



LIFE SCIENCE AND
GLOBAL HEALTH
DEVELOPMENT IN
WASHINGTON STATE:
FUTURE AT RISK



Innovating Tomorrow's Economic Landscape

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EXECUTIVE SUMMARY

Washington has consistently demonstrated its prowess in life science and global health research over the years, with inventions that are dramatically improving the health and well-being of Washingtonians and populations worldwide. And for a solid decade, bolstered by state support, Washington's life science industry and global health sector seized the opportunities created by that research to become one of the nation's most dynamic locations for life science and global health development and one of the state's major economic drivers.

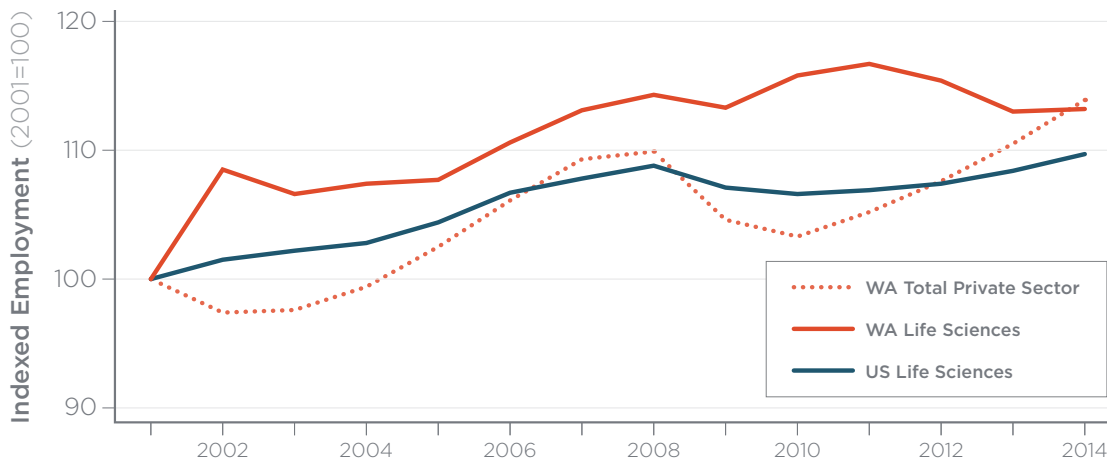
In recent years, however, the state has not been as effective when it comes to capitalizing on the fruits of its large and robust research engine with private sector job creation. With well over \$1 billion of federally-funded life science research annually throughout the state, Washington should be ranked among the premier locations for life science-related economic development, including company creation, attraction and growth. However, unlike other states aggressively pursuing this goal, Washington has not sustained the investments in commercialization infrastructure and public-private partnerships required to achieve this designation.

Recognizing both the need and the opportunity, and seeking to capitalize on the tremendous potential of life sciences and global health to bolster the state's economic development and provide life-saving technologies and treatments across the globe, in October 2015 Governor Inslee convened The Life Science and Global Health Advisory Council. Comprised of life science and global health leaders from across the state, the Council was tasked with taking stock of Washington's position in these highly competitive sectors and highlighting opportunities for future growth. TEconomy Partners was hired to assist the Council in completing its work by conducting a quantitative assessment of statewide trends; benchmarking key data points against seven "peer" states; interviewing over 30 industry and academic leaders across the state; and engaging the Council in a discussion of its findings and conclusions.

Key Findings:

- Washington's life science industry and global health sector stand out as outsized contributors to the state's economy. Average annual wages for Washington workers in the life sciences reached nearly \$82,000 in 2014, 49 percent more than for the state's entire private sector (\$55,000). In global health, wages averaged \$71,129 in 2013. And, for every 1 job directly generated by the life science industry in Washington, another 3.8 jobs are created across the state's economy.
- Washington's life science industry—which incorporates much of the global health sector—recorded a decade of strong employment growth from 2001 through 2011, supported by targeted state policies. This growth in high-wage jobs outpaced the nation and other private sector job growth in Washington and provided a solid buffer in the state against the last two recessions.
- Since 2011, Washington has seen a decline in life science industry jobs (see Figure ES-1) and lagging measures of industry innovation at a time when the nation and other peer states have been making larger gains. This decline coincides with the erosion of state support for R&D tax incentives, the Life Sciences Discovery Fund, and the Washington Global Health Fund, which were eliminated.
- Washington continues to be among the best in the nation in attracting federally-funded research; however, the state lags in translating that research into industry-led R&D and related job growth.
- Among the most promising areas of opportunity for life science development in Washington are cancer immunotherapies (and other cell therapies) and ultrasound technologies. Emerging areas of innovation include agricultural and marine biosciences, precision medicine, and digital health/health information technologies. Examples of promising partnerships in global health include the intersection of big data with population health research and anti-microbial resistance.

