



Johns Hopkins Committed to Our Communities



BALTIMORE CITY

COVER: Operating under a contract with Baltimore City Public Schools, Henderson-Hopkins K-8 elementary/middle school is operated by the Johns Hopkins University School of Education in partnership with Morgan State University's School of Education and Urban Studies.

Cover photo © Albert Vecerka/Esto



This report was prepared by Appleseed, a New York City-based consulting firm, founded in 1993, that provides economic research and analysis and economic development planning services to government, non-profit and corporate clients.

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Executive Summary

Johns Hopkins as an enterprise

Johns Hopkins is Baltimore's largest employer, a major purchaser of goods and services, a sponsor of construction projects and a magnet for students and visitors. In fiscal year 2014, we estimate that Johns Hopkins and its affiliates directly and indirectly accounted for more than \$4.7 billion in economic output in Baltimore.

- In fiscal year 2014 Johns Hopkins and its affiliates directly and indirectly accounted for more than 52,700 jobs in Baltimore¹ – a total equivalent to one out of every five private sector wage-and-salary jobs in the City. This total included 36,067 people employed directly by Johns Hopkins at its various locations in Baltimore.

1. This figure excludes student employees.

- In addition to its 36,067 regular full- and part-time employees, Johns Hopkins employed 8,239 students in a variety of part-time jobs.
- In the spring of 2014, 15,030 of the 55,714 total non-student Johns Hopkins employees worldwide (about 27 percent of all non-student employees) lived in Baltimore.
- In FY 2014, Johns Hopkins spent nearly \$473.4 million on purchases of goods and services (excluding construction) from companies in Baltimore, directly supporting approximately 3,183 FTE jobs.
- In FY 2014, Johns Hopkins spent nearly \$213.6 million on construction and renovation, including more than \$38.1 million paid to contractors and subcontractors based in Baltimore. This investment directly supported 264 FTE jobs with Baltimore-based contractors and subcontractors.

LEFT: Designed with student input, the Brody Learning Commons was built with collaboration in mind, featuring nooks for quiet study and team rooms for group projects.

- We estimate that spending in Baltimore by Johns Hopkins employees who live outside the City, students and visitors from outside the City directly and indirectly generated nearly \$457.8 million in economic output in the City in FY 2014, and 3,938 FTE jobs.
- Institutions affiliated with Johns Hopkins directly employed 3,328 people in Baltimore in FY 2014. Their spending within the City on purchasing and construction directly generated an additional 263 FTE jobs in Baltimore.
- Through the “multiplier effect,” spending by Johns Hopkins, its affiliates, its employees, vendors and contractors, students and visitors, indirectly generated \$1.2 billion in economic output and created 6,468 FTE jobs in Baltimore.
- Johns Hopkins paid more than \$13.9 million in taxes and fees to the City in FY 2014. This does not include usage fees such as the \$3.4 million paid for water and sewer usage.
- In FY 2014 Johns Hopkins withheld nearly \$216.9 million in state and local income taxes from the earnings of its employees. We estimate that local income taxes paid to Baltimore City from the earnings of Johns Hopkins employees living in the City totaled approximately \$15.8 million.

Impact of Johns Hopkins, students, visitors, and affiliates in Baltimore, FY 2014
(jobs in FTE, earnings and output in \$ millions)

	Direct spending impact		Indirect/ induced effects	Total impact
	Employment/ Payroll	Purchasing/ Construction		
Johns Hopkins				
Jobs	36,067	3,447	5,183	44,698
Wages	\$2,356.1	\$199.5	\$312.1	\$2,867.7
Output	\$2,356.1	\$511.5	\$1,024.4	\$3,891.9
Affiliate spending				
Jobs	3,328	263	538	4,129
Wages	\$198.3	\$19.2	\$32.4	\$249.9
Output	\$198.3	\$44.7	\$108.3	\$351.3
Commuter				
Jobs	—	622	116	738
Wages	—	\$15.3	\$7.3	\$22.6
Output	—	\$62.3	\$17.5	\$79.8
Student spending				
Jobs	—	1,287	312	1,599
Wages	—	\$42.5	\$19.4	\$61.9
Output	—	\$164.0	\$47.4	\$211.4
Visitor spending				
Jobs	—	1,283	318	1,600
Wages	—	\$49.2	\$19.8	\$69.0
Output	—	\$120.2	\$46.4	\$166.6
TOTAL				
Jobs	39,395	6,902	6,468	52,765
Wages	\$2,554.4	\$325.7	\$390.9	\$3,271.1
Output	\$2,554.4	\$902.8	\$1,243.9	\$4,701.0

Developing human capital

- During the spring of 2014, 20,272 students were enrolled in for-credit programs at Johns Hopkins, including 5,900 undergraduates and 14,372 graduate and professional students. About 5 percent of all undergraduates and 15 percent of all graduate and professional students were residents of Baltimore.
- In fiscal year 2014, Johns Hopkins provided nearly \$48.8 million in financial aid from University sources to students residing in Baltimore - an increase of 15.4 percent from the \$42.3 million provided in FY 2010.
- In 2004, Johns Hopkins reinforced its commitment to expanding educational opportunity for young residents of Baltimore by creating the Baltimore Scholars Program. From 2005 through 2013-2014, 261 Baltimore high school students were accepted to Johns Hopkins under this program, including 22 in 2013-2014. To date, the value of scholarships awarded under the program (including future-year commitments to currently enrolled students) has totaled about \$20.7 million.
- As of the spring of 2014, 16,000 Hopkins graduates - 7.5 percent of all living alumni - lived in Baltimore.
- Part-time graduate programs - such as the Whiting School of Engineering's Engineering for Professionals program - are particularly important for the continued growth of knowledge-based industries in Baltimore and elsewhere in Maryland.
- Johns Hopkins is also expanding access to its academic programs by offering an ever-growing array of courses and degree programs online. In 2013-14, a total of 10,517 students were enrolled in for-credit online courses and more than one million people worldwide participated in "massively open online courses" (MOOC's), offered by the Bloomberg School of Public Health.

The impact of University research

- During fiscal year 2014, externally-funded spending at Johns Hopkins on research and related programs totaled \$2.8 billion. Research and related spending rose by nearly \$452.9 million between fiscal year 2010 and fiscal year 2014.
- Research conducted by the University's Baltimore-based schools and programs accounted for \$1.6 billion of this total.
- Johns Hopkins consistently ranks first in research spending among all U.S. universities - by a wide margin.
- Almost all of this spending is financed from sources outside Baltimore; state and local funds account for 1 percent of the total spent by the University's Baltimore-based schools in FY 2014.
- The platform that Johns Hopkins provides within a single, integrated enterprise for collaboration across disciplines and among scientists, engineers, clinicians and other professionals is one of its greatest strengths as a research institution. The creation of the Bloomberg Distinguished Professorships - 50 new faculty positions that are being filled during a five-year period starting in 2014, and that will be focused on interdisciplinary research, teaching and service - will further strengthen the University's position as a leading center for collaborative research.

Meeting the health needs of Baltimore residents

- Johns Hopkins is a leading source of high-quality health care for residents of Baltimore. During fiscal year 2014, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center reported a total of 24,587 inpatient stays by Baltimore residents.
- In fiscal year 2014 the two hospitals reported a total of 457,280 outpatient visits involving Baltimore residents. In addition to these services, Johns Hopkins faculty physicians reported a total of 105,484 outpatient visits by City residents at locations other than those of The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center.
- The four primary care centers operated in the City by Johns Hopkins Community Physicians – in East Baltimore, Wyman Park, Canton Crossing and at Johns Hopkins Bayview– reported a total of 150,813 patient visits in FY 2014.
- In fiscal year 2014, Johns Hopkins Home Care Group provided home health services to approximately 12,700 Baltimore residents.
- As of the end of fiscal year 2014, managed care plans administered by Johns Hopkins Health-Care provided comprehensive health care coverage to 70,005 residents of Baltimore – about 11.3 percent of the City’s total population.
- In addition to the services that the Health System provides to City residents, Baltimore benefits economically from the continued growth of Johns Hopkins as a global enterprise – providing health care to growing numbers of patients who come to Baltimore from outside the U.S., and partnering with non-U.S. institutions in the development of health systems around the world.

Turbocharging innovation and entrepreneurship

- During the past five years, the University has significantly expanded its commitment to support translation of the intellectual and human capital developed at Johns Hopkins into new products and services, new businesses and new jobs – and this effort is already starting to show results.
- During that time, the pace of formal technology transfer activity at Johns Hopkins (including all of the University’s Baltimore-based schools, but excluding the Applied Physics Laboratory) has accelerated.
 - » The number of U.S. patents awarded to Johns Hopkins rose from 48 in FY 2009 to 88 in FY 2014.
 - » The number of licensing and option agreements executed rose from 105 to 157.
 - » The number of start-up companies formed rose from 10 to 13.
- Growth in the number of start-ups launched from Johns Hopkins is particularly dramatic when measured on a multi-year basis. Between 2009 and 2014, 80 start-up companies were created to bring Johns Hopkins technologies to market.
- Johns Hopkins is developing a web of programs and facilities – an “innovation ecosystem” – designed to encourage and support faster and more effective translation of new ideas and technologies into new products and services, businesses and jobs. This ecosystem includes:
 - » Programs such as the Center for Bioengineering Innovation and Design, Medical and Educational Perspectives (MEP), the Social Innovation Lab and the Johns Hopkins Business Plan Competition that help students discover and develop their talents as innovators and entrepreneurs

Investing in and serving Baltimore communities

- » Programs that fund translational research, including the Institute for Clinical and Translational Research, the Cohen Translational Engineering Fund and the Coulter Translational Research Partnership
- » Accelerator programs such as Johns Hopkins Fast Forward, DreamIt Health Baltimore and DC I-Corps
- » Space for start-ups and growing companies, including the Emerging Technology Center @ Johns Hopkins Eastern and the Science + Technology Park in East Baltimore
- In part as a result of programs such as those described above, Baltimore today is home to a growing number of young companies started by University faculty, students, alumni and other members of the Johns Hopkins community.
- Working with the City, the State, the Annie E. Casey Foundation, East Baltimore Development Inc. (EBDI), Forest City Science and Technology and residential developers, Johns Hopkins, since 2003, has directly contributed more than \$50 million to the redevelopment of an 88-acre area adjacent to its East Baltimore campus, including:
 - » \$21 million for property acquisition and relocation
 - » More than \$21 million toward the cost of construction and ongoing operations of the Henderson-Hopkins School and the Weinberg Early Childhood Center
- Johns Hopkins has supported the revitalization of the area in other ways as well:
 - » As the anchor tenant in the 280,000 square-foot Rangos Building, the first building developed in the Science + Technology Park
 - » Through the renovation of a former police station on Ashland Avenue, now the home of the Berman Institute for Bioethics
 - » Through the rents paid by graduate students, postdoctoral fellows and others affiliated with Johns Hopkins, who are living in the 929 Apartments
- Under the Homewood Community Partners Initiative (HCPI) Johns Hopkins has committed \$10 million to a series of projects aimed at strengthening the neighborhoods that surround the University's Homewood campus. Projects undertaken to date include renovation of the Margaret Brent and Barclay schools, a mixed-use development on a University-owned site in Charles Village and the planned renovation of two historic theaters.

- Johns Hopkins also seeks to strengthen neighborhoods through its Live Near Your Work (LNYW) program, which provides grants to encourage Johns Hopkins employees to purchase homes near its principal locations in Baltimore. In fiscal year 2014, 84 homebuyers employed by Johns Hopkins received LNYW grants totaling \$1,411,000, of which \$756,500 was contributed by Johns Hopkins, along with \$654,500 provided by other supporters of the program.
- In addition to the Henderson-Hopkins School, Johns Hopkins is engaged in a wide range of partnerships aimed at strengthening K-12 education in Baltimore and expanding educational opportunities for the City's young residents. Examples include:
 - » During the 2013-14 school year, placement of approximately 117 School of Education graduate students in teaching, counseling and other internships in 72 schools, institutions and community organizations in Baltimore
 - » Professional development partnerships with Henderson-Hopkins School, Patterson Park Charter School and Paul Lawrence Dunbar High School
 - » STEM Achievement in Baltimore Elementary Schools (SABES), a program that seeks to improve science education in grades 3 to 5 in nine of the City's elementary schools; in 2013-14, 40 teachers and 1,620 students participated
- Like other not-for-profit hospitals, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center are required by the federal government to track and report annually on the benefits they provide to their local communities, such as charity care, health education programs, support for community organizations and participation in local community improvement projects. For fiscal year 2014, the community benefits provided by The Johns Hopkins Hospital and by Johns Hopkins Bayview Medical Center were valued at \$246.4 million.
- Baltimore neighborhoods and their residents also benefit from engagement of Johns Hopkins students in various forms of community service. In 2013-2014:
 - » Homewood students performed a reported 97,528 hours of community service. Over 1,500 students performed nearly 76,000 hours of community service work through Center for Social Concern based programs.
 - » 1,350 students from the East Baltimore campus performed more than 24,400 hours of community service work through programs affiliated with SOURCE, which provides a focal point for community engagement at the School of Medicine, the School of Nursing and the Bloomberg School of Public Health.

The impact of affiliated institutions

- Beyond the impact of Johns Hopkins itself, Baltimore's economy is strengthened by the presence of institutions which have chosen to locate on or near Johns Hopkins' campuses. While they exist separately from Johns Hopkins and have their own leadership, governing structures and funding, were it not for the presence of Johns Hopkins these institutions might not have located in Baltimore. The most notable are:
 - » The Kennedy Krieger Institute, with 2,601 employees, an extensive program of health care, rehabilitation and education for children with disabilities, and nearly \$30 million in research spending in fiscal year 2014
 - » The Space Telescope Science Institute, with 468 employees and nearly \$109 million in research spending
 - » The Lieber Institute for Brain Development, with 101 employees and \$14.1 million in research spending
 - » The Howard Hughes Medical Institute, located at Johns Hopkins, with 62 employees and \$5.5 million in research spending
 - » The Carnegie Institution for Science, Department of Embryology, with 95 employees in fiscal year 2014
- Like Johns Hopkins, these institutions have been significant contributors to Baltimore's recovery from the Great Recession, adding more than 500 jobs between 2009 and 2014.

Johns Hopkins and the future of Baltimore's economy

During the next five to ten years, Johns Hopkins is likely for several reasons to be a major contributor to the ongoing redevelopment of the Baltimore economy.

- Johns Hopkins will continue to attract and develop the talented undergraduates, graduate and professional students, post-docs, residents, researchers, clinicians and staff on whom the continued growth of the City's increasingly knowledge-based economy depends.
- Despite recent constraints on the growth of federal research spending, the Johns Hopkins research enterprise is well-positioned to remain a strong contributor to the Baltimore economy.
- Over time, the expansion and intensification of Johns Hopkins' support for innovation and new enterprise development will not only increase the number of businesses started by faculty members, students, alumni and other members of the Johns Hopkins community, but will also increase significantly the likelihood that those start-ups will be able to attract outside investors to grow and succeed in the marketplace.
- Investments by Johns Hopkins will make the neighborhoods in which it operates more attractive places to live, work and do business, and will create new opportunities for residents of those neighborhoods.
- As the Johns Hopkins Health System continues to extend its reach to new markets and new populations, the leading role that Johns Hopkins is playing in the ongoing transformation of the region's (and the nation's) health care system will help ensure that Baltimore remains a leading center for the delivery of health services, and for efforts to expand access to, improve the quality of and reduce the cost of health care.

- The continued growth of both the University's and the Health System's engagement with countries in Europe, Asia, Africa and Latin America will reinforce Baltimore's position as the center of an increasingly global enterprise, raise its visibility around the world and create new opportunities for the City to expand its role as an exporter of higher education and health services.



Introduction

Johns Hopkins, including The Johns Hopkins University and the Johns Hopkins Health System, plays a central role in the Baltimore economy. The University and the Health System are major enterprises in themselves, and contribute to the vitality of the City's economy through activities related to their tripartite mission – education, research and health care. The institutions' expanding role in innovation and enterprise development, and their engagement with the communities in which they operate, similarly contribute to the ongoing revitalization of the City's economy.

This report assesses, and where possible quantifies, the impact of Johns Hopkins on the Baltimore economy. Part One provides a brief overview of Johns Hopkins and – to provide a context for the analysis that follows – briefly discusses recent economic trends in Baltimore. Part Two analyzes the impact of Johns Hopkins as an enterprise – a major employer, purchaser of goods and services, and sponsor of construction projects; and analyzes as well the impact of spending in Baltimore by students at and visitors to Johns Hopkins.

Part Three discusses the University's role in the development of Baltimore's human capital. Part Four examines how its role as one of the nation's leading research institutions contributes to the City's economy; and Part Five discusses the role of Johns Hopkins in meeting the health care needs of the City's residents.

Part Six of the report focuses on the role of Johns Hopkins as a source of innovation and entrepreneurship. Part Seven of the report highlights the multiple ways in which Johns Hopkins helps to strengthen Baltimore's economy through its investments in and engagement with its local communities – in particular in the neighborhoods in which it operates. Part Eight briefly describes several Baltimore institutions that are affiliated with Johns Hopkins, and their contributions to the local economy.

Finally, Part Nine of the report explores several reasons why Johns Hopkins could play an especially valuable role during the next decade as a partner in the ongoing redevelopment of the City's economy.



PART ONE

Johns Hopkins & Baltimore: An Overview

The Johns Hopkins University and the Johns Hopkins Health System both trace their origins to Johns Hopkins, a Baltimore merchant who, at his death in 1873, left a bequest of \$7 million, to be divided equally between a new university and a new hospital. The Johns Hopkins University opened its doors just three years later (in 1876) and was dedicated to advancing learning and scholarly research. The Johns Hopkins Hospital followed in 1889 and was founded to “administer the finest patient care, train superior physicians and seek new knowledge for the advancement of medicine.”

To this day, The Johns Hopkins University and the Johns Hopkins Health System embrace a tripartite mission of education, research and health care. They honor the founder’s wish to support education and healthcare for the “good of humanity” and provide for those most in need. Today The Johns Hopkins University is ranked among the world’s leading research universities, and the Johns Hopkins Health System is one of the world’s most highly-regarded providers of health services.

LEFT: Gilman Hall’s spectacular atrium includes the eye-catching Vessel Field, a hanging sculpture by artist Kendall Buster.

The Johns Hopkins University

The Johns Hopkins University is comprised of nine schools (Table 1) with a total enrollment of more than 20,000 undergraduate, graduate and professional students, along with the Applied Physics Laboratory – a division of the University whose primary mission is to conduct scientific and technological research for federal agencies on topics related to national and homeland security and space exploration.

TABLE 1:

The Johns Hopkins University - major divisions

School/Division	Year founded	Principal location	Enrollment Spring '14
Krieger School of Arts & Sciences	1876	Homewood	6,803
Whiting School of Engineering	1912	Homewood	4,803
School of Education	1907	Homewood	1,625
Carey Business School	2007	Harbor East	1,512
School of Medicine	1893	East Baltimore	1,273
School of Nursing	1889	East Baltimore	765
Bloomberg School of Public Health	1916	East Baltimore	2,139
Peabody Institute	1857	Mount Vernon	601
School of Advanced International Studies	1943	Washington, D.C.	751
TOTAL	–	–	20,272
Applied Physics Laboratory	1942	Laurel, Md.	–

As shown in Figures 1 and 2, the University's major divisions operate at four principal locations in Baltimore, and at several other locations in Maryland and the District of Columbia.

- The **Homewood campus**, located in north Baltimore's Charles Village neighborhood, is the University's headquarters, and home to the Krieger School of Arts and Sciences, the Whiting School of Engineering, and the School of Education.
- The **East Baltimore campus** is home to the School of Medicine, the School of Nursing and the Bloomberg School of Public Health.
- The **Peabody Institute** is located in Baltimore's Mount Vernon neighborhood, near many of the City's leading cultural institutions and organizations.
- The **Carey Business School** occupies four floors of the Legg Mason building in the City's Harbor East area with locations in Rockville and Columbia, Maryland, and Washington, D.C.
- The **Applied Physics Lab (APL)** is located on a 399-acre campus in Laurel, Maryland, halfway between Baltimore and Washington, D.C. The APL also has field offices in Lexington Park, Maryland and at five other sites in the U.S.
- The **School of Advanced International Studies (SAIS)** and the University's D.C. Center, which offers a variety of academic programs, are located in Washington, D.C. SAIS also has programs located in Bologna and Nanjing.
- The **Montgomery County Campus**, a 36-acre campus in Rockville, Maryland, offers graduate programs in the arts and sciences and education. It also includes a 108-acre site nearby that is to be developed as a research campus for the University and for other non-profit, corporate and government research partners.
- The **Columbia Center**, located in Columbia, Maryland, offers a range of programs for working adults, with a particular focus on teachers and other education professionals.

FIGURE 1:

Johns Hopkins locations in Baltimore



The Johns Hopkins Health System

The Johns Hopkins Health System is similarly comprised of multiple divisions operating at multiple locations. The Health System includes six hospitals.

- The **Johns Hopkins Hospital**, founded in 1889 and located in East Baltimore, is a 1,145-bed acute-care facility that serves as the principal teaching hospital for the Johns Hopkins School of Medicine and as a major center for medical research. Johns Hopkins also operates outpatient health care and surgical centers at several suburban locations.

- **Johns Hopkins Bayview Medical Center** is the current incarnation of a hospital that was founded in 1773, making it one of the oldest continuously operating hospitals in the U.S. For many years Hopkins Bayview functioned as a municipal hospital. The City transferred ownership of the facility to Johns Hopkins in 1984. Today it is a 447-bed hospital, including acute care and special hospital beds, with particular strengths in geriatric medicine and alcohol and substance abuse. It also houses Maryland's only burn center.

Other facilities located on the Hopkins Bayview 130-acre campus include several biomedical research buildings.

- **Howard County General Hospital**, located in Columbia, Maryland, was founded in 1973 as a short-stay facility for members of the Columbia Health Plan. Today it is a 277-bed comprehensive acute-care facility serving residents of Howard County. The hospital affiliated with the Johns Hopkins Health System in 1998.
- **Suburban Hospital**, founded in 1943, is a 220-bed community hospital located in Bethesda, Maryland, primarily serving residents of Montgomery County. Suburban has been part of the Health System since 2009.
- **Sibley Memorial Hospital**, a 318-bed acute-care community hospital located in Northwest Washington, D.C. Founded in 1890, Sibley joined the Johns Hopkins Health System in 2010.

- **All Children's Hospital and Health System**, a pediatric hospital with a 259-bed inpatient facility and an outpatient center in St. Petersburg also has 10 children's health centers throughout West Central Florida. Founded in 1926, All Children's Hospital joined the Health System family in 2011.

In addition to its hospital properties, the Johns Hopkins Health System includes several other health service enterprises.

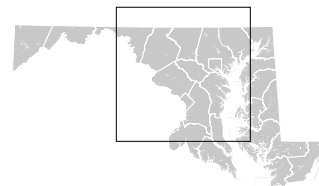
- **Johns Hopkins Community Physicians** provides health services to Maryland and D.C.-area residents through a network of 39 primary care centers, including four in Baltimore City.
- **Johns Hopkins Home Care Group**, founded in 1983, is a full-service home health care agency owned jointly by the University and the Health System. It provides comprehensive home care services (including medical equipment and supplies) for both adults and children in Baltimore City and in the six-county Greater Baltimore area, and offers a more limited range of services in six other Maryland counties.
- **Johns Hopkins HealthCare LLC**, a joint venture of the University and the Health System created in 1995, manages three health care plans.
 - » **Priority Partners Managed Care Organization** provides health care for recipients of Medicaid in Maryland as well as case management services which provide connection and access to other social support programs.
 - » **Johns Hopkins Employee Health Programs** provides health care for employees of Johns Hopkins and several partner institutions.
 - » **Johns Hopkins U.S. Family Health Plan** provides health care to military families living not only in Maryland but also in adjoining areas in several other states.

FIGURE 2:

Johns Hopkins locations in Maryland



- JH University Campus/Center
- JH Health System Hospital
- JH Community Physicians
- JH Health Care & Surgery Centers
- JH Signature OB/GYN locations



Affiliated institutions

In addition to the schools, research centers and health care providers that are formally part of The Johns Hopkins University and the Johns Hopkins Health System, several other Baltimore institutions share similar missions and locations with Johns Hopkins.

