Bold italics*** indicate clusters with location quotients over 1.00, which indicates a strong regional concentration when compared to the national economy.

As indicated in Table 1, the region's location quotients for establishments, employment, and total annual wages in the biotechnical/biomedical industry cluster (referred to from this point on as the life science cluster) are the highest of any of the region's clusters and are well above 1.00, indicating a strong regional concentration of these industries. The life science cluster includes life-science-related manufacturing; wholesale and retail distribution; and research and development (R&D) facilities. The cluster also includes life science-related services, including outpatient care facilities; companies that provide diagnostic and medical support; hospitals; and residential care facilities. Appendix A provides a complete list of NAICS codes of companies included in this cluster.

Greater Philadelphia's Life Science Industry Cluster

Table 1 provides location quotients for life science establishments, employment, and wages in each of the region's nine counties. As indicated in Table 2, the location quotients for life science establishments are above 1.00 in all of the region's counties except Burlington and Gloucester counties. The life science cluster is especially significant in Philadelphia, Montgomery, and Delaware counties in Pennsylvania and Mercer and Camden counties in New Jersey.

Table 2: Location Quotients of the Region's Life Science Industry Clusters by County

County	Establishments Location Quotient	Employment Location Quotient	Wages Location Quotient
Bucks County, PA	1.26	1.19	1.11
Chester County, PA	1.25	1.03	0.99
Delaware County, PA	1.26	1.28	0.99
Montgomery County, PA	1.25	1.39	1.65
Philadelphia County, PA	1.48	1.56	1.41
Burlington County, NJ	1.15	0.95	0.89
Camden County, NJ	1.25	1.38	1.40
Gloucester County, NJ	1.15	0.96	0.97
Mercer County, NJ	1.22	1.49	1.47
Nine-County Region	1.29	1.33	1.31

Sources: U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development (cluster definitions).

Table 3 describes changes in Greater Philadelphia's life science cluster since 2001, including data on both the number of jobs and establishments, as well as employment and establishment location quotients. The table also includes the number of basic jobs in the life science industrial cluster, calculated by multiplying the number of jobs in the cluster by the portion of the location quotient that is above 1.00. Basic jobs are those jobs present in the region in excess of what one would reasonably expect to find here if the regional economy simply mimicked the national economy. The change in basic jobs combines the impact of changes in the location quotient with the overall size of the cluster.

Greater Philadelphia's life science employment cluster increased by 13 percent between 2001 and 2012, and the number of life science establishments increased by 41 percent. Basic jobs, however, increased by only two percent during the same time period, as the cluster grew even more significantly elsewhere in the nation, and the location quotient therefore declined. Life-science-related wages increased significantly regionally between 2001 and 2012, even as the location quotient declined.

Table 3: Life Science Industries in Greater Philadelphia, 2001–2012

Year	Establishments	Establishments Location Quotient	Employment	Employment Location Quotient	Basic Jobs	Average Annual Wage	Wages Location Quotient
2001	5,089	1.11	320,688	1.38	88,305	$38,957	1.39
2002	5,126	1.15	323,994	1.36	85,763	$39,578	1.33
2003	5,213	1.15	325,980	1.33	80,882	$41,919	1.31
2004	6,246	1.35	333,016	1.36	88,151	$45,479	1.37
2005	6,623	1.41	344,470	1.38	94,854	$47,056	1.40
2006	6,317	1.34	352,155	1.40	100,616	$48,510	1.40
2007	6,315	1.34	354,359	1.39	99,424	$50,822	1.39
2008	6,470	1.31	359,559	1.37	97,107	$52,952	1.38
2009	6,626	1.30	358,815	1.33	89,029	$54,679	1.34
2010	6,811	1.29	360,890	1.32	87,488	$54,959	1.33
2011	6,987	1.29	359,222	1.31	85,007	$55,715	1.32
2012	7,165	1.29	362,975	1.33	90,061	$56,556	1.31
Change, 2001–2012	41%	16%	13%	-4%	2%	45%	-6%

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Wages and Earnings (QCEW).

How Does Greater Philadelphia Compare to Other Large Metros?

Table 4 and Figure 1 describe how Greater Philadelphia's life science cluster compares to that of the nation's largest metropolitan areas. Among the nation's ten largest metropolitan areas, the life science industrial cluster has a location quotient at or above 1.00 in only Boston, Philadelphia, and New York (Miami has an LQ of exactly 1.00). With the second highest number of employees (behind only New York and just ahead of Boston) and the second highest location quotient (behind only Boston), the life science cluster is obviously a critical sector of the region's economy. Table 4 also includes the number of basic life science jobs in each metro, calculated by multiplying the percent of the location quotient above 1.0 by the total number of life science jobs.

Figure 1, however, indicates that since 2001, Philadelphia is one of five large metros where the life science location quotient has declined, despite growth in the cluster's total employment. This

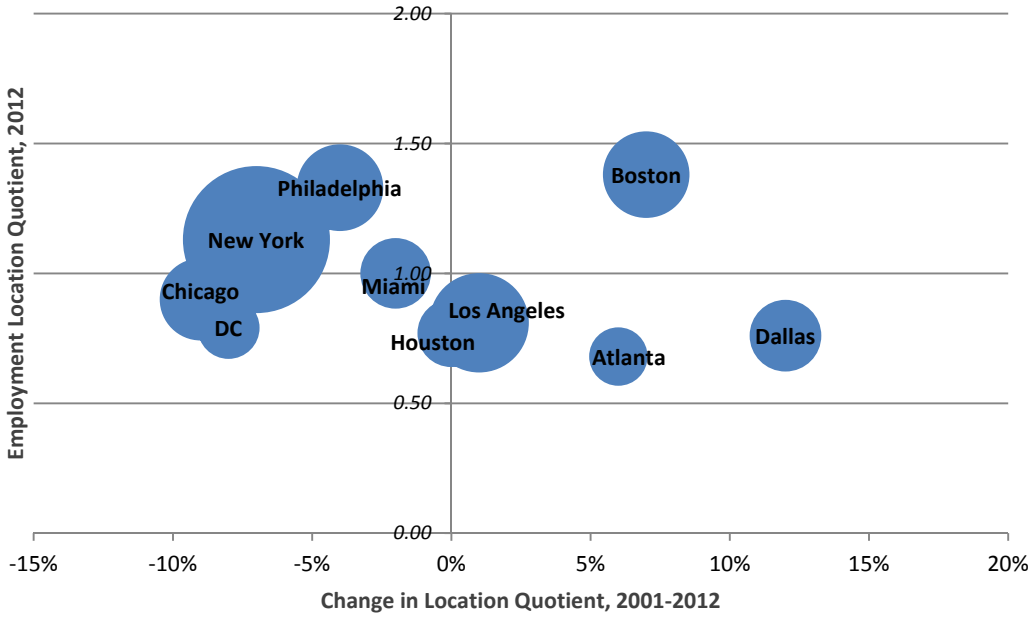
indicates that growth in the region's life science employment has not kept pace with the national growth in the cluster, and that the cluster is becoming relatively more concentrated in some of the nation's other areas, including Dallas, Atlanta, and Los Angeles. Unlike in Greater Philadelphia, the already significant concentration of life science industry in Boston has become even more concentrated since 2001.

Table 4: Life Science Industries in the Nation's Ten Largest Metros, 2012

Metropolitan Area	Life Science Employment	Employment Location Quotient	Basic Jobs*	Change in Employment, 2001-2012	Change in Location Quotient 2001-2012	Change in Basic Jobs, 2001-2012
New York, New York-New Jersey	1,047,044	1.13	120,456	13%	-7%	-25.0%
Los Angeles, California	478,476	0.81	0	18%	1%	----
Chicago, Illinois	327,142	0.90	0	3%	-9%	----
Dallas, Texas	248,775	0.76	0	46%	12%	----
Houston, Texas	222,294	0.77	0	40%	0%	----
Greater Philadelphia	***362,975***	***1.33***	***90,061***	***13%***	***-4%***	***2.0%***
Washington, DC	185,451	0.79	0	19%	-8%	----
Miami, Florida	240,652	1.00	0	19%	-2%	-100.0%
Atlanta, Georgia	164,838	0.68	0	28%	6%	----
Boston, Massachusetts	362,526	1.38	99,826	26%	7%	54.3%

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Wages and Earnings (QCEW).
***Basic jobs are those jobs present in the region in excess of what one would reasonably expect to find if the regional economy simply mimicked the national economy, and are calculated by multiplying the percent of the location quotient above 1.0 by the total number of life science jobs.

Figure 1: Life Science Industry Cluster Dynamics, 2001–2012



Note: The size of each bubble correlates to the total number of jobs in the life science cluster in 2012.
Source: Delaware Valley Regional Planning Commission, April 2015.

Table 5 illustrates the value of the life science cluster to Greater Philadelphia's regional economy. Although the region's location quotient related to total wages decreased by six percent between 2001 and 2012, it remains tied with Boston at 1.31, meaning that total wages generated by life science industries in both Philadelphia and Boston are more concentrated here than in the nation as a whole. The average annual wage earned by life science employees in Greater Philadelphia is fourth among major metros, behind only Boston; Washington, DC; and Los Angeles.

Table 5: Wages of Life Science Industry Employees, 2001–2012

Metropolitan Area	Total Wages 2012	Average Annual Wage			Wages Location Quotient		
		2001	2012	Percent Change	2001	2012	Percent Change
New York, New York–New Jersey	$57,025,883	$40,447	$54,464	35%	1.01	0.90	-11%
Los Angeles, California	$28,324,923	$37,156	$59,198	59%	0.77	0.86	12%
Chicago, Illinois	$16,343,974	$38,098	$49,960	31%	0.93	0.79	-15%
Dallas, Texas	$11,919,790	$34,042	$47,914	41%	0.59	0.67	14%
Houston, Texas	$10,141,057	$34,392	$45,620	33%	0.66	0.57	-14%
Greater Philadelphia	***$20,528,345***	***$38,957***	***$56,556***	***45%***	***1.39***	***1.31***	***-6%***
Washington, District of Columbia	$11,365,218	$40,879	$61,284	50%	0.78	0.71	-9%
Miami, Florida	$10,995,330	$32,326	$45,690	41%	1.00	0.97	-3%
Atlanta, Georgia	$8,054,970	$33,106	$48,866	48%	0.55	0.63	15%
Boston, Massachusetts	$22,904,508	$41,681	$63,180	52%	1.16	1.31	13%

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Wages and Earnings (QCEW). Total wages are displayed in thousands ($1,000s).