FIGURE ES-1: Washington Stagnating in Life Science Industry Employment* After a Strong Decade of Growth



*Note: Life science industry employment includes significant overlap with the global health sector.
Source: TEconomy Partners' analysis of U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) data; enhanced file from IMPLAN.

Conclusions

The life science industry and global health sector are at a critical juncture. To capitalize on state strengths and realize the emerging opportunities, an intentional public-private partnership and consistent, supportive public policy are required. Building successful life science companies, particularly those bringing new therapies to market, is a high-risk endeavor that often requires navigating a complex, lengthy, and expensive regulatory process that can require investments of hundreds of millions of dollars over a decade or more before becoming profitable. To address these challenges most of Washington's peer states have a diversity of programs in place to grow and sustain a world-class life science industry and they continue to invest in new initiatives. Washington is the envy of most other states in the union when it comes to our federally-funded research base. Unfortunately, when it comes to leveraging those federal dollars to achieve private sector job growth, Washington is falling behind.

To re-establish its position as a leading high-growth, high-impact life science and global health state, Washington must take action in the form of public-private initiatives to address specific challenges facing these industry sectors. Four strategic priorities have been identified:

1. Reinstate the R&D tax incentives. Not only is Washington out of step with leading life science states in not having an R&D tax

credit or R&D sales tax deferral, its business and occupation (B&O) tax on gross receipts makes it one of the most challenging states in the country for life science companies to grow and add manufacturing jobs in the state.

- 2. Support entrepreneurship and company creation statewide.** Entrepreneurs and young companies need easy access to a wide range of public and private resources to raise capital and launch successfully, including: access to affordable wet lab space; a statewide entrepreneurship network to connect industry leaders throughout the state and nation; and deepening the pool of available venture capital.
- 3. Retain high growth potential mid-sized companies.** Washington currently lacks a "critical mass" of larger, more mature life science companies that help attract seasoned employees and provide stability. The state needs to do more to retain its home-grown companies that are having success and reaching critical expansion stages of development, though are still not profitable. This is a particularly pressing issue as some of Washington's rising stars are currently being courted by other states.
- 4. Attract major corporate innovation centers** that leverage Washington's strategic growth opportunities in life sciences and global health through advancing public-private partnerships. This is important for the state to effectively compete with leading life science states that are having notable success in attracting research centers of major biopharmaceutical and medical device companies to collaborate with their universities and non-profit research centers.

INTRODUCTION

Washington has consistently demonstrated its prowess in life science and global health research over the years, with inventions that are dramatically improving the health and well-being of Washingtonians and populations worldwide. And for a solid decade, bolstered by state support, Washington's life science industry and global health sector seized the opportunities created by that research to become one of the nation's most dynamic locations for life science and global health development and one of the state's major economic drivers.

In recent years, however, the state has not been as effective when it comes to capitalizing on the fruits of its large and robust research engine with private sector job creation. With well over \$1 billion of federally-funded life science research annually throughout the state, Washington should be ranked among the premier locations for life science-related economic development, including company creation, attraction and growth. However, unlike other states aggressively pursuing this goal, Washington has not sustained the investments in commercialization infrastructure and public-private partnerships required to achieve this designation.

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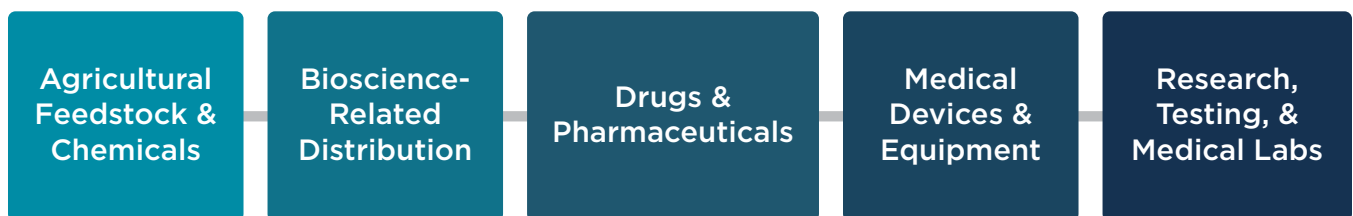
taking stock of Washington's position in these highly competitive sectors and highlighting opportunities for future growth. TEconomy Partners was hired to assist the Council in completing its work by conducting a quantitative assessment of statewide trends; benchmarking key data points against seven "peer" states; interviewing over 30 industry and academic leaders across the state; and engaging the Council in a discussion of its findings and conclusions.