- The **Space Telescope Science Institute** manages scientific research, education and public outreach programs for the Hubble Space Telescope and the new James Webb Space Telescope (scheduled to launch in 2018). The Institute, which was founded in 1981, is located on the University's Homewood campus; it is managed by a consortium of major universities (the Association of Universities for Research in Astronomy) under a contract with NASA.
- The **Kennedy Krieger Institute**, founded in 1937, serves children and adolescents with developmental disabilities through an array of programs that includes health care, special education, research and professional development. The Institute's facilities are adjacent to the Johns Hopkins East Baltimore campus.
- The **Howard Hughes Medical Institute (HHMI)**, a non-profit foundation created in 1953, is one of the world's leading biomedical research organizations. The Institute employs approximately 345 senior scientists and 700 post-doctoral researchers, who along with nearly 1,000 graduate students, work primarily in laboratories located at 70 leading U.S. universities, hospitals and other research centers. Johns Hopkins hosts 62 employees on its East Baltimore campus. HHMI's headquarters is located in Chevy Chase, Maryland.
- The **Carnegie Institution of Washington's Department of Embryology**, a leading center of research in developmental biology, has been affiliated with Johns Hopkins since 1913. It is located on the Homewood campus, and its researchers work closely with the University's Department of Biology.
- The **Lieber Institute for Brain Development**, the newest Johns Hopkins affiliate, is a non-profit research foundation specializing in neuroscience. The Institute is located in the Science + Technology Park in East Baltimore, a location that the Institute chose in part due to the opportunities it offers for collaboration with researchers at Johns Hopkins.

Johns Hopkins in context: the Baltimore economy

After a decade of overall employment decline, culminating in a severe worldwide recession, the Baltimore City economy finally began in 2011 to show signs of recovery. Between 2001 and 2007, private payroll employment in Baltimore declined by 11.2 percent – a loss of 33,500 jobs. With the arrival of the recession, job losses accelerated; between 2007 and 2010, the City lost 21,400 additional private sector jobs. Between 2001 and 2010, private-sector employment in Baltimore fell by 18.3 percent.

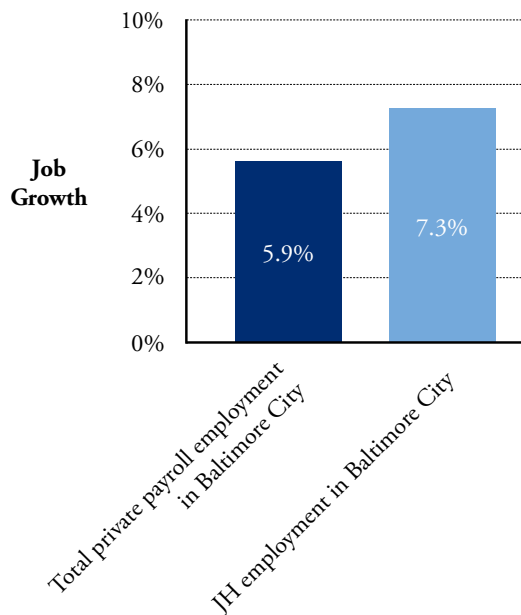
From April 2010 through April 2014, in contrast, private employment in Baltimore rose by 14,623 jobs, to more than 261,000 – an increase of 5.9 percent. Job growth was particularly strong in business and professional services, health care, transportation and hospitality. During this period, the City regained more than 68 percent of the private-sector jobs it had lost during the recession.

By adding 2,449 jobs at its various Baltimore locations between April 2010 and April 2014, Johns Hopkins directly accounted for 16.8 percent of the City’s private-sector job growth during the same period.

Baltimore’s recovery, however, masked some continuing weaknesses.

FIGURE 3:

Job growth in Baltimore, April 2010-April 2014: total private sector and Johns Hopkins



Source: *Quarterly Census of Employment and Wages (BLS)*

- The long-term decline of the City’s manufacturing sector continued. Following a decline of 20 percent between 2007 and 2010 (a loss of 3,270 jobs), employment in manufacturing declined by an additional 7.6 percent (a loss of 984 additional jobs) between 2010 and 2013.
- Despite the City’s renewed job growth, the unemployment rate among Baltimore residents in 2013 still averaged 9.6 percent – three percentage points higher than the statewide rate (6.6 percent).

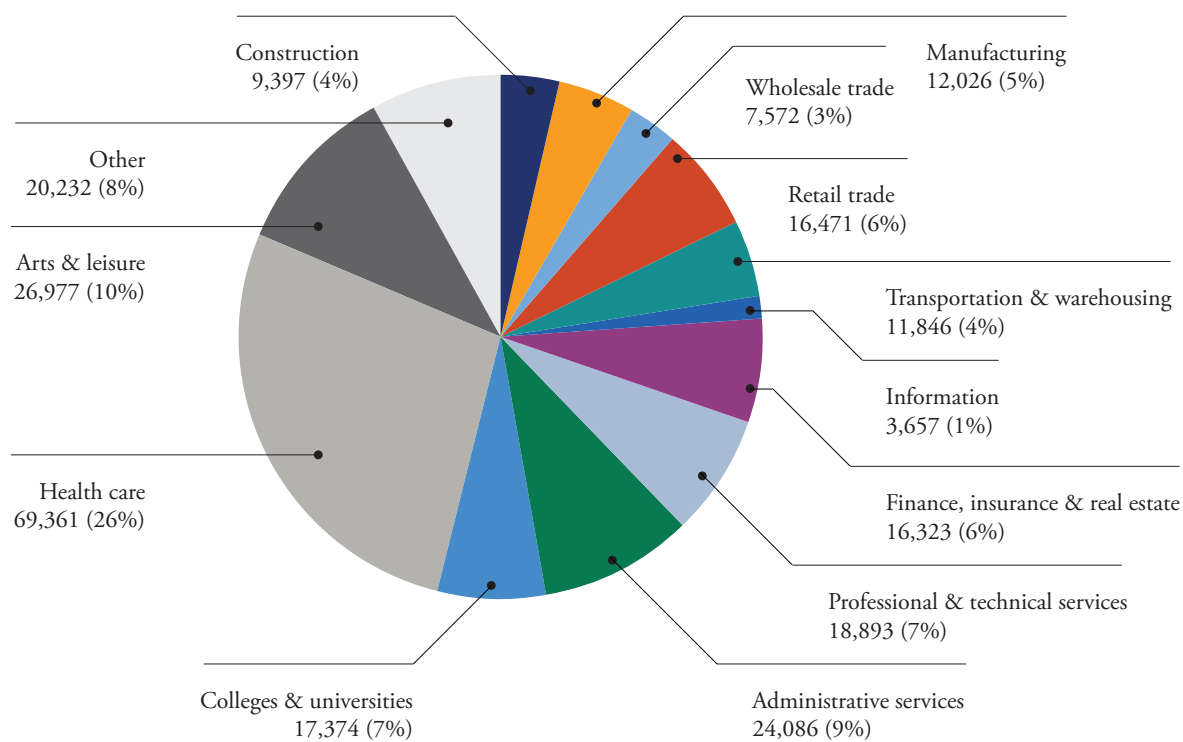
- Baltimore's median household income in 2013 was \$42,266, 42 percent below Maryland's median income (\$72,483).
- In 2013, 23.3 percent of all Baltimore residents – including 33.4 percent of all residents less than 18 years old – lived in households with incomes below the federally-defined poverty level².
- In 2013, nearly 76,400 Baltimore residents age 25 and older – about 18.2 percent of the City's 25-and-older population – had less than a high school education.

As two of the City's strongest industries – respectively employing 26.5 and 6.6 percent of all private-sector wage-and-salary workers in Baltimore – health care and higher education are likely to play a central role in determining whether the City can prolong a still-fragile recovery and overcome long-standing barriers to continued economic growth and expanded economic opportunity. As Baltimore's leading enterprise in both these sectors, Johns Hopkins could have a great impact on how the City's economy evolves in the years ahead.

2. For a family of four, the federally-defined poverty threshold in 2013 was \$23,550.

FIGURE 4:

Private payroll employment in Baltimore by sector, 2013



Source: Quarterly Census of Employment and Wages (BLS)



PART TWO

Johns Hopkins as an Enterprise

As a major enterprise in its own right, Johns Hopkins contributes to the economic vitality of the City of Baltimore in several ways: as a major employer, a buyer of goods and services from local businesses, a sponsor of construction projects and a generator of tax revenues. Before assessing the combined impact of The Johns Hopkins University and the Johns Hopkins Health System in each of these areas, we describe briefly the combined revenues of the Johns Hopkins enterprise, the sources from which those revenues are derived, and the growth in total revenues since 2010.

LEFT: The Sheikh Zayed Tower and The Charlotte R. Bloomberg Children's Center opened in 2012 to provide state-of-the-art facilities and services for patients, families, and visitors.

In fiscal year 2014, the combined revenues of The Johns Hopkins University and the Johns Hopkins Health System totaled nearly \$10.1 billion – an increase of 6.96 percent from fiscal year 2013, and an increase of nearly 32.5 percent since fiscal year 2010. As Figure 5 shows:

- Patient care and clinical services (\$5.16 billion) accounted for 51 percent of all revenues
- Grants and contracts (\$2.84 billion) accounted for 28 percent
- Tuition and fees (net of institutional scholarships and fellowships) totaled \$492.9 million – 4.9 percent of all revenues
- Investment income totaled \$68.8 million, approximately 1.0 percent of all revenues
- Contributions and gifts accounted for \$197.4 million, approximately 2.0 percent
- Endowment payout accounted for \$142.9 million, 1.4 percent of all revenues
- Auxiliary sales and services accounted for \$96.7 million, nearly 1.0 percent of all revenues

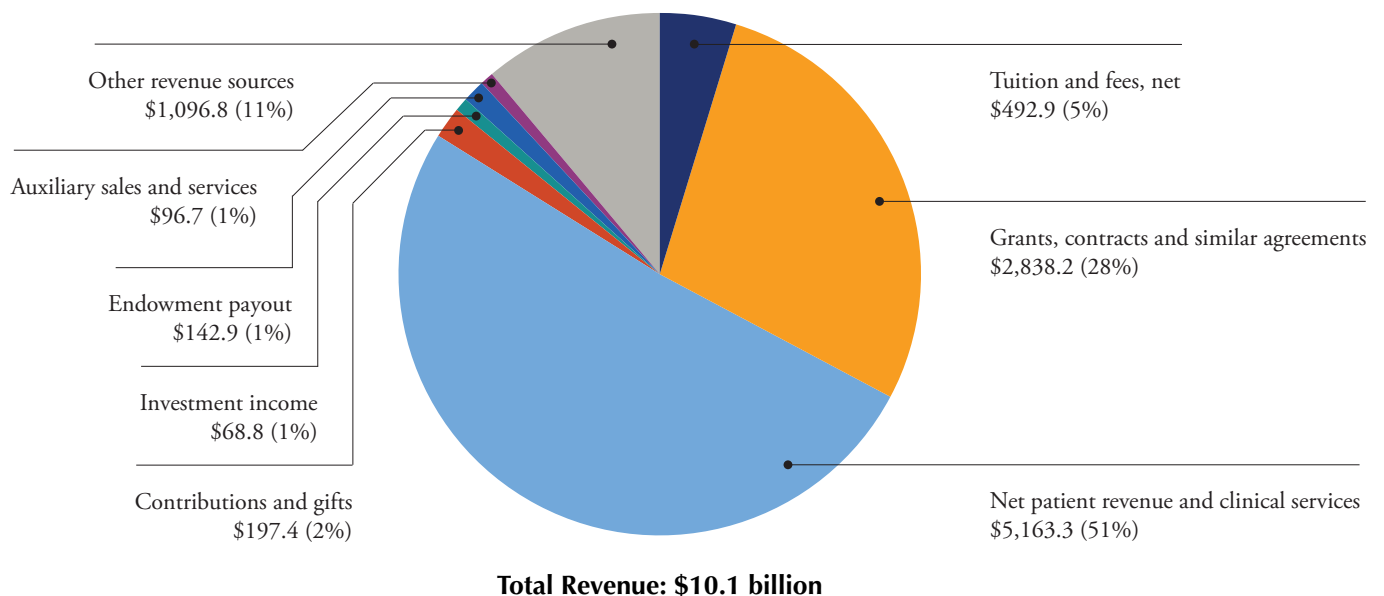
- Other sources accounted for the remaining \$1.1 billion – 10.9 percent of all revenues – including \$447.7 million in affiliate revenue and \$17.9 million in Maryland State aid

In assessing the impact of the Johns Hopkins enterprise on Baltimore's economy, it should be noted that most of the revenues generated by the University and the Health System are derived from sources outside the City – much of which (as we explain below) is then spent in Baltimore.

Nearly all of the operating revenues that Johns Hopkins generates each year are spent directly on education, health care, research, community service and investments in existing and new facilities. In fiscal year 2014 the combined net operating revenues of the University and the Health System accounted for approximately 2.56 percent of total operating revenues in FY 2014. Maintaining this relatively modest operating margin helps stabilize the University's and the Health System's operations.

FIGURE 5:

The Johns Hopkins University and the Johns Hopkins Health System combined revenues, FY 2014 (\$ millions)



Employment at Johns Hopkins

In the spring of 2014, the Johns Hopkins enterprise directly employed 64,577 people, an increase of more than 20 percent (11,045 jobs³) since the spring of 2010, and an increase of nearly 70 percent since 2003 (Figure 6). This total included:

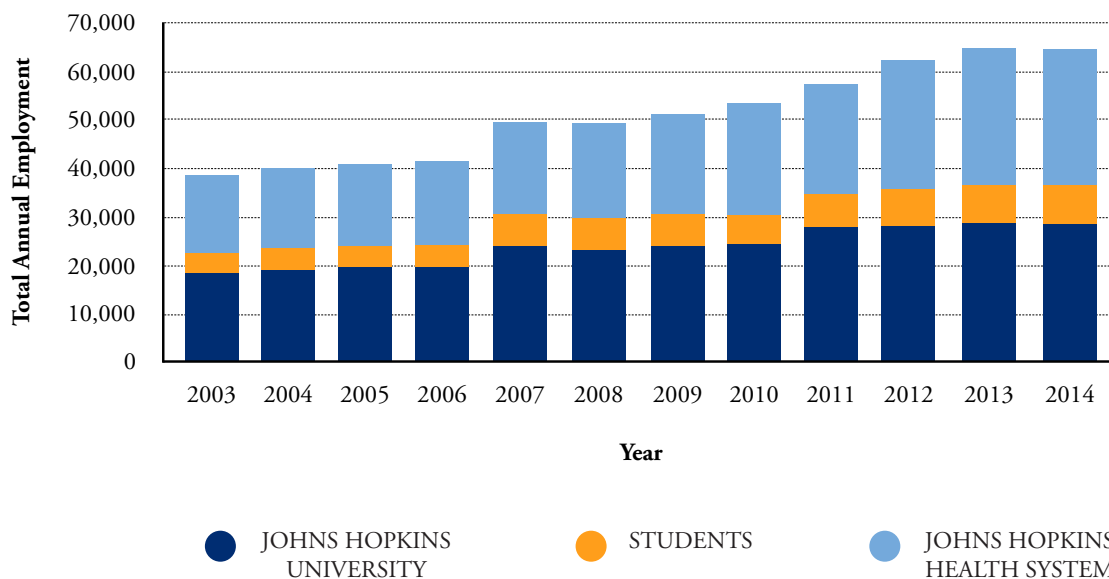
- 55,714 regular employees (77 percent of whom worked full-time)
- 8,863 undergraduate, graduate and professional students who were employed in a wide range of part-time positions

Of the 55,714 people (excluding students) employed by Johns Hopkins in the spring of 2014, about 65 percent (36,067 people) worked on the Homewood and East Baltimore campuses or at other locations in Baltimore City. In addition to these regular employees, 8,239 students were employed at various locations in Baltimore, for a total of 44,306.

3. The increase since 2010 in the number of people employed by the Johns Hopkins enterprise in part reflects the Johns Hopkins Health System's merger with Sibley Memorial Hospital in Washington, D.C. and All Children's Hospital in St. Petersburg, Florida. Together, these two additions account for about 45 percent of total growth in employment at Johns Hopkins since 2010.

FIGURE 6:

Johns Hopkins institutions total employment, spring 2003-spring 2014



Johns Hopkins is the City's (and Maryland's) largest private employer. The University and the Health System helped mitigate the impact of the recession on the City's economy, and since 2010 have been a major contributor to the City's ongoing recovery. By adding more than 2,400 jobs at its various Baltimore locations between 2010 and 2014, Johns Hopkins directly accounted for more than 17 percent of the City's private-sector job growth during the same period.

The University's and the Health System's combined payroll in fiscal year 2014 (including wages paid to student employees) totaled \$3.89 billion – an increase of nearly 32 percent since fiscal year 2010. We estimate that wages and salaries paid to employees who worked primarily in Baltimore City in fiscal year 2014 totaled more than \$2.4 billion.

Table 2 below shows the breakdown of jobs by location in Baltimore as of the spring of 2014.

TABLE 2:

Employment (including students) by location in Baltimore, spring 2014

Baltimore location	Jobs
Homewood campus	8,904
East Baltimore campus	26,965
Hopkins Bayview campus	4,179
Peabody campus	1,156
Harbor East	421
Other locations	2,681
TOTAL	44,306

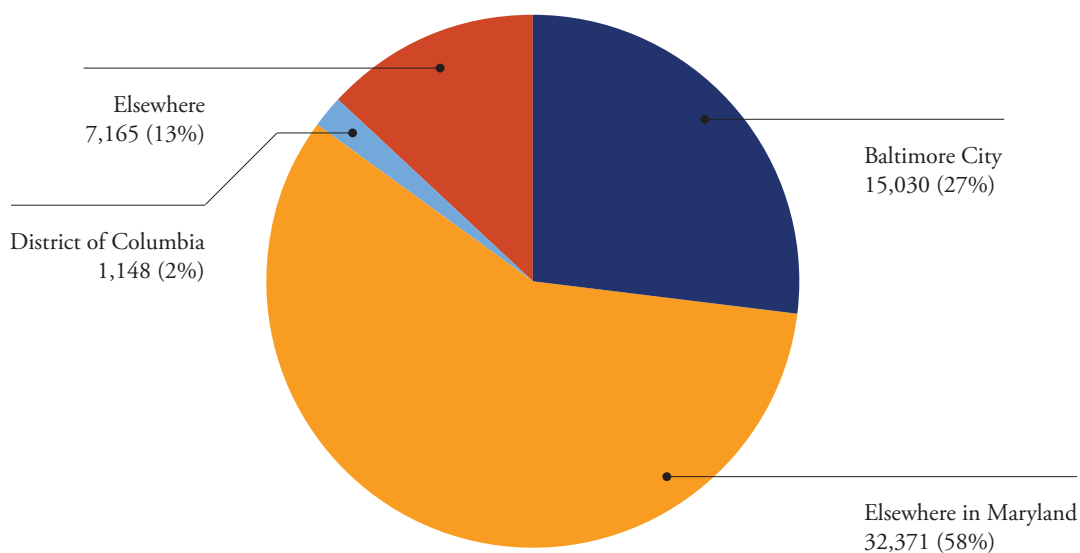
Where Johns Hopkins employees live

As Figure 7 shows, 15,030 Johns Hopkins employees (excluding students) lived in Baltimore in the spring of 2014 – 27 percent of all non-student employees of the University. Overall, about 6 percent of all employed City residents work for Johns Hopkins. Salaries and wages paid to these employees in fiscal year 2014 totaled \$903.4 million (about 24 percent of the total Johns Hopkins payroll for non-student employees).

In addition to these regular employees, 6,312 Johns Hopkins student employees were living in Baltimore City in the spring of 2014 – 71 percent of all student employees. In fiscal year 2014, wages paid to student employees living in Baltimore totaled \$65.7 million.

FIGURE 7:

Number of non-student employees by place of residence, spring 2014



Diversity and quality of Johns Hopkins employment

Johns Hopkins offers a wide variety of high-quality jobs.

- At the University campuses located in Baltimore, faculty account for 32 percent of total employment; administrative and other professionals, 30 percent; clerical, technical and support staff, 30 percent; and postdoctoral and medical trainees, 8 percent.
- At Baltimore-based Johns Hopkins Health System locations, physicians, administrative and other professionals account for 22 percent of total employment; nursing staff, 25 percent; clerical, technical and support staff, 48 percent; and residents, 5 percent.

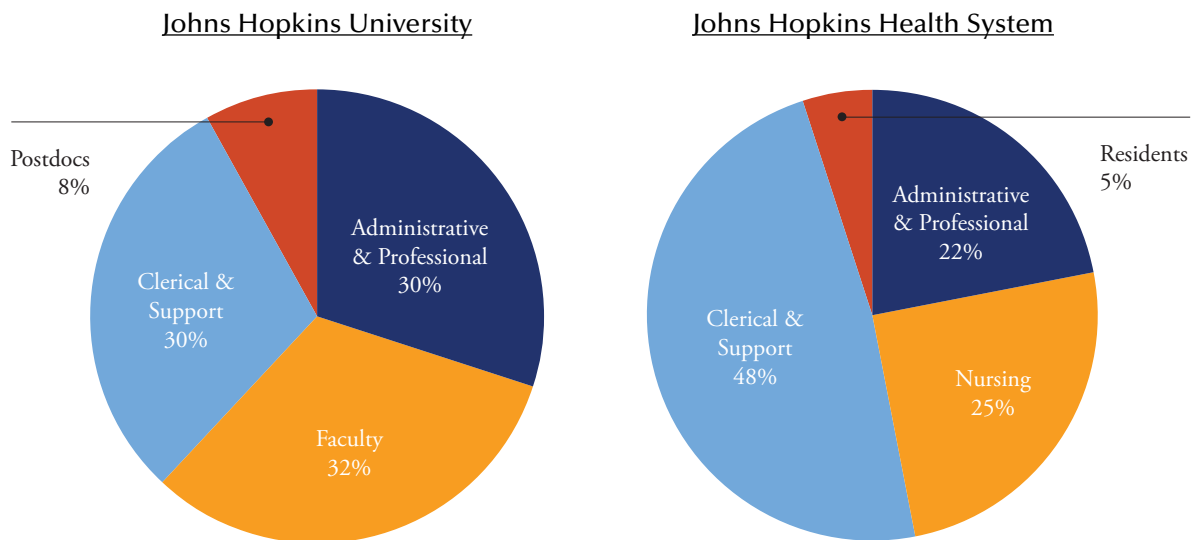
Employment by occupation for the University and the Johns Hopkins Health System is shown in Figure 8 below.

In fiscal year 2014:

- The average salary for full-time, full-year non-faculty employees at The Johns Hopkins University was \$62,964
- The average salary for full-time, full-year Johns Hopkins Health System employees was \$64,137

FIGURE 8:

Johns Hopkins full- and part-time employment by occupation at Baltimore locations, spring 2014



Earnings are, of course, not the only factor that affects the quality of jobs. Johns Hopkins also provides a wide range of benefits to its employees. They include:

- Health, dental and vision insurance
- Flexible spending accounts
- Life, disability, and long-term care insurance
- Tax-deferred retirement plans
- Live Near Your Work, a program that provides incentives for employees to purchase homes near the Homewood and medical center campuses (described in Part Nine)
- Education

In fiscal year 2014 The Johns Hopkins University and the Johns Hopkins Health System provided more than \$41.9 million to their employees in education program benefits.

The University's contribution included \$26.5 million through the following programs:

- Tuition Remission – Employees and members of their family can be reimbursed tuition costs up to \$5,250 per year for part-time, credit and non-credit, graduate or undergraduate courses at a Johns Hopkins University school. In fiscal year 2014, the University provided \$3.9 million in tuition remission to 1,209 employees.
- Tuition Grant - The University provides 50 percent of full-time undergraduate tuition and mandatory academic fees to dependent children of employees for up to four years. In fiscal year 2014, the University provided grants totaling \$22.1 million for 1,462 children of its employees.
- Tuition Reimbursement – Employees taking part-time undergraduate courses at other universities and colleges may be reimbursed for up to \$2,000 per year for tuition costs. In fiscal year 2014, 302 employees received \$469,652 in tuition reimbursement.

Similarly, the Johns Hopkins Health System provided more than \$15.4 million in education benefits to their employees through the programs described below:

- The Health System's tuition assistance program provides 50 percent of undergraduate tuition for dependent children of employees. In fiscal year 2014, the Health System provided nearly \$8.3 million in tuition assistance for 885 children of its employees.
- Through the Health System's tuition reimbursement program employees continuing their education are eligible for up to \$15,000 per year for part time undergraduate or graduate coursework. The Health System provided nearly \$7.2 million in tuition reimbursement to 2,393 employees in fiscal year 2014.

While Johns Hopkins, its employees and their families all benefit directly from these programs, they also benefit the City's economy more broadly.

- By making higher education more affordable for thousands of employees and their dependents, they help increase overall levels of educational attainment of the City's and the region's workforce, which (as discussed below in Part Three) has positive spillover effects on the regional economy as a whole.
- Some of the workers who use these programs to earn undergraduate or graduate degrees may eventually move on from Johns Hopkins to other employers in the City or the region, bringing with them the knowledge and skills they have acquired.
- By making higher education more affordable for employees' children, Johns Hopkins also supports greater economic mobility between generations – a critically important step toward solving many of the City's (and the nation's) most pressing economic and social problems.

The impact of purchasing and construction

In addition to the people it employs directly, Johns Hopkins supports Baltimore's economy through its purchases of goods and services from local companies, and through construction and renovation of its facilities.

Purchasing goods and services

Johns Hopkins spent nearly \$3.3 billion on the purchase of goods and services during fiscal year 2014. As shown in Figure 9, about 14 percent of this total – nearly \$473.4 million – was spent on goods and services provided by Baltimore companies.⁴

4. For purposes of calculating the local economic impact of Johns Hopkins spending, employee health insurance is treated as a purchased service, with 85 percent of net expenditures allocated according to employees' place of residence.