Life Science Employers in Greater Philadelphia

In addition to employment data available through federal agencies, this data snapshot also considers data available through the National Establishments Time Series (NETS) database to identify the location of life science-related employers in Greater Philadelphia. Table 6 provides data on the number of life science employers in the Greater Philadelphia region, based on the same set of six-digit NAICS codes used to define each life science cluster in the above analysis.

Over 72 percent of the region's life science industries are services, followed by companies conducting research and development related to the life sciences; retail establishments (primarily pharmacies and drug stores); and life science-related manufacturing (including pharmaceuticals). Figure 2 illustrates the breakdown of life science industries by type, and Table 7 provides data on life science-related services by type. Appendix B provides detailed data on the number of employees and establishments included in the region's life sciences industry cluster, by specific type.

The region's largest life science employers include Children's Hospital of Philadelphia, the University of Pennsylvania Health System, Thomas Jefferson University Hospital, Albert Einstein Medical Center, and Temple University Hospital, all in Philadelphia; GlaxoSmithKline (a pharmaceutical R&D

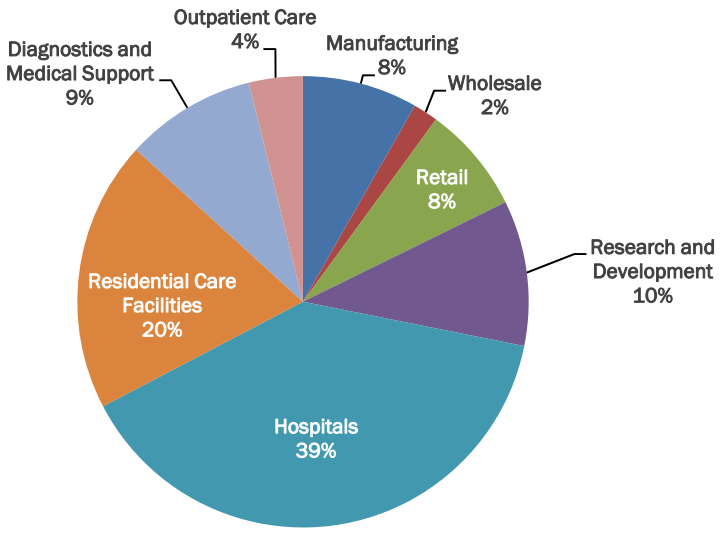
company), and Abington Memorial Hospital, in Montgomery County; Cooper University Health System and Kennedy Health Systems, in Camden County; and the Helen Fuld Medical Center, in Mercer County.

Table 6: Life Science Employers in Greater Philadelphia, 2010

Employment Type	Employees	Percent of Life Sciences Employment	Establishments	Average Employees per Establishment
Services	218,709	72%	2,852	76.7
Hospitals	*119,236*	*39%*	*448*	*266.2*
Residential Care Facilities	*59,183*	*20%*	*832*	*71.1*
Diagnostics and Medical Support	*28,497*	*9%*	*1,106*	*25.8*
Outpatient Care	*11,793*	*4%*	*466*	*25.3*
Research and Development Facilities	31,734	10%	1,296	24.5
Manufacturing Facilities	25,002	8%	954	26.2
Retail Establishments	23,421	8%	3,058	7.7
Wholesale Establishments	5,409	2%	534	10.1
Medical Waste Disposal	123	0.04%	16	7.7
Total Life Sciences Employment	**304,398**	**100%**	**8,710**	**34.9**

Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

Figure 2: Life Science Employers in Greater Philadelphia, 2010



Note: In this chart, "medical waste disposal" facilities have been combined with "manufacturing."
Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

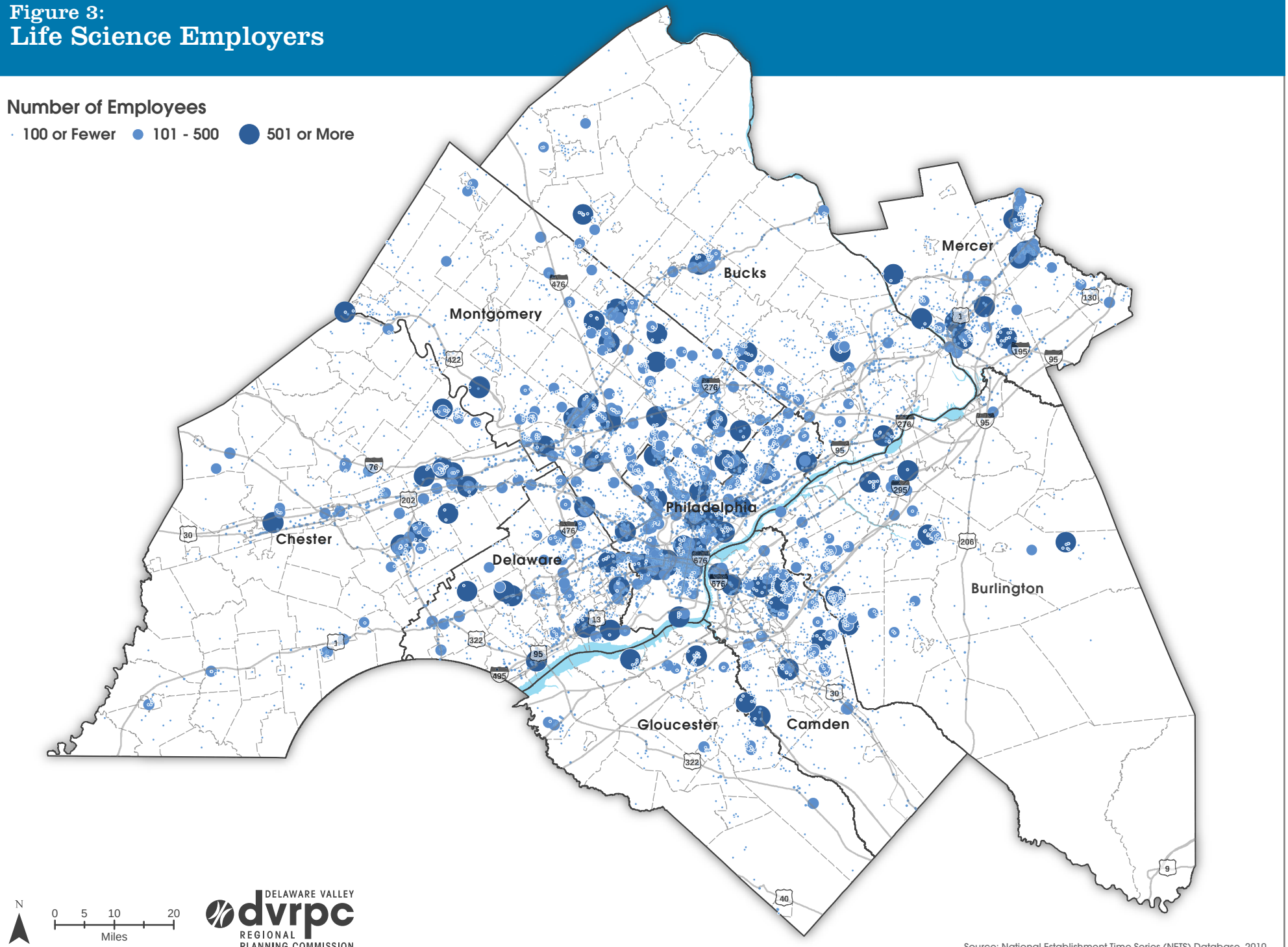
Table 7: Life Science-Related Service Employment in Greater Philadelphia

Life Science Services	Employment	Percent	Establishments	Average Employees per Establishment
Hospitals	**119,236**	**54.5%**	**448**	**266.2**
General medical and surgical hospitals	117,607	53.8%	189	622.3
Psychiatric and substance abuse hospitals	1,117	0.5%	88	12.7
Other hospitals	512	0.2%	171	3.0
Residential Care Facilities	**59,183**	**27.1%**	**832**	**71.1**
Nursing care facilities	43,336	19.8%	505	85.8
Developmental disabilities facilities	943	0.4%	48	19.6
Mental health and substance abuse facilities	559	0.3%	27	20.7
Homes for the elderly	4,970	2.3%	76	65.4
Other residential care facilities	9,375	4.3%	176	53.3
Diagnostics and Medical Support	**28,497**	**13.0%**	**1,106**	**25.8**
Medical laboratories	5,916	2.7%	358	16.5
Diagnostic imaging centers	756	0.3%	62	12.2
Home health care services	15,761	7.2%	370	42.6
Ambulance services	4,949	2.3%	226	21.9
Blood and organ banks	186	0.1%	21	8.9
Miscellaneous ambulatory care centers	929	0.4%	69	13.5
Outpatient Care	**11,793**	**5.4%**	**466**	**25.3**
Family planning centers	314	0.1%	32	9.8
Outpatient mental health centers	5,907	2.7%	187	31.6
HMO medical centers	1,296	0.6%	51	25.4
Kidney dialysis centers	1,114	0.5%	53	21.0
Freestanding emergency medical care centers	337	0.2%	22	15.3
Other outpatient care centers	2,825	1.3%	121	23.3
Total	**218,709**	**100%**	**2,852**	**76.7**

Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

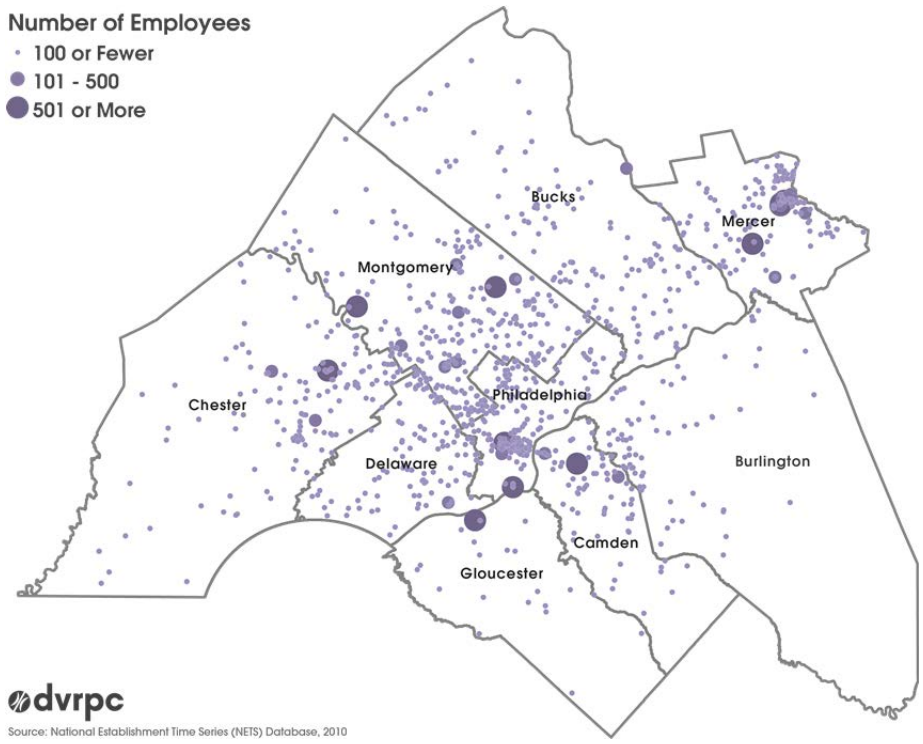
Figure 3 illustrates the location of life science employers throughout Greater Philadelphia, categorized by the number of employees. In general, the majority of these employers, and particularly the largest employers, are typically located within the region's most densely developed cities and centers and along major transportation routes. To improve clarity, Figures 4 through 8 illustrate the locations of life science-related research and development companies; manufacturing and hazardous waste facilities; wholesale and retail facilities; and life science services, including hospitals; outpatient care facilities; diagnostics and medical support companies; and residential care facilities. The largest employers in each category are also listed.

