

DRIVING GROWTH IN BIOTECH

AN OUTSIDE PERSPECTIVE ON WHAT OTHER
CLUSTERS ARE DOING, and STATE OF THE REGION:
PROGRESS TOWARDS THE 2023 VISION

Richard Bendis
President & CEO
BioHealth Innovation

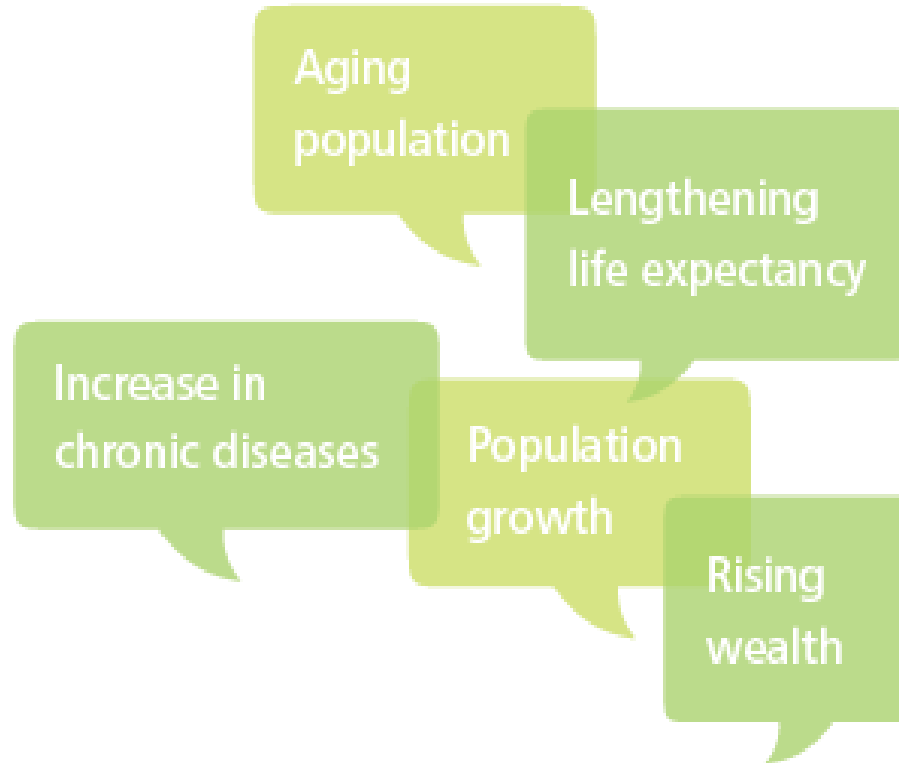


BioHealth's Time is Now!

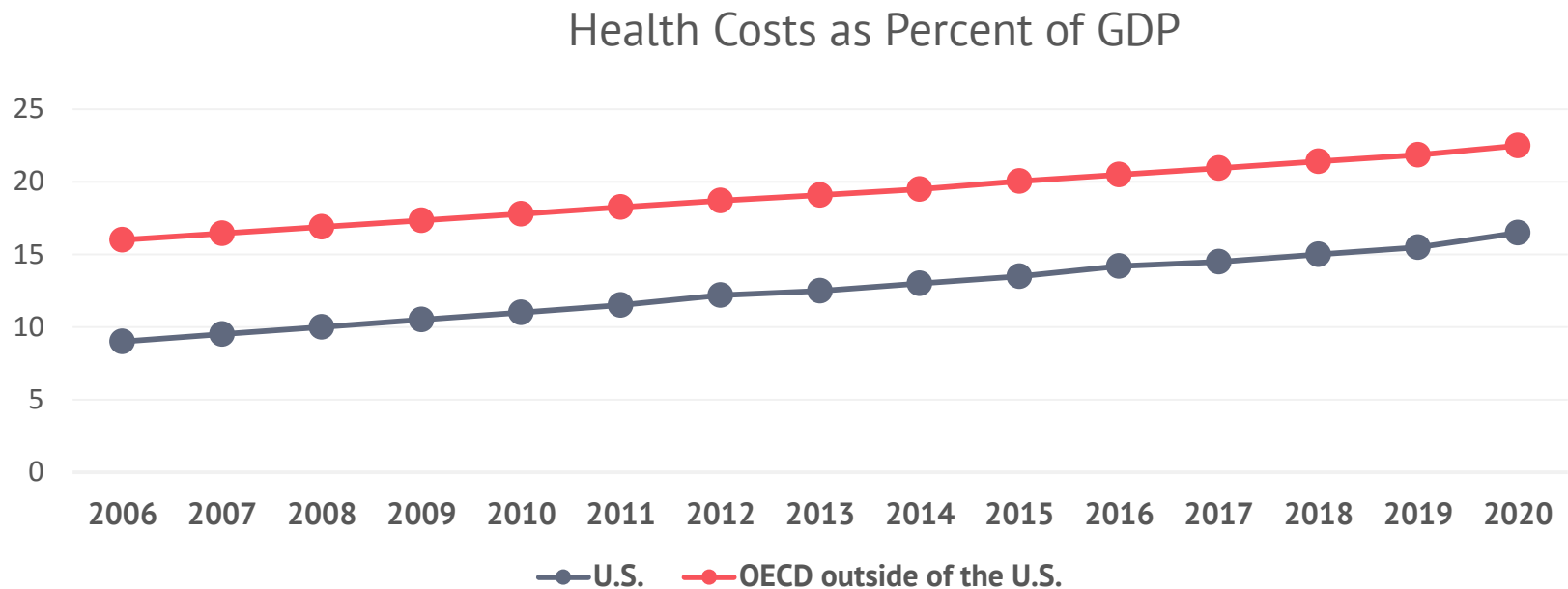
- Health care spending in North America is expected to increase on an average 4.9% during 2014-2018
- Pharmaceutical segment is expected to generate an all time high revenue of \$1.23T.
- The global biotech segment is expected to post revenues of \$288.7B in 2014. Revenues are projected to grow at an annual 9% up to 2019.