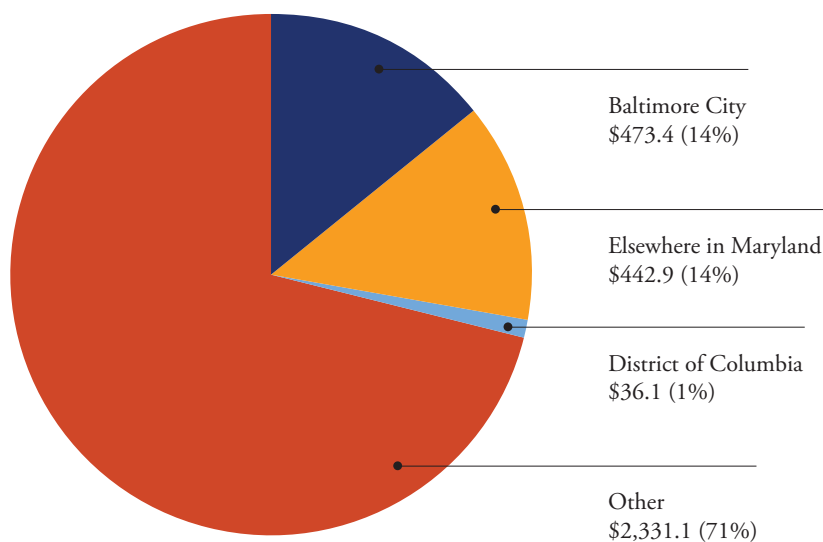
Leading categories of goods and services purchased from businesses in Baltimore in fiscal year 2014 include:

- Professional and technical services
- Leasing of space
- Building services and facilities support
- Temporary employment services

Using the IMPLAN input-output economic modeling system – a modeling tool commonly used in economic impact analyses – we estimate that in fiscal year 2014 Johns Hopkins' purchases of goods and services directly supported approximately 3,183 full-time-equivalent (FTE) jobs in Baltimore.

FIGURE 9:

Johns Hopkins purchasing by location of vendor, FY 2014 (\$ millions)



Broadway Services: Jobs for Baltimore residents

Baltimore-based Broadway Services was established in 1982 to provide security services to Johns Hopkins. In addition to security services, the company's lines of business now include building maintenance and environmental services, parking, transportation, and property management.

In fiscal year 2014, Broadway Services' revenues totaled approximately \$72 million, about 70 percent of which came from its contracts with Johns Hopkins. As of July 2014 the company employed 1,490 people, of whom 1,262 worked in Baltimore City. About 66 percent of the company's workers also live in the City.

Investing in University and Health System facilities

In addition to generating jobs and economic activity through its purchases of goods and services, Johns Hopkins also does so through its investments in its University and Health System facilities. Between fiscal years 2009 and 2014, Johns Hopkins invested a total of nearly \$1.7 billion in facility construction and renovation – an average of \$278.3 million annually.

In fiscal year 2014 (as shown in Figure 10), Johns Hopkins spent nearly \$213.6 million on construction and renovation of facilities, of which about 18 percent, or \$38.1 million, was paid to contractors and subcontractors located in Baltimore. Using IMPLAN, we estimate that investments in facility construction and renovation directly supported 264 jobs in Baltimore in construction and related industries.

A significant share of the money Johns Hopkins spends on purchasing and construction is paid to minority- and women-owned businesses, including many in Baltimore. In fiscal year 2014, the University spent \$271.3 million on goods, services and construction work provided by minority- and women-owned businesses, including \$63.2 million paid to vendors and contractors in Baltimore.

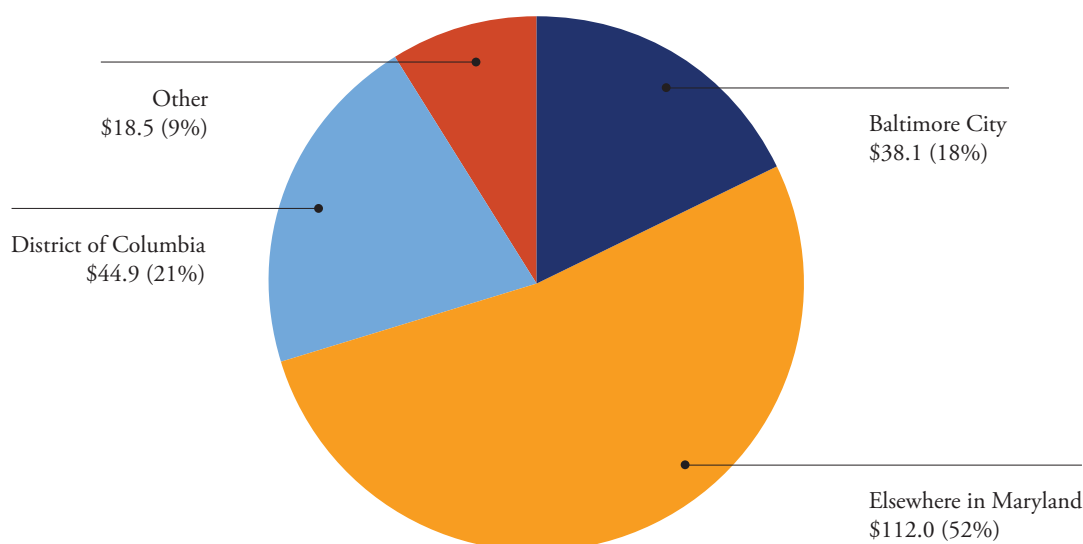
Direct, indirect and induced effects

The jobs and economic activity generated by Johns Hopkins Institutions' spending for payroll, purchasing, and construction are not limited to the direct impacts cited above. For example, some of the money that Johns Hopkins pays to its local suppliers and contractors is used to buy goods and services from other local companies. Those companies then buy goods and services from other local businesses.

Johns Hopkins employees, and the employees of its suppliers and contractors, similarly use part of their earnings to buy a wide variety of goods and services, such as housing, utilities, food, personal services, and other household needs, from local businesses. The employees of those businesses do the same.

FIGURE 10:

Johns Hopkins construction spending by location of contractor, FY 2014 (\$ millions)



Using a tool of economic analysis called an input-output model, we can measure these “indirect and induced” (or “multiplier”) effects of Johns Hopkins Institutions’ spending. We estimate that in Baltimore, the Johns Hopkins Institutions’ spending on payroll, purchasing, and construction in fiscal year 2014 indirectly generated:

- 5,183 FTE jobs in Baltimore City, with earnings totaling \$312.1 million
- More than \$1.0 billion in City-wide economic output

When we combine these indirect and induced effects with the direct effects cited previously, we estimate that in fiscal year 2014 (as shown below in Table 3), spending by Johns Hopkins on payroll, purchasing and construction directly and indirectly accounted for:

- 44,698 jobs in Baltimore City, with earnings totaling nearly \$2.9 billion
- Nearly \$3.9 billion in City-wide economic output

TABLE 3:

Direct, indirect and induced impacts of Johns Hopkins spending Baltimore, FY 2014 (Jobs in FTE, earnings and output in \$ millions)

	Direct spending impact		Indirect and induced effects		Total impact
	Employment/ Payroll	Purchasing/ Construction	Employee spending	Vendor/contractor spending	
University					
Jobs	19,043	1,842	2,474	741	24,100
Wages	\$1,371.7	\$108.4	\$146.9	\$46.3	\$1,673.2
Output	\$1,371.7	\$273.9	\$530.1	\$107.3	\$2,282.9
Health System					
Jobs	17,024	1,605	1,412	556	20,598
Wages	\$984.4	\$91.1	\$84.1	\$34.8	\$1,194.4
Output	\$984.4	\$237.6	\$307.1	\$79.9	\$1,609.0
TOTAL					
Jobs	36,067	3,447	3,887	1,297	44,698
Wages	\$2,356.1	\$199.5	\$231.0	\$81.1	\$2,867.7
Output	\$2,356.1	\$511.5	\$837.2	\$187.2	\$3,891.9

Contributing to local and state revenues

Despite its tax-exempt status, Johns Hopkins is a significant source of revenues for City government. As shown in Table 4, Johns Hopkins paid more than \$13.9 million in taxes and fees to Baltimore City in fiscal year 2014. This total included nearly \$5.42 million in parking taxes, \$4.19 million in energy taxes, and nearly \$3.37 million in property taxes on non-exempt properties. It did not include usage fees such as the \$3.4 million paid for water and sewer usage.

In addition to these direct payments to the City, Johns Hopkins spent nearly \$4.1 million to provide off-campus security in the neighborhoods where it operates, thus relieving the City of a significant cost it would have to incur if it were to provide these services directly.

TABLE 4:

Taxes and fees paid to the City of Baltimore, FY 2014

Type of tax	Amount
Property tax	\$3,369,121
Parking tax	\$5,419,513
Energy taxes	\$4,190,352
Telecom taxes	\$236,300
Licenses/permits/fees	\$337,011
Other taxes and fees	\$371,335
<i>Subtotal</i>	<i>\$13,923,632*</i>
Estimated local income taxes paid from salaries and wages of JH employees living in Baltimore	\$15,810,000
TOTAL	\$29,733,632

*This does not include usage fees such as the \$3.4 million paid for water and sewer usage.

Johns Hopkins paid more than \$13.9 million in taxes and fees to Baltimore City in fiscal year 2014.

As shown in Table 5, Johns Hopkins as the largest private employer in Maryland also paid nearly \$222.6 million in employment related taxes and fees to the State of Maryland in fiscal year 2014, including \$216.9 million in state and local income taxes withheld from the wages and salaries of Johns Hopkins employees. We estimate that employment at Baltimore-based Johns Hopkins facilities generated about \$136.0 million out of the \$216.9 million in state income taxes withheld from all wages attributed to Baltimore jobs.

We further estimate (as shown in Table 4) that in fiscal year 2014, the City's share of income taxes withheld from the salaries and wages of City residents working at Johns Hopkins totaled approximately \$15.8 million.

TABLE 5:

Employment related taxes and fees paid to the State of Maryland, FY 2014

Type of tax	Amount
State income taxes withheld	\$216,890,978
Unemployment insurance payments	\$5,693,757
TOTAL	\$222,584,735

The impact of student and visitor spending

In addition to the impact of its spending on payroll, purchasing and construction, Johns Hopkins contributes to the vitality of Baltimore's economy through off-campus spending in the City by University students and by out-of-town visitors to the Health System's hospitals and to the University.

The impact of student spending

The impact of student spending is determined in part by whether students live on campus, in off-campus University housing, or elsewhere in Baltimore or the surrounding communities. In the spring of 2014, 5,900 undergraduate and 14,372 graduate students were enrolled at The Johns Hopkins University. Approximately 46 percent of undergraduate students lived on the Hopkins campus while virtually all graduate students lived off-campus in Baltimore or the surrounding communities.

During the fall of 2014, Appleseed conducted an online survey to understand student spending. Questions captured residence location and type, program and degree status, and weekly expenditures on goods and services. A total of 1,456 undergraduate, graduate and professional students completed the survey. Based on their responses and supplemented by data provided by the University's Office of Financial Aid, we estimated average annual expenditures on housing, transportation, books, supplies, food, and personal expenses to be \$12,731 for undergraduates living off-campus and \$17,961 for graduate students, as shown in Table 6. For undergraduate students living on-campus, we estimate that off-campus spending averaged \$3,731.

Using IMPLAN, we estimate that off-campus student spending directly supported 1,287 FTE jobs in Baltimore, with \$42.5 million in wages and salaries, and nearly \$164.0 million in City-wide economic output (as shown in Table 7).

TABLE 6:

Average annual student off-campus expenditures

Expense	Undergraduate	Graduate
Room and board	\$9,000	\$14,230
Books, supplies, food and personal expenses	\$3,165	\$3,165
Transportation	\$566	\$566
TOTAL	\$12,731	\$17,961

TABLE 7:

Direct, indirect and induced impact of off-campus student spending in Baltimore, FY 2014 (jobs in FTE, earnings and output in \$000s)

	Jobs	Wages	Output
Direct	1,287	\$42,511.9	\$163,983.9
Indirect/induced	312	\$19,378.4	\$47,376.7
TOTAL	1,599	\$61,890.3	\$211,360.6

The impact of visitor spending

As shown in Table 8, we estimate that about 125,700 non-Hopkins affiliated visitors (excluding patient visitors) came to one of the Johns Hopkins campuses in fiscal year 2014. As the table shows, we estimate that about 94,000 (about 75 percent of total visitors) came from outside Baltimore.

Using data on visitor spending compiled by Visit Baltimore, we estimate that these visitors spent about \$25.9 million on off-campus purchases of hotel accommodations, food, shopping, entertainment and transportation.

TABLE 8:

Visitors to Johns Hopkins, FY 2014

Type of visitor	Total visitors	# outside Baltimore
Alumni visitors	12,093	2,735
Admissions visitors	40,353	39,673
Commencement visitors	10,000	8,500
Peabody concerts	6,000	1,500
Other entertainment/exhibitions	10,664	9,838
Conferences/lectures	10,663	2,392
Vendors	887	788
Athletic visitors	35,126	28,803
TOTAL	125,785	94,228

In addition, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center also bring patients' friends and family and other patient visitors to Baltimore. As Table 9 shows, in fiscal year 2014, there were about 747,705 outpatient visits to The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center from outside Baltimore, including 134,767 visits from elsewhere in the U.S. and 31,766 visits from outside the U.S.

In FY 2014 (as shown in Table 9), there were 45,931 inpatient discharges from the two Baltimore hospitals of patients who reside outside Baltimore. This included 9,521 patients from elsewhere in the U.S. and 1,548 patients from outside the U.S.

Using visitor spending data reported by Visit Baltimore, we estimate that patients' companions and visitors spent nearly \$94.3 million in Baltimore in FY 2014, including \$19.8 million on food, \$17.5 million on lodging, \$26.4 million on shopping and entertainment and \$30.7 million on transportation costs.

Using IMPLAN, we estimate that spending by visitors to the University and the two Baltimore hospitals directly generated 1,283 FTE jobs in Baltimore with \$49.2 million in wages and \$120.2 million in economic output in Baltimore in FY 2014.

TABLE 9:

Analysis of number of patients' visitors, and visitor-days, FY 2014

	The Johns Hopkins Hospital	Hopkins Bayview Medical Center	Average length of stay	Baltimore visits/ patient- days	Visitors per patient	Baltimore visitor-days
Outpatient visits						
<i>From outside Baltimore:</i>						
Other Maryland/D.C.	371,604	209,568	–	581,172	0.5	290,586
Elsewhere in the U.S.	114,790	19,977	–	134,767	1.0	134,767
Outside U.S.	20,828	10,938	–	31,766	3.0	95,298
TOTAL	507,222	240,483	–	747,705	–	520,651
Inpatient visits						
<i>From outside Baltimore:</i>						
Other Maryland/D.C.	23,498	11,364	3.6	125,503	0.5	62,752
Elsewhere in the U.S.	8,565	956	3.6	34,276	2.0	68,551
Outside U.S.	1,016	532	3.6	5,573	3.0	16,718
TOTAL	33,079	12,852	–	165,352	–	148,021

Adding it all up

As shown in Table 10, we estimate that in fiscal year 2014:

- The Johns Hopkins Institutions directly employed 36,067 people in Baltimore, with a payroll of \$2.4 billion and through payments of \$511.5 million to Baltimore vendors and contractors, directly supported 3,447 additional FTE jobs.
- Institutions affiliated with Johns Hopkins (listed in Part One of the report, and described in more detail in Part Eight) directly employed 3,328 people, with a payroll of \$198.3 million and through payments of \$44.7 million to Baltimore vendors and contractors, directly supported 263 additional FTE jobs.
- Approximately \$346.5 million in local spending by students, visitors and Johns Hopkins employees who commute into the City, directly supported 3,192 FTE jobs.

- Through the multiplier effect, spending by the Johns Hopkins Institutions, by its employees, vendors and contractors, by students and visitors, and by affiliated institutions indirectly generated 6,468 FTE jobs, with \$390.9 million in wages and \$1,243.9 billion in economic output in the City.

In total, spending by Johns Hopkins, its employees, students and visitors, and affiliated institutions directly and indirectly accounted for:

- 52,765 FTE jobs in Baltimore, with nearly \$3.3 billion in salaries and wages
- More than \$4.7 billion in City-wide economic output

TABLE 10:

Impact of Johns Hopkins, students, visitors, and affiliates in Baltimore, FY 2014
(jobs in FTE, earnings and output in \$ millions)

	Direct spending impact		Indirect/ induced effects	Total impact
	Employment/ Payroll	Purchasing/ Construction		
Johns Hopkins				
Jobs	36,067	3,447	5,183	44,698
Wages	\$2,356.1	\$199.5	\$312.1	\$2,867.7
Output	\$2,356.1	\$511.5	\$1,024.4	\$3,891.9
Affiliate spending				
Jobs	3,328	263	538	4,129
Wages	\$198.3	\$19.2	\$32.4	\$249.9
Output	\$198.3	\$44.7	\$108.3	\$351.3
Commuter				
Jobs	—	622	116	738
Wages	—	\$15.3	\$7.3	\$22.6
Output	—	\$62.3	\$17.5	\$79.8
Student spending				
Jobs	—	1,287	312	1,599
Wages	—	\$42.5	\$19.4	\$61.9
Output	—	\$164.0	\$47.4	\$211.4
Visitor spending				
Jobs	—	1,283	318	1,600
Wages	—	\$49.2	\$19.8	\$69.0
Output	—	\$120.2	\$46.4	\$166.6
TOTAL				
Jobs	39,395	6,902	6,468	52,765
Wages	\$2,554.4	\$325.7	\$390.9	\$3,271.1
Output	\$2,554.4	\$902.8	\$1,243.9	\$4,701.0



PART THREE

Contributing to the Development of Baltimore's Human Capital

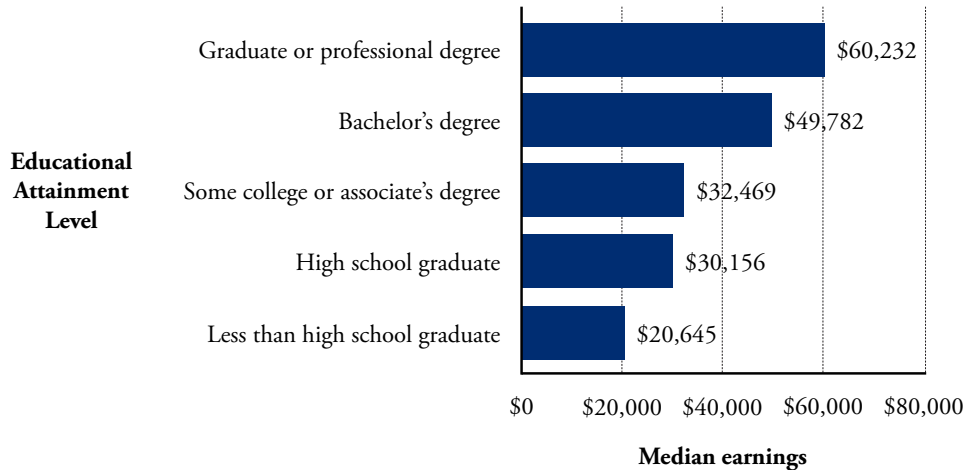
Human capital, the accumulated knowledge, skills, and experience of a nation's, a region's or a city's people, is perhaps the single most important contributor to economic growth. At the individual level, the relationship between education and income is readily evident. As Figure 11 shows, in 2013 the median earnings of Baltimore residents who had four-year college degrees were 65 percent higher than the earnings of those who had only a high school diploma; and the median earnings of Baltimore residents who had graduate or professional degrees were nearly 100 percent higher than the earnings of those who had no education beyond high school.

The economic value of education, however, is not limited to its impact on individual earnings. A study published by the Milken Institute in 2013 found that in U.S. metropolitan areas, increasing employed workers' average years of schooling by one year increased regional GDP per capita by 10.5 percent and increased average real wages by 8.4 percent.

LEFT: Baltimore Education Fellow Lance McCoy, a student in the master of arts in teaching program and a member of the JHU class of 2013, works with a Baltimore City school student.

FIGURE 11:

Median earnings by educational attainment for Baltimore City residents age 25 years and older, 2013



Source: 2013 American Community Survey (1-Year Estimates), (Social Explorer)

Higher education was found to have an even greater impact than education generally: Adding one year of schooling to the educational attainment of workers who already had a high school diploma increased average GDP per capita by 17.4 percent and average real wages by 17.8 percent.⁵

Even non-college educated workers benefit from this effect. Enrico Moretti has shown that a one percentage point increase in the percentage of workers with college degrees is associated with a 1.6 percent increase in the earnings of workers who only have high school diplomas.⁶

Johns Hopkins University contributes in several ways to the development of Baltimore's human capital:

- By providing a high-quality education for thousands of Baltimore residents
- By attracting talented students from around the world, some of whom remain in Baltimore after they graduate
- By preparing both undergraduates and graduate students for careers in fields that are critical to the future of Baltimore's economy
- By providing opportunities for working professionals to upgrade their skills
- By helping to improve the quality of elementary and secondary education in Baltimore

Part Three of this report examines the first four of these aspects of Johns Hopkins' role in the development of the City's human capital. The role of Johns Hopkins in strengthening elementary and secondary education is addressed in Part Seven.

5. Ross de Vol et al, A Matter of Degrees: The Effect of Educational Attainment on Regional Economic Prosperity, The Milken Institute, February 2013, p.1.

6. Enrico Moretti, "Social Returns to Human Capital," NBER Reporter: Research Summary, spring 2005; and Moretti, The New Geography of Jobs (Houghton Mifflin Harcourt, 2012) p. 100.

Student enrollment at Johns Hopkins

During the spring of 2014, a total of 20,272 students were enrolled in for-credit programs at Johns Hopkins, including 5,900 undergraduates and 14,372 graduate and professional students. Table 11 shows total for-credit enrollment for each of the University's eleven schools and programs.

TABLE 11:

Total for-credit enrollment by school, spring 2014

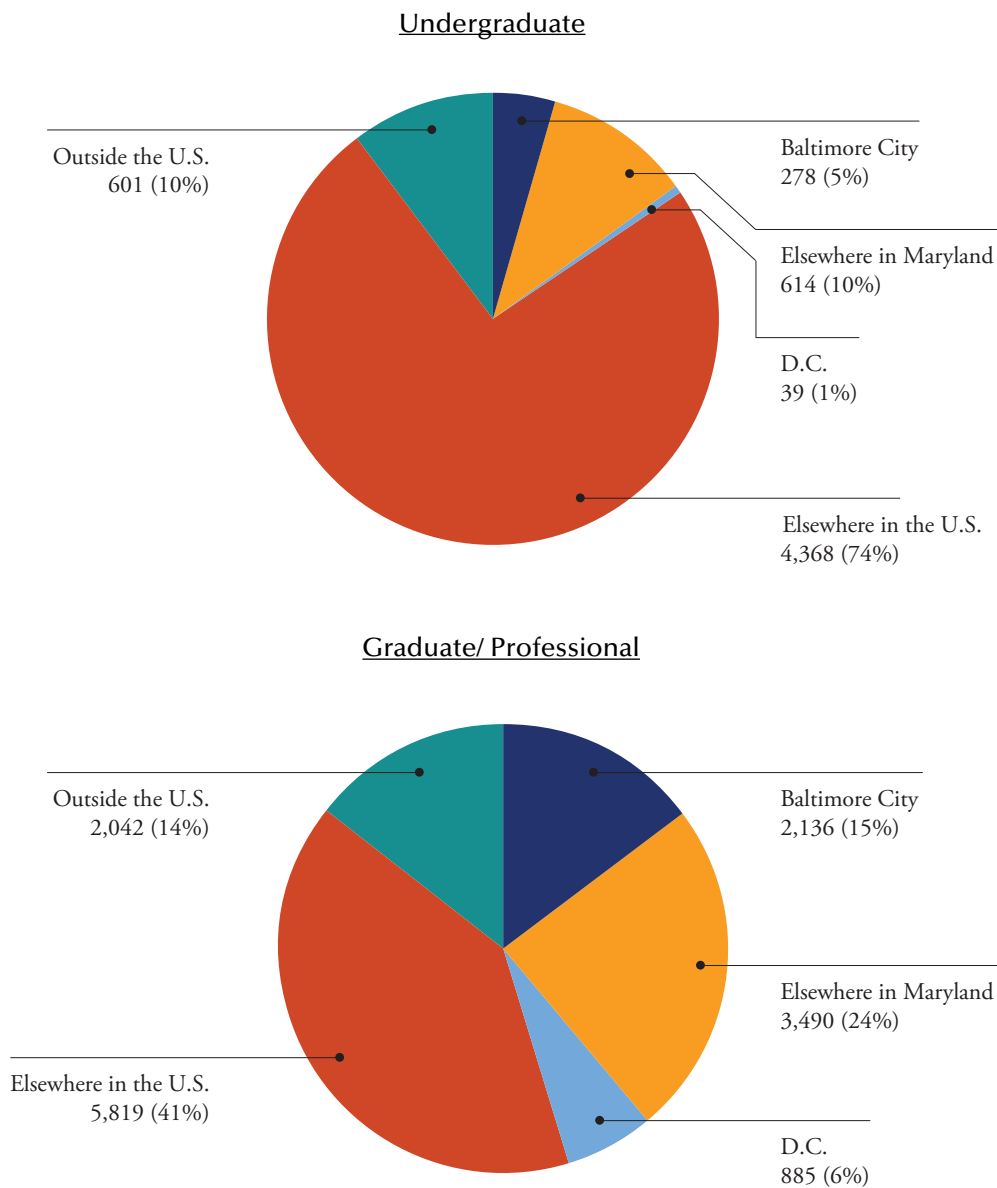
School	Undergraduate	Graduate/ professional
Advanced Academic Programs	—	2,478
Krieger School of Arts and Sciences	3,373	952
Carey Business School	114	1,398
School of Education	39	1,586
Whiting School of Engineering	1,610	894
Engineering for Professionals	—	2,299
School of Nursing	470	295
Bloomberg School of Public Health	—	2,139
Peabody Institute	294	307
SAIS	—	751
School of Medicine	—	1,273
TOTAL	5,900	14,372

As of the spring of 2014, 278 Johns Hopkins undergraduates – about 5 percent of total undergraduate enrollment – were residents of Baltimore, as were about 15 percent of all graduate students.

