



LIFE SCIENCES MARYLAND

Jobs Analysis & Economic Impact Report 2011 • Jobs Analysis & Economic Impact Report 2011 • Jobs Analysis & Economic Impact Report 2011

A Maryland Department of Business &
Economic Development Research Report

*Measuring the job growth fueled by life
sciences research and development in private,
federal and academic facilities in Maryland
between 2002-2010*

Martin O'Malley, Governor
Christian S. Johansson, Secretary



HIGHLIGHTS

LIFE SCIENCES MARYLAND is a Jobs Analysis and Economic Impact Report conducted by the Department of Business & Economic Development.

KEY FINDINGS

- Maryland's life sciences leadership is the result of research preeminence in private companies, federal facilities and academia. The number of principal organizations conducting industry research and testing include:
 - 500+ Private Companies
 - 15 Federal Facilities
 - 16 Universities & Colleges
- Maryland leads the nation in university conducted life sciences research per capita
- The life sciences sector accounted for one-third of all job gains during 2002 to 2010
- 94% of all private life sciences jobs are in two areas: Research, Testing & Medical Labs (74%); and, Drugs & Pharmaceuticals (20%)
- Between 2002 and 2010, private life sciences salaries grew almost 50% from \$60,906 to \$91,034
- Health & Human Services is the largest federal life sciences employer in Maryland with 22,840 of the 29,777 federal jobs
- The Capital Region has the highest concentration of private (15,832) and federal (28,591) life sciences jobs; the Baltimore Region second largest cluster of private (13,994) and federal (1,186) jobs
- 96% of all federal life sciences jobs (28,591) are in the Capital Region (Frederick, Montgomery and Prince George's counties)

DIRECT IMPACTS

- Over 1,700 private sector establishments are directly involved in life sciences work - 5th highest concentration in the US
- Life sciences directly accounts for 71,600 jobs - 3% of all jobs in Maryland
 - 33,600 Private
 - 29,800 Federal
 - 8,250 Academic
- Maryland life sciences direct salaries total \$6.5 billion
- Average life sciences salary across sectors is \$91,100, 76% higher than the state's average
- 6% of Maryland's GDP – \$17.6 billion – is generated by the life sciences

SECONDARY IMPACTS

- Including direct, indirect and induced jobs, the life sciences support 160,030 jobs -- 6.5% of the state's total -- and equivalent to \$9.6 billion in salaries
- Life sciences activity support nearly \$500 million in annual income and sales taxes

INTRODUCTION

Among states, Maryland has been a national life sciences leader since the earliest years of this field due to the state's perennial leading position as a site for federal, academic and private life sciences activity. This report highlights the economic role and impact of life sciences in Maryland by explicitly recognizing the importance of each of these three categories.

Maryland's leadership position in life sciences research is driven by the research conducted in its world class federal, academic and private industry laboratories. The industry is a significant part of the \$14 billion in total research and development conducted in the state. Life sciences are also supported by the intellectual capital of university, government research and non-profit institutions.



DEFINITIONS

Life sciences can be described as how knowledge of life – from microbes to plants and animals to humans – can be applied broadly to improving human and animal health, the quality of food, and the protection of the environment. The interdisciplinary and interdependent nature of discovery in life sciences requires a wide variety of technologies to support this pipeline of development, including molecular biology, nanotechnology, engineering and software. In almost all disciplines, information technology becomes a critical tool to analyze the unprecedented volumes of data generated by high throughput screening, genomic sequencing and population studies.

We developed a definition of life sciences that spans the breadth of research, development and support activities. Along with private sector life sciences, we wanted to recognize the significant activity occurring at federal research centers and academic institutions in Maryland, resulting in a three-pronged definition. Our definition recognizes the principle that life sciences activity is not defined or distinguished necessarily by the products or services it creates, but is better characterized by the application and development of knowledge regarding the functioning of living things, such as plants, people or animals. Our definition excludes hospital and health care providers to the extent possible.