Source: Deloitte, 2015 Global Life Sciences Outlook

BioHealth Drivers



Healthcare Innovation Is Key to Controlling Costs



Source: PricewaterhouseCoopers Health Research Institute

BioHealth Market Size

Biotech
\$289 billion

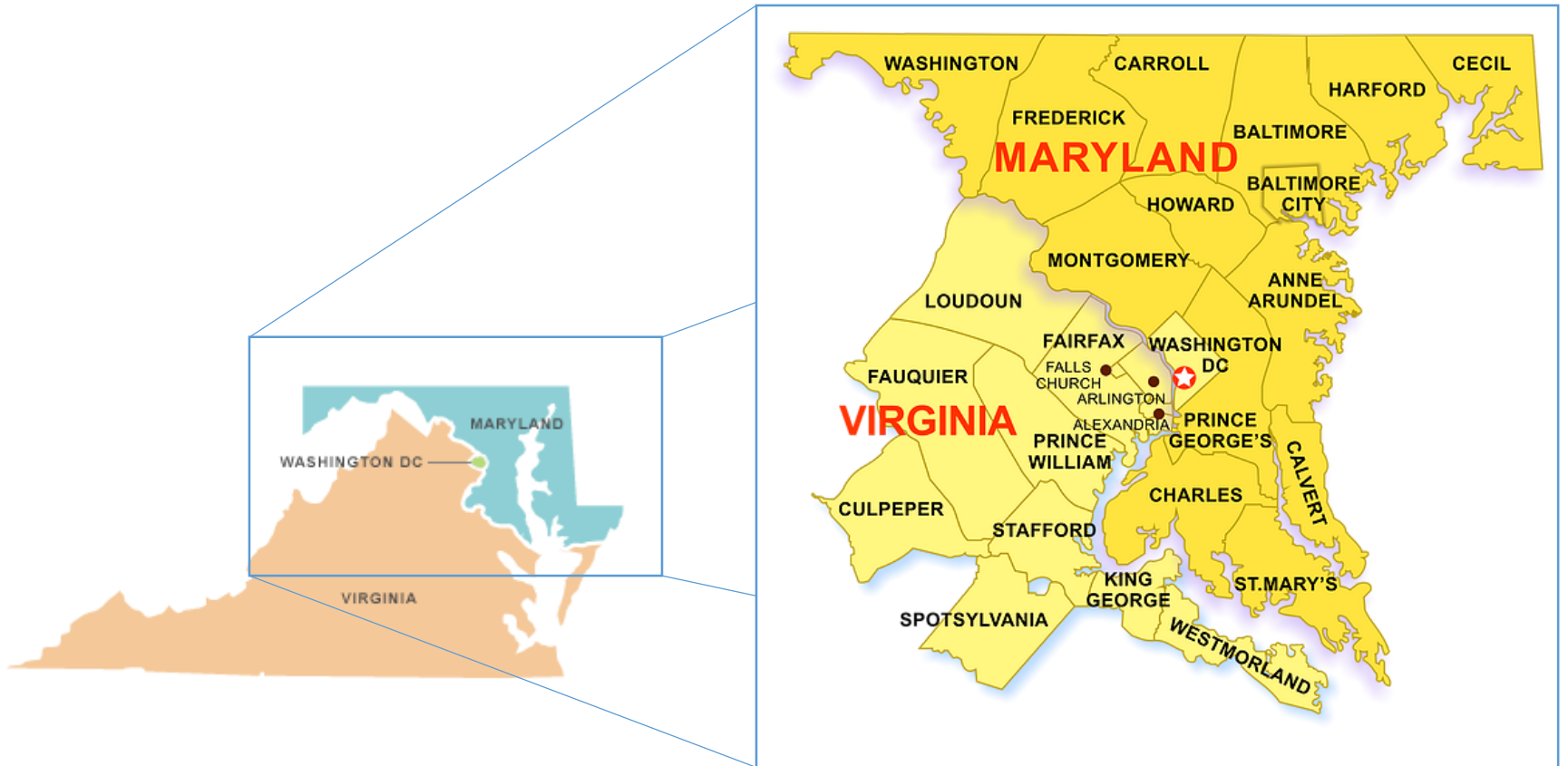


Med tech
\$364 billion

Welcome to the

BioHealth Capital Region™

Advancing Science. Accelerating Innovation.

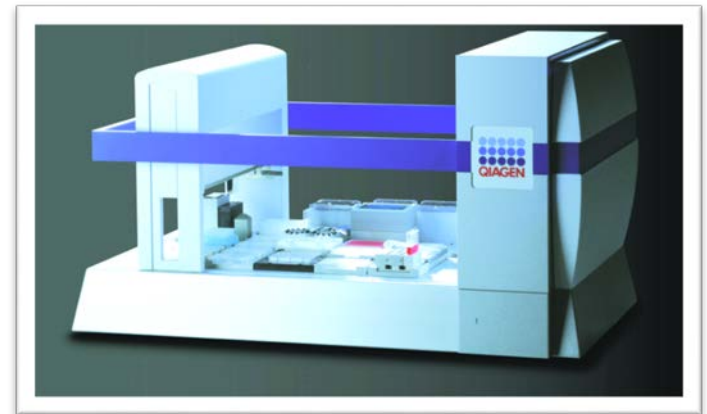


**BioHealth
Capital Region Forum**

Advancing Science. Accelerating Innovation.

What is BioHealth?

- Therapeutics
- Diagnostics
- Medical Devices
- Healthcare Services
- E-Health
- Mobile Health
- Electronic Medical Records
- Health Informatics
- BioHealth Cyber Security



BioHealth Capital Region™

Advancing Science. Accelerating Innovation.

- Unrivaled Research Assets -
- Unfulfilled Commercial Promise -
- 800+ BioHealth Companies -



Regional Assets



Major Regional BioHealth Companies

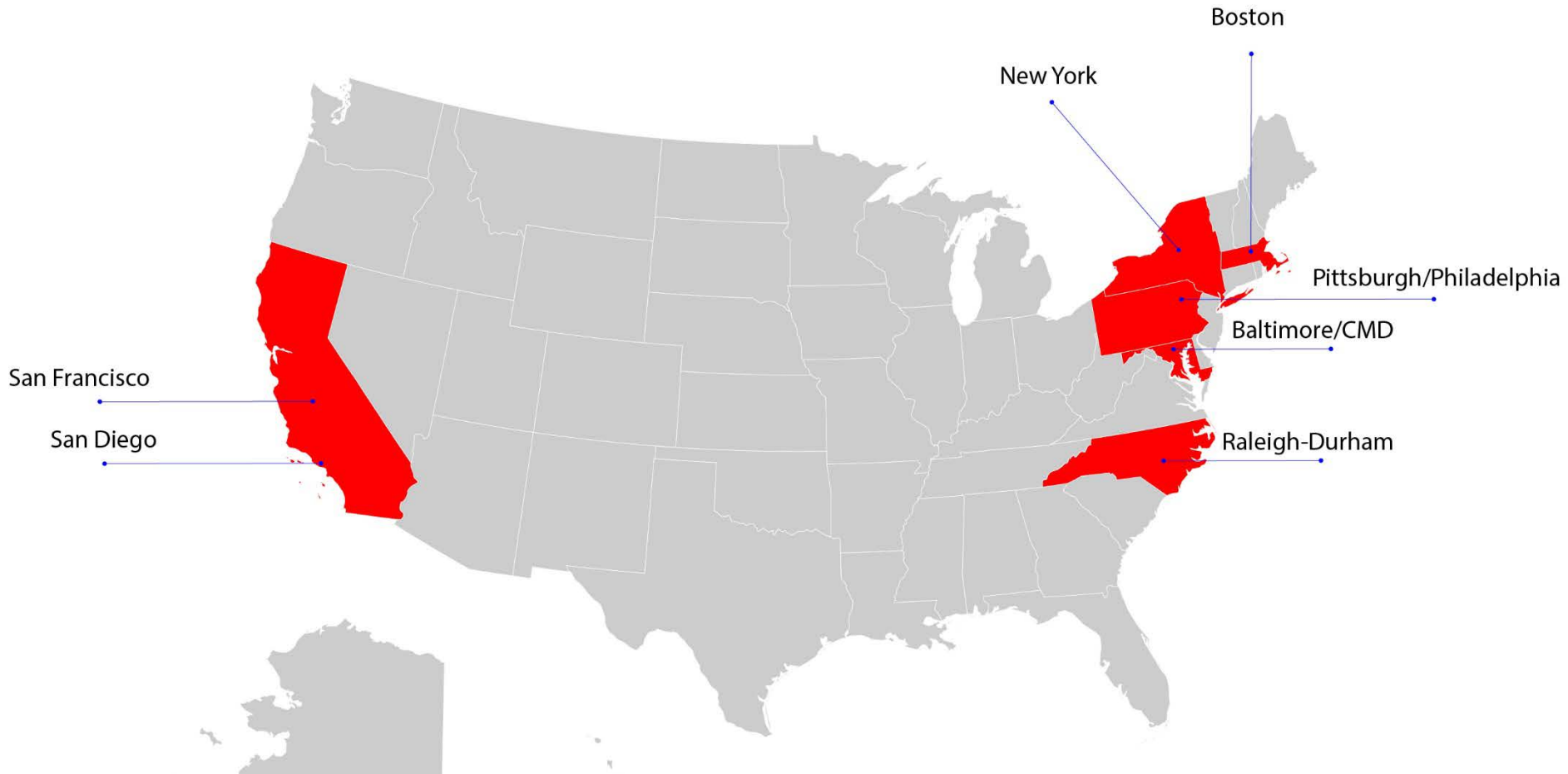


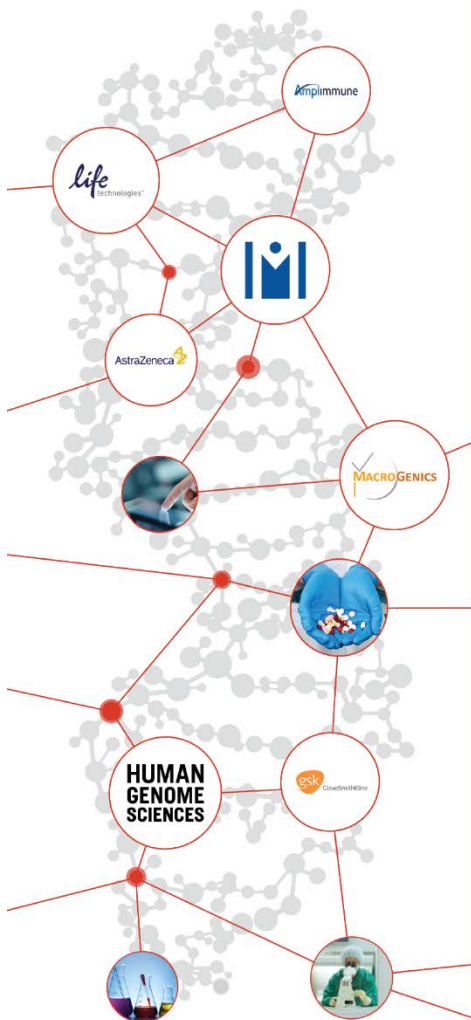
BioHealth Commercialization Highlights in Virginia



- Merck announces \$168M expansion
- Teva wins \$170M vaccine manufacturing contract
- Leidos lands \$4.3B contract for HER
- Gencia partners with Takeda
- Inova Center for Personalized Health launched at former global HQ campus of Exon Mobile in Fairfax