Figure 12 shows the distribution of Johns Hopkins undergraduate and graduate/professional students by place of residence.

FIGURE 12:

Enrollment by student's permanent residence, spring 2014

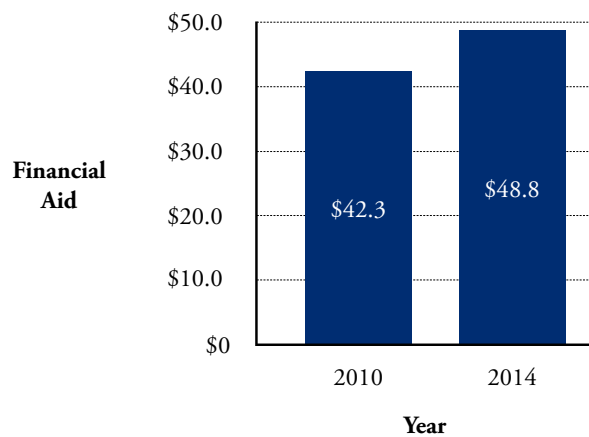


In fiscal year 2014 (as shown in Figure 13), Johns Hopkins provided nearly \$48.8 million in financial aid from University sources to students who resided in Baltimore – an increase of 15.4 percent over the \$42.3 million in University financial aid provided in fiscal year 2010.

In 2013-2014, Johns Hopkins awarded 1,682 undergraduate, 5,032 graduate and professional degrees and 279 medical degrees. Approximately 9 percent of all undergraduate degrees and 15 percent of all graduate, professional and medical degrees were awarded to residents of Baltimore. In addition, Johns Hopkins awarded 254 graduate certificates to Maryland residents – nearly 60 percent of the total 455 graduate certificates awarded by the University.

FIGURE 13:

Financial aid provided to Baltimore residents, FY 2010 and FY 2014 (\$ millions)



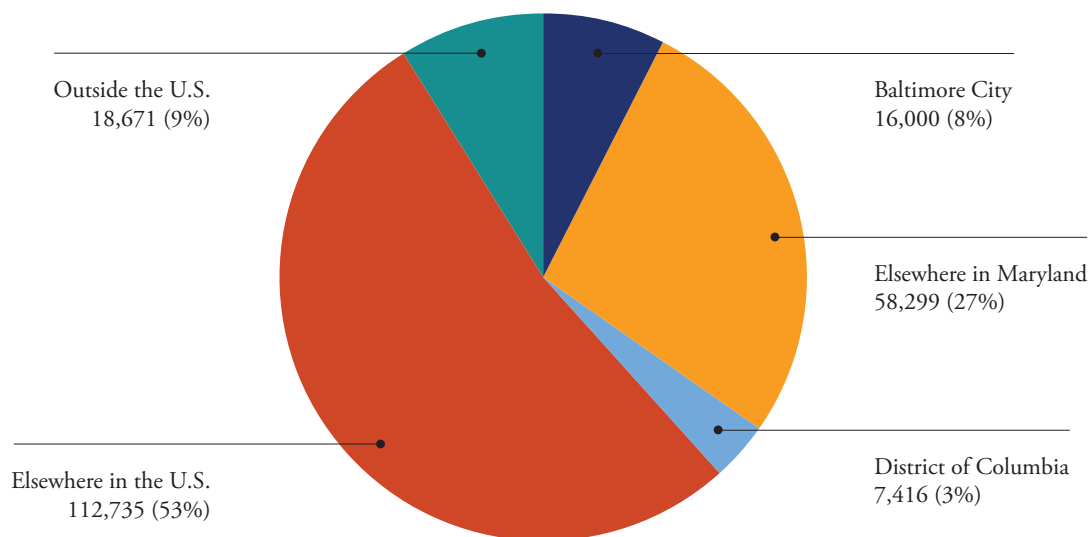
Graduates of Johns Hopkins account for approximately 13 percent of all residents of Baltimore who have at least a bachelor's degree.

Where Johns Hopkins alumni live

As of the summer of 2014, Johns Hopkins had 213,121 living alumni, of whom 16,000 (7.5 percent of all living alumni) resided in Baltimore. We estimate that graduates of Johns Hopkins account for approximately 13 percent of all residents of Baltimore who have at least a bachelor's degree.

FIGURE 14:

Current address of Hopkins alumni, as of summer 2014



Preparing Johns Hopkins students for tomorrow's economy

Johns Hopkins offers its students opportunities for learning in a number of fields that have a major impact on Baltimore's economy, or that could be important sources of future growth. Below are just a few examples.

- The Zanvyl Krieger School of Arts and Sciences offers an interdisciplinary **major in neuroscience**, with options to concentrate in cognitive, systems, or cellular and molecular neuroscience. The Krieger School also offers Johns Hopkins students the option of earning an MS degree in neuroscience by adding an intensive fifth year of study. Since it was introduced in the 1990s neuroscience has become one of the School's most popular undergraduate majors.
- The Krieger School also offers an interdisciplinary **major in global environmental change and sustainability** that approaches the problem of global environmental change from both environmental science and social science perspectives.
- Through its Center for Financial Economics, the Krieger School offers a **minor in financial economics**, designed to allow students to acquire a solid understanding of financial institutions and markets that can be applied across multiple fields.
- The Peabody Institute offers both undergraduate and graduate programs that prepare students for career opportunities beyond performing and teaching music.
 - » The Institute offers a **BA in recording arts and sciences**, available as a double major for students who are working toward a BA in music.
 - » The Institute's **MA in recording arts and sciences** is open to students with undergraduate degrees in music or in other fields such as engineering and to working audio professionals.
 - » For undergraduates, Peabody also offers a **business of music minor**.
- The Whiting School of Engineering offers undergraduate, master's and doctoral programs in **biomedical engineering**. Concentrations are offered in several areas, including biological systems, computational biology, cell and tissue engineering and sensors and micro-devices.
- Through The Johns Hopkins University Information Security Institute, the University offers a full-time, three-semester **master's degree in security informatics**. Whiting School undergraduates also have an option to pursue this degree concurrently with a bachelor's degree in computer science. The breadth of the Johns Hopkins enterprise also permits students to combine a master's degree in security informatics with relevant studies in other fields, including health informatics and national security studies.
- The Carey Business School's **Global MBA** program is an intensive two-year, full-time program that combines training in management, finance, marketing and other traditional areas of business with a focus on a broader set of issues. The program has several innovative features, including a first-year exercise in which students engage directly in the creation of businesses designed to address real-world problems in developing countries and a Discovery to Market project that engages students in the process of translating scientific discoveries and new technologies into commercially viable products and businesses.
- In the fall of 2014, the Carey School also began offering a **master's degree in health care management**, a 36-credit program that combines basic courses in business and health care with elective courses in such areas as applied and behavioral economics in health care and, health care innovation. Students also can elect to participate in one of the Global MBA program's Discovery to Market projects.

- The **Master of Public Health** is Bloomberg School of Public Health's "flagship" degree program, and the top-ranked program of its kind in the United States. Students can choose between an intensive, full-time eleven-month program in Baltimore and a more flexible combination of part-time attendance, short courses offered in Baltimore and Barcelona and online learning. Students can also choose from among ten areas of concentration, such as epidemiology and biostatistics, child and adolescent health, food and nutrition, health care in humanitarian crises and disasters, and health policy, or they may seek approval for a more customized program, tailored to their own professional interests.
- The Bloomberg School of Public Health also offers several more specialized master's degrees. The **Master of Health Science in Health Economics**, for example, is a one-year program that includes courses in health economics, econometrics, statistics and evaluation of health programs.
- The School of Nursing offers an intensive, **accelerated summer-entry program** through which students who have already earned a bachelor's degree in another discipline can complete a BS in nursing in just 13 months.
- Starting in the fall of 2015, the School of Nursing will also offer a **two-year master's degree in nursing** for students who already have bachelor's degrees in other fields. This option allows students to explore nursing in greater depth, with a particular emphasis on evidence-based learning and practice, health care quality and patient safety, and integration of perspectives from the physical, life and social sciences, medicine and public health.
- The School of Medicine offers three degrees in **health science informatics**:
 - » A PhD program, focusing on research on furthering the prevention and management of disease through more effective use of information technology
 - » A two-year, full-time master's degree, also focused on research, that combines medicine, public health and nursing
 - » A one-year, intensive master's degree in applied health sciences informatics. This program assumes that students already possess the required technical skills, and focuses on preparing them for leadership roles in the development and deployment of innovative applications of health informatics

In addition to these and other degree programs, Johns Hopkins students can develop the knowledge and skills they will need in the future through participation in a wide range of co-curricular and extra-curricular programs. Among the most popular in recent years have been programs that help students learn the basics of entrepreneurship; these programs are described in Part Six. Other specialized programs include the **Marshall Salant Student Investment Team**, that gives a group of undergraduate students in the Krieger School and the Whiting School an opportunity to manage an investment fund with assets of approximately \$150,000.

Engagement with the world outside the U.S. is an important part of the process of preparing students to live and work in an increasingly integrated global economy. In 2013-2014, hundreds of Johns Hopkins undergraduates earned academic credit through participation in international programs. Hundreds of other students participated in research or service projects in other countries. The University's Office of Study Abroad estimates that during their undergraduate years approximately 33 percent of all Johns Hopkins students participate in some type of study outside the U.S.

Building the skills of Baltimore's professional workforce

Johns Hopkins is unusual among leading American research universities in the extent of its commitment to providing educational opportunities for working professionals. Continuing professional education courses and lectures are available through all of the University's major divisions. A few examples are sorted below.

Engineering

The most extensive of the University's part-time graduate programs is the Whiting School's **Engineering for Professionals (EP)** program. EP offers master's degrees in 19 program areas, ranging from traditional disciplines such as chemical, civil, electrical and systems engineering to fast-growing specialties in emerging fields such as:

- Bioinformatics
- Climate change, energy and environmental sustainability
- Computer science
- Cybersecurity
- Space systems engineering

EP courses are offered at the Homewood campus, at five other locations in Maryland and in Arlington, Virginia. As discussed below, a growing number of EP courses also are available online.

In the spring of 2014, 2,299 students (including 200 Baltimore residents) were enrolled in EP courses, making Engineering for Professionals one of the largest part-time graduate engineering programs in the U.S.

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Arts and sciences

Through its **Advanced Academic Programs (AAP)**, the Krieger School of Arts and Sciences also offers an array of part-time master's degree and certificate programs geared to the needs of working professionals. Programs offered in Baltimore include master's degrees in biotechnology, bioinformatics, science writing and liberal arts.

In the spring of 2014, 2,478 students (including 155 Baltimore residents) were enrolled in AAP courses at Johns Hopkins.

Business

The Carey School of Business also offers several part-time graduate degree programs that are popular with working professionals. They include master's degree programs in finance, risk management, health care management and real estate and infrastructure that are offered at the School's Harbor East location in Baltimore.

Growth in online learning

During the past few years, Johns Hopkins has significantly expanded the range of degree programs and courses that are offered online. For example:

- The Krieger School's Advanced Academic Programs now include 16 online master's degree programs and 10 online graduate certificate programs. They range from broader degrees in liberal arts, communication and government to more specialized career-oriented programs such as master's degrees in museum studies and biotechnology entrepreneurship and a graduate certificate in gene sequencing analysis and genomics.
- The Whiting School's Engineering for Professionals program offers 10 master's degree programs that can be completed entirely online, in fields such as bioinformatics, computer science, cybersecurity and environmental engineering.
- The Bloomberg School of Public Health offers an online option for students pursuing a master's degree in public health. After completing an on-campus introductory course, students can complete as much as 80 percent of their course work online, with the remainder taken on campus. As of the fall of 2014, the Bloomberg School offers more than 100 for-credit courses online.
- The School of Nursing offers an online master's degree for clinical nurse specialists, and an online master's degree in health systems management.

The Bloomberg School of Public Health, the School of Nursing and Advanced Academic Programs offer "massive open online courses" (MOOC's) that are available to virtually anyone with broadband access. Between 2012, when the Bloomberg School of Public Health offered its first MOOC, and the spring of 2014, more than 1.0 million people in more than 100 countries enrolled in these courses.

During the 2013-14 academic year, a total of 10,517 students were enrolled in for-credit online courses. As Table 12 shows, Advanced Academic Programs, Engineering for Professionals, the Bloomberg School of Public Health, the School of Education and the School of Nursing all enrolled substantial numbers of students online.

In addition to these online degree programs and for-credit courses, Johns Hopkins offers a growing array of online courses that may be taken on a non-credit basis. The Bloomberg School of Public Health's Open Courseware program, for example, offers online access to course materials, lectures, interactive discussions and other resources from 122 Bloomberg School courses.

The Bloomberg School of Public Health, the School of Nursing and Advanced Academic Programs also offer "massive open online courses" (MOOCs) that are available to virtually anyone with broadband access. Between 2012, when the Bloomberg School of Public Health offered its first MOOC, and the spring of 2014, more than 1.0 million people in more than 100 countries enrolled in these courses.

TABLE 12:

Enrollment in online for-credit courses, 2013-14

School	Enrollment
Whiting School of Engineering	11
Bloomberg School of Public Health	2,448
School of Nursing	1,043
Carey Business School	33
School of Education	1,808
Advanced Academic Programs	3,007
School of Medicine	28
Engineering for Professionals	2,139
TOTAL	10,517

An invaluable resource for Baltimore

Johns Hopkins contributes in multiple ways to the development of Baltimore's human capital.

- The University provides undergraduate, graduate, professional and continuing education opportunities to more than 2,415 City residents, with increasing availability of financial aid that helps to make a Johns Hopkins education more accessible.
- The University attracts talented students from across the U.S. and around the world, some of whom choose to stay in Baltimore after they graduate.
- The University and the Health System similarly attract leading researchers, teachers and clinicians from other states and from outside the U.S., enriching the City's work force and at the same time bringing to Baltimore a network of relationships with countries and institutions around the world.
- Johns Hopkins is also deeply engaged in efforts to improve the quality of elementary and secondary schools in Baltimore, a topic addressed in Part Seven of this report.



PART FOUR

Baltimore's Leading Research Institution

Scientific discovery and technological innovation are among the most important sources of economic growth, both in the U.S. and increasingly throughout the world. America's research universities play an important role in this process. As of 2010, universities, with strong financial support from the federal government, accounted for about 55 percent of all spending on basic scientific research in the U.S.⁷

Research at Johns Hopkins contributes to the vitality of Baltimore's economy in several ways.

- Each year, Johns Hopkins attracts more external (primarily federal) funding for research and related activities than any other university or academic medical center in the U.S. A substantial part of this funding, especially in the area of medical research, is spent in Baltimore.

7. The Science Coalition, *Sparkling Economic Growth*, April 2010, p.3.

- Research conducted by Johns Hopkins faculty, staff and students expands the boundaries of knowledge in areas that in the years ahead are likely to be a continuing source of innovation and economic growth.
- The "intellectual capital" created by Johns Hopkins researchers provides a foundation for the creation of new products and services, new businesses, and new jobs.
- Opportunities to participate in significant research projects enhances the education of Johns Hopkins students and the ability of the University's graduates to participate in the continued development of Baltimore's economy.

This part of the report examines the growth of federal and other research funding at Johns Hopkins and highlights several examples of research being conducted at Johns Hopkins in areas that could drive future economic growth. The translation of University research into new products, new businesses and new jobs is discussed in Part Six.

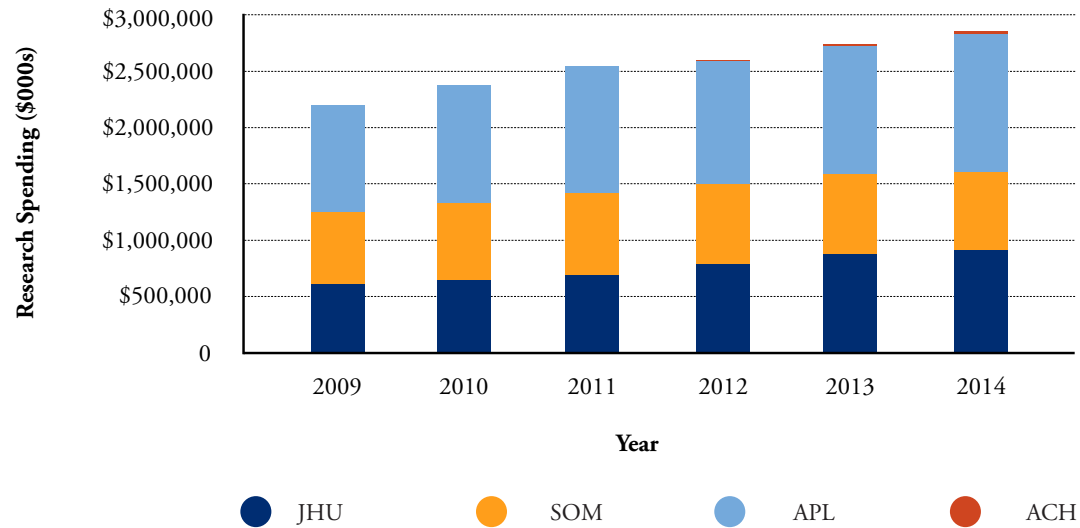
LEFT: Biomedical engineers at Johns Hopkins further the University's history of innovation and discovery every day.

Growth in research and related spending

During fiscal year 2014, externally-funded spending at Johns Hopkins on research and related programs totaled \$2.8 billion. As Figure 15 shows, research and related spending rose by nearly \$452.9 million between fiscal year 2010 and fiscal year 2014. This represents an average annual increase of 4.4 percent.

FIGURE 15:

Research and related spending, FY 2009 – FY 2014 (\$000s)



As Figure 16 shows, the Applied Physics Laboratory (APL), located in Laurel, Maryland, accounted for about 43 percent of all University research and related spending in fiscal year 2014, the School of Medicine accounted for about 24 percent, all other divisions of the University for 32 percent and All Children's Hospital for 0.2 percent.

FIGURE 16:

Research and related spending, by division, FY 2014 (\$000s)

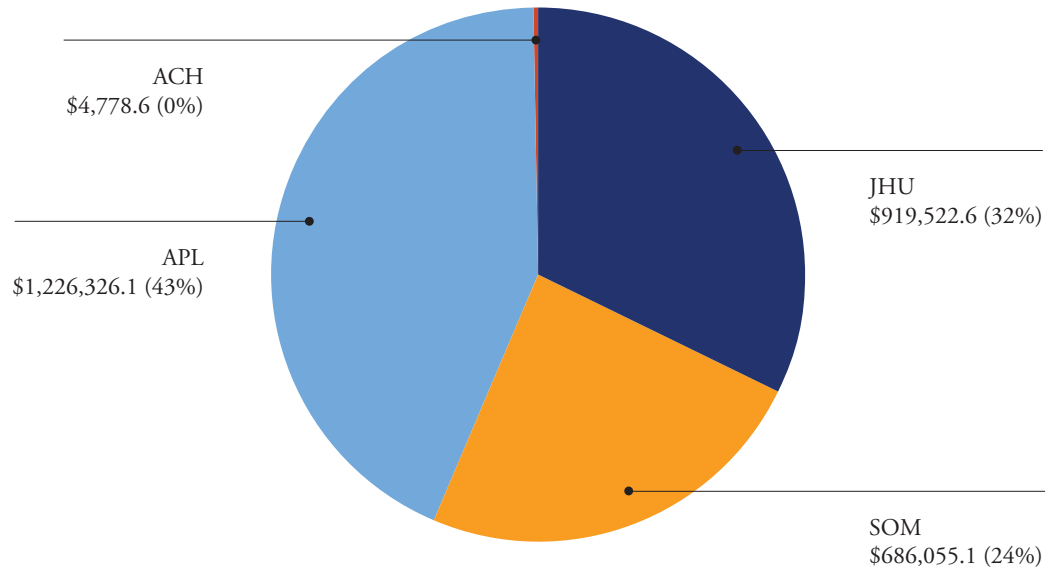


Figure 17 provides a breakdown of research and related spending in fiscal year 2014 by source of funding. For the University as a whole, the leading sources of funding included:

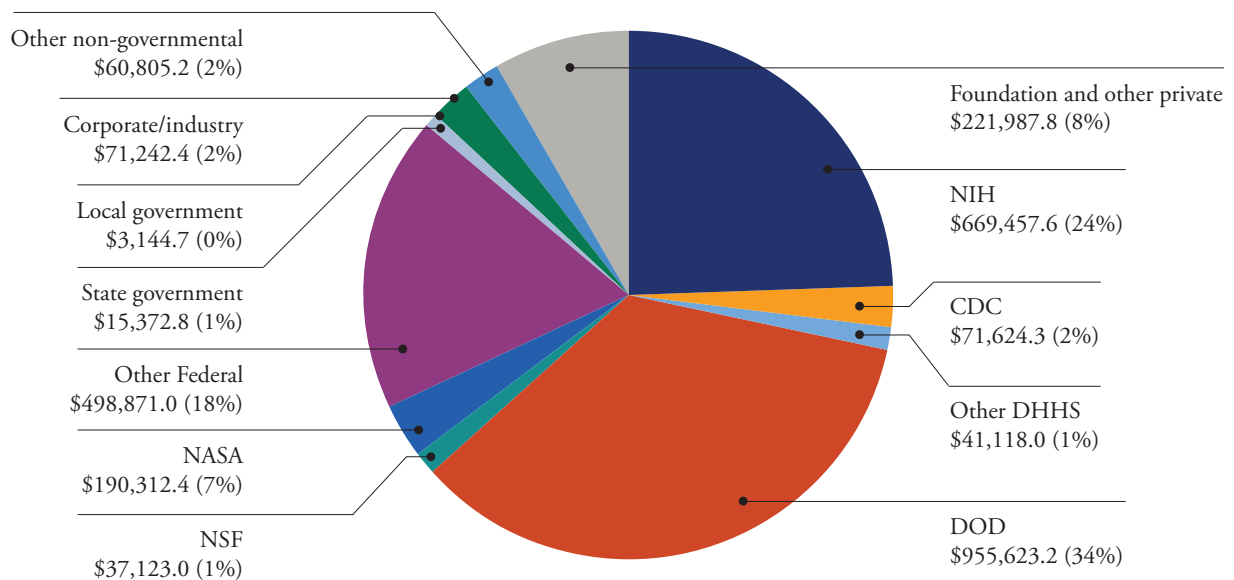
- The Department of Defense, provided more than \$955 million (34 percent of the University's externally-funded spending on research and related programs), primarily for work done at the Applied Physics Lab
- The National Institutes of Health, \$669 million (24 percent)
- The U.S. Agency for International Development, nearly \$330 million (about 12 percent)
- NASA, \$190 million (6.7 percent)

- Foundations and private donors, nearly \$222 million (7.8 percent)
- Corporate and other non-governmental donors, \$132.0 million (4.7 percent)

During the past four years, Johns Hopkins has been able to sustain the growth of its research enterprise despite recent constraints on federal funding. Its success in doing so in part reflects the University's strengths in several high-priority research areas, including life sciences, national defense, information security, and global health. But it also reflects ongoing efforts to diversify the funding of Johns Hopkins research. Between fiscal year 2010 and fiscal year 2014, funding of Johns Hopkins research spending from foundations, private donors, corporate and other non-governmental sources grew by more than 50 percent, to \$354 million.

FIGURE 17:

Research and related spending, by source, FY 2014 (\$000s)



Knowledge that can drive economic growth

Research conducted at Johns Hopkins can provide a foundation for future growth in some of Baltimore's leading industries. The core of the Johns Hopkins Baltimore research enterprise is concentrated in the life sciences, health care, public health and related fields of science and engineering.