Private Sector Life Sciences Activity Definition Used in This Report

| NAICS | NAICS Industry Title |
|---|--|
| Agricultural Feedstock and Chemicals | |
| 325199 | All Other Basic Organic Chemical Manufacturing |
| 325221 | Cellulosic Organic Fiber Manufacturing |
| 325311 | Nitrogenous Fertilizer Manufacturing |
| 325314 | Fertilizer (Mixing Only) Manufacturing |
| 325320 | Pesticide and Other Agricultural Chemical Manufacturing |
| Drugs and Pharmaceuticals | |
| 325411 | Medicinal and Botanical Manufacturing |
| 325412 | Pharmaceutical Preparation Manufacturing |
| 325413 | In-Vitro Diagnostic Substance Manufacturing |
| 325414 | Biological Product Manufacturing |
| Medical Devices and Equipment | |
| 333298 | All Other Industrial Machinery Manufacturing |
| 334510 | Electromedical and Electrotherapeutic Apparatus Manufacturing |
| 334516 | Analytical Laboratory Instrument Manufacturing |
| 334517 | Irradiation Apparatus Manufacturing |
| 339112 | Surgical and Medical Instrument Manufacturing |
| 339113 | Surgical Appliance and Supplies Manufacturing |
| Research, Testing and Medical Laboratories | |
| 541380* | Testing Laboratories |
| 541690 | Other Scientific and Technical Consulting Services |
| 541711 | Research and Development in Biotechnology |
| 541712* | Research and Development in the Physical, Engineering, and Life Sciences |
| 621511 | Medical Laboratories |
| 621512 | Diagnostic Imaging Centers |

The DBED definition of private sector life sciences is based on standard industry categories to reflect core life science activities

** Many facilities/establishments associated with this NAICS industry code are not actually engaged in life sciences activity. DBED identified the appropriate portion to include using methods described in the complete report. Source: DBED analysis based on Battelle Technology Partnership Practice.*

MAJOR FINDINGS

Maryland life sciences directly accounted for 71,618 Maryland jobs in 2010. These consisted of 33,602 private sector non-academic jobs, 29,777 federal non-academic jobs and 8,240 jobs in higher education. The life sciences directly accounted for \$6.5 billion in aggregate wages and salaries in 2010. These include \$3.0 billion in private life sciences wages and salaries and \$2.8 billion in federal government life sciences wages and salaries.

MARYLAND LIFE SCIENCES JOBS, WAGES AND SALARIES



PRIVATE SECTOR

JOBS
33,602

AGGREGATE WAGES & SALARIES
\$3.1 Billion

AVERAGE ANNUAL SALARY
\$91,034



FEDERAL GOVERNMENT

JOBS
29,777

AGGREGATE WAGES & SALARIES
\$2.8 Billion

AVERAGE ANNUAL SALARY
\$93,118



ACADEMIC

JOBS
8,240

AGGREGATE WAGES & SALARIES
\$692.7 Million

AVERAGE ANNUAL SALARY
\$84,074



TOTAL

JOBS
71,618

AGGREGATE WAGES & SALARIES
\$6.5 Billion

AVERAGE ANNUAL SALARY
\$91,100

Source: DBED analysis based on data from the Maryland Department of Labor, Licensing and Regulation

Maryland's 71,618 life sciences jobs are in the private sector, federal government and academic institutions

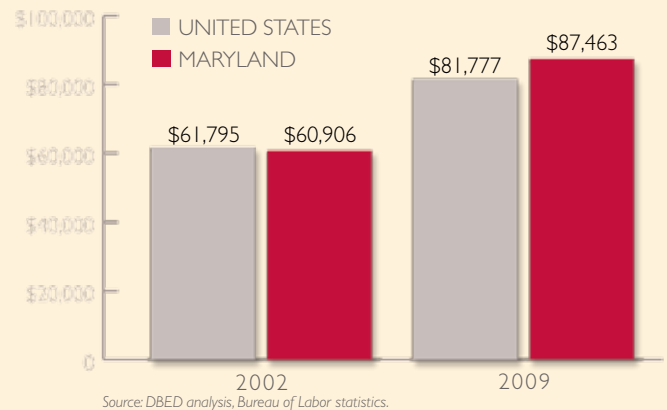


Private Industry

There are approximately 500 "core" life sciences companies in Maryland, engaged in biopharmaceutical discovery, research tools development, medical diagnostics and device development, as well as contract research and manufacturing organizations. These 500 companies are part of a broader network totaling over 1,700 establishments, including multiple facilities of medical labs, diagnostics and testing companies, specialized service providers and consulting services and direct suppliers of bio equipment. This private sector network accounted for 33,602 life sciences