Major BioHealth Clusters in the US

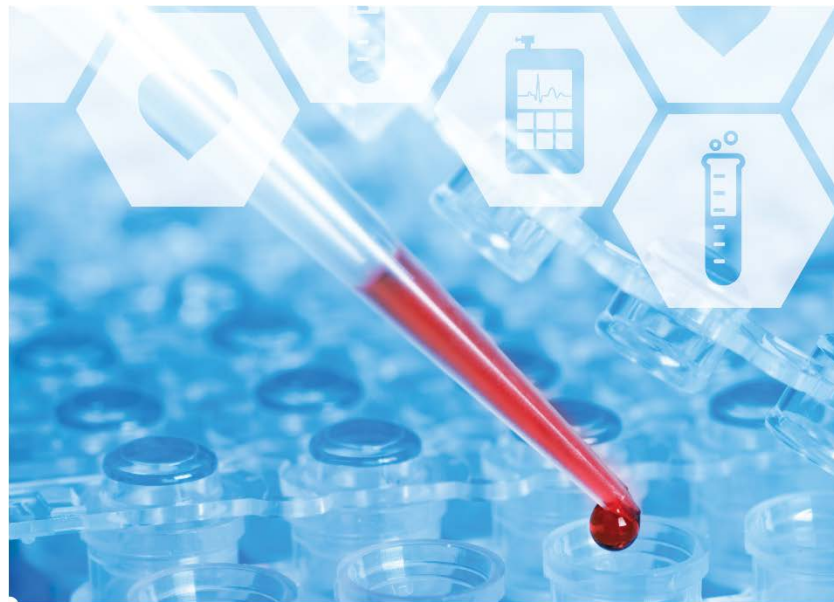




Updated Genealogies of Central Maryland BioHealth Companies

A Report to the Economic Alliance of Greater Baltimore and BioHealth Innovation

MRBS LLC
2015



CENTRAL MARYLAND **BIOHEALTH** INNOVATION INDEX

FULL OF OPPORTUNITY



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BioHealth Capital Region Cluster Fundamentals

- Home to more than 800 life sciences companies
- 70 federal labs including NIH and FDA
- More than 275,000 people in the region work in BioHealth industries.
- Region is densely concentrated with BioHealth degree holders and BioHealth professionals.
- Universities in the Region spend more on research and development than most peer markets.
- Small businesses in the BioHealth Capital Region earned over \$92 million through government-funded SBIR and STTR awards in 2013. \$1 billion was invested in BioHealth companies by venture firms between 2010 and 2014
- Three BioHealth firms have held IPOs in the last two years

Central Maryland BioHealth Innovation Index Ranking

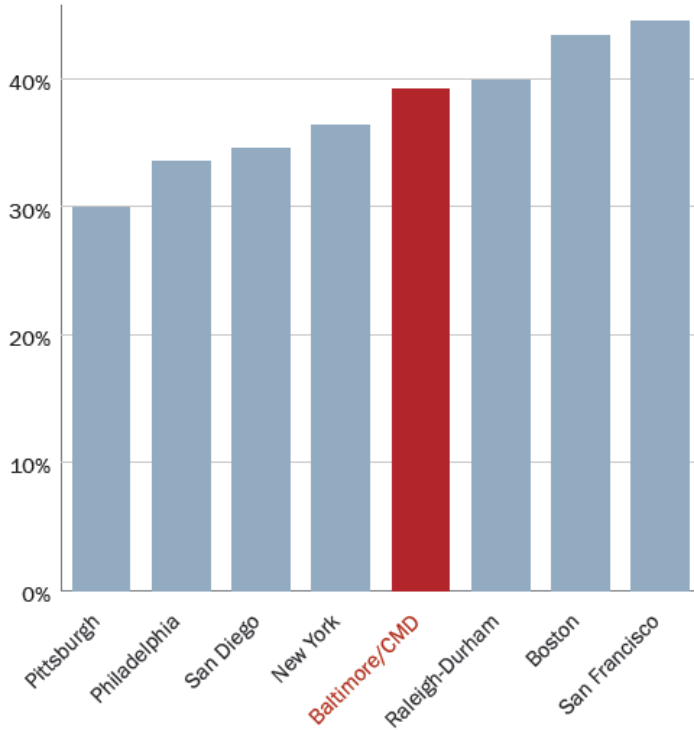
	Baltimore/CMD	Boston	New York	Philadelphia	Pittsburgh	Raleigh-Durham	San Diego	San Francisco
Talent	1	3	1	7	8	5	6	4
R&D	6	1	3	7	8	5	2	3
Entrepreneurship	7	1	1	3	8	6	4	4
Capital	6	1	5	7	8	4	5	2
BioHealth Innovation Index	6	1	3	7	8	5	4	2

Innovation Index: Talent

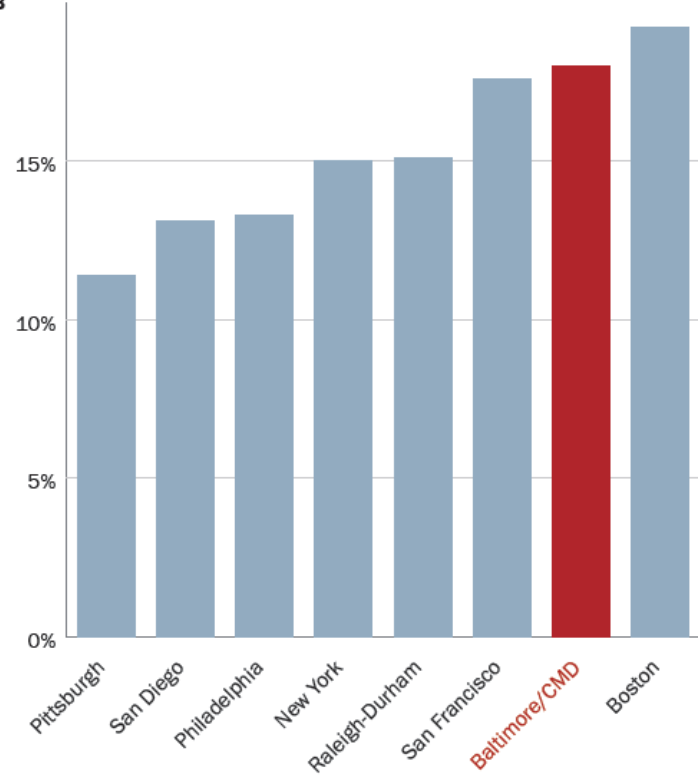
- Percent of Residents with a Bachelor's Degree or Higher
- Percent of Residents with a Graduate or Professional Degree
- Percent of Residents with BioHealth Degrees
- Number of BioHealth Workers
- Density of BioHealth Workers
- Young Professional Population
- Young Professional with a Bachelor's Degree or Higher Population Growth

Results

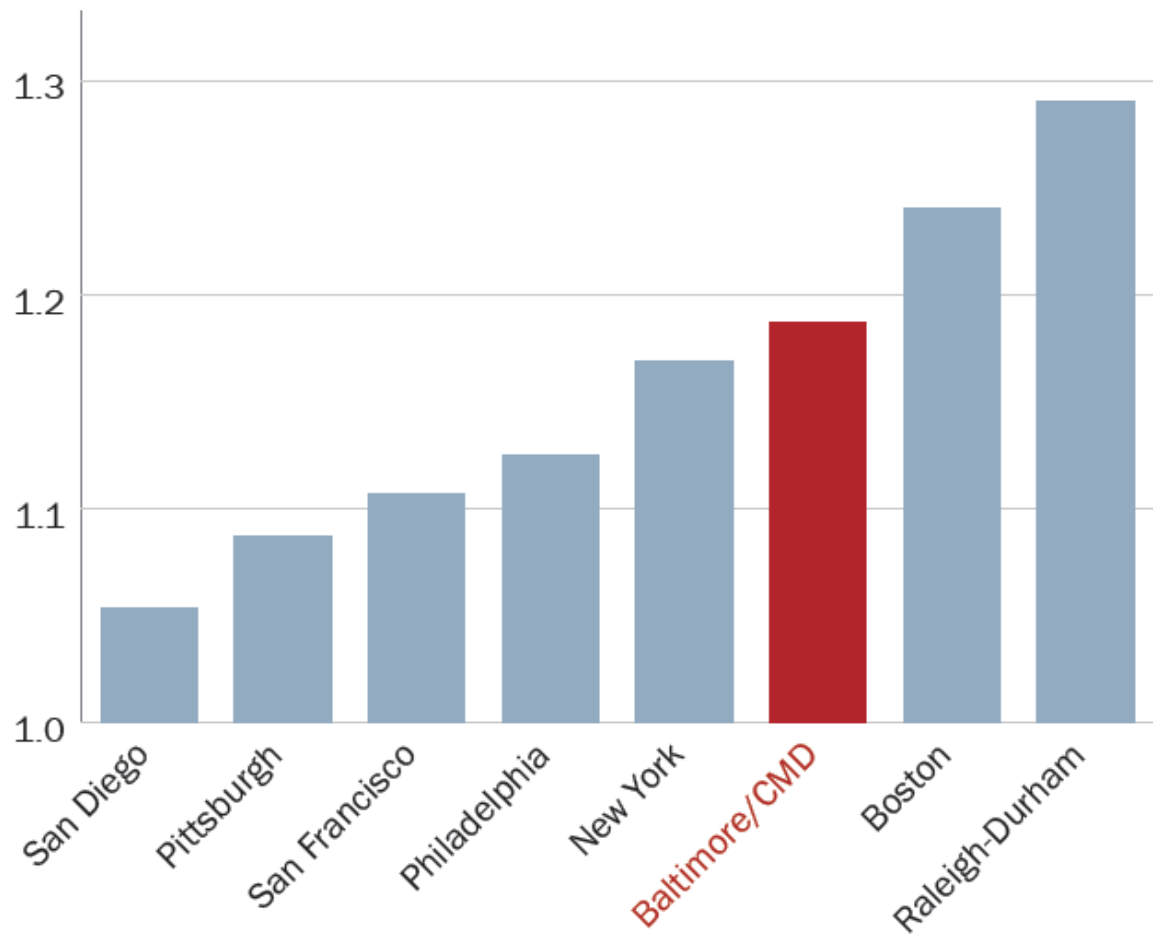
Percent of Residents with a Bachelor's Degree or Higher 2013