Figure 3:
Life Science Employers



Source: National Establishment Time Series (NETS) Database, 2010

Figure 4: Life Science-Related Research and Development Facilities



Major Life Science Research and Development Facilities

Glaxo Smith Kline, Upper Providence Township, PA (5,460 employees)

Pharmanet Development Group, West Windsor Township, NJ (2,000 employees)

Covance, Inc., West Windsor Township, NJ (1,100 employees)

Johnson & Johnson, Lower Gwynedd Township, PA (812 employees)

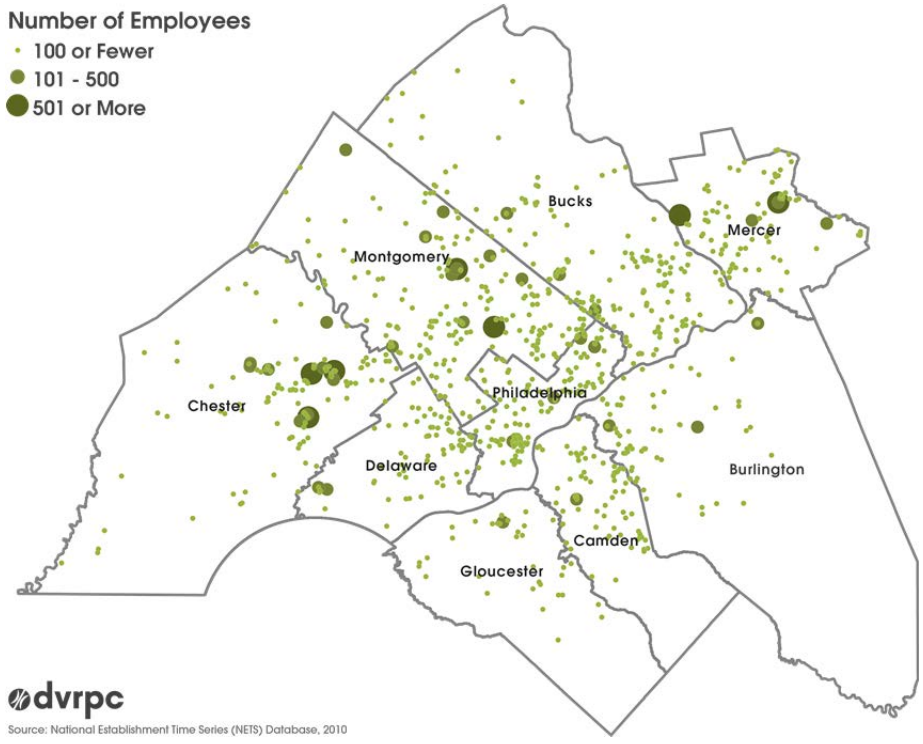
Lockheed Martin Advanced Technology Laboratories, Cherry Hill, NJ (700 employees)

Thomson Scientific, Philadelphia, PA (635 employees)

Sanofi Winthrop, East Whiteland Township, PA (592 employees

E.I. Dupont De Nemours Philadelphia, PA (438 employees)

Figure 5: Life Science-Related Manufacturing or Hazardous Waste Disposal Facilities



Major Life Science Manufacturing Facilities

Siemens Medical Solutions, East Whiteland Township, PA (2,102 employees)

Johnson & Johnson, Whitemarsh Township, PA (1,623 employees)

Ortho-McNeil-Jannsen Pharmaceuticals, Hopewell Township, NJ (1,100 employees)

Cephalon, Inc., East Whiteland Township, PA (739 employees)

Synthes, East Goshen, PA (550 employees)

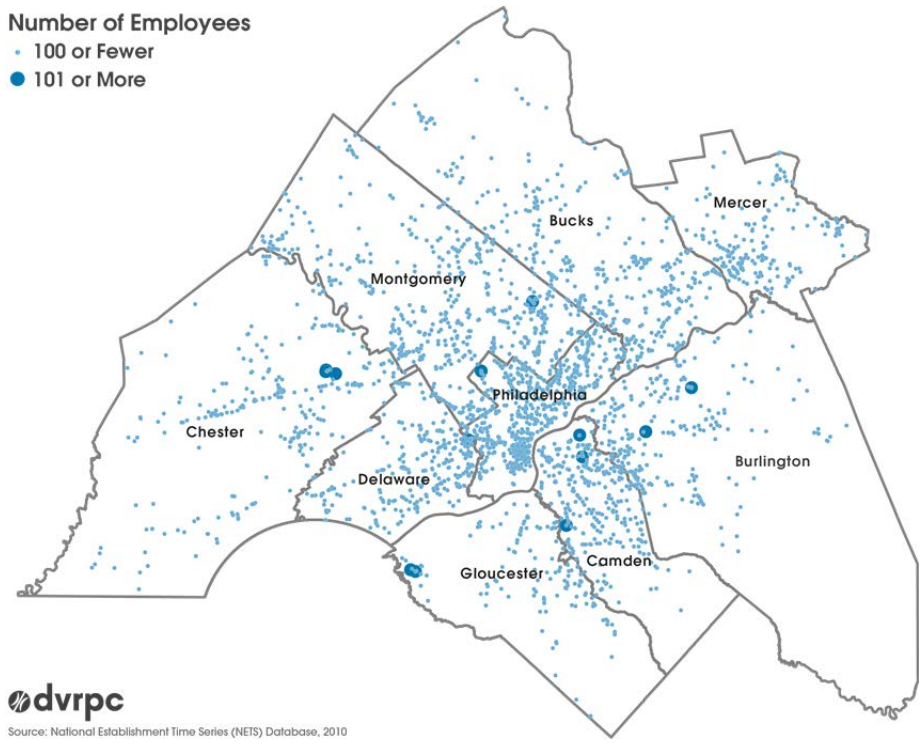
Merck, Upper Gwynedd Township, PA (544 employees)

Eon Labs, Inc., West Windsor Township, NJ (525 employees)

Centocor, USA, Horsham Township, PA (455 employees)

Wyeth, East Whiteland Township, PA (430 employees)

Figure 6: Life Science-Related Retailers and Wholesalers



Major Life Science Wholesalers and Retailers

Siemens Nuclear Systems Group, East Whiteland Township, PA (572 employees)

JC Penney Optical, Inc., Gloucester Township, NJ (412 employees)

CVG Products and Services, Pennsauken Township, NJ (300 employees)

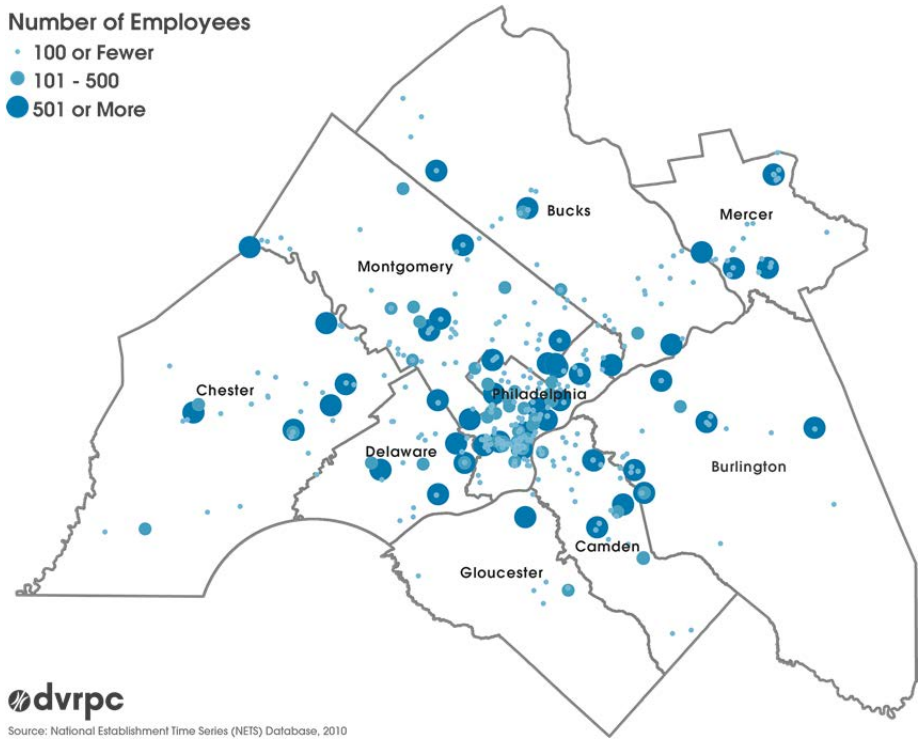
America's Best Contacts and Glasses, Pennsauken Township, NJ (226 employees)

Drugstore.com, Inc. Distribution Center, Logan Township, NJ (200 employees)

Symphony Mobilex, Horsham Township, NJ (198 employees)

Thomas Medical Products, East Whiteland Township, PA (177 employees)

Figure 7: Life Science-Related Services: Hospitals



Major Hospitals

Children's Hospital of Philadelphia, Philadelphia, PA (6,457 employees)

University of Pennsylvania Hospital, Philadelphia, PA (4,817 employees)