Life Sciences and Global Health: Distinct, but Closely Linked

The life science industry and global health sector in Washington overlap and are highly interrelated, encompassing a wide range of industries involved with R&D, manufacturing, distribution, and service-related activities, all with common linkages in their application of knowledge and technologies regarding how to advance health around the world. Much of Washington's global health sector, as defined in the recent Landscape Study developed by the Washington Global Health Alliance,¹ overlaps with the research, testing, and medical labs subsector of the life sciences, but also reaches beyond to include key university departments, selected hospitals, non-governmental and faith-based organizations, and grant-making foundations.

What sets life sciences and global health apart is how they focus on human health and innovation, with life sciences focusing on more of a disease model and advancing novel innovations for disease prevention, diagnosis, and treatment. Global health includes these, but also aims to improve population health

FIGURE 1: The TEconomy/BIO Definition of Life Sciences—a Diverse Industry with Broad Opportunities



¹ Washington Global Health Alliance and Community Attributes Inc., *Washington State Global Health Landscape Study*, August 2015.

INTRODUCTION

and health equity involving broader interventions than simply biomedical treatments, but also improvements in environmental, infrastructure, and societal conditions that impact the health of populations. In addition, the life science industry extends beyond health and biomedical applications to include the agricultural biosciences and far-reaching industrial biosciences technologies and applications.

Key Findings

The key findings from the quantitative and qualitative analyses for the study include:

- Washington's life science industry and global health sector stand out as outsized contributors to the state's economy. Average annual wages for Washington workers in the life sciences reached nearly \$82,000 in 2014, 49 percent more than for the state's entire private sector (\$55,000). In global health, wages averaged \$71,129 in 2013. And, for every 1 job directly generated by the life science industry in Washington, another 3.8 jobs are created across the state's economy.
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- Washington continues to be among the best in the nation in attracting federally-funded research; however, the state lags in translating that research into industry-led R&D and related job growth.

- Among the most promising areas of opportunity for life science development in Washington are cancer immunotherapies (and other cell therapies) and ultrasound technologies. Emerging areas of innovation include agricultural and marine biosciences, precision medicine, and digital health/health information technologies. Examples of promising partnerships in global health include the intersection of big data with population health research and anti-microbial resistance.

These key findings suggest that the Washington life science industry and global health sector are at a critical juncture. To capitalize on state strengths and realize the emerging opportunities, an intentional public-private partnership and consistent, supportive public policy are required. Building successful life science companies, particularly those bringing new therapies to market, is a high-risk endeavor that often requires navigating a complex, lengthy, and expensive regulatory process that can require investments of hundreds of millions of dollars over a decade or more before becoming profitable. To address these challenges most of Washington's peer states have a diversity of programs in place to grow and sustain a world-class life science industry and they continue to invest in new initiatives. Washington is the envy of most other states in the union when it comes to our federally-funded research base. Unfortunately, when it comes to leveraging those federal dollars to achieve private sector job growth, Washington is falling behind.

Washington's Large and Leading Global Health Sector

Washington's position as a leading hub in global health is not a new one, but took root over the past 40 to 50 years to innovate and disseminate global health solutions across the world. Organizations such as the Fred Hutchinson Cancer Research Center, PATH, Center for Infectious Disease Research, Infectious Disease Research Institute, World Vision, Global Good, SightLife, the Gates Foundation, and many others, combined with the University of Washington's Department of Global Health and Washington State University's Paul Allen School for Global Animal Health, have grown to form a significant cluster in Washington that works each day to save millions of lives around the world. The Washington Global Health Alliance, established nearly a decade ago, is playing a key role in bringing together the organizations, executives, and key stakeholders in the sector across the state to coordinate and leverage their combined influence and unique requirements as a cluster.