- **The Sidney Kimmel Comprehensive Cancer Center**, founded in 1973, is the only National Cancer Institute-designated comprehensive cancer center in Maryland, and one of only 41 nationwide. Its mission combines cancer research, education and community outreach with diagnosis, treatment and prevention of cancer. The Center's research has included pioneering work in areas such as cancer genetics, genomics and epigenetics; research on how environmental conditions and human behavior contribute to the development of cancer; and the development of cancer vaccines.

The Kimmel Center is also a major center for clinical trials. Those under way in 2014 have included:

- » Testing the use of a new immunotherapy drug in combination with stereotactic radiosurgery to treat brain and spinal cancers
- » Testing a new epigenetic treatment for early-stage lung cancer
- » Testing treatment of breast cancer using a combination of two drugs that have improved outcomes for patients with other types of cancer

- **The Zanvyl Krieger Mind/Brain Institute (MBI)**, founded in 1994, is engaged in research on fundamental questions about neural activity in the human brain, and how it gives rise to perceptions, knowledge, decisions and actions. The Institute brings together researchers from multiple disciplines, including neuroscience, psychology, medicine and biomedical engineering. Their research uses the tools of neurophysiology, brain imaging and psychophysics to explore questions such as:
 - » How visual and tactile information leads to perceptions and understanding of three-dimensional objects
 - » Recognition of speech and other complex sounds
 - » How memories are formed
- The **Center for Computational Biology (CCB)** is an interdisciplinary center focusing on research in genomics, genetics, DNA sequencing and computational methods for DNA and RNA sequence analysis. CCB brings together scientists and engineers from computer science, biostatistics, genomics and genetics, molecular biology, physics and mathematics.
- The **Institute for NanoBiotechnology (INBT)**, established in 2006, brings together researchers from the School of Medicine, the Whiting School of Engineering, the Krieger School of Arts and Sciences, the Bloomberg School of Public Health and the Applied Physics Lab - both to create new knowledge and to develop new technologies at the interface of nanoscience and medicine. INBT researchers, for example, are developing nanoscale devices that that could be used within the body to identify cancer cells, transmit diagnostic information, and directly deliver treatment at the cellular level.

- The University's **Information Security Institute** brings together experts from across Johns Hopkins, government and industry to address issues of information security and privacy. Research topics include information warfare, protection of critical infrastructure, intrusion detection, encryption technologies, protecting the privacy of medical records and protection of web-based intellectual property.
- The **Laboratory for Computational Sensing and Robotics (LCSR)** is the University's primary focal point for interdisciplinary research in robotics science and engineering. LCSR has worked extensively with the School of Medicine and The Johns Hopkins Hospital on medical applications of sensing and robotics technologies, including the development of computer-assisted, robot-assisted and image-guided surgery.
- **The Armstrong Institute for Patient Safety and Quality**, established in its current form in 2011, is dedicated to protecting patient safety, improving outcomes and reducing health care costs by eliminating avoidable errors in the treatment of patients. In addition to guiding safety and quality improvement efforts and providing training for health care workers, the Institute conducts research on and develops and tests innovative solutions to problems of patient safety and quality.
- The **Hopkins Extreme Materials Institute (HEMI)** was created in 2012 "to advance the science and engineering of how materials and structures respond to extreme conditions." A Johns Hopkins-led consortium of major universities, government laboratories and other research organizations, HEMI's work encompasses projects as diverse as analyses of the impact of an asteroid striking the Earth, the biomechanics of traumatic injuries, and the development of materials that can more effectively protect the human body from various types of high-velocity impact.
- The **Johns Hopkins Water Institute** supports research on the challenges involved in ensuring safe, adequate supplies of clean water and basic sanitation, both in the U.S. and around the world. Water Institute researchers, for example, are currently studying how farmers in the Chesapeake Bay watershed might adapt to climate change, how these adaptations might affect the health of the Bay, the resulting impacts on the region's economy, and how agricultural policy might be used to encourage farmers to adapt in ways that protect the Bay.

Research without boundaries

Year in and year out, Johns Hopkins is ranked among the world's leading research institutions. Its leadership across many disciplines and many fields of scientific endeavor is in part a result of its success throughout many decades in attracting and developing highly talented researchers. But it is also a result of the fact that Johns Hopkins offers these researchers opportunities for collaboration that few other institutions can match. In particular, Johns Hopkins combines within a single enterprise world-class strengths in the physical, biological and medical sciences, public health, engineering and clinical services.

The advantages that Johns Hopkins offers as a center of interdisciplinary, collaborative research will be greatly enhanced in the year ahead by the creation of the Bloomberg Distinguished Professorships – 50 new faculty positions that are being filled during a five-year period by outstanding scholars who will be focusing on interdisciplinary research, teaching and service. The first six Bloomberg Professors were announced in 2014, all with joint appointments in fields such as sociology and public health, biology and medicine, business and medicine, brain science and medicine, and sociology and education.

The growing importance of (and capacity for) “big data”

In many areas of science, engineering and medicine, cutting-edge research increasingly requires the collection, organization, processing and analysis of massive volumes of data. At Johns Hopkins, the Institute for Data-Intensive Engineering and Science (IDIES) is engaged in the development of data-intensive technologies and their application to problems of national significance in the physical and biological sciences, engineering and medicine. Researchers affiliated with the Institute are currently engaged in research in genomics, genetics, human speech processing, fluid flows (in water, the atmosphere, biological systems and industrial processes) and other areas.

In 2014, Johns Hopkins and the University of Maryland joined forces to develop a new high-performance research computing facility, located on the Johns Hopkins Bayview campus. This new facility – developed at a cost of \$30 million, with \$27 million provided by the State of Maryland and \$3 million by Johns Hopkins – will support the work of researchers at IDIES and elsewhere at both universities who are exploiting the potential of “big data” to find answers to both research and practical questions.



PART FIVE

Improving the Health of the City and its Residents

Since its founding, Johns Hopkins has been committed to protecting the health of Baltimore residents, to better understanding and preventing the diseases that afflict them, and providing them with essential health services. The Johns Hopkins University and the Johns Hopkins Health System fulfill this commitment in several ways:

- By providing health care to residents of the City, the region and beyond
- Through the education of physicians, nurses and other health professionals
- Through biomedical research and innovation

Their involvement in preserving and improving the health of Baltimore residents is also among the University's and the Health System's most important contributions to the health of the City's and the region's economy.

- Health care is Baltimore's largest industry. The City's role as a major regional, national and global center for the delivery of health services is among its greatest strengths.
- Access to high-quality health care is critical to maintaining the health of the City's residents and the productivity of its work force, and for attracting and retaining the talented people on whom its future prosperity depends.
- Poor health is simultaneously a consequence and a cause of poverty and economic immobility. Improving the health of Baltimore's low-income residents is likely to be an essential element in any long-term strategy for reducing poverty and improving the quality of life for the entire community.

Part Four of this report highlighted the strengths of Johns Hopkins as a center of biomedical research. This part of the report describes its role in the education of physicians, nurses and other professionals, in caring for the City's residents, and in making Baltimore a global center for high-quality health care.

LEFT: Interpreter Carlos G. Mora Molina provides services to a patient at Johns Hopkins Bayview Medical Center.

Providing health care to Baltimore residents

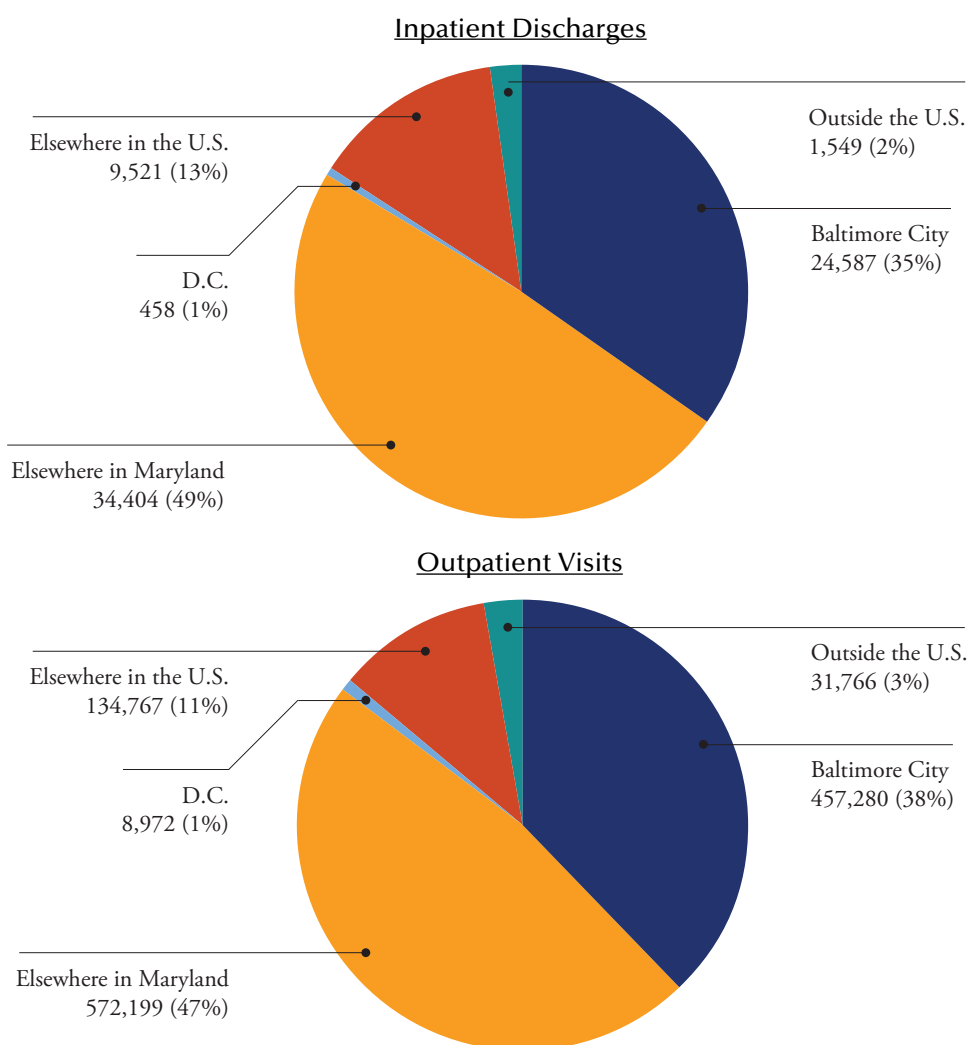
Johns Hopkins is a major provider of health care services to Baltimore residents, through its two major hospitals, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center, through several other subsidiaries of the Johns Hopkins Health System, through Johns Hopkins School of Medicine faculty physicians and Johns Hopkins School of Nursing faculty and nurse practitioners.

Hospital inpatient and outpatient services

The **Johns Hopkins Hospital (JHH)** provides a wide range of acute-care and specialty services to Baltimore residents. It is consistently ranked at or near the top among U.S. hospitals in neurology and neurosurgery, cancer care, eye surgery, gynecology, orthopedics, otolaryngology, psychiatry, pediatrics, rheumatology, urology, the treatment of diabetes and several other areas. Johns Hopkins is also home to the only state-designated level-1 pediatric trauma center in Maryland.

FIGURE 18:

Inpatient discharges and outpatient visits, by residence of patient, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center, FY 2014



Of the 49,863 inpatients discharged from The Johns Hopkins Hospital in fiscal year 2014, 16,784 – 33.7 percent of the total – were residents of Baltimore City. During the same year, JHH clinics handled 789,685 outpatient visits, including 282,463 (about 35.8 percent of all outpatient visits) that involved residents of Baltimore. Whether measured by number of inpatient beds or inpatients and outpatients served, Johns Hopkins is the City's largest hospital.⁸

Johns Hopkins Bayview Medical Center (JH-BMC) is similarly a provider of high-quality health care, with particular strengths in geriatric medicine, alcohol and substance abuse, and neonatal intensive care, and serves as Maryland's only adult burn center. Of the 20,655 inpatients discharged from Johns Hopkins Bayview Medical Center in fiscal year 2014, 7,803 – 37.8 percent of the total – were City residents. Hopkins Bayview also handled 415,300 outpatient visits in fiscal year 2014, of which 174,817 (42.1 percent) involved City residents.

While The Johns Hopkins Hospital and Johns Hopkins Bayview account for most of the inpatient and hospital-based outpatient services that the Johns Hopkins Health System provides to residents of Baltimore City, the Health System's other hospitals (identified in Part One) also serve City residents. Taking into account services provided by these other hospitals, during fiscal year 2014 the Health System's institutions:

- Reported a total of 25,059 inpatient stays by residents of Baltimore City; and
- Provided a total of 459,772 outpatient visits for City residents.

In addition to the institutions that are part of the the Health System network, Johns Hopkins owns a 50 percent interest in Mount Washington Pediatric Hospital in Baltimore, which is governed by a board that includes representatives of Johns Hopkins and the facility's other co-owner, the University of Maryland Medical System.

8. Baltimore Business Journal, Book of Lists 2014-5, p. 82.

Primary care and home care services

Hospital-based inpatient and outpatient services are not the only means through which Johns Hopkins provides health care to Baltimore residents. **Johns Hopkins Community Physicians** operates primary care centers in East Baltimore, Wyman Park and Canton Crossing, and at Johns Hopkins Bayview. In fiscal year 2014, these four centers reported a total of 150,813 patient visits.

Johns Hopkins faculty physicians provide additional outpatient services outside these settings. During fiscal year 2014, members of the **Johns Hopkins Clinical Practice Association** handled 597,541 outpatient visits that took place outside the two hospitals, of which 105,484 (nearly 18 percent) involved Baltimore residents.

Johns Hopkins is also a major provider of home care in Baltimore. In fiscal year 2014, **Johns Hopkins Home Care Group** provided a range of in-home health services – including skilled nursing and home health aide services, physical therapy and the provision of medication and medical equipment to 12,727 City residents.

Of the 49,863 inpatients discharged from The Johns Hopkins Hospital in fiscal year 2014, 16,784 – 33.7 percent of the total – were residents of Baltimore City. During the same year, JHH clinics handled 789,685 outpatient visits, including 282,463 (about 35.8 percent of all outpatient visits) that involved residents of Baltimore. Whether measured by number of inpatient beds or inpatients and outpatients served, Johns Hopkins is the City's largest hospital.

Providing health care coverage for Baltimore residents

As noted in Part One, **Johns Hopkins HealthCare LLC (JHHC)** – a joint venture of the University and the Johns Hopkins Health System created in 1995 – manages four health care plans.

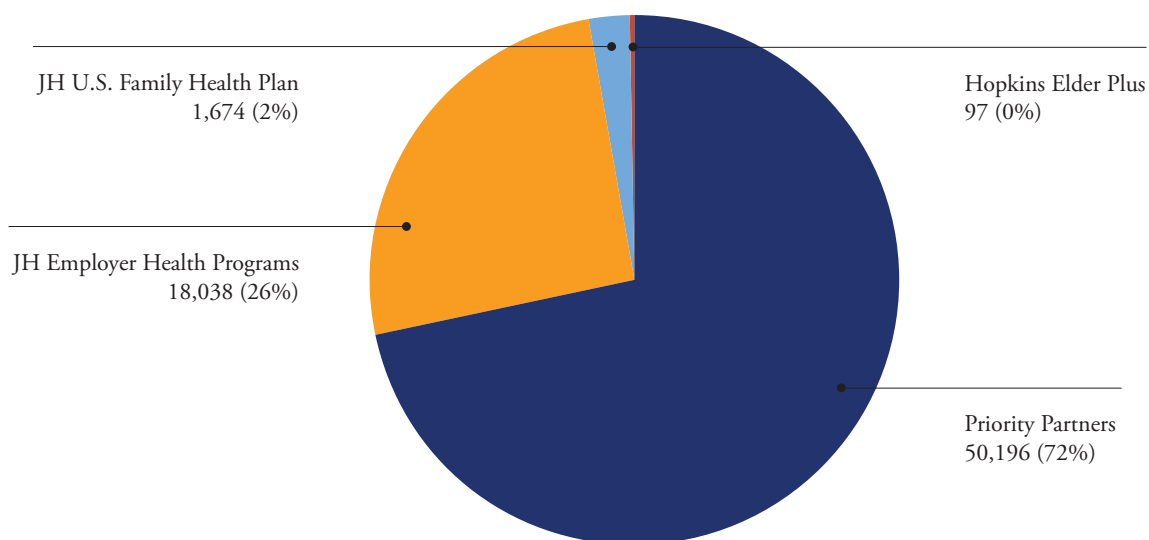
- **Priority Partners Managed Care Organization** provides health care for recipients of Medicaid in Maryland as well as case management services which provide connection and access to other social support programs.
- **Johns Hopkins Employer Health Programs** provides health care for employees of Johns Hopkins and several partner institutions.
- **Johns Hopkins U.S. Family Health Plan** provides health care to military families living in Maryland and in adjoining areas in several other states.
- **Hopkins Elder Plus** provides all-inclusive health care coverage for the elderly.

JHHC provides a variety of services for these plans, including member outreach and enrollment, ongoing development of provider networks, management of both provider and customer relations, and claims processing. JHHC also provides a range of health care management services for members. These range from information and assistance to members who want to adopt healthier lifestyles to individualized case management for members with chronic health conditions such as diabetes or shorter-term issues such as a high-risk pregnancy.

At the end of fiscal year 2014, enrollment in JHHC's four plans totaled 347,170 – including 70,005 members who were residents of Baltimore. Overall, in 2014 about 11.3 percent of all Baltimore residents were members of a JHHC health plan. As Figure 19 shows, Priority Partners accounted for more than two-thirds of the four plans' membership in Baltimore.

FIGURE 19:

Johns Hopkins HealthCare enrollment, Baltimore residents by plan, FY 2014



Educating physicians, nurses and other health care professionals

Baltimore also benefits from The Johns Hopkins University's role in the education of medical professionals. During the spring of 2014, the Johns Hopkins University's School of Medicine, School of Nursing, and the Bloomberg School of Public Health enrolled 4,177 students.

During the spring of 2014, 1,273 students were enrolled in the Johns Hopkins School of Medicine, including 190 who were residents of Baltimore.

In 2014, 854 graduates of the Johns Hopkins School of Medicine – 9.4 percent of all School of Medicine alumni – lived in Baltimore.

The City also benefits from the role of Johns Hopkins in graduate medical education. In the spring of 2014, 833 residents were enrolled in graduate medical education at Johns Hopkins, while training at Health System facilities in Baltimore. Residents represent a valuable addition to Baltimore's physician workforce – one that only a major academic medical center can provide.

Johns Hopkins also contributes to the ongoing development of Baltimore's physician workforce through its continuing medical education (CME) programs. These programs seek to help medical professionals develop their skills and provide better outcomes for their patients by providing the most up-to-date information in a variety of formats, including intensive, on-site short courses, online courses and grand rounds. In fiscal year 2014, the School of Medicine offered a total of 519 CME programs and events, with enrollment totaling 57,222.

The Johns Hopkins School of Nursing also contributes to the City's health care workforce. In the spring of 2014, 470 students were enrolled in undergraduate degree programs in the School of Nursing, of whom 70 were Baltimore residents; and 295 students were enrolled in graduate degree programs, including 58 who were Baltimore residents. As with the School of Medicine, some of those who graduate from the School of Nursing continue to work in Baltimore after graduation providing additional healthcare work in the community through practicums, clinical work and research.

The Institute for Johns Hopkins Nursing – a partnership between the School of Nursing and The Johns Hopkins Hospital – is also a major provider of continuing education for nurses in Baltimore and elsewhere. Advanced training for nurses is offered in a variety of formats, including one-day workshops, week-long courses, online programs and clinical experience at The Johns Hopkins Hospital.

The Bloomberg School of Public Health enrolled 2,139 graduate students in the spring of 2014, including 409 Baltimore residents.

Training technologists for Maryland's health care sector

In addition to its role in the clinical training of physicians and nurses, The Johns Hopkins Hospital is a leading center for the training of medical imaging technologists. The Hospital's Schools of Medical Imaging offer full-time, college-level certificate programs in radiology, nuclear medical technology and diagnostic sonography, as well as more specialized training in CT scanning and MRI technology.

Academic requirements for the certificate programs are rigorous. Admission to the nuclear medical imaging program requires at least an associate degree in a related allied health field, and the others require specific courses in mathematics, science and English. The radiology and nuclear medicine programs require 18 months of full-time study and clinical work; and the sonography program, 14 months. Clinical training is provided at Health System facilities, and at other hospitals and outpatient locations in the greater Baltimore area. Through a partnership with the University of Maryland, students can also combine their studies in medical imaging with work towards a bachelor's degree.

Health care as an international enterprise

Health care has traditionally been viewed as a local business, with local providers caring for local residents. But while most services are still delivered locally, health care has in recent years become an increasingly global business, a trend that has presented significant opportunities both for Johns Hopkins and for Baltimore.

The Johns Hopkins Health System attracts patients to Baltimore from around the world. In fiscal year 2014, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center provided inpatient care to 1,549 patients from outside the U.S. – an increase of 76 percent since fiscal year 2010. The two hospitals also reported 31,766 outpatient visits involving non-U.S. patients – more than double the number served in fiscal year 2010. Service provided to non-U.S. patients at the two hospitals generated \$72.56 million in revenues in fiscal year 2014, more than double the revenues generated from such patients in fiscal year 2010.

Johns Hopkins International (JHI) – a joint venture subsidiary of the University and the Johns Hopkins Health System, founded in 1999 – manages all aspects of international patients' engagement with Johns Hopkins, from initial referral and consultations to arranging transportation, making hotel reservations for family members and monitoring follow-up care. (Johns Hopkins International provides similar services to patients coming to Baltimore from elsewhere in the U.S.) JHI also has a growing business in the provision of remote second opinions, with patient records transmitted to Baltimore, and Hopkins physicians providing comments in writing, by telephone or via videoconference.

Johns Hopkins International also provides management, consulting and professional services to health care institutions and organizations overseas. JHI, for example:

- Jointly owns and manages Johns Hopkins Singapore, a 30-bed oncology unit and outpatient chemotherapy clinic housed within one of Singapore's leading hospitals

- Manages and provides professional services at two hospitals and a molecular imaging center in Abu Dhabi
- Is engaged in a multi-faceted collaboration with Pacifico Salud, a consortium of hospitals, outpatient centers and laboratories in Peru

JHI's most recent initiatives have included:

- An affiliation with **Sun Yat Sen University** and affiliated hospitals in Guangzhou. Under this agreement, Johns Hopkins experts teach courses in Guangzhou, assist in developing the infrastructure needed for long-term training and development of a cadre of medical researchers. The partnership also provides fellowships at Johns Hopkins for promising SYSU researchers; and provides seed grants for initial development of collaborative research projects.
- An agreement with **Hospital Moinhos de Vento (HMV)** in Porto Alegre, Brazil, under which Johns Hopkins International works with HMV to improve clinical care, patient safety and nursing education, as well as access to Johns Hopkins facilities in the U.S. for HMV patients who need more specialized care.
- **Johns Hopkins Aramco Health Care**, a joint venture that combines Johns Hopkins' expertise in clinical care, research and education with the health care system operated by Saudi Aramco (a major oil producer) for its employees in Saudi Arabia and their dependents – a total of 350,000 people. This new venture is aligned with the Saudi government's efforts to improve the quality of health care in the Kingdom, and to make health care a key element in its strategy for diversifying the country's economy.

In 2014, Johns Hopkins International employed 287 people (including 237 in Baltimore and 50 overseas) and generated \$294 million in total revenues (including patient care revenues passed through to The Johns Hopkins Hospital, Johns Hopkins Bayview Medical Center and other Hopkins institutions).