jobs in 2010. Even though private life sciences accounts for a relatively small share of Maryland's economy (1.7% of the state's total private jobs), other factors highlight its importance to the economy. Among industrial sectors, life sciences enjoys one of the highest average worker salaries in the state and wages higher than the US average. In 2010, annual salaries in Maryland private life sciences were \$91,034 or 76% higher than the state average annual salary.

Maryland and U.S. Private Life Sciences Salaries 2002 and 2009



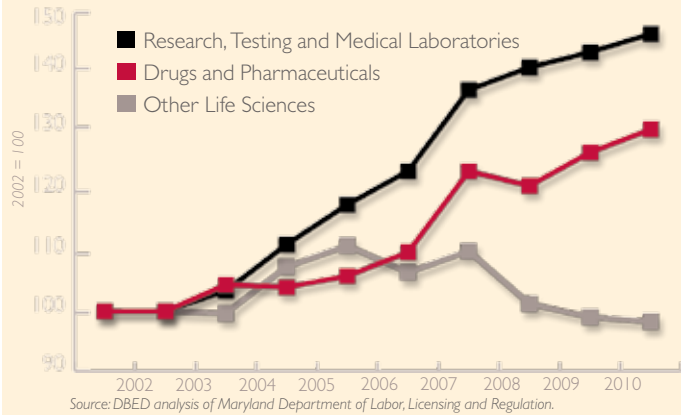
Maryland private life sciences salaries increased faster than U.S. private life sciences salaries 2002-2009 (44% vs. 32%)

Maryland private life sciences jobs are more highly concentrated in research, testing and medical laboratories than in the U.S. Nearly three-quarters of private Maryland life sciences jobs are in this sub-group, compared to roughly half of U.S. private life sciences jobs. On the other hand national life sciences employment is much more highly concentrated in medical devices and equipment and agricultural chemicals than in Maryland. Both in Maryland and nationwide, roughly 20% of private life sciences jobs are in drugs and pharmaceuticals.

Private life sciences jobs fall into four major sub-groups listed on page 1. The average size of research, testing and medical laboratories in Maryland is 16 jobs and the average medical devices and equipment facility has 23 jobs. Drugs and pharmaceuticals average over 100 jobs per facility, reflecting the presence of several major companies such as MedImmune with over 2,000 employees, BD Diagnostics with 1,600 employees and QIAGEN with 700 employees.

Since 2002 Maryland private life sciences has added jobs much faster than the state. This has been true both before and after the 2007-2009 recession. Maryland private life sciences employment stood 39% higher in 2010 than in 2002, compared to 20% growth nationwide. Remarkably, the life sciences sector accounted for over one-third of all of Maryland's job gains during 2002-2010. It did this, despite accounting for a mere 1% of all Maryland nonfarm payroll jobs back in 2002. Research testing and medical laboratories drove private life sciences job growth during 2002-2010. Thus subgroup grew at more than twice the rate of the rest of private life sciences combined and added more than five times as many jobs.

Maryland Private Life Sciences Job Growth Driven by Research and Testing 2002-2010



Maryland private life sciences jobs increased nearly 40% from 2002-2010

Maryland's concentration of private life sciences establishments is the 5th largest in the country, with a 20% higher concentration of life sciences establishments than the U.S. Maryland's concentration of private life sciences employment is the 9th largest in the country, with a 60% higher concentration of life science employees than the U.S.