Cooper University Hospital, Camden, NJ (4,500 employees)

Thomas Jefferson University Hospital, Philadelphia, PA (4,198 employees)

Abington Memorial Hospital, Abington, PA (3,635 employees)

Albert Einstein Medical Center, Philadelphia, PA (3,107 employees)

Helene Fuld Medical Center, Trenton, NJ (3,000 employees)

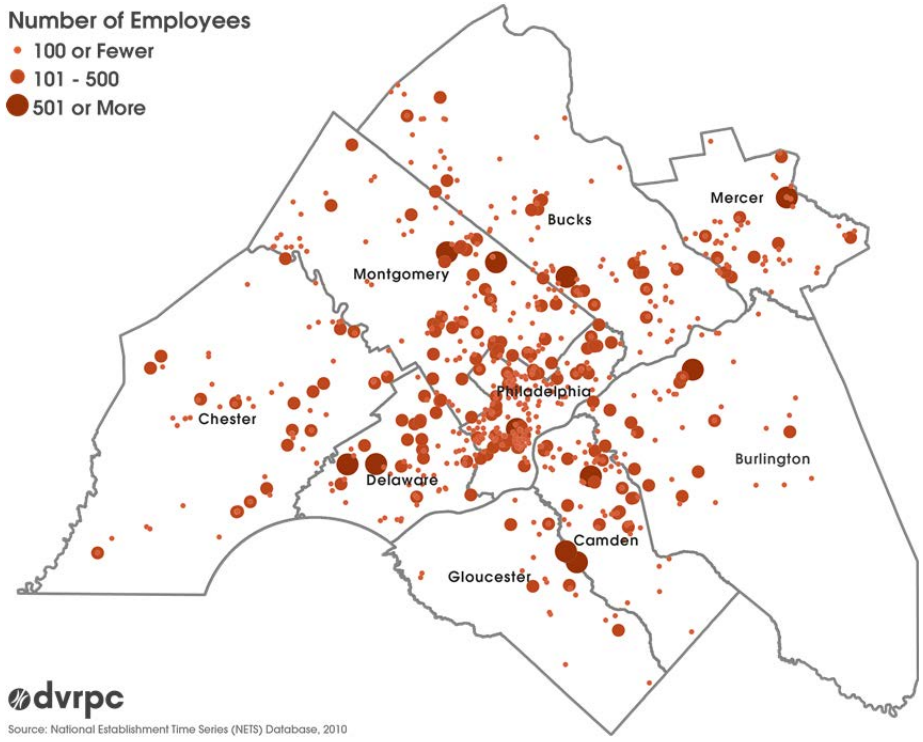
Kennedy Health Care, Stratford, NJ (2,800 employees)

Philadelphia VA Medical Center, Philadelphia, PA (2,655 employees)

Hahnemann Hospital, Philadelphia, PA (2,315 employees)

Our Lady of Lourdes Medical Center, Camden, NJ (2,142 employees)

Figure 8: Life Science-Related Services: Residential Care Facilities



Major Residential Care Facilities

Presbyterian Homes and Services, West Windsor Township, NJ (1,300 employees)

Fair Acres Geriatric Center, Middletown Township, PA (1,095 employees)

Madlyn and Leonard Abramson Center, Horsham Township, PA (899 employees)

Brittany Pointe Estates, Upper Gwynedd, PA (764 employees)

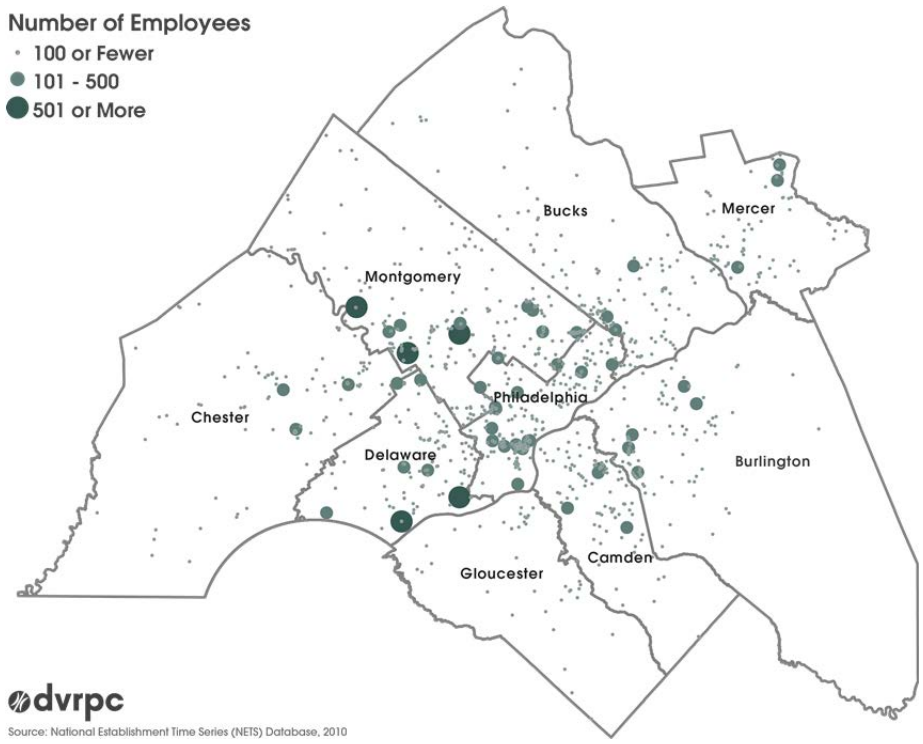
Bancroft Neuro Health, Haddonfield Borough, NJ (700 employees)

Ann's Choice, Inc., Warminster Township, PA (696 employees)

Long Term Care Nursing Home, Washington Township, NJ (650 employees)

Masonic Home, Burlington Township, NJ (608 employees)

Figure 9: Life Science-Related Services: Diagnostics and Medical Support



Major Diagnostics and Medical Support Facilities

MDwise Hoosier Alliance LLP, Philadelphia, PA (1,500 employees)

Bayada Nurses, Inc., Upper Merion Township, PA (915 employees)

General Healthcare Resources, Inc., Plymouth Meeting, PA (746 employees)

Community Hospital, Chester City, PA (675 employees)

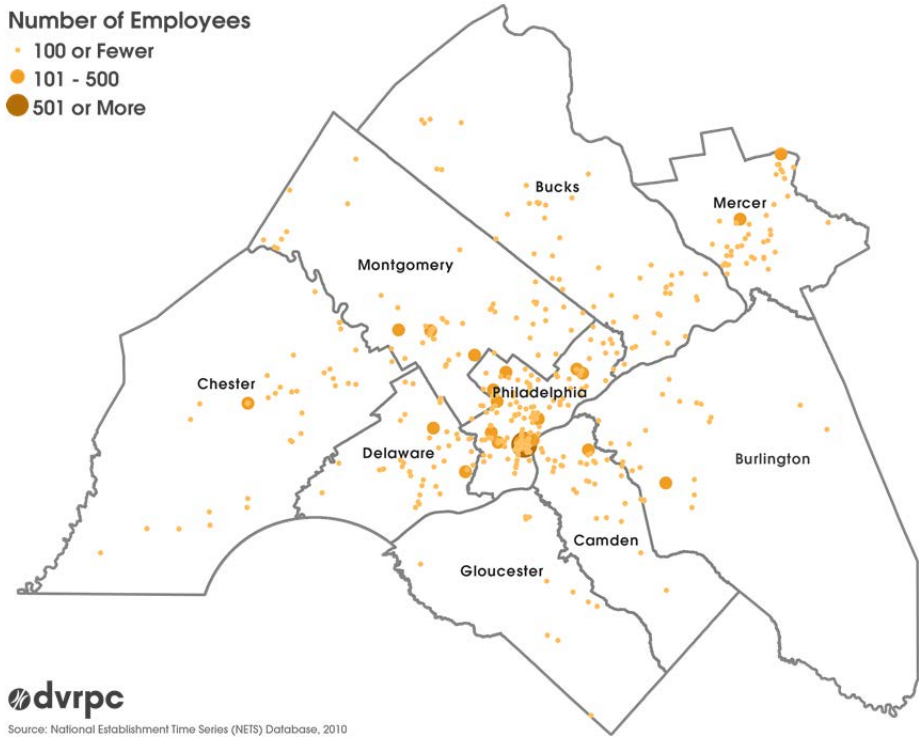
Quest Diagnostics, Collegeville Borough, PA (529 employees)

Moorestown Visiting Nurse Association, Moorestown, NJ (461 employees)

Quest Diagnostics, Norristown Borough, PA (415 employees)

Princeton Plasma Physics Lab, Princeton, NJ (400 employees)

Figure 10: Life Science-Related Services: Outpatient Care Facilities



Major Outpatient Care Facilities

Health Partners of Philadelphia, Philadelphia, PA (531 employees)

St. Lawrence Rehabilitation Center, Lawrence Township, NJ (400 employees)

Community Treatment Teams, Philadelphia, PA (319 employees)

CFG Health Systems, Evesham, NJ (300 employees)

Central Montgomery Mental Health Center, Norristown, PA (283 employees)

Resources for Human Development, Philadelphia, PA (275 employees)

Child Guidance Resource Center, Inc., Haverford Township, PA (248 employees)

JFK Community Health Center, Philadelphia, PA (209 employees)

Occupation Cluster Analysis

Occupation cluster analysis is a relatively new approach in regional development that focuses on the knowledge, skills, and abilities of the workforce. Occupation clusters are groups of occupations that share similar knowledge and skill requirements. Supported by the U.S. EDA, a team of experts that included representatives of both academia and the private sector collaboratively developed a tool that focuses on 15 knowledge-based occupation clusters, to provide insight into the talent base that drives regional economies.[6] One of the 15 clusters (health care and medical science) was further disaggregated into three specialized sub-clusters.

Originally envisioned as a tool to help rural regions identify their strengths and opportunities, the tool has been found to work equally well for urban and suburban regions. The 15 knowledge-based clusters and three sub-clusters, defined based on six-digit NAICS codes, include the following:

- Agribusiness and food technology
- Arts, entertainment, publishing, and broadcasting
- Building, landscape, and construction design
- Engineering and related sciences

[6] The research team included Purdue University's Center for Regional Development; the Indiana Business Research Center at Indiana University; the University of Missouri's Rural Policy Research Institute; the Strategic Development Group; and Economic Modeling Specialists, Inc. See www.statsamerica.org/innovation/index.html for more details on EDA's *Innovation in American Regions* project.