Improving health care for women and their families worldwide

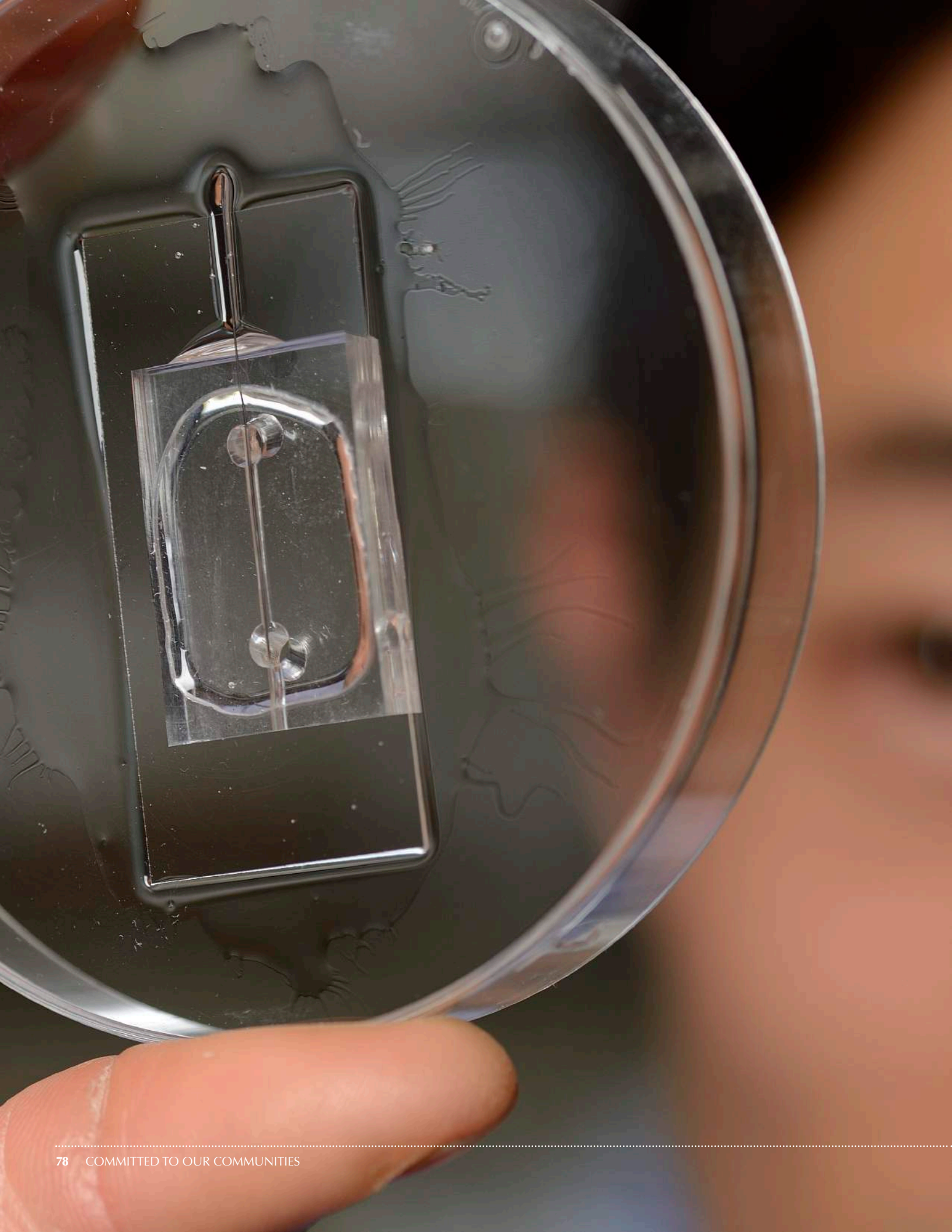
Johns Hopkins Health System's engagement in the delivery of health care overseas is not limited to its partnerships with major institutions. Founded in 1973 as the Johns Hopkins Program for International Education in Gynecology and Obstetrics, **Jhpiego** (pronounced je-pie-go) is a non-profit organization within Johns Hopkins that is dedicated to improving the delivery of health care services to women and their families in low-income communities worldwide.

From its headquarters in Baltimore's Fells Point neighborhood and field offices in 35 countries, Jhpiego oversees projects in more than fifty countries in Africa, Asia, the Middle East, the Caribbean and Latin America, as well as the U.S. Jhpiego develops low-cost, practical solutions to health problems that affect some of the most vulnerable communities in these countries, and works to get these solutions into the hands of frontline health workers. Areas in which it is particularly active include maternal and child health, reproductive health, and the prevention and treatment of HIV/AIDS, malaria and cervical cancer.

Jhpiego's operating budget has increased rapidly during the past decade, growing from \$39.5 million in 2003 to \$295 million in 2014. In 2003 the organization employed 198 people; in 2014, it employed more than 2,100 people worldwide, including about 200 in Baltimore.

A cornerstone of Baltimore's economy

Health care is one of Baltimore's most important exports, in the sense that Johns Hopkins and other institutions generate revenues by providing services to patients who come to Baltimore from elsewhere in Maryland, other states and other countries. But high-quality health care and public health programs are important to the City's economy in other ways as well. Much like improvements in education and the expansion of educational opportunity, improving the health of Baltimore's residents enhances the quality of the City's human capital and the overall productivity of its economy. High-quality health care also enhances the overall quality of life in Baltimore – and thus helps make the City more attractive to the highly skilled workers on whom its future depends.



PART SIX

Innovation and Entrepreneurship at Johns Hopkins

One of the most critical factors affecting an institution's impact on a city's or a region's economy is how effectively it, along with local entrepreneurs, and the broader community, support the translation of new knowledge into new products, new businesses, and new jobs. The communities that have been most successful in using their intellectual strengths to spur economic growth are typically those that combine great research universities with a network of institutional, financial, physical, informational, social and professional resources needed to encourage and support innovation and new enterprise development.

During the past several years, Johns Hopkins has made a substantial investment – on its own and in partnership with others – in developing this type of “innovation ecosystem.” This part of the report examines several key aspects of the support that Johns Hopkins provides for innovation and new enterprise development, including:

- The licensing of new technologies first developed at Johns Hopkins for further development and commercial use;
- Programs aimed at educating and nurturing the next generation of innovators and entrepreneurs; and
- Facilities and services that support – and in some cases seek to accelerate – innovation and new enterprise development.

Also highlighted are the contributions that Johns Hopkins faculty, students and alumni have made in recent years to the development of Baltimore's innovation economy.

LEFT: Materials science and engineering doctoral student, Andrew Wong, developed a metastasis research device with his faculty adviser, Peter Searson, that could keep cancer in check.

Technology transfer at Johns Hopkins

The most formal way in which the University promotes the translation of its research into new products and businesses is by securing patents on the results of its research, and then entering into licensing agreements with private companies for commercial use of its intellectual property. In some cases Johns Hopkins licenses its technology to established companies, in Maryland or elsewhere. In others, the University assists in the creation of new businesses founded specifically for the purpose of further developing and bringing to market technologies on which Johns Hopkins holds a patent.

During the past five years, the pace of technology transfer activity at Johns Hopkins has increased significantly. As Table 13 shows, between fiscal year 2009 and fiscal year 2014:

- New inventions disclosed by faculty and other researchers at Johns Hopkins (including both the East Baltimore and Homewood campuses, but excluding the Applied Physics Lab in Laurel, Maryland) rose by nearly 29 percent (from 352 to 454)
- New U.S. patents awarded to the University rose by 83 percent (from 48 to 88)
- New licensing and option agreements rose by nearly 50 percent (from 105 to 157)
- Gross licensing income rose by 33.5 percent, to more than \$16.5 million
- Between 2009 and 2014, 80 start-up companies were created to bring Johns Hopkins technologies to market

TABLE 13:

Technology transfer activity, Johns Hopkins University (excluding APL), FY 2009 – FY 2014

	2009	2010	2011	2012	2013	2014
Gross licensing income	\$12,387,416	\$12,413,172	\$15,285,555	\$15,938,401	\$17,886,278	\$16,535,093
Invention disclosures	352	355	407	427	444	454
New patent applications filed	453	481	603	540	404	419
U.S.-issued patents	48	65	64	78	85	88
Foreign-issued patents	152	128	113	174	102	148
Licenses/ options executed	105	123	166	160	136	157
Start-up companies formed	10	13	27	9	8	13

The stream of revenue produced by Johns Hopkins' licensing agreements is more than just a source of additional income for the University. Because a portion of this income is allocated to the faculty members and other researchers from whose work this revenue is ultimately derived, it provides a valuable incentive for members of the university research community to consider carefully the practical uses and the commercial potential of their work. Moreover, licensing revenue also provides an additional source of funding for the University's research enterprise.

Several of the companies that have been created in order to bring to market technologies first developed at Johns Hopkins are located in Baltimore. For example:

- **AsclepiX Therapeutics**, founded in 2013 by faculty members in the School of Medicine and the Department of Biomedical Engineering, is working to bring to market new treatments for macular edema and other eye diseases and for certain types of cancer, using technology they first developed at and licensed from the University. Since its founding, AsclepiX has joined Johns Hopkins Fast Forward, a business accelerator program for business startups launched by the Johns Hopkins Whiting School of Engineering in 2013. AsclepiX Therapeutics has obtained more than \$1 million in funding from the State of Maryland, the National Eye Institute, the National Cancer Institute and other sources to support the commercialization of its technology.
- **Cerecor**, founded in 2011 by several Johns Hopkins faculty members, is using the results of neuroscience research conducted at Johns Hopkins to develop new drugs for treatment of depression, schizophrenia and other conditions. Since its founding, the company has attracted \$62 million in venture capital and other investments.
- **Cognoscenti Systems** was started in 2013 to commercialize technology first developed by its founder, a researcher at the Applied Physics Laboratory. Cognoscenti's technology is designed to protect command-and-control systems and the "internet of things" from cyber attacks.
- **Fyodor Biotechnologies**, founded in 2008 by a researcher in the Johns Hopkins School of Medicine, specializes in the development of biotherapeutics and diagnostics for use in developing countries.
- **Gemstone Biotherapeutics**, another Fast Forward tenant founded in 2013, is developing new products that accelerate wound healing, using hydrogels first developed at the Whiting School of Engineering. The company was started by Gamma 3 LLC, an investment fund established in 2012 that focuses on the development of technology-based businesses in Baltimore. While Gemstone has focused initially on wound care, its founders believe hydrogel technology could also have other applications in regenerative medicine.
- **GrayBug LLC**, founded in 2011 by an assistant professor of ophthalmology at the School of Medicine, is based on research conducted at SOM's Wilmer Eye Institute. Graybug's technology uses specially-designed nanoparticles to deliver drugs used to treat a variety of eye ailments, including age-related macular degeneration and glaucoma.
- **Personal Genome Diagnostics**, founded in 2010 by two members of the School of Medicine's oncology faculty, provides patient-specific analyses of the cancer genome.

In the long run, year-to-year increases in the rate at which new companies are started are less significant than the cumulative impact of this growth. From fiscal year 2003 through fiscal year 2008, 14 new businesses were started with technologies licensed from Johns Hopkins (excluding APL); and from fiscal year 2009 through fiscal year 2014, 80.

Educating the next generation of innovators and entrepreneurs

Both through its formal curriculum and through other programs and activities, Johns Hopkins offers students multiple opportunities to learn the basics of creating and growing a business.

- Through its Center for Leadership Education, the Whiting School of Engineering offers a seven-course **minor in Entrepreneurship and Management** that is open to undergraduate students throughout the University. Among the 1,682 undergraduate students who graduated from Johns Hopkins in 2013-14, 136 completed the minor in Entrepreneurship and Management.
- The Whiting School also offers a **masters degree in Engineering Management (MSEM)**. As their final “capstone” project, MSEM students are required to develop a plan for a new business venture and participate in the annual Johns Hopkins Business Plan Competition (described below).
- The Whiting School’s **Center for Bioengineering Innovation and Design (CBID)** offers programs at both undergraduate and graduate levels that “immerse students in the clinical, technical, and business realities of practical health care innovation,” including:
 - » **Design Team**, an academic-year-long course in which teams of undergraduate students research, design and develop innovative medical devices aimed at solving specific practical problems identified by practicing clinicians and medical device industry representatives.
 - » An **MS in Bioengineering Innovation and Design**, an intensive one-year program in which students work for two months with a team of clinicians at The Johns Hopkins Hospital to better understand their needs; learn the business and regulatory aspects of biomedical innovation; and work in teams that take a design project through the entire innovation cycle, from problem identification and definition of a solution to design, testing and commercialization. Students also collaborate with Jhpiego (described in Part Five) on the design of low-cost practical solutions to health problems in developing countries.
- The Carey Business School’s **Global MBA** includes two required elements aimed at developing students’ skills as innovators and entrepreneurs.
 - » In the **Innovation for Humanity** program, teams of students seek to develop an innovative response to a practical, real-world problem in a developing country, and spend three weeks on-site working with a local partner to implement their solution.
 - » In the **Discovery to Market** program, Global MBA students work in teams with students from other schools at Johns Hopkins in a year-long exercise aimed at developing and bringing to market a new technology.

In addition to these degree programs and courses, Johns Hopkins also offers students a variety of other opportunities to gain experience in conceiving, planning and developing a new venture.

- **Hopkins Student Enterprises**, a program of the Center for Leadership Education, helps students gain hands-on business experience by assisting them in starting on-campus businesses – and where they are successful, continuing those businesses after their founders graduate. Current examples include a moving company, a graphic design business, and an intellectual property consulting firm.
- The annual **Johns Hopkins Business Plan Competition**, begun in 2000, seeks to expand undergraduate and graduate student interest in entrepreneurship, to provide hands-on experience in what it takes to start and grow a business and to provide pre-seed funding for the most promising entries. In 2014, a total of 32 student teams competed in four categories – separate undergraduate and graduate student categories for medical technology and life sciences; general business; and social enterprise. The winning entries included:
 - » In the general business category, **Seque-Base**, a company started in 2013 by two Whiting School undergraduates, that is developing a suite of bioinformatics software tools aimed at making genomic data and analyses more accessible.
 - » In the undergraduate medical technology category, **White Light Medical**, founded in December 2012, a CBID start-up that has developed a new device that improves the accuracy of placement of pedicle screws during spinal fusion surgery. Greater accuracy in the placement of screws can translate into less time spent in the OR (thus reducing the cost of the procedure), and reduced rates of injury to patients.

- » In the graduate medical technology category, **Respira**, a team of five engineering students who have developed a device called PreVent that allows patients on ventilators to cough normally, thus helping to improve respiration while also reducing secondary infections.
- » In the social enterprise category, the **RightFit Prosthetics Initiative**, a team of Johns Hopkins engineers and practitioners who have developed a method for providing patients in developing countries with well-fitted prosthetic devices, more quickly and at lower cost than with existing methods. RightFit's approach involves the use of low-temperature thermoplastics to mold a prosthetic socket directly onto a patient's leg, eliminating the need to take a plaster cast and then separately fabricate the socket.

The four winners, along with second- and third-place finishers in each category, shared \$72,000 in cash prizes.

- The Johns Hopkins **Social Innovation Lab (SIL)**, first established in 2011 by a group of MPH and MBA students, has quickly evolved from an informal student group to a more structured co-curricular program with a full-time director and funding to support student projects. The 13 individuals and teams who were selected to join SIL in the fall of 2013 (out of 45 who applied) participated in a six-month program of workshops and one-on-one counseling sessions, culminating in a public presentation of their projects on "Demo Day" in May 2014.

Since its founding in 2011, SIL has "incubated" 33 social ventures. The effectiveness of its program is reflected in the fact that as of the summer of 2014, 26 of these 33 were still operating – 18 of them in Baltimore.

- The **Innovation Factory**, a student-led organization started in 2013 “to foster the entrepreneurial spirit throughout the Johns Hopkins community,” provides an array of resources and activities for aspiring entrepreneurs, including: co-working space on the Homewood campus; online resources such as video interviews with successful entrepreneurs; a monthly “demo day” and other events for student entrepreneurs. The Innovation Factory also manages the participation of Johns Hopkins students in the Venture Capital Investment Competition, an annual program that in 2013 engaged approximately 1,200 students from 60 colleges and universities; and in 2013 and 2014 organized a day-long “Summit” for aspiring Johns Hopkins entrepreneurs.
- **Medical and Educational Perspectives, Inc. (MEP)** is a student-led organization that provides entrepreneurship training to medical and graduate students, post-docs and young faculty members, with a particular focus on development of low-cost, non-invasive medical solutions that can be used in resource-poor areas in both the U.S. and other countries. MEP participants work in teams that typically include MD, PhD, and MBA/MPH students. Based at Johns Hopkins, MEP is currently planning to expand to other universities in Maryland.

Building an innovation ecosystem at Johns Hopkins

In addition to these educational programs, the University has during the past five years launched an array of programs and facilities that have contributed to the development of an “innovation ecosystem” at Johns Hopkins. Below we describe several elements of this ecosystem.

Supporting translational research

The process of translating the results of university research into new products and services is rarely simple or straightforward. Even the most promising scientific discoveries or new technologies often require substantial additional work before they can begin to attract the kind of financing that will be needed to bring them to market. To help close this gap, Johns Hopkins provides several types of financing for faculty members’ “translational research.”

- Under its **Accelerated Transitional Incubator Program (ATIP)**, the Johns Hopkins Institute for Clinical and Translational Research (ICTR), founded in 2007, provides grants of up to \$100,000 to help University faculty members develop new biomedical technologies to a point where they can begin to secure outside funding. In 2013-2014 the Institute awarded ATIP grants to 10 Johns Hopkins faculty members to accelerate their work in areas as diverse as research on new treatments for lung and pancreatic cancer, work on a biomarker assay that could provide a rapid, real-time indicator of brain injury, and development of an app designed to help users stop smoking.
- As one of 16 universities participating in the Wallace H. Coulter Foundation’s **Translational Research Partnership**, Johns Hopkins has since 2012, provided longer-term (three- to five-year) funding for teams of physicians, biomedical engineers and other researchers engaged in the development of new medical devices and diagnostics that have the potential to improve treatment and reduce costs.

- With a donation from an alumnus, supplemented by its own internal funding, the Whiting School of Engineering in 2014 launched the **Cohen Translational Engineering Fund**, which provides short-term (typically two- to three-month) “pre-seed” funding for Whiting School faculty to conduct further work on promising new technologies.

Accelerating the development of new technologies and new businesses

Johns Hopkins has also created or co-sponsored programs designed to accelerate the development of promising new ventures, and to improve their chances to succeed.

- **Johns Hopkins Fast Forward** is an accelerator program for technology start-ups that was launched by the Whiting School of Engineering in January 2013. Fast Forward serves early-stage start-ups working on technologies that (based on an initial screening) appear to have commercial potential, and that can benefit from the services the program offers. Participating start-ups also must be affiliated in some way with Johns Hopkins – for example, by including faculty, students, staff or alumni among their team members, or by virtue of licensing University technology. For those who are accepted into the program, Fast Forward provides space for up to two years in its 13,000 square-foot accelerator (located in the historic Stieff Silver Building, less than a mile from the Homewood campus); mentoring by Fast Forward staff, University faculty and alumni entrepreneurs; and access to external funding sources.

Since it opened in 2013, Fast Forward has reviewed applications from 64 Johns Hopkins affiliated start-ups, and has accepted 33 (including some that are not Stieff Building tenants, but make use of the program’s other services). Current tenants include AsclepiX Therapeutics and Gemstone Biotherapeutics (described above), as well as:

- » **Circulomics**, a company founded in 2009 by a Whiting School alumnus and a faculty member that is developing assays for micro-RNA biomarkers.
- » **NanoDirect**, a start-up that will provide highly-refined nanomaterials for use in a variety of electronic applications, including integrated circuits, solar technology and sensors.
- » **Revolve Biotechnologies**, a company that offers rapid access to customizable gene libraries, founded in 2013 by a Johns Hopkins alumnus and two students.

Based on Fast Forward’s success to date and strong demand for its space and services, the University in 2014 approved expansion of the program to East Baltimore. For the next few years, Fast Forward East will temporarily occupy a 4,000 square-foot space in the Rangos Research Building (described below), located in the East Baltimore Science + Technology Park. Fast Forward will subsequently move into a new 30,000 square-foot “innovation hub” that will be developed as part the Science + Technology Park’s third building, which should be ready for occupancy by 2018.

- In the spring of 2014, Johns Hopkins partnered with DreamIt Ventures, Northrop Grumman and Kaiser Permanente to sponsor **DreamIt Health Baltimore**, an intensive, sixteen-week accelerator program for start-ups engaged in the development of innovative, health-related applications of information technology. The program included basic business training, mentoring, access to professional services, introductions to industry representatives and investors and “pre-seed” funding of up to \$50,000 per firm. Nine start-ups were selected to participate, including four affiliated with Johns Hopkins:
 - » **Aegle**, a venture started by a group of Johns Hopkins engineers, has developed a wearable, wireless patient monitoring device.

- » **Avhana**, founded by IT professionals in the Johns Hopkins facilities department, is developing a “virtual marketplace” where health care professionals can access the latest treatment guidelines published by national medical organizations, public agencies and others.
 - » **eMocha**, based on technology first developed at Johns Hopkins, has developed a mobile platform for remote patient management.
 - » **Quantified Care** – a start-up that had begun in 2013 as a student project in the Social Innovation Lab, has developed an online marketplace designed to assist clinicians in learning about and purchasing new mobile health technologies, and integrating them into their practice.
- Since June 2014, Johns Hopkins has also been a partner (along with the University of Maryland, George Washington University and Virginia Tech) in the **DC I-Corps**, one of five regional “nodes” that make up the National Science Foundation’s National Innovation Network. DC I-Corps offers teams of faculty members, postdoctoral researchers and graduate students an intensive, hands-on experience in the process of translating a technological innovation into a business.

In the initial five-week phase, team members spend 15 to 20 hours each week talking with potential customers, industry partners and competitors, with the goal of developing a better understanding of the technology’s real market potential, and of what will be required to turn it into a successful business. The goal of this phase is to arrive at an initial conclusion on whether the technology has commercial value, whether as the basis for a new business or as a licensing opportunity.

Teams that are ready after the first phase to proceed with the development of a new business are eligible to participate in the DC I-Corps Accelerator program. It provides assistance in continued market analysis, prototyping, organizing the business and connecting with sources of early-stage funding, such as the federal Small Business Innovation Research program and angel investor networks.

Including the Social Innovation Lab, Fast Forward and DreamIt Health, we estimate that during fiscal year 2014, 55 start-ups participated in incubator and accelerator programs sponsored by Johns Hopkins. By increasing the likelihood that participating companies will be able to survive, attract outside investment and succeed in the marketplace, these Johns Hopkins sponsored programs should over time have a significant impact on Baltimore’s innovation economy.

Providing space for technology companies

While Fast Forward provides space and services for Johns Hopkins-related start-ups, other Johns Hopkins properties include space for technology companies as well.

- In addition to housing several of the University’s biomedical research centers, University-affiliated labs and Johns Hopkins research partners, the 280,000 square-foot **Rangos Building** – completed in 2009 by Forest City Science and Technology as the first new building in the East Baltimore Science + Technology Park – also provides space for several early-stage technology-based businesses.

Forest City is now planning to construct a second, 170,000 square foot building on Ashland Avenue that will include the Fast Forward “innovation hub” along with space for commercial biotechnology, medical device and other life science companies.

- Through a partnership with the University, the Baltimore Development Corporation (BDC) provides space and services for start-up businesses at the **Emerging Technology Center @ Johns Hopkins Eastern (ETC)**. One of two such centers created by BDC, the 45,000 square-foot ETC is housed in the former Eastern High School, now owned by Johns Hopkins, just a few blocks from the University's Homewood campus.

Student, faculty and alumni entrepreneurs

In addition to businesses that are engaged in the commercialization of technologies first developed at Johns Hopkins or that have been developed through programs such as Fast Forward, there are dozens of other businesses in Baltimore that have been started by Johns Hopkins faculty, students and alumni that are contributing to the renewal of Baltimore's economy. Listed below are a few examples:

- **The Canton Group**, co-founded in 1998 by a Johns Hopkins alumnus, provides IT consulting services to government, business and non-profit clients, and is ranked by the Baltimore Business Journal as the City's largest web design firm.
- **Intralytix, Inc.**, founded in 1998 by a former Assistant Dean of the Johns Hopkins School of Medicine, produces and markets "bacteriophage-based" products for use in controlling bacterial pathogens in a variety of settings – in medical care, in food processing and in the environment. The *Baltimore Business Journal* ranks Intralytix as the fifth-fastest-growing privately-held company in the greater Baltimore area in 2014.
- Founded in 1998 by a Johns Hopkins alumnus, **Securityhunter** is one of the fastest-growing technology firms in the Baltimore area. The firm provides electronic security systems and services to federal agencies and other clients.
- **Mindgrub Technologies**, founded in 2002 by a former graduate student in the School of Education's Technology for Educators program, specializes in design and development of mobile, social and web applications for corporate, government, educational and other non-profit clients.
- **SmartLogic Solutions** is a web and mobile applications developer, founded in 2005 by two Johns Hopkins undergraduates.