The global health sector in Washington is distinct from the life sciences in its approaches to health outcomes—in general, where the life sciences have a primary focus on affecting health outcomes on an individual level through products spanning vaccines and therapeutics to medical devices, global health organizations are focused on improving health outcomes across wide-reaching populations in areas that include biomedical treatments but extend still further to include environmental technologies such as sanitation and clean drinking water, as well as advancing education, most often in developing countries with the greatest needs. Global health efforts include predicting and tracking pandemics that the life science industry will be called upon to treat and to cure.

According to the 2015 Washington State Global Health Landscape Study, the state's global health sector today is large, growing, and having a substantial impact on the state's economy as well as impacting millions of lives worldwide. The study found an extensive innovation ecosystem that includes 168 individual global health organizations employing 12,620 with average wages exceeding \$71,000 annually, with \$5.8 billion in funding and revenues, largely from federal and philanthropic grants. In turn, these direct economic impacts are yielding an overall economic impact of 32,800 jobs and \$9.4 billion in business revenues across the state. Each global health job was found to support an additional 1.6 jobs in Washington. And the sector is growing, with employment increasing by 4.4 percent per year from 2009 to 2013, four times the rate of the overall economy.

The related though unique nature of the global health sector to the life science industry requires distinct consideration with respect to state policies and attention to enhance this sector into the future.

OUTSIZED BENEFITS: WHY THE LIFE SCIENCE INDUSTRY AND GLOBAL HEALTH SECTOR MATTER IN WASHINGTON

As both innovation and economic drivers, the life science industry and global health sector in Washington stand out as outsized contributors to the state economy, with the following key characteristics.

High-Wage, Middle-Skills Job Generator. Average wages for workers in the life sciences reached nearly \$82,000 annually in 2014, 49 percent more than for the state’s overall private sector (\$54,955). In global health, the *Landscape Study* found wages averaged \$71,129 in 2013. These wage premiums reflect the high value of the goods produced and the high-quality jobs created across the sectors. But, while the popular image of life sciences and global health jobs is primarily scientists and engineers, this is not the case. Production workers, technicians, and other middle-skill occupations represent a majority of the jobs generated by the manufacturing subsectors within the industrial life sciences, typically requiring some post-high school education and training, but not necessarily a four-year college degree or higher. Specifically, in the major manufacturing components of Washington’s life science industry—drugs and pharmaceuticals and medical devices—which together represent about one-quarter of industry jobs, more than 60 percent of these jobs are among middle-skill groups.

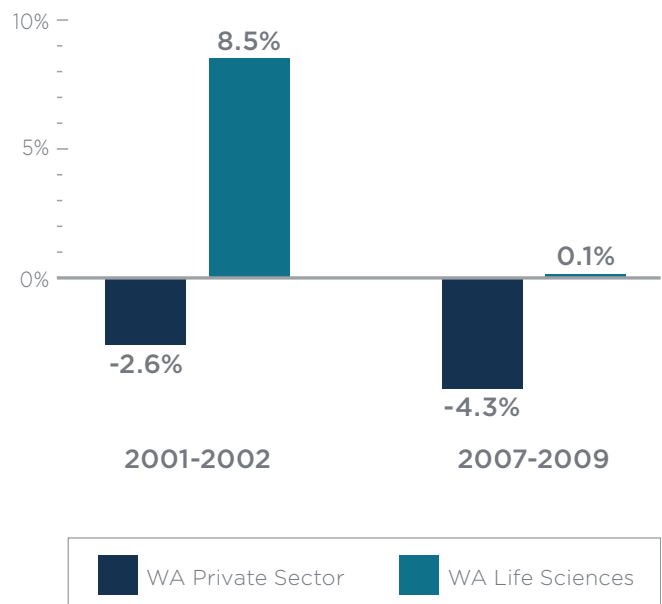
High Economic Impact. Like other advanced manufacturing industries, life sciences and global health have an outsized impact on the state’s economy due to their supplier industry relationships and the high salaries earned. For every 1 job directly generated by the life science industry, another 3.8 jobs are created across Washington’s economy, which, based on the state’s nearly 30,000 life science industry jobs, translates into more than 110,000 additional jobs supported across the Washington economy. In global health, for every 1 job generated, an additional 1.6 jobs are supported statewide. Thus, the global health sector’s nearly 13,000 Washington

jobs support an additional 20,000 jobs across the rest of the state economy.²

A Bulwark against Recessions. The life science industry and global health sector also stand out because they are less influenced by the ups and downs of the economy. The need for healthcare and agricultural products is less discretionary than other advanced manufacturing products, and so these jobs offer a more stable industry base over business cycles.