- Health care and medical science
    - Medical practitioners and scientists
    - Medical technicians
    - Therapy, counseling, nursing, and rehabilitation
- Information technology (IT)
- Legal and financial services, and real estate
- Managerial, sales, marketing, and human resources
- Mathematics, statistics, data, and accounting
- Natural sciences and environmental management
- Personal services
- Postsecondary education and knowledge creation
- Primary, secondary, and vocational education, remediation, and social services
- Public safety and domestic security
- Skilled production workers, including technicians, operators, trades, installers, and repairers

Specific occupations included in the health care and medical science cluster and its three sub-clusters are listed in Appendix C, by six-digit Standard Occupational Classification (SOC) code. Analyzing and assessing occupation clusters enables economic development and planning professionals to analyze the regional knowledge-based workforce in greater detail; determine how well occupation cluster strengths align with the region's industry cluster strengths; understand the local workforce and educational situation within the broader regional economic development context; and bridge the gap between workforce and economic development when constructing a regional economic development strategy. Understanding how a region's most significant and promising industry clusters compare to the strengths of its workforce also allows regions to consider how well positioned the region is to compete effectively in a knowledge-based innovation economy.[7]

Table 8 provides data on occupation clusters in the Greater Philadelphia region. Several of the region's technology and science-based clusters have location quotients above 1.00, indicating that a higher percentage of the region's workforce work in these occupations than would be expected based on national averages. The region's strongest occupational clusters include health care and medical science; mathematics, statistics, data, and accounting; and post-secondary education.

Greater Philadelphia's Health Care and Medical Science Occupation Cluster

This snapshot focuses specifically on the health care and medical science cluster, considering the cluster in its entirety as well as the sub-categories of medical practitioners and scientists (which has the highest location quotient among all of the region's occupation clusters); medical technicians; and therapy, counseling, and rehabilitation specialists.

[7] Center for Regional Development, Purdue University; Indiana Business Research Center, Kelley School of Business, Indiana University; Center for Regional Competitiveness, Rural Policy Research Institute; Truman School of Public Affairs, University of Missouri; Strategic Development Group, Inc.; and Economic Modeling Specialists, Inc. *A Practitioner's Guide to Economic Development Tools for Regional Competitiveness in a Knowledge-Based Economy*, page 4. 2014.

Table 8: Greater Philadelphia's Occupation Clusters

Occupation Cluster	Employment	Location Quotient
Agribusiness and Food Technology	16,722	0.34
Arts, Entertainment, Publishing, and Broadcasting	75,066	1.00
Building, Landscape, and Construction Design	14,845	1.04
Engineering and Related Sciences	30,320	1.05
Health Care and Medical Science (Aggregate)	230,493	1.27
Medical Practitioners and Scientists	47,579	1.34
Medical Technicians	43,513	1.13
Therapy, Counseling, and Rehabilitation	139,400	1.30
Information Technology (IT)	77,156	1.20
Legal and Financial Services, and Real Estate	283,458	1.12
Managerial, Sales, Marketing, and Human Resources	267,754	1.07
Mathematics, Statistics, Data, and Accounting	100,786	1.27
Natural Sciences and Environmental Management	9,538	1.10
Personal Services Occupations	77,881	1.00
Postsecondary Education and Knowledge Creation	46,017	1.26
Primary, Secondary, and Vocational Education, Remediation, and Social Services	190,562	1.13
Public Safety and Domestic Security	37,936	0.99
Skilled Production Workers	192,806	0.86

Source: Stats America, accessible at www.statsamerica.org/innovation/index.html.

Table 9 lists location quotients for the health care and medical science clusters in each of the Greater Philadelphia region's nine counties. While the number of people working in health care and medical science occupations is significant throughout the region as a whole, the highest location quotients for health care and medical science occupations are, as expected, in the region's most densely populated counties, including Philadelphia and Delaware County in Pennsylvania and Camden County, New Jersey.

Table 9: Health Care and Medical Science Location Quotients In Greater Philadelphia

County	Health Care and Medical Science (in aggregate)	Medical Practitioners and Scientists	Medical Technicians	Therapy, Counseling, and Rehabilitation
Bucks County, PA	1.07	1.22	1.08	1.01
Chester County, PA	0.94	1.16	0.88	0.90
Delaware County, PA	1.29	1.39	1.16	1.30
Montgomery County, PA	1.18	1.73	1.08	1.04
Philadelphia County, PA	1.79	1.51	1.50	1.98
Burlington County, NJ	0.97	0.97	0.83	1.02
Camden County, NJ	1.33	1.26	1.15	1.42
Gloucester County, NJ	0.93	0.83	0.91	0.97
Mercer County, NJ	1.05	0.98	0.89	1.13
Greater Philadelphia Region	1.27	1.34	1.13	1.30

Source: Stats America, accessible at www.statsamerica.org/innovation/index.html.

How Does Greater Philadelphia Compare to Other Large Metros?

Table 10, Table 11, and Figure 11 illustrate how Greater Philadelphia's health care and medical science occupation cluster compares to that of the nation's largest metropolitan areas. As illustrated in Table 10, Greater Philadelphia is second among the nation's ten most populated metropolitan areas in terms of the fewest residents per health care provider (behind only Boston), for both the cluster as a whole and also for medical practitioners (including general physicians and specialists), medical technicians, and therapists and counselors. Residents of Greater Philadelphia are well served in terms of health care, with more health care service providers available to meet their needs. People also come to Greater Philadelphia from areas outside the region to take advantage of the quality health care services provided here, meaning that health care is also an exporting cluster (exporting services rather than goods) in addition to being a local service cluster.

As illustrated in Table 11, among the nation's ten largest metropolitan areas, the health care and medical science occupation cluster has a location quotient at or above 1.00 in only Boston, Philadelphia, and New York. With the second highest location quotient (behind only Boston), a greater percentage of the region's workforce is working in health care or medical science-related jobs than would be expected based on national averages. Greater Philadelphia's workforce clearly has the talent and skills necessary to support this important cluster.

Table 10: Health Care and Medical Science Occupation Clusters In the Nation's Ten Largest Metro Areas, 2010

Metropolitan Area	Practitioners and Scientists		Medical Technicians		Therapy and Counseling	
	Number	Residents per Practitioner	Number	Residents per Technician	Number	Residents per Counselor
New York-Newark-Jersey City, NY–NJ	136,756	143	93,235	210	305,623	64
Los Angeles-Long Beach-Anaheim, CA	81,506	157	82,496	156	197,238	65
Chicago-Joliet-Naperville, IL	47,524	153	42,272	172	140,867	52
Dallas-Fort Worth-Arlington, TX	37,091	173	43,096	149	99,250	65
Houston-Woodlands-Sugarland, TX	34,322	172	39,368	150	88,732	67
Greater Philadelphia Region	***47,579***	***118***	***43,513***	***129***	***139,400***	***40***
Miami-Fort Lauderdale-West Palm Beach, FL	32,133	173	42,545	131	94,941	59
Atlanta-Sandy Springs-Roswell, GA	29,163	181	32,226	164	73,399	72
Boston-Cambridge-Newton, MA	49,970	91	44,192	103	139,105	33
Washington, DC Metro	25,222	155	17,236	227	49,315	80
United States	1,908,604	162	2,071,267	149	5,774,427	53

Source: Stats America, accessible at www.statsamerica.org/innovation/index.html.

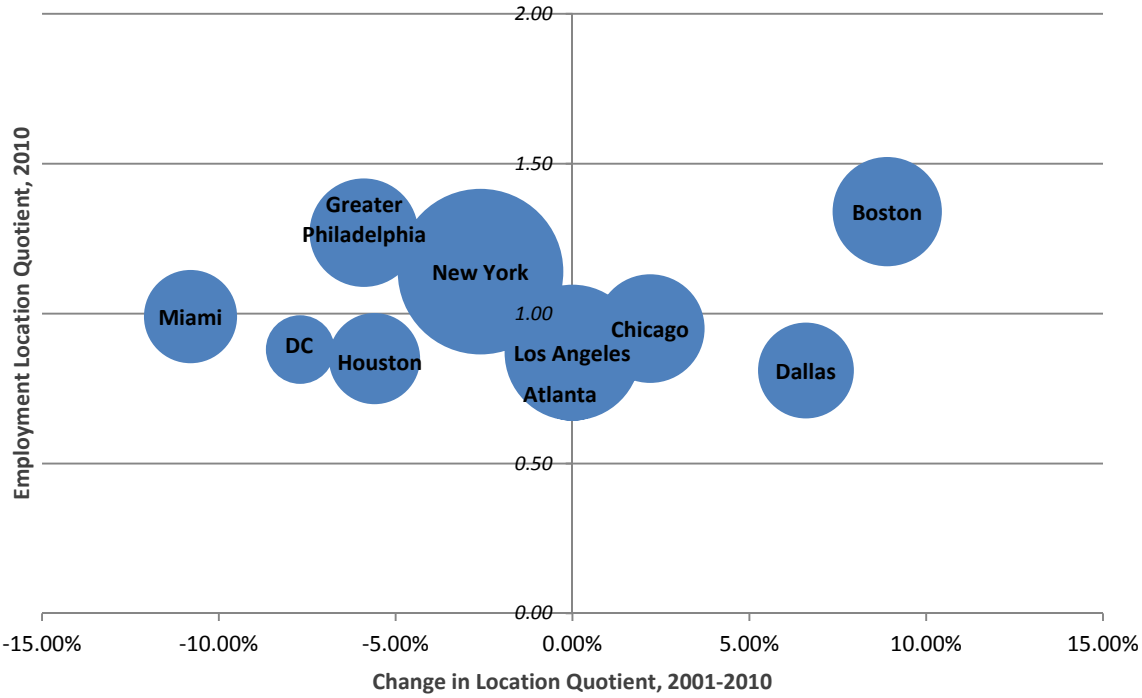
Table 11: Health Care and Medical Science Employment Location Quotients In the Nation's Ten Largest Metro Areas, 2001-2010

Metropolitan Area	2001	2007	2008	2009	2010	Percent Change 2001-2010
New York-Newark-Jersey City, NY–NJ	1.17	1.17	1.09	1.08	1.14	-2.6%
Los Angeles-Long Beach-Anaheim, CA	0.87	0.87	0.87	0.87	0.87	0.0%
Chicago-Joliet-Naperville, IL	0.93	0.94	0.95	0.95	0.95	2.2%
Dallas-Fort Worth-Arlington, TX	0.76	0.79	0.80	0.81	0.81	6.6%
Houston-Woodlands-Sugarland, TX	0.90	0.91	0.85	0.85	0.85	-5.6%
Greater Philadelphia Region	***1.35***	***1.34***	***1.29***	***1.28***	***1.27***	***-5.9%***
Miami-Fort Lauderdale-West Palm Beach, FL	1.11	1.06	0.99	1.01	0.99	-10.8%
Atlanta-Sandy Springs-Roswell, GA	0.78	0.80	0.76	0.78	0.78	0.0%
Boston-Cambridge-Newton, MA	1.23	1.28	1.34	1.34	1.34	8.9%
Washington, DC Metro	0.91	0.88	0.88	0.88	0.84	-7.7%
United States	1.00	1.00	1.00	1.00	1.00	0.0%

Source: Stats America, accessible at www.statsamerica.org/innovation/index.html.