Percent of Residents with a Graduate or Professional Degree 2013



BioHealth Workforce Density



Source: County Business Patterns, US Census Bureau



Innovation Index: R&D

- BioHealth Research and Development Expenditure at Universities
- BioHealth Research and Development Expenditure at Universities per Graduate
- Student Invention Disclosures at Universities
- Invention Disclosures at Universities per \$100 of Sponsored Research
- Patent Awards at Universities Patent Awards at Universities per \$100 of Sponsored Research
- Utility Patent Awards
- Utility Patent Awards per 10,000 Residents

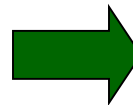
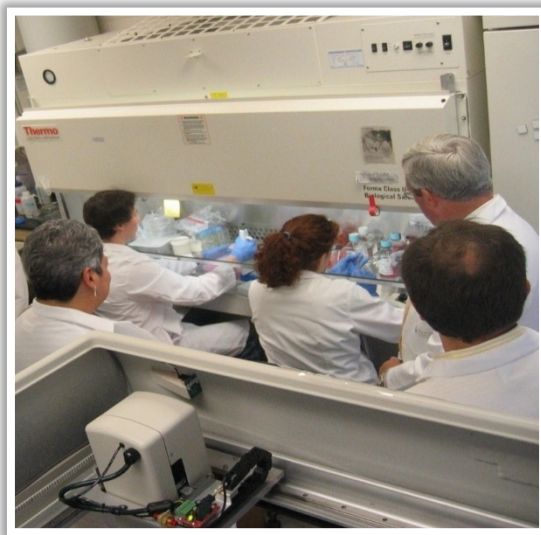
Innovation Paradigm Shift

PROOF OF CONCEPT

(Technological Feasibility)

Laboratory Push

“It Works!”



PROOF OF COMMERCIAL RELEVANCE

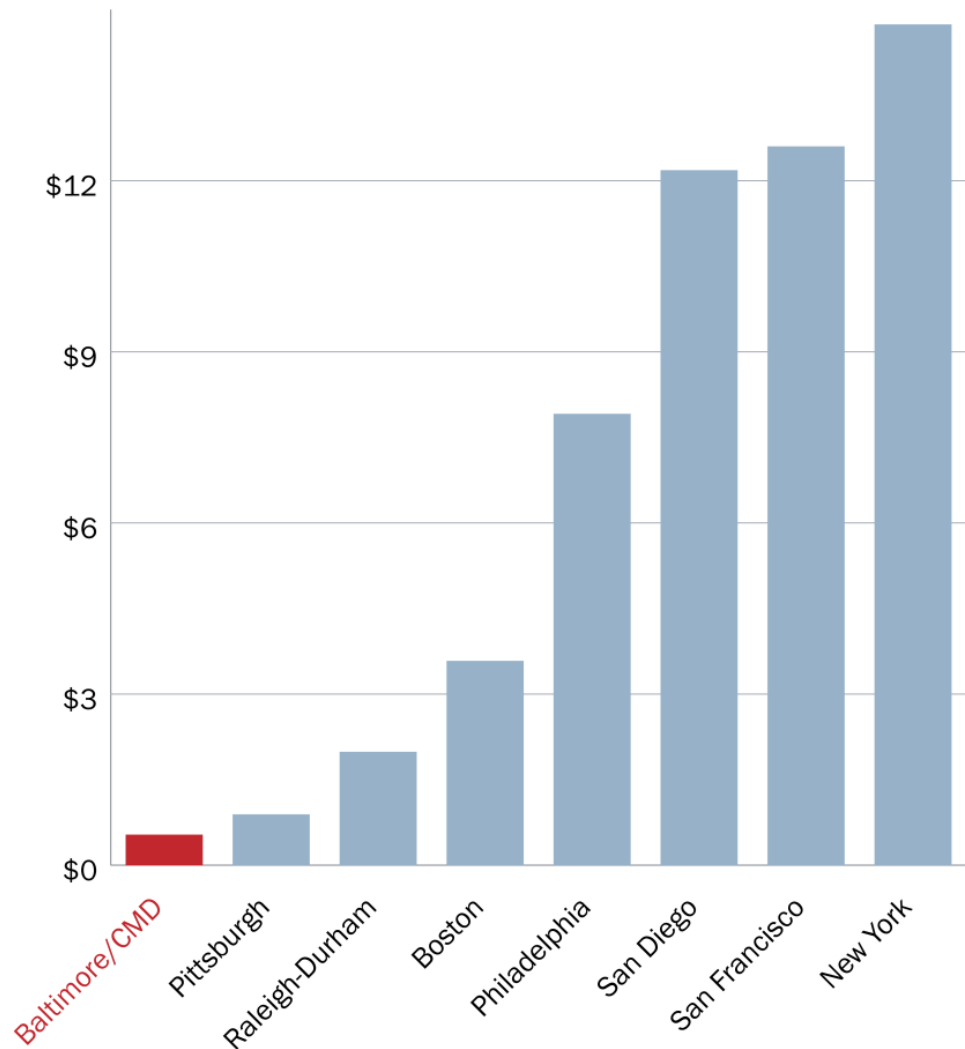
(Market Pull)

“It Works To Solve A Problem”

“I’ll Buy It”



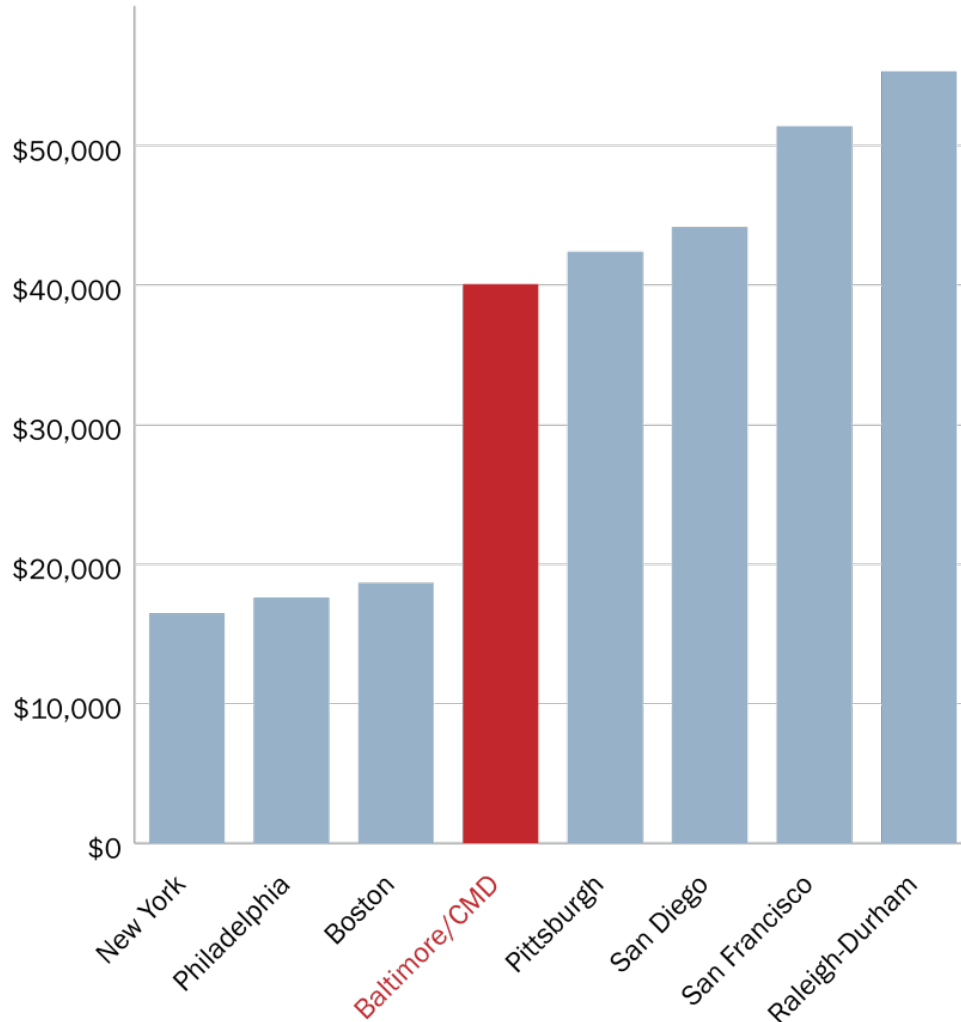
License Income at Universities per \$100 of Research Expenditure, 2013