In the recessions of both 2001–2002 and 2007–2009, the life science industry provided Washington with a much-needed source of new job growth. During the 2001–2002 recession, private-sector employment in Washington fell by more than 57,000 jobs, while the life science industry added more than 2,000 jobs, an 8.5 percent increase (Figure 2). Over the Great Recession,

FIGURE 2: A Bulwark against Recessions—Employment Trend in Washington’s Life Sciences* vs. Total Private Sector



*Note: Life science industry employment includes significant overlap with the global health sector.
Source: TEconomy Partners’ analysis of U.S. Bureau of Labor Statistics, QCEW data; enhanced file from IMPLAN.

2 It is important to note that these employment and broader economic-impact figures for life sciences and global health should not be summed as there is significant overlap between the two sectors and these employment figures have been developed independently—the life sciences employment-impact figure was developed by TEconomy Partners via the IMPLAN Input/Output model, and the global health impact figure was developed by Community Attributes as part of the *Landscape Study*.

Washington realized a staggering loss of more than 104,000 private-sector industry jobs, while the life science industry held its own and did not decline, and the global health sector continued to add jobs.

Broad Geographic Footprint. The life science industry and global health sector are also more geographically distributed than many other innovation-led industries. This occurs in part because of the diversity of activities across research and development, manufacturing, services and distribution. In Washington, while the Seattle and Greater Puget Sound region have the highest concentration of industry jobs, each metropolitan area in the state has a presence in life sciences and global health, with strengths and specialized concentrations shown in the map.

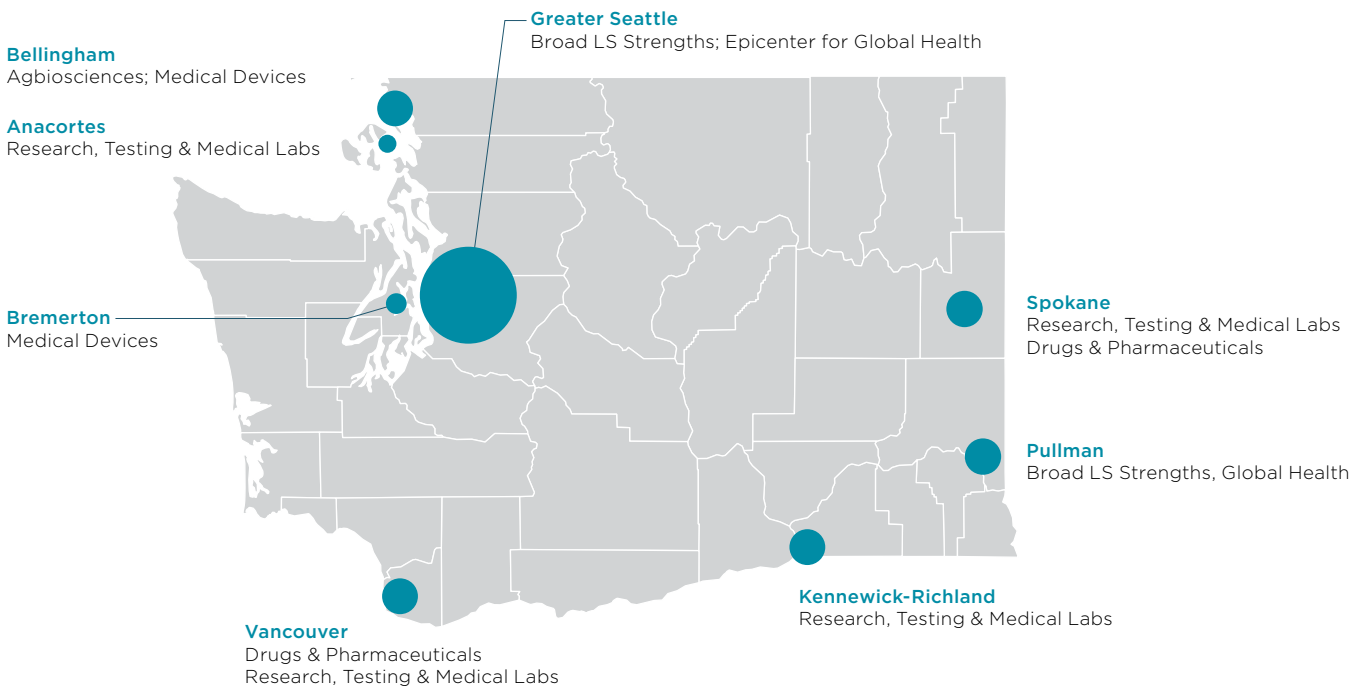
This geographic footprint of the life science industry is expected to continue to diversify given the investments by the state in expanding research and development activities of Washington State University. This includes the new medical school in Spokane, which also includes new investments and opportunities at each of its campuses throughout the state. Likewise, WSU