- **R2integrated**, founded in 2007, provides digital, mobile and social network marketing services to a wide range of clients, including Under Armour, MasterCard, Microsoft, Hershey's and Loyola University. In addition to its Baltimore headquarters, the firm has offices in Seattle and New York City. R2i's co-founder and CEO is a Johns Hopkins alumnus.
- **AgeneBio**, founded in 2008 by a Johns Hopkins faculty member, is developing new treatments for dementia and other memory problems. Its first drug is scheduled to begin Phase III clinical trials in 2015.
- **CyberPoint International**, an information security firm founded in 2009 by a Whiting School alumnus, ranks sixth on the *Baltimore Business Journal's* list of the largest cybersecurity firms in the Greater Baltimore area.
- **viaPlace LLC**, started in 2009 by the founder and CEO of Mindgrub, has developed location-based mobile apps that allow property owners to provide information to people visiting their neighborhoods.
- **Hemova Medical**, founded in 2010 by a Whiting School alumnus, is engaged in the development of devices used in treating vascular and renal problems. A recipient of translational research funding from Johns Hopkins and the State of Maryland, Hemova is currently a tenant in the Emerging Technology Center @ Johns Hopkins Eastern.
- **LessonCast Learning LLC**, founded in 2010 by a husband and wife who are both School of Education alumni, operates an online service through which master teachers make their knowledge of instructional and problem-solving techniques available to their less experienced colleagues.
- **Reify Health**, founded in 2010 by a Johns Hopkins PhD alumnus and a graduate student, has developed a web-based platform through which it collaborates with physicians and other health professionals on the development, testing and evaluation of mobile health applications. Through this process, Reify seeks to ensure that these applications – like any other form of therapeutic intervention – are solidly evidence-based.
- **Evergreen Health Cooperative**, founded in 2011 by a PhD graduate of the Bloomberg School of Public Health who had also served as Baltimore's Health Commissioner, provides affordable health care to low-income residents of the Baltimore area, combining four directly operated health centers with a low-cost insurance plan.
- **Rehabtics**, founded in 2011 by a Johns Hopkins PhD student, has developed several innovative applications of motion-controlled game technology for use in physical rehabilitation, as well as several other software programs for use in planning, managing and monitoring patients' rehab activities. Located in the ETC @ Johns Hopkins Eastern, Rehabtics was selected in 2014 as Maryland's "Incubator Company of the Year" in health care.
- **Allovue**, founded in 2013 by a former Baltimore teacher who had earned a master's degree at the School of Education, provides software tools to assist K-12 schools and school districts in budgeting, capital planning and financial management. In its first year Allovue, which is located in the ETC @ Johns Hopkins Eastern, secured \$800,000 in early-stage funding from angel investors and from the State of Maryland.
- **Terbium Labs LLC**, founded in 2013 by a researcher at the Applied Physics Laboratory, has developed a patent-pending "digital fingerprinting" technology that allows clients to detect unauthorized access to and use of their proprietary software.

- **Tissue Analytics**, founded in 2014 by two Johns Hopkins alumni, has developed a smart-phone app that allows clinicians and caregivers to photograph wounds, burns, bedsores and other serious skin conditions, as well as desktop software for analyzing the information these photos provide.

Collaboration begets innovation

As noted in Part Four, the opportunities that Johns Hopkins provides for collaboration across schools and disciplines, and among researchers, clinicians and other practitioners, is one of the great strengths of the Johns Hopkins research enterprise. This commingling of talents is perhaps even more essential to the process of turning new knowledge and new ideas into new products and new jobs. The University and the Johns Hopkins Health System together provide a common space within which innovators and entrepreneurs – faculty, students, post-docs, staff, alumni and others – can meet and start working together. Programs such as the Center for Bioengineering Innovation and Development, the Johns Hopkins Business Plan Competition, and Fast Forward provide the resources they need to do so successfully.

Whether Baltimore flourishes or falters economically in the years ahead will depend in part on its continued growth and development as a hub for innovation and entrepreneurship. Johns Hopkins can be an invaluable partner in that process.



PART SEVEN

Investing in and Serving Neighboring Communities

Since their founding in the late nineteenth century, the Johns Hopkins Institutions have been committed to investing in and serving Baltimore's diverse communities. This part of the report examines the Johns Hopkins Institutions' engagement with the communities in which they operate, focusing in particular on six aspects of that engagement:

- Investments in neighboring communities
- Including local residents and businesses in the development and operations of the Johns Hopkins enterprise
- Improving elementary and secondary education and expanding educational opportunity for young residents of Baltimore
- Expanding access to – and improving the quality of – health care
- Engagement of University students and Johns Hopkins employees in service to Baltimore communities
- The University's role as a cultural resource for local communities

LEFT: Each year, nearly 1,300 students participate in President's Day of Service, serving dozens of community organizations around Baltimore City.

Investing in neighboring communities

The Johns Hopkins University and the Johns Hopkins Health System have invested tens of millions of dollars in Baltimore neighborhoods.

Revitalizing East Baltimore

Since 2001, Johns Hopkins has been collaborating with the City, the State, the Annie E. Casey Foundation, private developers and community organizations in the redevelopment of an 88-acre area adjacent to Johns Hopkins' East Baltimore campus. As revised in 2012, the master plan for the area provides for the development of more than 1,200 units of new and rehabilitated housing, a 6-acre park, a school, a 1.5 million square-foot Science + Technology Park and 144,000 square feet of retail space.

Although the redevelopment of the area has been slowed by the financial crisis of 2008 and by a depressed real estate market, much has already been accomplished.

- Forest City Science and Technology completed the first building in the Science + Technology Park – the 300,000 square-foot Rangos Research Building – in 2009. Johns Hopkins was the anchor tenant of the building which includes lab and office space for Johns Hopkins, other not-for-profit biomedical research organizations and life sciences technology companies, as well as 30,000 square feet of retail and restaurant space.
- In 2011 Johns Hopkins completed the renovation of a landmark former police station at 1809 Ashland Avenue; the building now houses the University's Berman Institute of Bioethics.
- 929 Apartments, a privately-developed, 321-unit residential building at 929 North Wolfe available to the general public as well as Johns Hopkins graduate students and employees, was completed in 2012.
- A total of 249 other units of new housing have also been built, including approximately 200 low-income units.

- A 10-story, 1,450-space parking garage with a Walgreen's pharmacy on the building's first floor, located at the corner of Ashland Avenue and Washington Street, was completed in 2012.
- The Henderson-Hopkins School, a 90,000 square-foot K-8 school with space for 540 students, was completed in 2013. It was built by East Baltimore Development Inc. (EBDI), and is managed by the Johns Hopkins School of Education in collaboration with Morgan State University. The seven acre site was developed at a cost of \$43 million through a onetime capital contribution from Johns Hopkins of \$21 million and funds raised from the Casey and Weinberg foundations and other local and national philanthropies. This was accomplished without state or city school capital funds which are in short supply.
- The 30,000 square-foot Harry and Jeanette Weinberg Early Childhood Center, with space to serve 174 pre-school children, opened in September 2014. It was built by East Baltimore Development Inc. and is managed by the School of Education in partnership with the Greater Baltimore YMCA.
- The second building in the Science + Technology Park, the Maryland Department of Health and Mental Hygiene's \$171 million, 235,000-square-foot Public Health Laboratory, located in the Eager Park area in part to increase potential collaboration with Johns Hopkins researchers, was completed in June 2014.

Other projects now in various stages of development include:

- The development of 250 additional units of new and rehabilitated housing
- A 182-room extended-stay hotel
- A 167,000 square-foot research facility, the Science + Technology Park's third building, to be developed at 1812 Ashland Avenue; the University will be the building's anchor tenant

- Eager Park, a three-block-long, six-acre public park that will include a 30,000 square-foot lawn, a playground, a community garden, exercise facilities, a performance venue and other amenities

The Johns Hopkins Institutions' commitments to the redevelopment of the project area have been substantial. Johns Hopkins estimates that from 2003 through 2013 it has invested more than \$50 million in the redevelopment of the 88-acre project area, including \$21 million for property acquisition and relocation, and \$21 million toward the cost of construction and ongoing operations of the Henderson-Hopkins School and the Weinberg Early Childhood Center.

Strengthening Homewood

The Johns Hopkins Institutions' involvement in efforts to strengthen the neighborhoods in which they operate reflects both their longstanding and in recent years, redoubled commitment to community service and their own institutional interests. In 2012, a report prepared for the University noted that applicants who are accepted at Johns Hopkins but who choose to enroll elsewhere often cite conditions in the surrounding area as being among the reasons for their decision. At the same time, many residents of surrounding neighborhoods believe that Johns Hopkins should be doing more to address problems that affect both the University and the community.

Acknowledging these perceptions, in 2011 the University, in collaboration with other local institutions and neighborhood organizations, launched the Homewood Community Partners Initiative (HCPI). HCPI covers 10 neighborhoods and one commercial area surrounding the University's Homewood campus. Through a broad-based planning process, the partners in 2012 identified five neighborhood priorities:

- Maintaining clean and safe neighborhoods
- Eliminating blight and developing new housing
- Strengthening public education
- Commercial and retail development
- Local hiring, purchasing and workforce development

The partners also formulated 29 specific project and program recommendations, with an estimated price tag of \$60 million, aimed at achieving HPCI's objectives during the next five to ten years.

In December 2012, Johns Hopkins announced that it would commit \$10 million to leverage additional private and public investments toward the implementation of HPCI's recommendations. Since then, the University has undertaken or helped to fund several projects in the area.

- In December 2012, the Baltimore Development Corporation (BDC) approved a proposal from the Maryland Film Festival, in collaboration with Johns Hopkins and the Maryland Institute College of Art (MICA), for a \$17 million renovation of the long-shuttered Parkway Theater, located in the Charles North neighborhood, a mile south of the University's Homewood campus. The restored Theater will include a three-screen, 600-seat film center and live music venue, as well as space for the two institutions' film programs.

Johns Hopkins and MICA are similarly collaborating with a private developer, Jubilee Baltimore, on an \$18 million renovation of the Centre Theater. Located just a few blocks from the Parkway, the Centre will similarly include a theater and space for the Johns Hopkins and MICA film programs, along with a restaurant and retail space.

- In February 2013, Johns Hopkins designated Armada Hoffer and the Beatty Group to develop a mixed-use project on a University-owned site at St. Paul and 33rd Street in Charles Village, approximately a block from the Homewood campus. The project will include 157 market-rate student apartments and 30,000 square feet of retail space (including a pharmacy), wrapped around a 162-space parking structure.
- During the summer of 2013, the University contributed \$800,000 toward the \$1.6 million cost of renovating two public schools in Charles Village, the Margaret Brent and Barclay elementary and middle schools.

Investments in other neighborhoods

Johns Hopkins has also supported revitalization efforts in other Baltimore neighborhoods. The University, for example, supports the work of the Mount Vernon Place Conservancy, a non-profit group that has undertaken a multi-year renovation of the public park that represents the heart of the City's Mount Vernon neighborhood – the home of the Peabody Institute since its founding in 1857, and one of Baltimore's leading centers of culture and the arts.

Buying homes in Baltimore

In addition to its investments in the projects described above, Johns Hopkins has also sought to strengthen Baltimore neighborhoods through its **Live Near Your Work (LNYW)** program, which provides grants to employees as an incentive to purchase homes in Baltimore. Grants range from \$5,000 in many parts of the City to \$23,000 in neighborhoods near the Homewood campus to \$36,000 in East Baltimore. Recipients may also be eligible for a small matching grant from the City.

In fiscal year 2014, LNYW grants totaling \$1,411,000 were awarded to 84 homebuyers employed by Johns Hopkins. Of this total about \$756,500 was contributed by Johns Hopkins, with another \$654,500 contributed by other supporters of the program, such as the Annie E. Casey Foundation. Since the program was launched in 1997, LNYW has supported Johns Hopkins employees' purchases of 418 homes in Baltimore.

Economic inclusion

As the largest enterprise in Baltimore, Johns Hopkins has long been committed to ensuring that opportunities to participate in its work are available to all, including women, minorities and local residents and businesses. This commitment has shaped the University's and the Health System's employment practices, purchasing policies and construction contracts.

The following are just a few examples of the Johns Hopkins Institutions' commitment to the expansion of economic opportunity.

- The Johns Hopkins Summer Jobs Program provides a six-week, paid summer internship for Baltimore high school students. Participants work 30 hours per week in a variety of departments at The Johns Hopkins Hospital and the University, and also take part in a series of career development seminars, focusing on topics such as job readiness, workplace etiquette, customer service and financial literacy. From 2010 through 2014, approximately 1,200 students participated in the program.
- In 2013, the University selected Palo Alto-based Bon Appétit Management Company to provide food services on its Homewood campus. The company's commitment to local hiring and local sourcing was a key factor in its selection. As of the spring of 2014, Bon Appétit was employing 168 Baltimore residents in its Homewood campus operations (accounting for nearly 83 percent of the company's Homewood workforce), and was working with 13 local suppliers. During fiscal year 2014, Bon Appétit spent nearly \$1 million on purchases from its local suppliers.
- Malone Hall, a 69,000 square-foot, \$38.8 million building that houses the University's Department of Computer Science along with three science and engineering research centers, was completed in the summer of 2014. During a two-year construction period, minority-owned firms accounted for 27 percent of all subcontract work on the project, and local firms for 17 percent.

To build on these and other efforts, and to deepen its commitment to the expansion of economic opportunity for Baltimore businesses and residents, Johns Hopkins is planning the roll out of a more aggressive economic inclusion effort in 2015, focused on expanding the extent to which local Baltimore residents and businesses benefit from the economic activity generated by the Hopkins institutions.

Transitioning public assistance recipients to full-time employment

Working with the Baltimore City Department of Social Services, the Center for Urban Families, and Impact Training Corporation, the Johns Hopkins Health System's Department of General Services in 2013 launched a program that provides public assistance recipients with training and work experience as front-line health care workers. The twenty-week program includes training in basic workplace skills and the ethics of health care, as well as technical training in various front-line jobs. Participants also rotate through internships in several front-line departments at The Johns Hopkins Hospital, including environmental services, materials management, patient transportation and nutrition.

In 2013 and 2014, a total of 62 Baltimore residents were enrolled in the program's first three cohorts. Of those, 44 completed the program, and 39 have been hired in permanent, full-time jobs at Johns Hopkins. The Department of General Services is now developing a certification process for participants who complete the program. Certification would provide workers with a recognized credential, with the potential for greater mobility within the health care industry.

Improving schools and expanding educational opportunity

Of the many factors that contribute to the strength of local communities, none is more important than the quality of elementary and secondary education. Johns Hopkins contributes in multiple ways to the goal of improving Baltimore's public schools, and expanding educational opportunity for the City's young residents. Below are a few examples.

A new community school for East Baltimore

As noted above, Johns Hopkins worked closely with EBDI, the Baltimore City Public Schools and Morgan State University on the development of the Henderson-Hopkins School, a 540-seat K-8 public "contract" school in East Baltimore. The school, which opened in January 2014, is managed jointly by the Johns Hopkins School of Education and the Morgan State School of Education and Urban Studies, under a contract with the Baltimore City Public Schools.

Priority for enrollment at Henderson-Hopkins School is given to children who live in the EBDI area (now called Eager Park), followed by siblings of children currently enrolled at the school, and children whose parents work in East Baltimore.

The curriculum at Henderson-Hopkins School is based on one developed by faculty members at the Johns Hopkins School of Education. It emphasizes the role of parents and the broader community as active participants in the education of their children; and also emphasizes "personalized education," the use of data to tailor learning to the needs of each individual student. Students from the Johns Hopkins School of Education also work at the school as student teachers, interns and volunteers; and Johns Hopkins faculty members serve as mentors and advisors. The school also includes a "health suite" for students and their families, staffed by the Johns Hopkins School of Nursing.

Henderson-Hopkins School shares its seven-acre campus with the Weinberg Early Childhood Center (ECC), which is also managed by the School of Education. The ECC, which opened in September 2014, will serve up to 174 children, ages six weeks to four years. As with K-8 students, priority is given to children of parents who live or work in the area.

Other school partnerships

In addition to its role in the development and management of the Henderson-Hopkins School, the Johns Hopkins School of Education is engaged in a wide range of partnerships aimed at strengthening public education and expanding educational opportunity in Baltimore.

- Each of the colleges and universities in Maryland that offer teacher training programs maintains ongoing partnerships with several professional development schools – elementary and secondary schools where the institutions provide professional development services for currently-employed teachers, place undergraduate and graduate students in teaching internships, and collaborate on other school improvement initiatives. In 2013-2014, Johns Hopkins worked with three professional development schools in Baltimore – Patterson Park Charter School, Paul Lawrence Dunbar High School and Henderson-Hopkins School.
- During the 2013-14 school year (including the summer session), approximately 117 School of Education graduate student interns worked as teachers, counselors and other professionals at 72 schools (including the three cited above), institutions and community organizations in Baltimore.
- Johns Hopkins is also a leading provider of graduate education for participants in Teach for America (TFA). In 2013-2014, 285 TFA teachers in more than 100 Baltimore schools were enrolled in master's degree programs in the School of Education.

- The School of Education's **STEM Achievement in Baltimore Elementary Schools (SABES)** uses an innovative, community-oriented approach to STEM education to engage students in grades 3 to 5, their teachers and community residents in learning about science. Rather than seeking to draw students directly into the world of science, SABES seeks to bring science into the world in which its students live, by linking STEM education in the participating schools with practical applications of STEM disciplines to neighborhood problems. The program, which currently operates in nine schools in three Baltimore neighborhoods, is funded by a \$7.4 million grant from the National Science Foundation. In 2013-2014, 40 teachers and 1,620 students at the nine schools participated in the program.
- **Talent Development Secondary** offers "an evidence-based school improvement model for grades 6 through 12." The program focuses on improving college and career readiness among students in high-need schools. The 48 schools in 14 states that participated in the program in 2013-2014 included two public high schools in Baltimore.
- The **Paul Robeson College Readiness Program**, started in 2009, is a joint effort of the School of Education and the Cambio Group, a Baltimore-based consulting firm. The program seeks to help young African-American males in Baltimore compete more effectively for admission to – and to succeed in – four-year colleges and universities. The program, which is located on the Johns Hopkins Homewood campus, includes SAT preparation, seminars and workshops aimed at improving students' writing skills, college application and financial aid workshops, individual counseling and visits to college and university campuses.

Programs and projects at Johns Hopkins that seek to improve local schools and provide educational opportunity for Baltimore residents are not limited to those led by the School of Education. For example:

- The **Harriet Lane Tutorial Project**, sponsored by the Harriet Lane Clinic – The Johns Hopkins Hospital's principal pediatric outpatient service which has been serving East Baltimore residents since the early 1900s – provides after-school tutoring in reading and math to elementary school students in East Baltimore.
- The Peabody Institute's **Peabody Preparatory** is Baltimore's largest community education program in the performing arts. The school offers individual and group instruction in music and dance to young Baltimore residents from pre-school through high school, and to adults as well.

Educational opportunity at Johns Hopkins: The Baltimore Scholars Program

In 2004, Johns Hopkins reinforced its commitment to expanding educational opportunity for young residents of Baltimore by creating the Baltimore Scholars Program.

From 2005 through 2013-2014, 261 Baltimore high school students were accepted to Johns Hopkins under this program, including 22 in 2013-2014. To date, the value of scholarships awarded under the program (including future-year commitments to currently enrolled students) has totaled about \$20.7 million.

Meeting residents' health needs – in East Baltimore and beyond

Even as the scale and scope of its operations have grown, the Johns Hopkins Health System, along with the University's School of Medicine, School of Nursing and Bloomberg School of Public Health, have remained deeply rooted in East Baltimore, and committed to meeting the health needs of other City neighborhoods as well.

Improving access to health care

Johns Hopkins has in recent years pursued a variety of strategies aimed at making it easier for City residents – especially those who are low-income, uninsured or otherwise vulnerable – to gain essential access to both primary care and more specialized services.

- **East Baltimore Medical Center (EBMC)**, which first opened in 1975, is one of 39 primary care centers operated by Johns Hopkins Community Physicians (JHCP). Located on Eager Street, just a few blocks from the Eager Park area, EBMC provides comprehensive health care services to residents of East Baltimore. In fiscal year 2014, EBMC reported more than 69,700 patient visits, making it the busiest primary care facility in the JHCP network.

The JHCP network also includes three other sites within the City – one on the Johns Hopkins Bayview campus, one at Wyman Park and one in Canton Crossing.

- The School of Nursing operates **Community Nursing Centers** at three locations in East Baltimore, providing basic health and wellness services at no charge to low-income and uninsured neighborhood residents. These centers are staffed by undergraduate and graduate student nurses and clinical faculty, and by other Johns Hopkins physicians and nurses who work on a volunteer basis.
- The **Harriet Lane Clinic** at The Johns Hopkins Hospital is both a center for teaching and research in pediatrics and a major provider of primary care and wraparound services to children and adolescents in East Baltimore and surrounding communities.
- The John Hopkins Hospital's **Case Management Unit in Community Psychiatry** provides intensive case management services for Medicaid recipients in Baltimore age 16 and older who suffer from serious mental illness.

- » The **Lillian Wald Community Nursing Center**, located at the Rutland Center on North Broadway, provides a variety of health care and wellness services to neighborhood residents.
- » The **Isaiah Wellness Center** provides health education programs for the elderly residents of Apostolic Towers.
- » The health suite at the **House of Ruth** serves victims of domestic violence and their children.

- In 2009, the Johns Hopkins Health System launched **The Access Partnership (TAP)**, an initiative that aims to improve uninsured or under-insured neighborhood residents' access to the full range of specialty care that is available at The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center. The program is currently open to residents of five ZIP codes surrounding the East Baltimore and Hopkins Bayview campuses.

Because participating Hopkins specialists donate their services, TAP is able to minimize the cost of these services to uninsured neighborhood residents. Eligible patients who are referred by their primary care physicians to specialists at Hopkins pay a one-time fee of \$20.00 as a demonstration of their commitment to follow through with the scheduled care; there are no other charges for any services provided as a result of the referral.

- Johns Hopkins Bayview Medical Center's **Healthy Community Partnership** is a collaboration that grew out of Hopkins Bayview's longstanding working relationships with several churches in Southeast Baltimore. The Partnership seeks to improve local residents' access to health care, improve the overall health of the community and reduce health care disparities. Its programs include:
 - » A 10-week training program for "lay health educators," preparing to organize and deliver health education, screening and other health programs for their congregations.
 - » Training and ongoing support for "lay health advocates," community volunteers who work one-on-one with neighborhood residents who need help in managing chronic illnesses and other medical problems. Such help can include arranging and getting patients to appointments, help with medications and other elements of prescribed courses of treatment, monitoring patients' condition and communicating with medical professionals.
 - » Supporting local congregations' other health-related programs.
- Johns Hopkins Bayview Medical Center's **Care-A-Van** is a fully-equipped mobile medical unit, staffed by health care professionals from Hopkins Bayview. Its services include basic primary care, testing (for pregnancy, HIV and other conditions), referrals to specialists, and patient education. Services are provided free of charge to uninsured children who do not have a regular source of health care and to their families.
- The **Food Re-education for Elementary School Health (FRESH)** program is a research-based nutrition education program that Johns Hopkins Bayview Medical Center provides to elementary schools in Southeast Baltimore. Started in 1989 as part of the Heart Health Program, the program is aimed at helping students learn the importance of healthy eating and regular exercise.
- The **Center for Health/Salud and Opportunity for Latinos (Centro SOL)** was established August 2013 to enhance the health of Latinos in Baltimore and beyond by combining coordinated clinical care with advocacy, education and research. The Center brings together medicine, pediatrics, gynecology and obstetrics and psychiatry in a wide variety of health services and education initiatives. Centro SOL partnerships include a Latino HIV outreach program run in conjunction with El Zol, a leading Spanish-language radio station, and La Esperanza Center.

J-CHiP – transforming health care from the ground up

One of the greatest challenges of health care reform is to ensure that people can get "the right care, at the right time, in the right place and at the right cost." This can be especially difficult for people who have multiple health problems, and who may be wrestling with other issues that affect their ability to access needed services, such as poverty and language barriers.

The Johns Hopkins Community Health Partnership (J-CHiP), launched in 2012 with a \$19.9 million grant from the federal Center for Medicare and Medicaid Innovation, serves residents of seven East and Southeast Baltimore ZIP codes who are enrolled either in Johns Hopkins HealthCare's Priority Partners (a Medicaid managed care plan) or Medicare. The program seeks to focus on high-risk patients who are the most frequent (and highest-cost) users of health services. This high-risk group is estimated to include about 1,000 Priority Partners and 2,000 Medicare patients. As of December 2014, about 2,800 residents of the targeted neighborhoods have enrolled in J-CHiP and have been assigned a community-based care coordinator.

Data on the 1,000 high-risk Priority Partners patients targeted by J-CHiP highlight some of the challenges inherent in serving this population.

- They represent about 14 percent of all Priority Partners patients in the area, but account for 76 percent of all hospital admissions.
- During the twelve months ended October 2012 (that is, just as J-CHiP was being launched), the cost of health care provided to these patients averaged \$29,679 per person – about 5.5 times the average cost for low- to moderate-risk Priority Partners patients in the same community.
- The incidence of chronic illnesses and behavioral health problems among the target population is very high; 98 percent, for example, have some type of heart disease, 84 percent suffer from hypertension, 71 percent smoke, and 49 percent have diabetes.

In serving these patients, J-CHiP seeks to improve their health and their experience in dealing with the health care system, and to reduce the cost of caring for them. J-CHiP's approach to achieving its three goals involves:

- The use of 34 community health workers (employed by neighborhood partner organizations) to connect with and enroll J-CHiP-eligible patients
- Using 40 nurse case managers to conduct initial assessments, develop care plans, interact regularly with patients, coordinate the delivery of services across teams of health care professionals, and coordinate with other institutions (such as skilled nursing facilities) that may be involved in caring for J-CHiP patients
- Providing primary care through six Health System sites in the community
- Having J-CHiP community health workers provide ongoing support – for example, by monitoring and encouraging compliance with medication schedules

Project managers have also focused on collecting data and developing metrics for measuring J-CHiP's impact. This will enable them (and the Johns Hopkins Health System more broadly) to determine not only whether J-CHiP has improved the health and well-being of project participants while also reducing costs, but also whether its impact is great enough that it can begin to “move the needle” on these measures for the community J-CHiP serves.