Source: Association of University Technology Managers



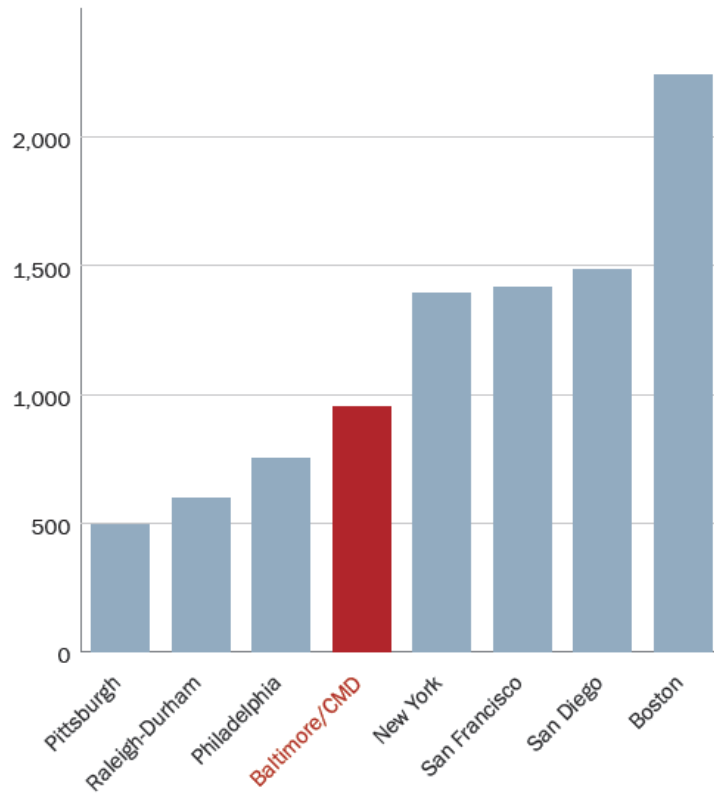
BioHealth Research and Development Expenditures per Graduate Student at Universities, 2013



Universities in the region spent over **\$1.7 billion** on BioHealth R&D in 2013

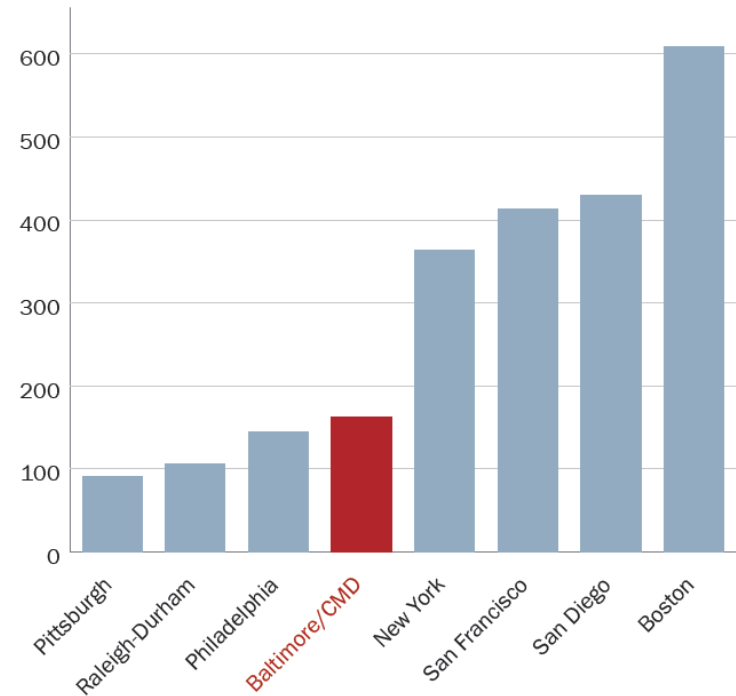
Invention Disclosures at Universities

Fiscal Year 2013



Patent Awards at Universities

Fiscal Year 2013



BioHealth Commercialization Highlights in Virginia

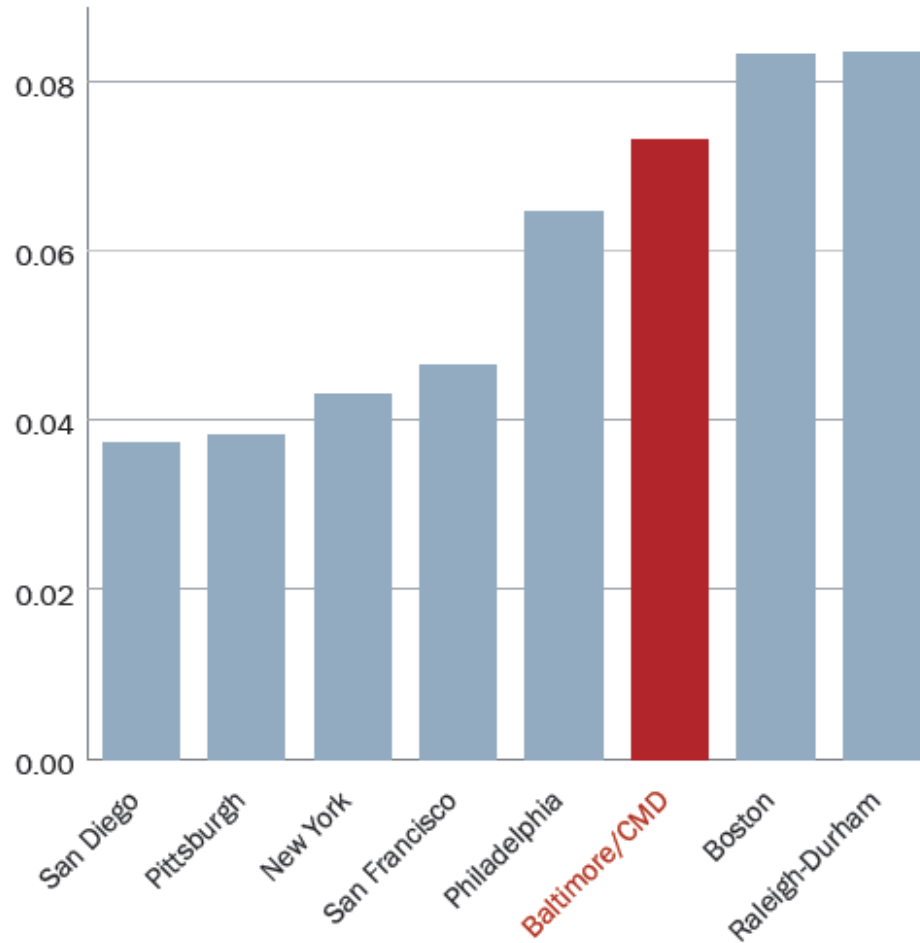


- VCU Engineering School leads the Medicine for All initiative reinventing small molecule drug manufacturing
- Ceres Nanoscience offers first direct antigen test for Lyme Disease
- Hemoshear lands \$20M in SBIR funds
- Three Virginia companies, Dynport Vaccine, Leidos and TASC, share lead in \$900M Medical Product R&D contract with DOD