is conducting cutting-edge research with industry partners in the areas of agriculture, bioproducts and biofuels, and animal health at its campuses and extension centers distributed across the state.

A statewide “health dividend” from clinical excellence. Beyond economic benefits are the critical quality of life benefits afforded to residents in a leading life sciences and global health state. Clinical excellence in a state depends upon the excellence of its hospitals and health systems and their ability to develop and deploy leading-edge treatments and preventive care. Having a premier life science industry and global health sector in a state translates into increased access to innovative therapies, clinical trials and procedures, and other lifesaving and quality-of-life improving technologies for Washingtonians.

Together, these economic and quality-of-life benefits suggest the imperative for Washington to realize its statewide economic development potential from life sciences and global health. The industries can become a major driver for economic prosperity in Washington and help to diversify the economy and achieve broadly shared growth across the state.

FIGURE 3: Strengths and Specialized Concentrations Across Washington Metro Areas



AFTER A STRONG DECADE OF GROWTH, WARNING SIGNS OF ECONOMIC STAGNATION LOOM FOR WASHINGTON'S LIFE SCIENCE INDUSTRY AND GLOBAL HEALTH SECTOR

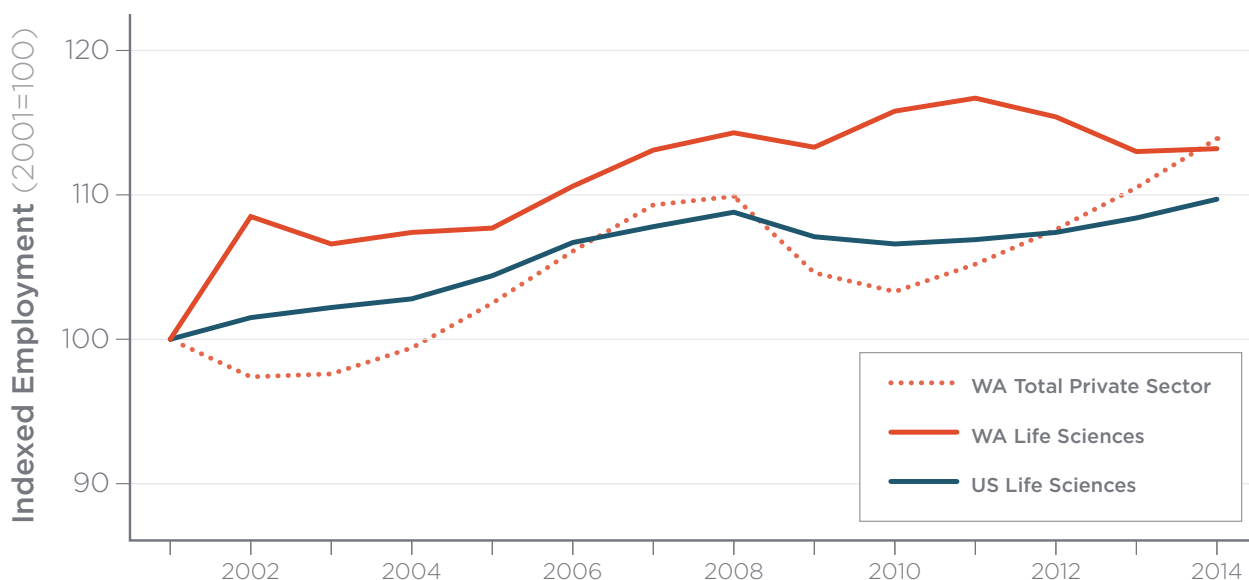
For a decade, Washington's life science industry and global health sector seized the opportunities created by a world-class life sciences research complex and bolstered by state support to take a major leap forward and place them among the state's major industry drivers. From 2001 to 2011, Washington grew its life science industry by more than 4,300 jobs, representing a gain of 17 percent. By comparison, total state private-sector jobs grew by just 5 percent.