Quantifying the value of community benefits

Like other not-for-profit hospitals, The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center are required by the federal government to track and report annually on the benefits they provide to their community. Table 14 provides information on the dollar value of various community benefits that the two hospitals provided in fiscal year 2014. These benefits include:

- Direct health services aimed at improving the lives of community residents
- Education of health professionals – for example, through clinical training of medical and nursing students
- Unreimbursed research costs for providing community-based services - for example health information websites

- Contributions to local community organizations
- Community-building activities, such as economic development, workforce development and housing improvement programs
- The cost of operating and managing community service programs
- Unreimbursed costs incurred in serving Medicaid patients
- The cost of free or heavily discounted “charity care” provided to uninsured low-income patients.

As Table 14 shows, the value of community benefits provided by JHH and JHBMC in fiscal year 2014 totaled more than \$246.4 million.

TABLE 14:

Value of community benefit and charity care activity, FY 2014

Community Benefit Activity	Johns Hopkins Hospital	Johns Hopkins Bayview Medical Center
Community Health Services	\$9,841,187	\$3,850,715
Health Professions Education	\$112,589,611	\$24,294,846
Mission Driven Health Services	\$17,593,085	\$3,290,509
Research	\$984,078	\$200,574
Cash & In-Kind Contributions	\$3,145,720	\$1,709,318
Community Building Activities	\$2,936,162	\$287,992
Community Benefits Operations	\$605,532	\$134,008
Unreimbursed Medicaid Costs	\$7,854,247	\$2,208,985
<i>Subtotal, Community Benefits</i>	<i>\$155,549,622</i>	<i>\$35,976,948</i>
Charity Care	\$32,721,000	\$22,183,000
Total Community Benefit and Charity Care	\$188,270,622	\$58,159,948

Student engagement in community service

Baltimore neighborhoods and their residents also benefit from engagement of Johns Hopkins students in various forms of community service – through volunteer work; through “service learning” courses, which combine classroom learning with practical experience in the provision of community services; and through internships and other forms of on-the-job learning.

On the Homewood campus

The **Center for Social Concern (CSC)** is the primary focal point on the Homewood campus for student engagement with and service to Baltimore communities.

One of CSC’s oldest and largest initiatives is the **Johns Hopkins Tutorial Program**. Every year during the fall and spring semesters, the Program brings approximately 100 Baltimore elementary school students to the Homewood campus for two one-on-one, hour-long tutoring sessions each week. The assistance provided is tailored to each student’s needs in reading and math, based on individual assessments conducted at the beginning of the semester. In 2013-2014, the 126 Johns Hopkins student volunteers participating in the program contributed almost 18,000 hours.

The Center also provides a home for approximately 65 student groups who provide a wide variety of services. For example:

- **Thread**, founded in 2004 by a Johns Hopkins graduate student and her husband, provides mentoring, assistance in day-to-day activities and access to community resources for at-risk students attending three Baltimore high schools. In 2013-2014, 200 Homewood campus students devoted more than 8,600 hours to working with Thread students attending the City’s Academy for College and Career Exploration (ACCE).
- Through **Health Leads** – a program started in Boston in 1996 and now active in 15 U.S. cities – Johns Hopkins students staff help desks in several Baltimore clinics, providing assistance in gaining access to a wide range of resources and benefits. In 2013-2014, 75 Homewood students worked a total of 8,300 hours as Health Leads volunteers.
- The **GED Prep** program provides GED tutoring three days each week for two target groups: lower-skilled workers employed on the Homewood campus and residents of nearby neighborhoods. In 2013-2014, 17 Johns Hopkins students provided nearly 900 hours to GED students through this program.
- The **Johns Hopkins Jail Tutorial** provides GED preparation and conducts reading groups with female inmates at the Baltimore City Prison. In 2013-2014, 33 students provided 1,810 hours of volunteer work.
- The Johns Hopkins Chapter of **Habitat for Humanity** works with local affiliates to build housing for Baltimore families. In 2013-2014, 60 students performed 1,376 hours of volunteer work on Habitat projects.

In 2013-2014, Homewood students performed a reported 97,528 hours of community service. Over 1,500 students performed nearly 76,000 hours of community service work through CSC based programs.

CSC also administers the **Community Impact Internship Program (CIIP)**. Each summer, CIIP places 50 undergraduates in eight-week, full-time, paid internships with local community organizations and agencies to work on community projects. All CIIP interns are paid a salary of \$4,000 for the summer.

In East Baltimore

At the East Baltimore campus, **SOURCE** – the Student Outreach Research Center – provides a focal point for community engagement among students in the School of Medicine, the School Nursing and the Bloomberg School of Public Health. The following are examples of SOURCE's programs:

- The **Connection Community Consultant Group** assists community organizations with a variety of short-term projects. In 2013-2014, 26 student volunteers provided 890 hours of volunteer consulting work.
- **Bienestar Baltimore** focuses on helping to meet the health needs of the City's Latino community, through services such as prenatal education, tuberculosis screening and prevention programs, and diabetes screening.
- The **SOURCE Service Scholars Program**, launched in 2012, trains a select group of medical, nursing and public health students in service learning methods and in working collaboratively with community partners. In 2013-2014, 13 SOURCE scholars and 114 other student recruits worked a total of 4,663 hours on community-identified projects.

In addition to SOURCE's programs, all three schools on the East Baltimore campus offer a variety of service learning courses. For example:

- In 2013-14, 49 student nurses participated in service learning courses recording approximately 1,850 hours of service, the majority of which were in the School of Nursing's Community Outreach Placement (COP) program serving approximately 1,000 community members.
- The 203 students who participated in the Bloomberg School of Public Health's service learning courses, such as the Baltimore Community Practicum course, performed 5,516 hours of work in the community.
- Through the School of Medicine's TIME: Health Care and Disparities service learning course, 120 medical students performed approximately 480 hours of service during 2013-14.

During 2013-14, SOURCE estimates that between its volunteer programs and service learning programs such as those described above, students at the three schools provided over 24,400 hours of service to the community – primarily but not exclusively in East Baltimore.

The Schools of Medicine and Nursing and the Bloomberg School of Public Health are not the only schools at Johns Hopkins offering service learning courses. At the Carey Business School, for example, MBA students are required to complete a "capstone" project, in which teams of students work as consultants to a company or a non-profit organization, helping its leaders address a real-world business problem. We estimate that Johns Hopkins students provided more than 16,000 hours of consulting services to these organizations in 2013-14.

Johns Hopkins as a cultural resource

Johns Hopkins also contributes to the life of Baltimore communities through its role as a major cultural institution, with music, dance and theater performances, museums and lectures that are open to members of the University community and to neighborhood residents as well.

The Peabody Institute – the oldest school of music in the U.S., and one of the core institutions in the City’s Mount Vernon cultural district – offers a range of cultural opportunities to community residents that few institutions can match. Peabody has averaged about 15,000 annual total attendees at ticketed concerts. Through its community engagement programs Peabody employees and students touch the lives of more than 20,000 Baltimore City residents, mostly youth, each year. Through its **Peabody Prep** division, the Institute provides opportunities for promising children and adolescents to develop their talents; and also offers instruction in music and dance to community residents of all ages and all skill levels.

In 2013-2014, approximately 1,800 young people and adults enrolled in programs offered by Peabody Prep; together they accounted for more than 5,500 enrollments. (As these numbers imply, many students enroll in multiple classes or programs.)

Peabody Prep offers instruction at the Institute’s Mount Vernon campus and at three satellite locations – in Towson, in Howard County and in Annapolis. In 2013-2014, the Mount Vernon Campus accounted for 63 percent of all Prep enrollments.

Several of the programs Peabody offers are of particular relevance to young residents of Baltimore.

- The Institute’s **Music Teacher Mentoring Program (MTMP)**, founded in 1998, provides mentoring and support for music teachers in more than 70 public schools in Baltimore. The program assists teachers not only with music pedagogy, but also with practical matters such as writing grant proposals.

- Each year, MTMP participants nominate promising low-income Baltimore middle and high school students to participate in Peabody’s **Tuned-In** program. Tuned-In provides instruments, individual lessons, music theory classes, participation in Peabody ensemble performances and other opportunities. Begun in 2007 with seven students, Tuned-In now serves about 50 students each year.
- Started by a Peabody Conservatory composition student in 2007, Peabody’s **Junior Bach** programs gives students at a nearby middle school (St. Ignatius Loyola Academy) an opportunity to learn about and express themselves through music composition. About seven students each year participate in the program.
- Each year the **Estelle Dennis/Peabody Dance Training Program** provides tuition-free dance training to about 20 Baltimore boys ages 9 through 15.

In addition to the music education programs it offers, Peabody presents nearly 100 major concerts and performances each year, many of which are free and open to the public, and hundreds of student recitals, all of which are free. In addition to these on-campus events, a Peabody Conservatory student organization, **The Creative Access**, brings about 80 concerts and individual performances each year to hospitals, nursing homes, senior housing and other Baltimore community venues.

In addition to those offered by the Peabody Institute, Johns Hopkins offers a variety of other cultural opportunities to local residents.

- The **Hopkins Symphony Orchestra (HSO)** is a 150-member community orchestra, founded in 1981. Its members – who include Johns Hopkins students, faculty members and staff, as well as other community residents – are chosen through annual open auditions. In addition to full orchestral and chamber music performances, HSO offers mentoring for public school students, lectures and demonstrations.

- The annual **Shriver Hall Concert Series (SHCS)** – one of the leading chamber music programs in the U.S. – started in 1965 as a university-sponsored concert series. SHCS became an independent non-profit organization in 1970 – but continues to present its concerts on the Homewood campus. SHCS presents eleven concerts each year, including three free “discovery concerts” featuring up-and-coming young performers.
- The **Johns Hopkins University Theatre**, affiliated with the School of Arts and Sciences, stages several plays each year.
- Johns Hopkins is the home of three museums. The **Homewood Museum** and the **Archaeological Museum** are located on the University campus and the **Evergreen Museum** which is slightly north of the Homewood campus. All are open to the public and offer various programs throughout the year for general audiences.
- The Johns Hopkins **Foreign Affairs Symposium (FAS)** is a free, student-run lecture and discussion series on global issues that began in 1998. Each spring, FAS events give members of the University community and others an opportunity to interact with international leaders and experts, and with each other. Speakers in the spring of 2014 included Maryland Governor Martin O’Malley, former U.N. Ambassador John Bolton, Cornel West, and a debate between former NSA and CIA Director Michael Hayden and Georgetown Law Professor David Cole on privacy and national security.

Strong neighborhoods, strong city

In an era when the strength of a city's economy depends on its ability to attract, develop and retain talent, cities are in the long run only as strong as their neighborhoods. Through the programs described here and many others, Johns Hopkins is helping to improve the communities in which it operates, and others throughout Baltimore.



Kennedy Krieger

Kennedy Krieger Institute

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PART EIGHT

The Impact of Affiliated Institutions

Beyond the impact of Johns Hopkins itself, Baltimore's economy is strengthened by the presence of institutions which have chosen to locate on or near Johns Hopkins' campuses. While they exist separately from Johns Hopkins and have their own leadership, governing structures and funding, were it not for the presence of Johns Hopkins these institutions might not have located in Baltimore. Several such institutions were identified in Part One.

This part of the report highlights the contributions of five affiliated institutions – the Kennedy Krieger Institute, the Space Telescope Science Institute, the Lieber Institute for Brain Development, the Howard Hughes Medical Institute, and the Carnegie Institution for Science – to the vitality of Baltimore's economy.

LEFT: The close location of prestigious research institutions on the Johns Hopkins campus, like the Kennedy Krieger Institute, facilitates collaboration between the nation's top researchers.

Five diverse institutions

The five institutions cited above differ significantly in the scale and scope of their activities, in the length of their tenure in Baltimore, and (to a lesser extent) in the nature of their relationship with Johns Hopkins.

Kennedy Krieger Institute

The oldest and largest of the affiliated institutions is the Kennedy Krieger Institute. Founded in 1937, the Institute serves children and adolescents suffering from disorders of the brain, spinal cord and musculoskeletal system. Kennedy Krieger provides health care, rehabilitation and educational services; conducts research on childhood disabilities; and provides training in caring for disabled children.

Kennedy Krieger's principal facilities are adjacent to the Johns Hopkins East Baltimore campus. The Institute also operates a private school for disabled children (grades K through 8) in East Baltimore; a high school for disabled students in the City's Greenspring neighborhood; and a school for grades 2 through 8 in Montgomery County. In addition to its own educational programs, Kennedy Krieger supports special education through partnerships with public schools in Baltimore City and in 12 other counties in Maryland.

With research expenditures totaling approximately \$29.6 million in fiscal year 2014, Kennedy Krieger is a leading center for research on the causes, prevention and treatment of neuro-developmental disabilities. A significant portion of the Institute's research funding comes from sources outside Baltimore. The Institute also provides specialized training for hundreds of medical, education and other professionals who come to Baltimore each year for specialized training in caring for disabled children. Many of the Institute's senior faculty members hold joint appointments at Johns Hopkins.

In fiscal year 2014 the Kennedy Krieger Institute had revenues of \$217.8 million and employed 2,601 people – an increase of 335 jobs (14.8 percent) since fiscal year 2009. The Institute's payroll in fiscal year 2014 totaled \$128.3 million.

Space Telescope Science Institute

The Space Telescope Science Institute (STScI) manages scientific research, education and public outreach programs for two NASA observatories:

- The Hubble Space Telescope (HST) was launched in 1990 and is still in use as it approaches the 25th anniversary. During that time, it has revolutionized diverse fields spanning the full gamut of astronomical research.
- Its successor, the James Webb Space Telescope (JWST), scheduled for launch in 2018, will study infrared light from the Universe. JWST's science goals include answering some of our most fundamental questions about the origin of the cosmos and life in the universe.

STScI is also a partner with the NASA Ames Laboratory, the Jet Propulsion Laboratory and several other organizations in NASA's Kepler Mission, which is searching the galaxy for planets that are potentially capable of supporting life.

Founded in 1981, STScI – which is located adjacent to the Johns Hopkins Homewood campus – is managed by the Association of Universities for Research in Astronomy (AURA – a consortium of leading space research institutions) under a contract with NASA. Research spending at the Institute in fiscal year 2014 totaled \$108.9 million – an increase of 26.8 percent since fiscal year 2009.

During the same five-year period, employment at STScI rose from 395 to 468 people – an increase of 18.5 percent. In fiscal year 2014, salaries and wages paid to STScI employees (97 percent of whom work full-time) totaled nearly \$46.0 million.

Lieber Institute for Brain Development

The Lieber Institute for Brain Development is a non-profit research foundation, founded in 2010, that focuses on abnormalities in brain development and their role in schizophrenia and other diseases. Its work includes:

- Basic research on the development of the human brain
- Clinical research aimed at developing new treatments for schizophrenia and related disorders that are rooted in a better understanding of the brain
- Development of new drugs to treat these diseases

The Lieber Institute is located in the Rangos Building, the first research facility constructed in the East Baltimore Science + Technology Park. The Institute chose this location in part due to the opportunities it offers for collaboration with researchers at Johns Hopkins.

From a staff of 11 in 2010, the Lieber Institute has grown to a staff of 101 in 2014, of whom 97 percent work full-time, with a payroll of more than \$14.4 million in fiscal year 2014.

The Lieber Institute's decision to locate in the City and its subsequent growth provide a notable example of the role that Johns Hopkins can play in attracting other not-for-profit research organizations to Baltimore, and in supporting their growth.

Howard Hughes Medical Institute

The Howard Hughes Medical Institute, with headquarters in Chevy Chase, is one of the country's leading independent, non-profit biomedical research foundations. The Institute employs teams of senior scientists, post-doctoral researchers and graduate students in labs that are typically located on the campuses of leading U.S. research universities, including the Johns Hopkins campus in East Baltimore. In fiscal year 2014, the Institute employed 62 people in East Baltimore, with an annual payroll of nearly \$5.3 million.

Carnegie Institution for Science, Department of Embryology

The Carnegie Institution for Science, founded by Andrew Carnegie in 1902, is a Washington, D.C.-based independent non-profit research institute. Its Department of Embryology has long been affiliated with Johns Hopkins and has since 1960 been located on the University's Homewood campus. In fiscal year 2014, the Department of Embryology employed 95 people with an annual payroll of \$4.3 million.

The impact of affiliated institutions

The five institutions profiled above contribute substantially to Baltimore's role as a leading center for health care, education, research and innovation. Collectively they employed 3,328 people in the spring of 2014, with a combined payroll of nearly \$198.3 million and research expenditures totaling nearly \$158.2 million in fiscal year 2014. And they have been active participants in the City's recovery, collectively adding more than 500 jobs in Baltimore between spring 2009 and spring 2014.

Based on data provided by the institutions, we estimate that of these 3,328 employees, 1,624 – approximately 49 percent of the total – were residents of Baltimore. We further estimate that approximately \$90.6 million in wages and salaries was paid to residents of Baltimore by these institutions.

TABLE 15:

Selected Johns Hopkins affiliates in Baltimore: Jobs, payroll and research spending, FY 2014 (\$000s)

Institution	Employees	Payroll	Research spending
Kennedy Krieger Institute	2,601	\$128,333.5	\$29,627.7
Space Telescope Science Institute	468	\$45,997.4	\$108,896.4
Lieber Institute for Brain Development	101	\$14,380.0	\$14,100.0
Howard Hughes Medical Institute	62	\$5,260.2	\$5,547.1
Carnegie Institution/Embryology	95	\$4,303.3	–
TOTAL	3,328	\$198,274.5	\$158,171.2

Impact of spending by affiliated institutions

As with Johns Hopkins itself, the impact of the affiliate institutions' spending on payroll and purchasing goes beyond their role as major employers.

Using data provided by the institutions, we estimate that they spent \$117.1 million on purchases of goods, services and construction in fiscal year 2014, of which approximately \$44.7 million was spent with Baltimore-based vendors and contractors. We estimate that this spending directly generated 263 FTE jobs in Baltimore in fiscal year 2014.

In addition to the direct spending impact cited above, spending by the affiliates also generated indirect and induced impacts in Baltimore. As shown in Table 16, through the multiplier effect, we estimate that in fiscal year 2014, the five affiliates' spending on payroll, purchasing and construction indirectly generated 538 FTE jobs and nearly \$108.3 million in economic output in Baltimore.

In total, we estimate that spending by the five affiliates directly and indirectly generated 4,129 FTE jobs and \$351.3 million in economic output in Baltimore in fiscal year 2014.

TABLE 16:

Direct, indirect and induced impact of affiliated institutions' spending in Baltimore, FY 2014 (jobs in FTE, wages and output in \$000s)

	Jobs	Wages	Output
Direct spending impact			
Payroll	3,328	\$198,274.5	\$198,274.5
Purchasing/construction	263	\$19,234.0	\$44,742.8
<i>Subtotal, direct impact</i>	<i>3,591</i>	<i>\$217,508.5</i>	<i>\$243,017.3</i>
Indirect and induced effects			
Employee spending	418	\$24,799.8	\$90,912.7
Contractor and vendor spending	121	\$7,557.5	\$17,380.4
<i>Subtotal, indirect/induced impact</i>	<i>538</i>	<i>\$32,357.3</i>	<i>\$108,293.0</i>
TOTAL	4,129	\$249,865.8	\$351,310.3



PART NINE

Johns Hopkins and the Future of Baltimore's Economy

Johns Hopkins has long been a mainstay of Baltimore's economy – the City's largest private employer, one of its leading private investors and its leading research institution; a magnet for and developer of talented students, faculty, researchers and clinicians; and a source of innovation and new business development.

During the next five to ten years, both the University and the Johns Hopkins Health System will face significant challenges, including pressures to control the cost of higher education, constraints on federal research funding, and the ongoing transformation of the financing, delivery and management of health care in the U.S. Nevertheless, despite these challenges, the University's and the Health System's impact on the Baltimore economy could be even greater in the future than it is today. This is so for several reasons.

LEFT: Johns Hopkins drives economic development in Baltimore by supporting local start-ups with its business accelerators FastForward and FastForward East, which is shown here.

Developing human capital

For more than a century, Johns Hopkins students and alumni have been active participants in the development of Baltimore's human capital. As the City's economy becomes progressively more knowledge-based, the University's role as a magnet for and developer of talented undergraduates, graduate and professional students, post-docs and residents takes on greater significance. Moreover, the continued growth of the Johns Hopkins research enterprise (discussed below), the quickening pace of innovation and new enterprise development both at Johns Hopkins and elsewhere, and increased student engagement in local communities in Baltimore, can all help make it more attractive for Johns Hopkins students to stay in the City after they graduate.

Unsurpassed strengths in research

Despite constraints on overall federal research spending, Johns Hopkins is particularly strong in several areas of research that are likely to remain top priorities for the federal government, such as brain science, life sciences, genomic medicine, health care quality and patient safety, public health, national defense and information security.

As noted in Part Four, Johns Hopkins has had some success in recent years in diversifying the funding of University research. Between fiscal year 2010 and 2014, research spending that was funded from corporate, philanthropic and other non-government sources grew by 50 percent. This trend is likely to continue.

Moreover, in an era when the development of new solutions to the nation's most pressing problems more than ever requires collaboration across disciplines and sectors, Johns Hopkins provides within a single integrated enterprise, a platform for collaboration among scientists, engineers, clinicians, entrepreneurs and business professionals that few other institutions can match. This capacity for collaborative research will be greatly enhanced during the next five years, as new faculty members are recruited to fill the Bloomberg Distinguished Professorships – fifty new positions that (as described in Part Four) will be filled by leading scholars with a strong focus on interdisciplinary research and teaching. These new faculty members will enhance Johns Hopkins' ability to address the country's most critical research needs – and to attract both research funding and talent to Baltimore.

For these and other reasons, Johns Hopkins research is likely to remain one of Baltimore's strongest industries.

A growing emphasis on innovation and entrepreneurship

For the past several years, Johns Hopkins has been working to develop a culture of innovation and entrepreneurship within the University, and to develop the resources needed to support the translation of new knowledge and new technologies into new products, new businesses and new jobs.

Evidence that this effort is producing results is growing year by year. It is evident in both the University's formal technology transfer metrics and in the growing presence in Baltimore of young entrepreneurial companies (such as those highlighted in Part Six) with roots at Johns Hopkins.

It is important to recognize that the value to the City of the University's investments in innovation and enterprise development is best measured by its cumulative impact over time – not just by the 10 or 15 new companies created in any year with technologies licensed from Johns Hopkins, but by the 100 to 150 that might be started over the course of a decade. Moreover, the knowledge, resources and support provided through programs such as the Center for Bioengineering Innovation and Design, the Johns Hopkins Business Plan Competition, Fast Forward and DreamIt Health will help not only to increase the number of new businesses that are created, but also to improve the odds that those businesses will survive, attract outside investment, grow and succeed in the marketplace.

Investing in communities

The investments that Johns Hopkins has made in innovation and enterprise development have been matched by its investments in the communities where it operates. As described in Part Seven, Johns Hopkins has been a major participant in the ongoing redevelopment of an 88-acre site adjacent to its East Baltimore campus. Over time, the development of new housing, the Henderson-Hopkins School, an increase in the number of people working in the Science + Technology Park, the creation of Eager Park and other improvements will help make East Baltimore a more attractive place to live, work and do business.

More recently, Johns Hopkins has also played a leading role in the Homewood Community Partners Initiative, which is helping to revitalize the neighborhoods that surround the University's Homewood campus.

In the years ahead, through its recently-refocused “economic inclusion” efforts, Johns Hopkins will also help ensure that residents of and businesses in these neighborhoods have the opportunity to participate in their revitalization, and in the continued growth of the Johns Hopkins enterprise.

The transformation of health care

Johns Hopkins has been a leader in the ongoing transformation of the nation's health care system from one that focuses primarily on treating sick people to one that focuses on maintaining and managing the health of whole populations. Even as the Johns Hopkins Health System continues to extend its reach to new markets and new populations, it remains anchored in Baltimore – and well-positioned to help ensure that the City remains a leading center for the delivery of health services, and for efforts to expand access to, improve the quality of and reduce the cost of health care.

Headquarters for a global enterprise

Johns Hopkins is increasingly a global enterprise. Between 2010 and 2014, the number of international students attending the University grew by 39 percent; the number of international inpatients treated at The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center grew by 76 percent; and the number of international outpatients treated at the two hospitals more than doubled. Johns Hopkins has thus been the principal contributor to the emergence of both higher education and health care as two of the City's fastest-growing export industries.

Beyond the international students, patients and visitors Johns Hopkins brings to Baltimore, the City also benefits from both the University's and the Health System's engagement in education, research and health care delivery in other countries.

During the next five to ten years, the international higher education and health care sectors are likely to present further opportunities for growth. Demand for both higher education and health care will be growing more rapidly outside than inside the U.S. The worldwide visibility and reputation of Johns Hopkins will make it a preferred partner for institutions in other countries that are growing to meet that demand – and will for many consumers of higher education and health care make Baltimore a preferred destination.

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