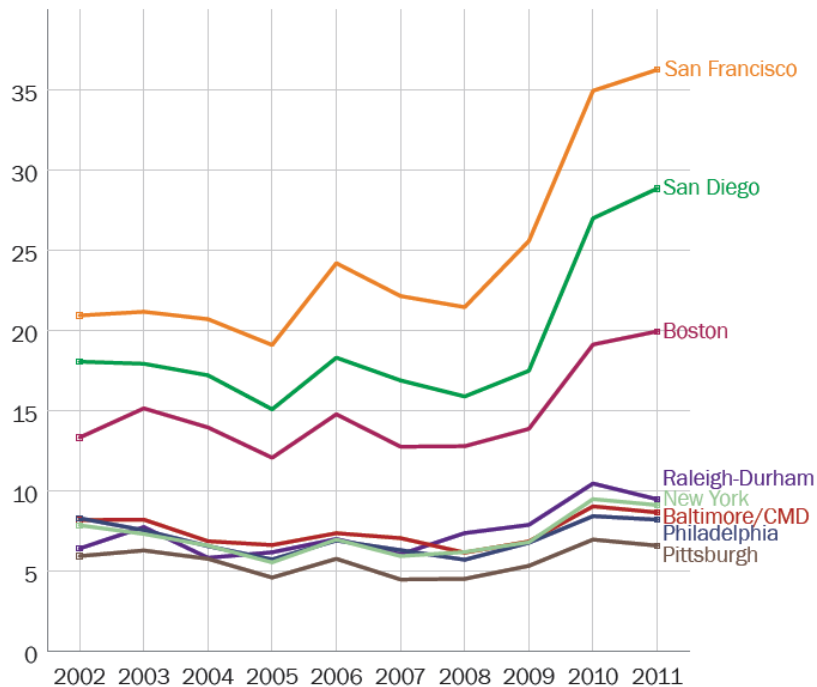
Innovation Index: Entrepreneurship

- Startups at Universities
- Startups at Universities per \$100 of Sponsored Research License Income at Universities
- License Income at Universities per \$100 of Sponsored Research
- Health and IT Firms on the Inc. 5000
- Health and IT Firms on the Inc. 5000 per 10,000 Residents

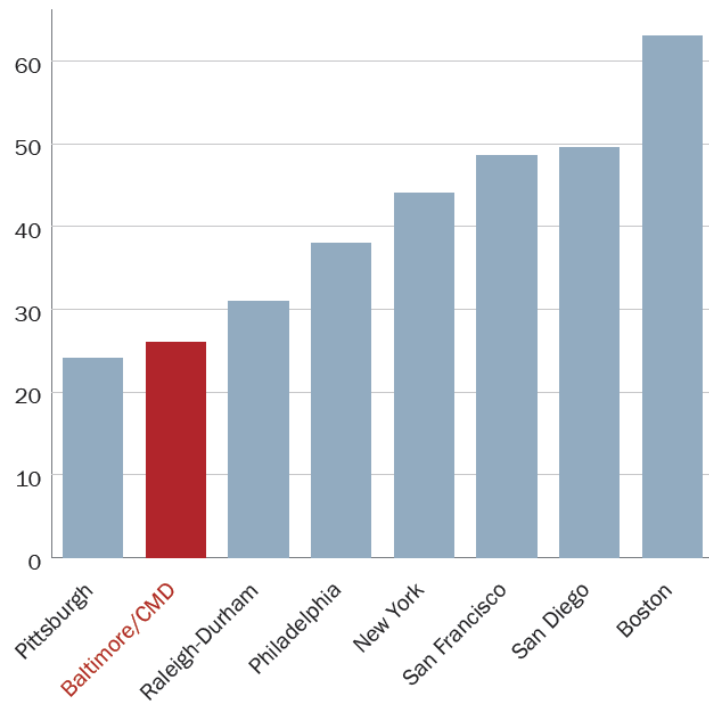
Health and IT Inc. 5000 Companies per 10,000 residents, 2014



Utility Patents Awarded per 10,000 Residents, 2002-2011



Startups at Universities Fiscal Year 2013



Entrepreneurship in the BioHealth Capital Region



- Region has 121 of the fastest-growing private companies on the Inc. 5000 list
- 36 of the fast-growing companies in the region are Health and IT Services companies

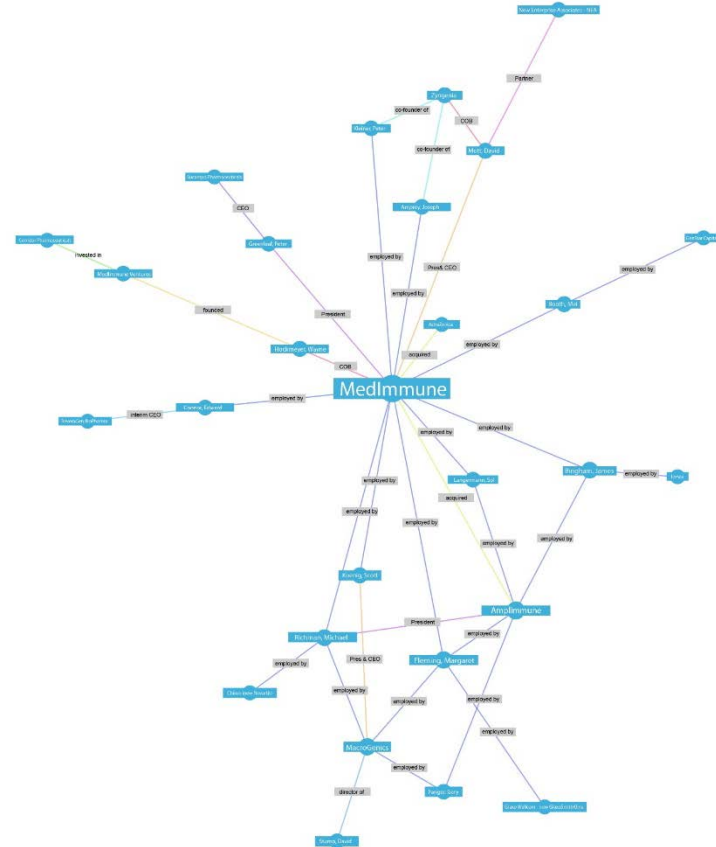
Famous Regional Entrepreneurs

- Wayne T. Hockmeyer
- William Haseltine
- Martine Rothblatt
- Kevin Plank
- Sergey Brin
- Brendan Iribe



MedImmune Impact on the BioHealth Ecosystem

- Corvidia
- Nextcure
- MedImmune Ventures
- Corridor Pharmaceuticals
- ReveraGen BioPharma
- Sucampo Pharmaceuticals
- Novartis
- MacroGenics
- GlaxoSmithKline
- Amplimmune
- Lonza
- Genstar Capital
- Astrazeneca
- NEA
- Zyngenia