Figure 11, however, indicates that since 2001, Philadelphia is one of five large metros where the health care and medical science location quotient has declined, despite growth in the cluster's total employment. This mirrors the declining location quotient evidenced in the earlier analysis of life science industries, and indicates that growth in region's health care occupations has been outpaced by growth in other regions, including Boston, Dallas, and Chicago. Unlike in Greater Philadelphia, the already significant concentration of health care occupations in Boston has become even more concentrated since 2001.

Figure 11: Health Care and Medical Science Cluster Dynamics, 2001-2010



Note: The size of each bubble correlates to the total number of people working in health care and medical science occupations in 2010.
Source: Delaware Valley Regional Planning Commission, April 2015.

Greater Philadelphia's Health Care Service Providers

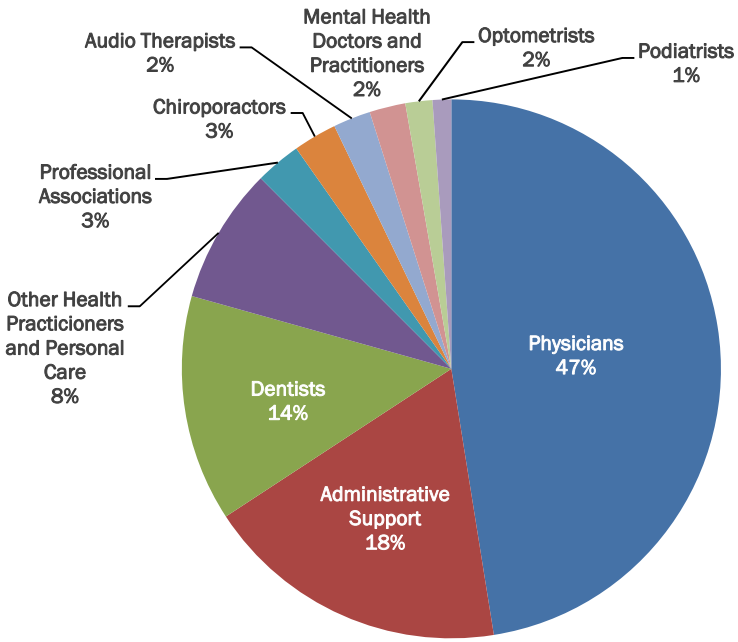
Thousands of individual doctors, nurses, dentists, and other professionals provide healthcare services within the Greater Philadelphia region. Table 12 provides the number of health care service employees and establishments in Greater Philadelphia, based on an analysis of data from the 2010 National Establishments Times Series (NETS) database. A few of these establishments are large firms with hundreds, if not thousands, of employees, particularly companies providing administrative support to health care-related businesses, or professional development associations. The vast majority of the region's healthcare professionals, however, are working in small practices and offices, including 20,500 offices and practices with five or fewer employees (82 percent). Figure 12 illustrates the percentages of employees working in health care occupations, by type, and Table 13 provides data on the number of healthcare service providers working in each of the region's nine counties.

Table 12: Health Care Service Occupations In Greater Philadelphia, 2010

Occupation	Employment	Establishments	Average Employees per Establishment
Physicians	69,017	10,705	6
Mental Health Doctors	1,146	253	5
Mental Health Practitioners	1,988	988	2
Dentists	19,736	3,566	6
Chiropractors	3,798	1334	3
Optometrists	2,355	592	4
Audio Therapists	3,279	586	6
Podiatrists	1,624	479	3
Other Health Care Practitioners	8,625	2398	4
Personal Care	3,216	867	4
Health Care-Related Administrative Support	26,583	2,817	9
Health Care-Related Professional Associations	3,985	500	8
Total	**145,352**	**25,085**	**6**

Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

Figure 12: Health Care Service Occupations In Greater Philadelphia, 2010



Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

Table 13: Employees Working in Health Care Service Occupations by County, 2010

Occupation	Bucks County	Chester County	Delaware County	Montgomery County	Philadelphia County	Burlington County	Camden County	Gloucester County	Mercer County
Population	625,249	498,886	558,979	799,874	1,526,006	448,734	513,657	288,288	366,513
Total Health Care Employees	14,790	11,588	13,065	26,303	38,159	10,423	12,862	5,336	12,826
Physicians	7,157	4,962	6,540	11,391	18,703	5,248	7,325	3,020	4,671
Mental Health Doctors	111	108	145	235	323	69	77	14	64
Dentists	2,745	1,924	2,272	4,056	3,284	1,464	1,870	854	1,267
Chiropractors	673	361	345	741	554	346	355	165	258
Optometrists	272	331	258	499	314	183	195	118	185
Mental Health Practitioners	265	194	148	510	421	69	174	41	166
Audio Therapists	312	561	376	1,016	316	214	192	73	219
Podiatrists	174	157	178	199	400	95	213	106	102
Other Health Practitioners	1,035	869	688	2,027	1,914	754	647	265	426
Personal Care	450	185	533	432	766	247	332	135	136
Administrative Support	1,470	1,687	1,385	4,776	9,531	1,677	1,255	487	4,315
Health Care-Related Professional Associations	126	249	197	421	1,633	57	227	58	1,017

Source: Delaware Valley Regional Planning Commission (based on data from the 2010 National Establishments Times Series (NETS) database), April 2015.

Life Science Venture Capital

Venture capital is financial capital provided to early-stage, entrepreneurial companies that have a high potential for growth, particularly in key emerging and expanding, knowledge-based, economic sectors. Venture capital is a catalyst for job creation, and it can be used as an indicator of both innovation and a region's capacity to continue expanding in key sectors. According to the National Venture Capital Association, approximately 11 percent of private sector jobs originate in venture-backed businesses and venture-backed revenue accounts for approximately 21 percent of the U.S. Gross Domestic Product (GDP).[8] In 2014, venture capitalists invested over $48 billion in 160 cities nationwide, approximately 18 percent of which was invested in life science companies.

Table 14 and Figure 13 illustrate the amount of venture capital invested in biotech, health care, and medical devices and instruments between 1995 and 2014, by region (see Appendix D for the definitions of the regions). Not surprisingly, northern California's Silicon Valley consistently ranks first in the amount of venture capital invested, both overall and specifically in life science-related industries. The Silicon Valley is followed by New England, the DC/Metroplex (which also includes Baltimore), San Diego, and the Southeast (which includes the Atlanta region as well as the Carolinas).

The Philadelphia Metro Area ranks ninth among the 18 regions in the amount of venture capital invested in life sciences between 1995 and 2014, with about five percent of the nation's total life science venture capital invested here. The region's share of available venture capital in the three sectors, however, declined by 11 percent between 1995 and 2014 when compared to the previous decade. This decline in share of available capital was exceeded only in the DC/Metroplex, the Southeast, and Sacramento, California. In contrast, the share of available capital invested in the South Central region (which includes Kansas, Oklahoma, Arkansas, and Louisiana), the Midwest, New England, and the Silicon Valley increased significantly.

Figure 14 illustrates the amount of venture capital invested in biotech, health care, and medical devices and equipment companies in the Philadelphia Metro between 1995 and 2015. For comparison, the chart also includes a national investment trend line for all three sectors combined (albeit at a different scale). While the total available venture capital invested nationally increased in 2014, the amount invested in the Philadelphia Metro remained relatively stagnant.

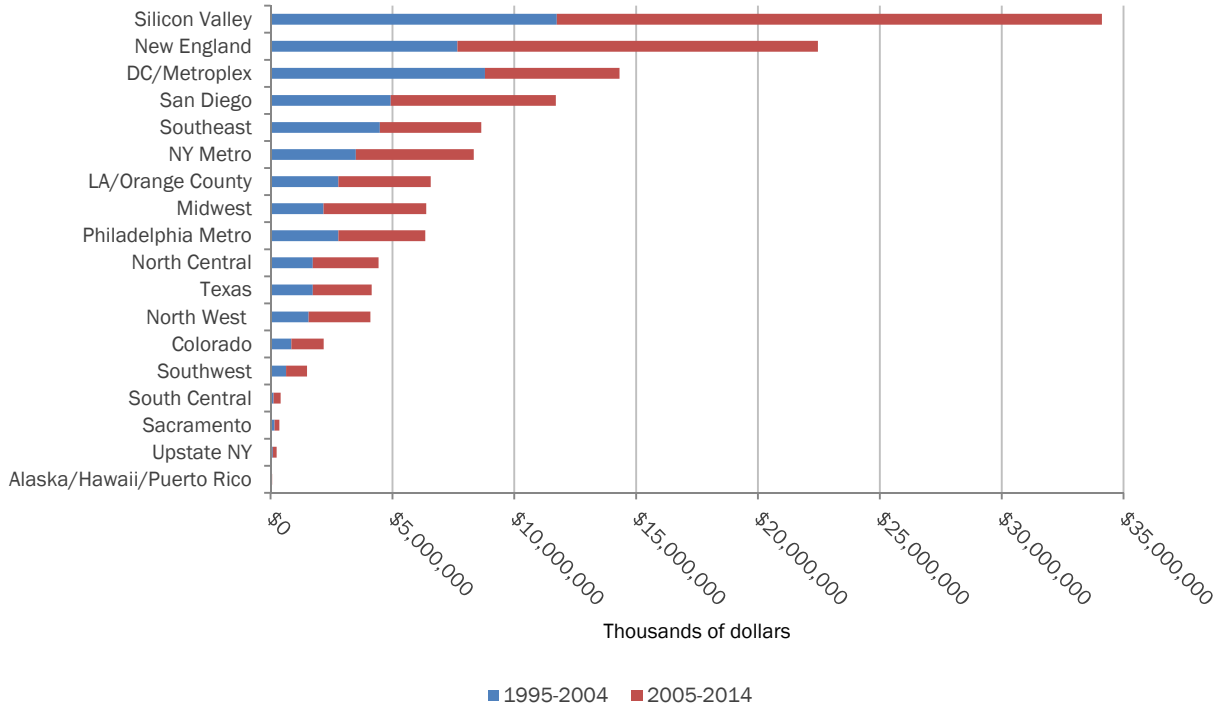
[8] *Venture Impact: The Economic Importance of Venture-Backed Companies to the U.S. Economy*. Accessed at www. nvca.org/research/venture-investment, April 2015.