Maryland Private Life Sciences Jobs, Salaries & Facilities 2010

| Sub-group | Employment | | Facilities | Avg. Salary |
|--|---------------|-------------|--------------|-----------------|
| | Jobs | Share | | |
| Agricultural Feedstock and Chemicals | 256 | 0.8% | 22 | \$63,780 |
| Drugs and Pharmaceuticals | 6,574 | 19.6% | 65 | \$102,084 |
| Medical Devices and Equipment | 1,962 | 5.8% | 86 | \$67,612 |
| Research, Testing and Medical Laboratories | 24,810 | 73.8% | 1,579 | \$90,239 |
| Total | 33,602 | 100% | 1,752 | \$91,034 |

Maryland's private sector life sciences jobs are largely found in research, testing and medical laboratories

Source: DBED analysis of data from the Maryland Department of Labor, Licensing and Regulation.



Federal Facilities

The federal government serves an important role in promoting and supporting national life sciences activity. It is a major funding source for research and development primarily through the National Institutes of Health (NIH) and provides critical oversight and support for private sector life sciences. The Food and Drug Administration (FDA), for example, supports the federal drug approval process allowing private pharmaceutical manufacturers to bring new drugs to market. Federal grants and procurement for life science activities represented over \$1.5 billion in Maryland in FY 2010.

The government's own laboratories conduct much of the nation's most significant life sciences research in Maryland, while administering programs that furnish additional training and experience to young researchers. Federal labs actively promote the transfer of technologies they have developed or goods they have invented to the broader economy. These transfers encourage economic growth and support further development and R&D by both private and academic research organizations.

DBED estimates that federal laboratories and support facilities account for the second largest Maryland life sciences group with 29,777 jobs. The largest facility is the National Institutes of Health (NIH) headquarters and main campus in Bethesda, with 14,261 jobs. Including all of its five facilities, NIH accounts for an estimated 16,397 jobs or 55% of Maryland federal life sciences jobs. The second largest is the FDA headquarters in Silver Spring, with 5,745 jobs, or 19% of the state's federal life sciences jobs. The Department of Defense accounted for 4,614 jobs or 15% of the total.

Maryland Federal Life Sciences Research & Support Facilities

| Agency/Facility Name | Jobs |
|---|---------------|
| Department of Defense | |
| Aberdeen Proving Ground - Edgewood Campus* | 550 |
| Fort Detrick - Army Medical Research and Materiel Command | 3,199 |
| Walter Reed Army Medical Center Forest Glen Annex | 865 |
| U.S. Department of Health and Human Services | |
| National Institutes of Health | |
| NIH main campus | 14,261 |
| National Cancer Institute, Rockville | 250 |
| National Cancer Institute, Frederick | 1,000 |
| Biomedical Research Center, Bayview | 636 |
| National Cancer Institute - Center for Cancer Research | 250 |
| Center for Food Safety and Applied Nutrition | 698 |
| Food and Drug Administration | 5,745 |
| U.S. Department of Agriculture | |
| Foreign Disease-Weed Science Research Unit | 53 |
| Henry A. Wallace Beltsville Agricultural Research Center | 1,700 |
| Animal and Plant Health Inspection Service | 150 |
| Other | |
| National Institute of Standards and Technology* | 270 |
| National Biodefense Analysis and Countermeasures Center | 150 |
| Total | 29,777 |

There are nearly 30,000 jobs at federal facilities in Maryland devoted to life sciences research

* Jobs listed represent DBED's estimate for employment accounted for by life sciences. Source: DBED.



Academic Institutions

Research funding is a vital component in the development and potential commercialization prospects of promising biopharmaceutical initiatives. Moreover, according to the Milken

Institute, the level of research funding is as an indicator of a region's future innovative capacity, as it aids in attracting companies, the appropriate workforce and necessary capital. University-based research is also an important component for the commercialization of research in the private sector.

In 2009 Maryland colleges and universities conducted \$1.45 billion in life sciences research and development. This ranked Maryland sixth in the country in academic life science R&D. At \$254 per person, Maryland institutions spent more intensively on life sciences research and development than any other state and over twice the national level. In 2009, Johns Hopkins University received \$738 million for life sciences R&D, including \$516 million for medical sciences and \$197 million for biological sciences.