Incubators/Accelerators

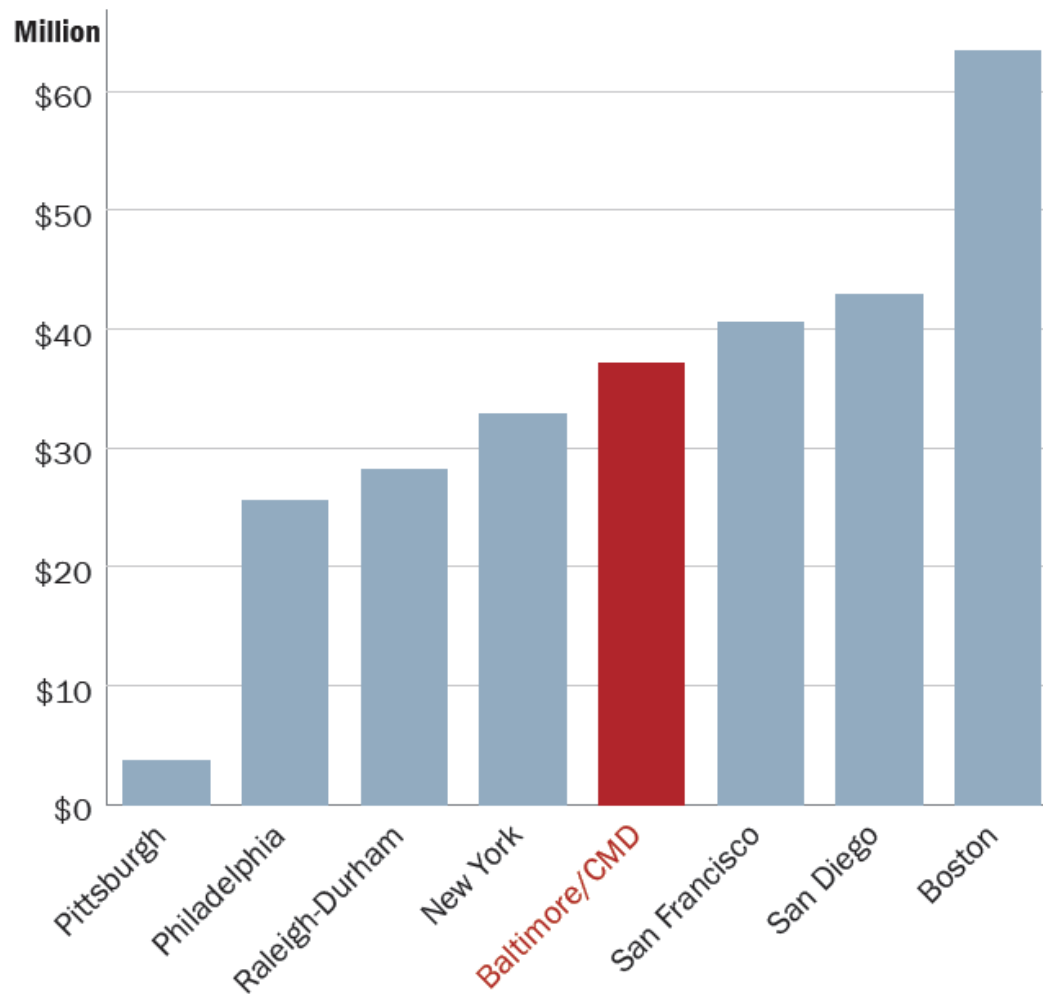


Innovation Index: Capital

- SBIR and STTR Award Funding per 10,000 Residents
- NIH SBIR and STTR Award Funding per 10,000 Residents
- Total BioHealth Venture Capital Investment
- Average BioHealth Venture Capital Deal Size
- Total BioHealth Seed and Early Stage Venture Capital Investment
- Average BioHealth Seed and Early Stage Venture Capital Deal Size
- Initial Public Offerings
- Initial Public Offerings per 10,000 Residents
- BioHealth Initial Public Offerings
- BioHealth Initial Public Offerings per 10,000 Residents
- Market Capitalization of BioHealth IPOs on First Day of Trading

NIH SBIR and STTR Funding

2014

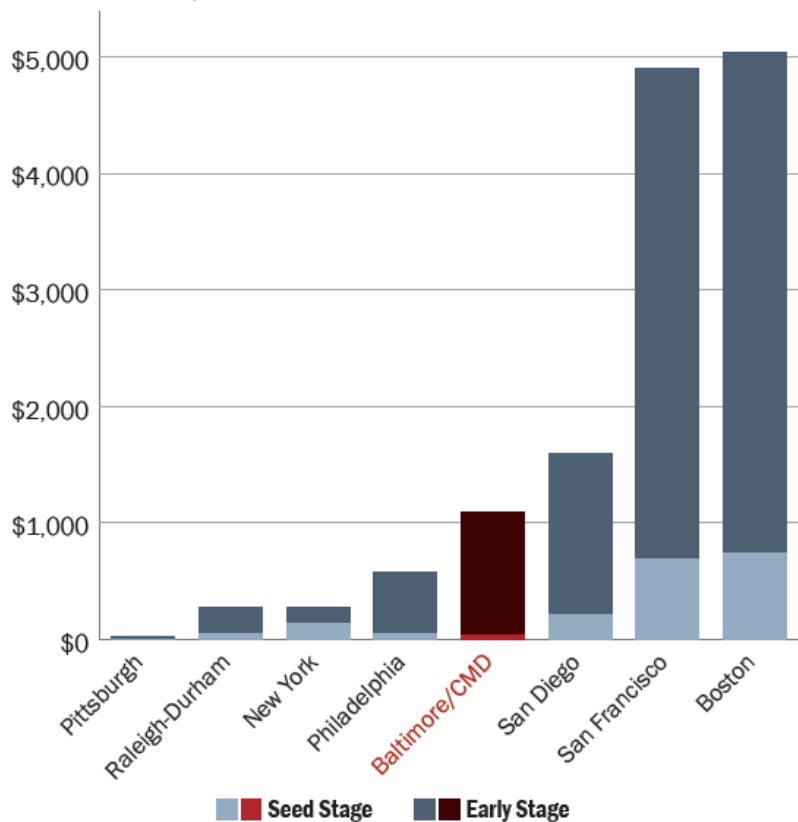


Source: National Institutes of Health, Office of Extramural Research



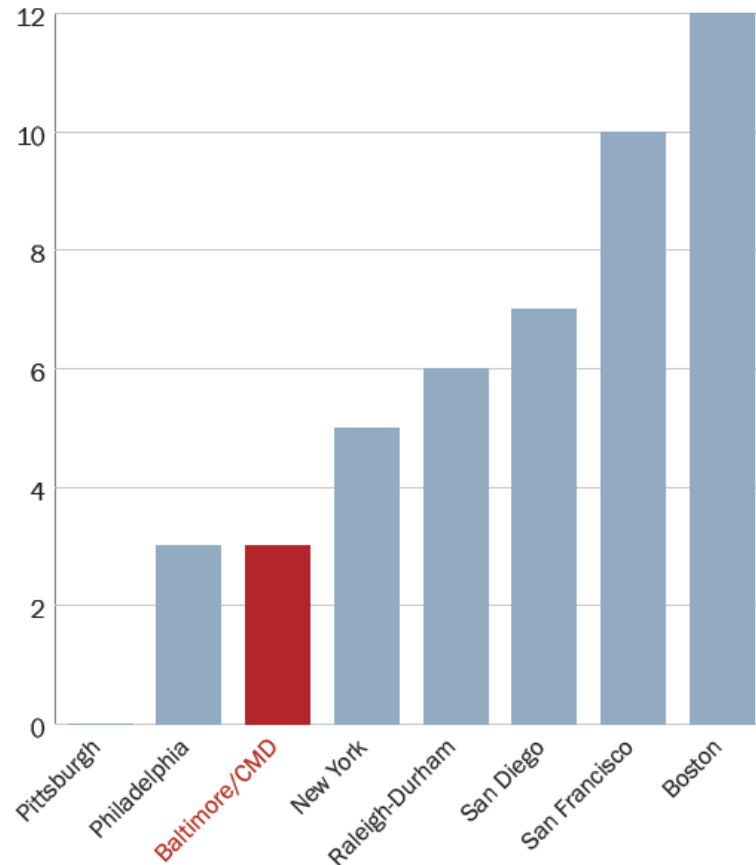
Seed and Early Stage Venture Capital Investment in BioHealth

in Millions of Dollars, 2010-2014



Initial Public Offerings by BioHealth Companies

2012-2013



Public BioHealth Companies Headquartered in the Region

NOVAVAX
Creating Tomorrow's Vaccines Today

 Glyco**Mimetics**, Inc.

 **MACROGENICS**

 **Osiris**
THERAPEUTICS, INC.

 PharmAthene

 **Supernus**[®]
Pharmaceuticals
www.supernus.com

 **ReGenX**
BIOSCIENCES

INTREXON[®]