Table 14: Venture Capital Invested in the Life Science Cluster by Region, 1995–2014

Region	1995–2004		2005–2014		1995–2014		Change in Percent Share 1995–2004 versus 2005–2014
	Total Investment (thousands)	Percent	Total Investment (thousands)	Percent	Total Investment (thousands)	Percent	
United States	***$55,746,790***	***100%***	***$80,550,443***	***100%***	***$136,297,293***	***100%***	***0%***
Silicon Valley	$11,743,959	21%	$22,367,343	28%	$34,111,301	25%	32%
New England	$7,664,244	14%	$14,792,891	18%	$22,457,134	16%	34%
DC/Metroplex	$8,794,266	16%	$5,524,823	7%	$14,319,090	11%	-57%
San Diego	$4,928,873	9%	$6,775,146	8%	$11,704,019	9%	-5%
Southeast	$4,482,788	8%	$4,160,176	5%	$8,642,964	6%	-36%
New York Metro	$3,499,261	6%	$4,835,351	6%	$8,334,612	6%	-4%
LA/Orange County	$2,781,399	5%	$3,786,238	5%	$6,567,636	5%	-6%
Midwest	$2,170,107	4%	$4,218,189	5%	$6,388,296	5%	35%
Philadelphia Metro	**$2,782,127**	**5%**	**$3,563,029**	**4%**	**$6,345,155**	**5%**	**-11%**
North Central	$1,728,673	3%	$2,702,025	3%	$4,430,699	3%	8%
Texas	$1,734,150	3%	$2,414,447	3%	$4,148,596	3%	-4%
Northwest	$1,562,002	3%	$2,530,179	3%	$4,092,181	3%	12%
Colorado	$849,628	2%	$1,326,878	2%	$2,176,506	2%	8%
Southwest	$635,577	1%	$858,168	1%	$1,493,745	1%	-7%
South Central	$125,384	0.2%	$288,137	0.4%	$413,521	0.3%	59%
Sacramento/Northern California	$162,306	0.3%	$199,859	0.2%	$362,165	0.3%	-15%
Upstate New York	$89,597	0.2%	$157,711	0.2%	$247,308	0.2%	22%
Alaska-Hawaii-Puerto Rico	$12,450	0.02%	$49,845	0.1%	$62,295	0.05%	177%

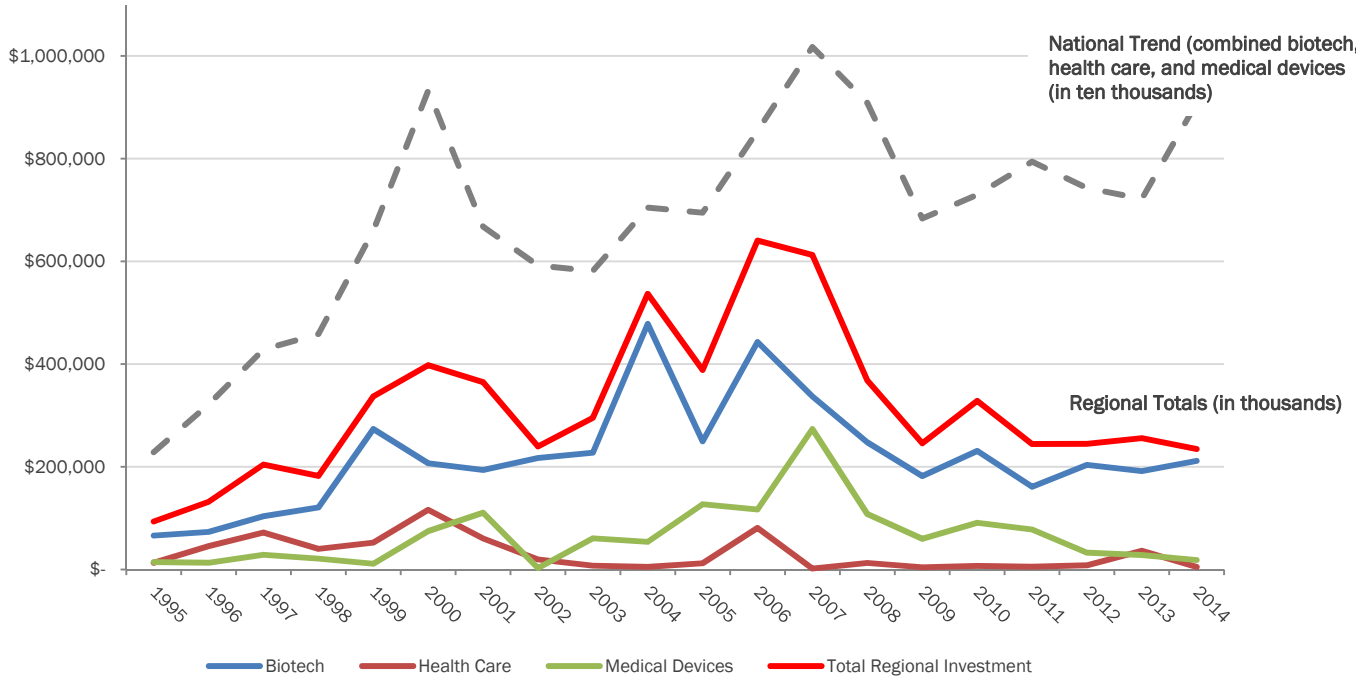
Source: Price Waterhouse Cooper/National Venture Capital Association Money Tree Report (data from Thomson Reuters), April 2015. Venture capital totals are listed in thousands of dollars. See Appendix D for definitions of regions. "Life Science" venture capital includes investments in biotech, health care, and medical devices and equipment. Totals may not add up due to rounding.

Figure 13: Life Science Venture Capital by Region, 1995–2014



Source: Price Waterhouse Cooper/National Venture Capital Association Money Tree Report (data from Thomson Reuters), April 2015. Venture capital totals are listed in thousands of dollars. See Appendix D for definitions of regions. For the purposes of this report, "life science" venture capital includes investments in biotech; health care; and medical devices and equipment.

Figure 14: Life Science Venture Capital Invested in the Philadelphia Metro Area by Type, 1995–2014



Source: Price Waterhouse Cooper/National Venture Capital Association Money Tree Report (data from Thomson Reuters), April 2015. Regional venture capital totals are shown in thousands of dollars; national total is shown in ten thousands of dollars.

Summary

In 2014, DVRPC completed *Data Snapshot 2:2: A Regional Economic Cluster Analysis*. That report identifies economic strengths, trends, and opportunities in Greater Philadelphia through an analysis of clusters of traded industries. The report characterizes the region's industry clusters as strong or weak, and as either growing or stable, and can be used to help identify clusters most vital to the regional economy and which present the best opportunities for economic growth.

In addition to the key economic clusters identified in *Data Snapshot 2:2*, Greater Philadelphia has long been known as a leader in the life science cluster, a broader categorization of related industries that include health care, pharmaceuticals, biotechnology, and all of their related support services. Because many of the industries and services that together make up the life sciences were considered as separate parts of other traded clusters, or were classified as local industries and were therefore not considered at all in *Data Snapshot 2:2*, the full combined extent and impact of life sciences on the regional economy was not readily apparent.

The current report assesses the relative importance of the life science cluster to Greater Philadelphia's regional economy. The snapshot concludes that the life science cluster, which includes life science-related manufacturing, wholesale and retail distribution, research and development, and services, is one of the region's strongest clusters. With location quotients well above 1.00, it is clear that the cluster's employment, number of establishments, and total wages are more concentrated in and significant to the regional economy when compared to the national economy. Among the nation's ten largest metropolitan areas, the life science industrial cluster has a location quotient above 1.00 in only Boston, Philadelphia, and New York. With the second highest number of employees (behind only New York) and the second highest location quotient (behind only Boston), the life sciences cluster is obviously a critical sector of Greater Philadelphia's regional economy.

The significance of the region's health care and life science sectors is also evidenced through an analysis of occupations. Among the nation's ten largest metropolitan areas, the health care and medical science occupation cluster again has a location quotient above 1.00 in only Boston, Philadelphia, and New York. A higher percentage of Greater Philadelphia's workforce is working in health care or medical science-related jobs than would be expected based on national averages. Given this analysis, and combined with the significance of the education and knowledge creation cluster identified in the previous Data Snapshot, Greater Philadelphia's current workforce clearly has the talent and skills necessary to support this critical cluster, and has tremendous potential to continue meeting its needs in the future.

The analysis also reveals, however, that the location quotients related to health care have declined in Greater Philadelphia since 2001, despite growth in total employment. This trend is true whether considering the life science industrial cluster or the health

care and medical science occupation cluster, and it indicates that growth in the region's life science industries and health care occupations has been outpaced by growth in other regions, including Boston (where the already significant life science cluster continues to gain in national significance), Dallas, and Chicago. Greater Philadelphia has also been less successful than other regions in maintaining its share of available life science-related venture capital, often seen as an indicator of regional innovation.

The region's economic development professionals and policy makers should continue to support the critical life science and health care clusters, and initiatives to ensure that the region's workforce is prepared to meet the needs of its future employers. Future DVRPC research will continue to explore the regional significance and impact of Greater Philadelphia's most significant economic clusters.