| R&D Expenditures at Universities & Colleges by Institution and Field: FY 2009 (\$ in 1,000) | | |
|---|-----------|---------------|
| Institution | Total R&D | Life Sciences |
| Frostburg State University | 215 | 215 |
| Goucher College | 269 | 197 |
| Johns Hopkins University | 1,856,270 | 787,092 |
| Morgan State University | 12,351 | 1,673 |
| St. Mary's College of Maryland | 338 | 157 |
| Towson University | 4,025 | 465 |
| Uniformed Services U. of Health Sciences | 192,268 | 188,911 |
| University of Maryland Baltimore | 359,542 | 359,542 |
| University of Maryland Baltimore County | 75,571 | 5,093 |
| University of Maryland Biotechnology Institute | 45,921 | 32,029 |
| University of Maryland College Park | 409,190 | 70,997 |
| University of Maryland Eastern Shore | 7,504 | 4,038 |

Research expenditures of \$1.45 billion at Maryland universities generate over 8,000 jobs

Source: National Science Foundation

An examination of academic life science R&D expenditures indicates that the direct economic impacts associated with life sciences research are considerable. We estimate that \$1.45 billion in life sciences research at universities and college supports approximately 8,240 jobs and \$694 million in salaries and wages.

RESEARCH METHODOLOGY

DBED based its definition for private sector life sciences activity on one presented by Battelle. Our review of possible model definitions found that some were overly broad and others were too narrow. Battelle struck a balance between the extremes. We applied the definition to the Maryland 2010

Quarterly Census of Employment and Wages, an official count of state and county aggregate wages categorized by NAICS code. We also used data from the 2007 Economic Census. This process allowed us to estimate private life sciences jobs and wages.

Federal life sciences is defined as activity occurring at Maryland federal centers for research and development or life sciences support. We identified 15 such facilities, mostly research laboratories. We then applied publicly available information to estimate direct federal non-contractor life sciences jobs and wages, arriving at a total of 29,777 jobs at those facilities.

Academic life sciences is defined as Maryland-based scientific activity meeting the National Science Foundation's (NSF) criteria for academic life sciences research and development. There is no official count of academic life sciences research and support jobs. Therefore we estimated these jobs and associated wages by applying 2009 NSF spending data on life sciences academic research and development to QCEW data, the May 2010 Occupational Employment and Wages Statistics and the proprietary IMPLAN® Regional Economic Model for Maryland.

DBED applied the above definitions to estimate direct Maryland life sciences jobs and annual salaries. The overall economic impact includes the indirect and induced effects, together known as secondary effects. Indirect effects encompass jobs at Maryland firms not considered life sciences firms, but which enable life sciences facilities to operate by supplying key supplies and/or services. Induced effects include jobs supported by the local spending of Maryland residents that work in life sciences. DBED estimated the secondary effects by applying the direct effect to the above-mentioned Maryland IMPLAN® model.

Including all secondary impacts, Maryland life sciences supported an estimated 160,030 jobs, \$9.6 billion in wages and salaries and \$500 million in tax revenues. The total job impact represents 6.5% of all Maryland jobs and 7.6% of all Maryland wages.

Further details regarding the methodology can be found in the complete report.



LIFE SCIENCE LEADERS

Joseph Amprey, III, M.D., PhD
Chief Business Officer



Dr. Amprey, serves as Chief Business Officer of Zyngenia, Inc., a biotherapeutics company, founded in 2008. Dr. Amprey, recognizing the need to develop better

therapies for patients suffering from life threatening diseases, focuses the company's development of next generation multi-specific antibodies.

Francis S. Collins, M.D., Ph.D.
Director, National Institutes of Health



Dr. Collins oversees the work of NIH, the largest supporter of biomedical research in the world, spanning the spectrum from basic to clinical research.

A physician-geneticist, he is noted for his landmark discoveries of disease genes and his leadership of the international Human Genome Project.

Carol Greider, Ph.D.,
Daniel Nathans Professor and Director of Molecular Biology & Genetics Johns Hopkins School of Medicine



Dr. Greider, a molecular biologist, won a Nobel Prize in 2009 for her landmark discovery of the enzyme telomerase, which maintains the ends

of chromosomes and protects them from damage. Her work has laid the foundation for novel studies connecting telomerase to human cancer and diseases of aging.