 **emergent**
biosolutions[®]

 **SUCAMPO**
The Science of Innovation

 **NEURALSTEM INC**

 **GENVEC**

 **rexahn**
PHARMACEUTICALS

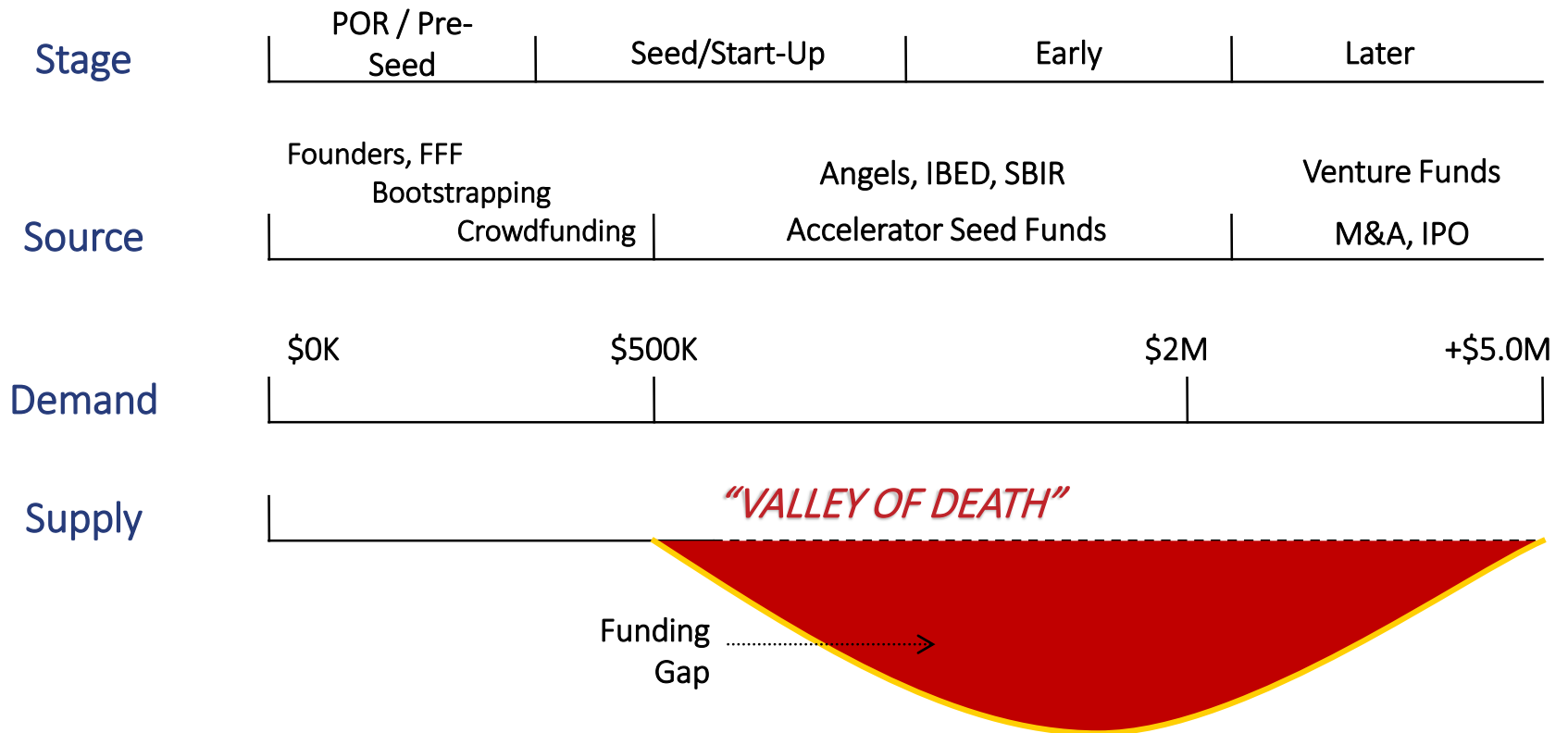
 **NORTHWEST
BIOTHERAPEUTICS**

 **MaxCyte**[®]
FLOW TRANSFECTION SYSTEMS[™]

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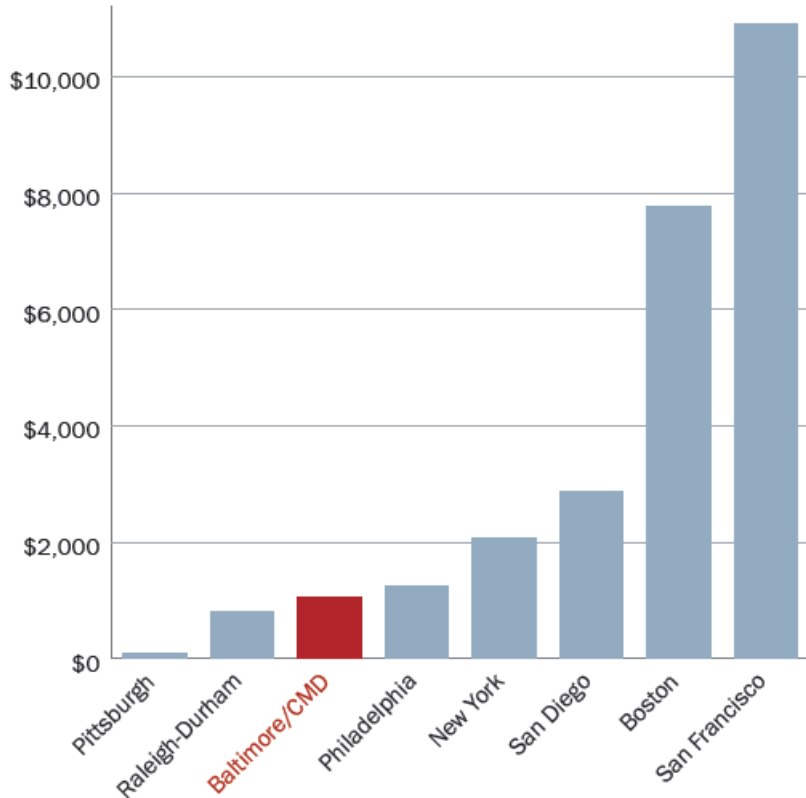
Innovation Capital Valley of Death



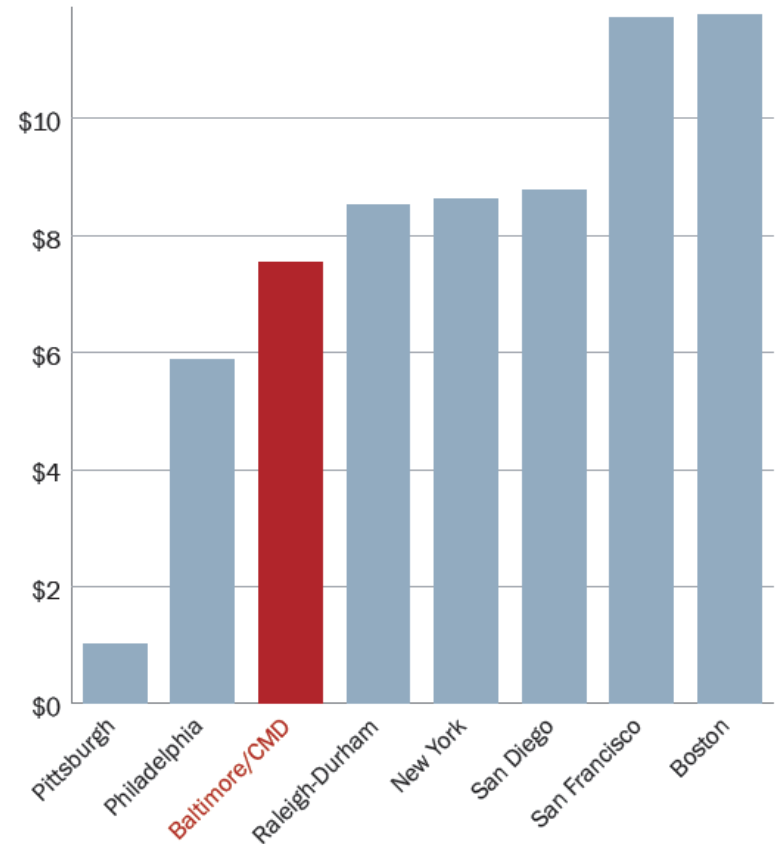
Key VC Investment Criteria

- Disruptive Innovation.
- Large Clinical or Critical Unmet Need.
- Freedom-to-Operate / Large Barriers to Entry.
- Technology Proof-of-Concept Established.
- Investing in the gap between seed financing and Series A/B financing.
- High caliber Management with relevant domain expertise.

Total Venture Capital Investment in BioHealth in Millions of Dollars, 2010-2014



Average Venture Capital Deal Size in BioHealth in Millions of Dollars, 2010-2014



Large Number of Regional Companies are Underfunded

Sector	Number of Companies	Number of Companies Funded	Percentage of Companies Funded	Amount of Funding (\$)
Healthcare IT	104	11	10.58%	\$228.4M
Therapeutics	78	38	48.72%	\$1,139.5M
Diagnostics	94	25	26.60%	\$310.0M
Medical Devices	66	12	18.18%	\$238.6M
Total	342	86	25.15%	\$ 1.917B

Proprietary BHI analysis from 2003-2014. Investments are any non-public investment in a private company larger than \$1M.

BioHealth Commercialization Highlights in Virginia



- The state, Carilion Clinic and Virginia Tech announce investments of \$70M to double the size and capacity of VTCarilion Research Institute
- UVA forms a \$5M seed fund and \$20M Series A fund
- Inova announces \$100M investment fund
- Sentara HealthCare's 3rd Core ramps up investments and partnerships that improve health through innovation
- VCU launches a Commercialization of Research Fund
- Venture Capital Assn, PWC name Charlottesville nation's top growing MSA in venture funding
- Virginia approves a new state bond issue financing over \$150M in bioscience R&D facilities at VCU, UVA and Virginia Tech

Recent Venture Capital Investments

NextCure


Vtesse



CORVIDIA
Precision Cardiovascular Therapeutics

 **BeneVir**

 **ORIGENE**

 **PROTENUS**

 **REGENXBIO™**



**Therabron
Therapeutics**

Senseonics™



IMMUNOMIC
Therapeutics, Inc.



**HARPOON
MEDICAL**

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BioHealth Capital Region Index

Key Findings

- Central Maryland compares well in **Talent** present and **Research** conducted
- Improvement is needed in **Commercialization** measures such as capital investment, university startups, and invention disclosures
- Region is not lacking for human capital or technologies required to form an innovation hub. Rather the region needs additional **Capital** to invest in catalyzing the next generation of **Entrepreneurs**

The Time is NOW for the

BioHealth Capital Region™

Advancing Science. Accelerating Innovation.

We will get there sooner if we **collaborate**
and **leverage** existing resources

We will become a **TOP 3** by 2023!