Appendix A: Industries Included in the Life Science Industry Cluster, by Six-Digit North American Industrial Classification System (NAICS) Code

NAICS*	Industry
Manufacturing and Hazardous Waste Disposal	
325411	Medicinal and botanical manufacturing
325412	Pharmaceutical preparation manufacturing
325413	In-vitro diagnostic substance manufacturing
325414	Other biological product manufacturing
333314	Optical instrument and lens manufacturing
334510	Electro-medical apparatus manufacturing
334516	Analytical laboratory instrument manufacturing
334517	Irradiation apparatus manufacturing
339111	Laboratory apparatus and furniture manufacturing
339112	Surgical and medical instrument manufacturing
339113	Surgical appliance and supplies manufacturing
339114	Dental equipment and supplies manufacturing
339115	Ophthalmic goods manufacturing
339116	Dental laboratories
562211	Hazardous waste treatment and disposal
Wholesale/Retail	
423450	Medical equipment merchant wholesalers
423460	Ophthalmic goods merchant wholesalers
446110	Pharmacies and drug stores
446120	Cosmetic and beauty supply stores
446130	Optical goods stores
446191	Food, health, supplement stores
446199	All other health and personal care stores
Research and Development	
541710	Research and development in physical, engineering, and life sciences
541720	Research and development in social sciences and humanities

Outpatient Care Facilities

621410	Family planning centers
621420	Outpatient mental health centers
621491	HMO medical centers
621492	Kidney dialysis centers
621493	Freestanding emergency medical centers
621498	All other outpatient care centers

Diagnostics and Medical Support

621511	Medical laboratories
621512	Diagnostic imaging centers
621610	Home health care services
621910	Ambulance services
621991	Blood and organ banks
621999	Miscellaneous ambulatory health care services

Hospitals

622110	General medical and surgical hospitals
622210	Psychiatric and substance abuse hospitals
622310	Other hospitals

Residential Care Facilities

623110	Nursing care facilities
623210	Residential mental retardation facilities
623220	Residential mental and substance abuse care
623311	Continuing care retirement communities
623312	Homes for the elderly
623990	Other residential care facilities

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW).

Appendix B: Life Science Industries in Greater Philadelphia

	Employment	Percent of Life Science Employment	Establishments	Average Employees per Firm
Life Science Manufacturing Companies	**25,002**	**8.2%**	**970**	**25.8**
Medicines and botanicals	1,493	0.5%	24	62.2
Pharmaceutical preparation	9,347	3.1%	205	45.6
In-vitro diagnostic substances	34	0.0%	6	5.7
Other biological products	675	0.2%	28	24.1
Optical instruments and lenses	1,079	0.4%	33	32.7
Electro-medical apparatuses	479	0.2%	57	8.4
Analytical laboratory instruments	719	0.2%	48	15.0
Irradiation apparatuses	50	0.0%	9	5.6
Laboratory apparatuses and furniture	707	0.2%	28	25.3
Surgical and medical instruments	4,732	1.6%	115	41.1
Surgical appliances and supplies	3,817	1.3%	110	34.7
Dental equipment and supplies	588	0.2%	42	14.0
Ophthalmic goods	337	0.1%	21	16.0
Dental laboratories	945	0.3%	244	3.9
Life Sciences Wholesalers	**5,409**	**1.8%**	**534**	**10.1**
Medical equipment merchant wholesalers	5,288	1.7%	521	10.1
Ophthalmic goods merchant wholesalers	121	0.0%	13	9.3
Life Sciences Retailers	**23,421**	**7.7%**	**3,058**	**7.7**
Pharmacies and drug stores	14,860	4.9%	1,303	11.4
Cosmetic and beauty supply stores	2,144	0.7%	555	3.9
Optical goods stores	3,195	1.1%	532	6.0
Food, health, and supplement stores	1,661	0.5%	357	4.7
Other health and personal care stores	1,561	0.5%	311	5.0
Research and Development	**31,734**	**10.4%**	**1,296**	**24.5**
R&D in physical, engineering, and life sciences	24,871	8.2%	973	25.6
R&D in social sciences and humanities	6,863	2.3%	323	21.2
Life Sciences Service Providers	**218,709**	**71.9%**	**2,852**	**76.7**
Outpatient Care	*11,793*	*3.9%*	*466*	*25.3*
Family planning centers	314	0.1%	32	9.8
Outpatient mental health centers	5,907	1.9%	187	31.6
HMO medical centers	1,296	0.4%	51	25.4
Kidney dialysis centers	1,114	0.4%	53	21.0
Freestanding emergency medical care centers	337	0.1%	22	15.3
Other outpatient care centers	2,825	0.9%	121	23.3
Diagnostics/Medical Support	*28,497*	*9.4%*	*1,106*	*25.8*
Medical laboratories	5,916	1.9%	358	16.5

	Employment	Percent of Life Science Employment	Establishments	Average Employees per Firm
Diagnostic imaging centers	756	0.2%	62	12.2
Home health care services	15,761	5.2%	370	42.6
Ambulance services	4,949	1.6%	226	21.9
Blood and organ banks	186	0.1%	21	8.9
Miscellaneous ambulatory care centers	929	0.3%	69	13.5
Hospitals	***119,236***	***39.2%***	***448***	***266.2***
General medical and surgical hospitals	117,607	38.7%	189	622.3
Psychiatric and substance abuse hospitals	1,117	0.4%	88	12.7
Other hospitals	512	0.2%	171	3.0
Residential Care	***59,183***	***19.5%***	***832***	***71.1***
Nursing care facilities	43,336	14.2%	505	85.8
Intellectual and developmental disabilities facilities	943	0.3%	48	19.6
Mental health and substance abuse facilities	559	0.2%	27	20.7
Homes for the elderly	4,970	1.6%	76	65.4
Other residential care facilities	9,375	3.1%	176	53.3
TOTAL	**304,275**	**100.0%**	**8,710**	**34.9**

Source: Delaware Valley Regional Planning Commission, April 2015. Base data is from the 2010 National Establishments Times Series (NETS) database.

Appendix C: Occupations Included in the Health Care and Medical Science Occupation Cluster, by Six-Digit Standard Occupational Classification (SOC) Code

SOC Code	Occupation
Medical Practitioners and Scientists	
11-9061	Funeral directors
11-9111	Medical and health services managers
13-1041	Compliance officers, except agricultural construction, health and safety, and transportation
19-1041	Epidemiologists
19-1042	Medical scientists, except epidemiologists
29-1011	Chiropractors
29-1021	Dentists, general
29-1022	Oral and maxillofacial surgeons
29-1023	Orthodontists
29-1024	Prosthodontists
29-1031	Dietitians and nutritionists
29-1041	Optometrists
29-1069	Physicians and surgeons
29-1071	Physician assistants
29-1081	Podiatrists
29-1121	Audiologists
29-1126	Respiratory therapists
29-2081	Opticians, dispensing
29-2091	Orthotists and prosthetists
39-4011	Embalmers
Medical Technicians	
29-1051	Pharmacists

29-1124	Radiation therapists
29-2011	Medical and clinical laboratory technologists
29-2021	Dental hygienists
29-2031	Cardiovascular technologists and technicians
29-2032	Diagnostic medical sonographers
29-2033	Nuclear medicine technologists
29-2034	Radiologic technologists and technicians
29-2051	Dietetic technicians
29-2054	Respiratory therapy technicians
29-2055	Surgical technologists
29-2056	Veterinary technologists and technicians
29-2071	Medical records and health information technicians
31-9092	Medical assistants
31-9094	Medical transcriptionists
49-9062	Medical equipment repairers
51-9082	Medical appliance technicians

Therapy, Counseling, Nursing, and Rehabilitation

19-3031	Clinical, counseling, and school psychologists
21-1011	Substance abuse and behavioral disorder counselors
21-1012	Educational, vocational, and school counselors
21-1013	Marriage and family therapists
21-1014	Mental health counselors
21-1015	Rehabilitation counselors
21-1021	Child, family, and school social workers
21-1022	Medical and public health social workers
21-1023	Mental health and substance abuse social workers
21-1092	Probation officers and correctional treatment specialists

29-1111	Registered nurses
29-1122	Occupational therapists
29-1123	Physical therapists
29-1125	Recreational therapists
29-1127	Speech-language pathologists
29-2053	Psychiatric technicians
29-2061	Licensed practical and licensed vocational nurses
31-2011	Occupational therapist assistants
31-2021	Physical therapist assistants

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Wages and Earnings (QCEW).

Appendix D: Definitions of Regions Used in the Venture Capital Analysis

Alaska/Hawaii/Puerto Rico: Alaska, Hawaii, and Puerto Rico.

Colorado: the entire state of Colorado.

DC/Metroplex: Washington, D.C., Virginia, West Virginia, and Maryland.

LA/Orange County: Southern California (excluding San Diego), the Central Coast, and the San Joaquin Valley.

Midwest: Illinois, Missouri, Indiana, Kentucky, Ohio, Michigan, and western Pennsylvania.

New England: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and parts of Connecticut (excluding Fairfield County).

New York Metro: Metropolitan New York area, northern New Jersey, and Fairfield County, Connecticut.

North Central: Minnesota, Iowa, Wisconsin, North Dakota, South Dakota, and Nebraska.

North West: Washington, Oregon, Idaho, Montana, and Wyoming.

Philadelphia Metro: Southeastern Pennsylvania, southern New Jersey, and Delaware.

Sacramento/Northern California: Northeastern California.

San Diego: the San Diego area.

Silicon Valley: Northern California, the San Francisco Bay area, and the Northern California coastline.

South Central: Kansas, Oklahoma, Arkansas, and Louisiana.

Southeast: Alabama, Florida, Georgia, Mississippi, Tennessee, South Carolina, and North Carolina.

Southwest: Utah, Arizona, New Mexico, and Nevada.

Texas: the state of Texas.

Upstate New York: Northern New York State, except the Metropolitan New York City area.

Source: Price Waterhouse Cooper/National Venture Capital Association Money Tree Report (data from Thomson Reuters), April 2015.

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Key Words: Economic clusters, life science industry cluster, health care and medical science occupation cluster, traded industries, local industries, location quotient analysis, basic jobs, venture capital

Abstract:

This report assesses the importance of the life science cluster to Greater Philadelphia's regional economy. With a location quotient of 1.33, biotechnology (or life science) is one of the region's strongest industrial clusters. An assessment of the health and medical science occupation cluster, combined with the previously identified significance of the region's education and knowledge creation cluster, shows that Greater Philadelphia's workforce clearly has the talent and skills necessary to support this critical cluster.

The analysis also reveals, however, that the location quotients related to health care have declined in Greater Philadelphia since 2001, despite growth in total employment. This trend is true whether considering the life science industrial cluster or the health care and medical science occupation cluster, and indicates that growth in the region's life science industries and health care occupations has been outpaced by growth in other regions. Greater Philadelphia has also been less successful than other regions in maintaining its share of available life science-related venture capital. Economic development professionals and policy makers should continue to work to support the critical life science cluster, and support initiatives to ensure that the region's workforce is prepared to meet the needs of its future employers.

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