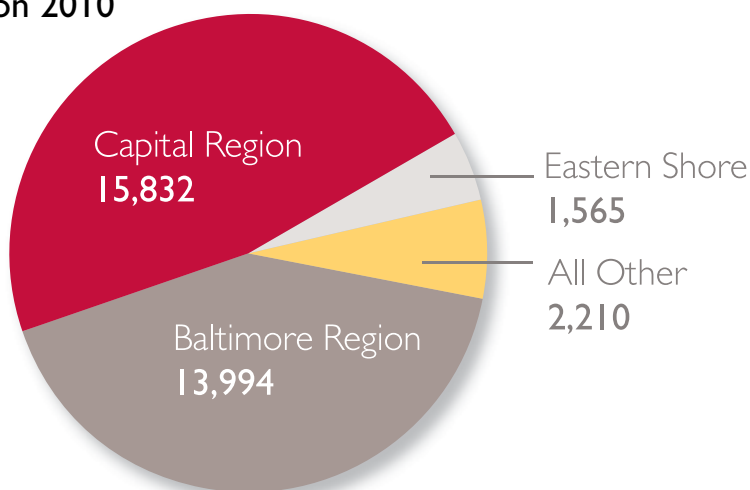
Johns Hopkins Medicine

| Maryland Economic Impact of Life Sciences Activity 2010 | | | | |
|---|----------------|-------------------|----------------|----------------|
| Quantity | Direct | Secondary Effects | | Total |
| | | Indirect | Induced | |
| Jobs | 71,618 | 28,246 | 60,166 | 160,030 |
| State Gross Domestic Product | \$17.6 Billion | \$7.2 Billion | \$12.2 Billion | \$37.1 Billion |
| Wages & Salaries | \$6.5 Billion | \$1.2 Billion | \$1.9 Billion | \$9.6 Billion |
| Wages & Salaries (Annual Average) | \$91,100 | \$41,589 | \$31,788 | \$60,062 |

Including secondary impacts, Maryland life sciences supported an estimated 160,030 jobs and \$9.6 billion in wages and salaries

Source: DBED calculations using available data and the IMPLAN Regional Economic Model for Maryland.

Maryland Private Life Sciences Jobs by Region 2010



Source: Maryland Department of Labor, Licensing and Regulation and Bureau of Labor Statistics.

Agency Acknowledgements

Christian S. Johansson, Secretary
Dr. Judith Britz, Executive Director, Maryland Biotechnology Center (MBC)
Andrea Vernot, Assistant Secretary
Nancy McCrea, Director of Research
Alfredo Goyburu, Principal Investigator & Economist
Dr. Chuck Montague, Program Manager, MBC
Saundra Jones, Senior Graphic Designer

References & Sources

Battelle/BIO State Biosciences Initiatives 2010, Battelle Memorial Institute, May 2010
Beyond Borders Global Biotechnology Report 2010, Ernst & Young
An Economic Engine, NIH Research, Employment and the Future of the Medical Innovation Sector, United for Medical Research, Spring 2011
An Economic Profile of the Bioscience Industry in West Virginia, West Virginia University, Bureau of Business and Economic Research, 2008
Federal Procurement Data System
IMPLAN® Economic Impact Modeling System version 3.0. MIG, Inc., Hudson, WI
Maryland Biodirectory, Maryland Biotechnology Center
Maryland Department of Labor, Licensing & Regulation, Office of Workforce Information & Performance, Quarterly Census of Employment Wages (QCEW) 2010
Maryland: The Nation's Bioscience Leader, Sage Policy Group, Inc., December 2007
National Science Foundation, National Center for Science and Engineering Statistics, Science & Engineering Indicators 2010
The Value of U.S. Life Sciences, Milken Institute, April 2009
U.S. Bureau of Labor Statistics, Quarterly Census of Employment Wages 2001-2009

Further Information

Full information available at www.ChooseMaryland.org

MARYLAND OF OPPORTUNITY.SM

www.ChooseMaryland.org

BIO X MARYLAND

401 E. Pratt Street • World Trade Center
Baltimore, MD 21202
1.888.CHOOSEMD

MARTIN O'MALLEY, GOVERNOR
ANTHONY G. BROWN, LT. GOVERNOR