The strength of Washington's decade of growth led to a cluster that stood out nationally and emerged as one of the nation's most dynamic locations for life sciences and global health development. While still behind the national leaders in terms of both size and relative concentration of the industry, the state's rapid, double-digit job growth far exceeded that for the country: 17 percent vs. 7 percent, respectively (Figure 4).

These strong gains in life sciences and global health were made possible, in part, by targeted state policies to spur innovation and industry growth. These state policies included:

- R&D tax incentives that helped life sciences and global health companies invest in new product development and offset the disincentive of having to pay state taxes against gross receipts derived from any business activity, including revenues from strategic alliances, even though they are not profitable and still in the midst of commercializing technologies into new products.
- R&D Sales and Use Tax Deferrals to support the construction of new facilities and lab space, and the purchase of equipment.
- The Biotechnology and Medical Device Manufacturing Tax Credit supporting the growth of new manufacturing facilities.
- A targeted Washington Global Health Fund designed to support commercialization and manufacturing of innovative global health technologies.
- The Innovation Research Teams (or STARS) program that provided strategic funding to universities to recruit transformational "star researchers" with proven commercial expertise to the state.

FIGURE 4: Washington Stagnating in Life Science Industry Employment* After a Strong Decade of Growth



*Note: Life science industry employment includes significant overlap with the global health sector.

Source: TEconomy Partners' analysis of U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) data; enhanced file from IMPLAN.

WARNING SIGNS OF ECONOMIC STAGNATION

- The Life Sciences Discovery Fund (LSDF) was established in 2005 utilizing a small portion of the revenue from the Master Tobacco Settlement Agreement to foster growth of the state's life science industry and improve the health and economic well-being of its residents. The state's investment of \$90 million in the LSDF resulted in significant economic benefits:³
 - Leveraged an additional \$634 million or \$7 dollars for every \$1 of state investment;
 - Assisted 40 start-up companies with commercialization assistance;
 - Generated more than 4,000 direct and indirect jobs from LSDF grants and follow-on funding.

One very positive aspect of these targeted state policies and programs is that a stronger research and entrepreneurial ecosystem for life sciences and global health has emerged and been sustained.

- **Academic research is significant in Washington and outpacing national growth.** Washington has a life sciences and global health research complex that exceeds \$1 billion annually, led by the University of Washington (ranking ninth in the nation in National Institutes of Health funding among all universities in Fiscal Year 2016 and fifth among public universities), Washington State University (ranking tenth in the nation in agricultural research expenditures), the Fred Hutchinson Cancer Research Center, the Allen Brain Institute, and many other nonprofit research institutes. In both per-capita levels of research and growth trends, Washington stands well above the U.S. average and is a leader among the benchmark states.
- **A steady stream of high-potential new start-ups is being generated in Washington, with improved performance in technology transfer by its research institutions and above-average growth in venture capital investments.**

Washington has seen above-average levels of venture capital invested in its life sciences and global health companies as well as above-average increases in these venture capital dollars. University and other institutional technology transfer activities are resulting in well above-average technology licensing activity and a growing number of new Washington start-ups. While this has helped launch new start-ups, Washington's research institutions still need to improve their approaches to university-industry partnerships required to attract and sustain larger companies.

Despite Washington's prior investments in life sciences development and its emerging innovation ecosystem, the state's overall life science industry is now shedding jobs while nationally it is continuing to grow.

Since 2011, the life science industry has lost more than 900 jobs or 3 percent of its employment base in Washington.⁴ At the national level, the life science industry has grown by 2.7 percent. Among the largest 20 states in the life sciences, Washington was one of just three to experience a net job loss during the three-year period to 2014. Recent industry employment declines mean Washington is losing life science industry market share to competitor states.⁵ Washington was the only state in the comparison group to shed industry jobs since 2011 (Figures 5 and 6).

Along with this reversal in job growth, the state experienced a small decline in life-science-related patent activity in recent years, running counter to a strong growth trend nationally. Plus, Washington's industry R&D expenditure grew by 11 percent, 8 percentage points below the national growth in industrial life sciences R&D of 19 percent.

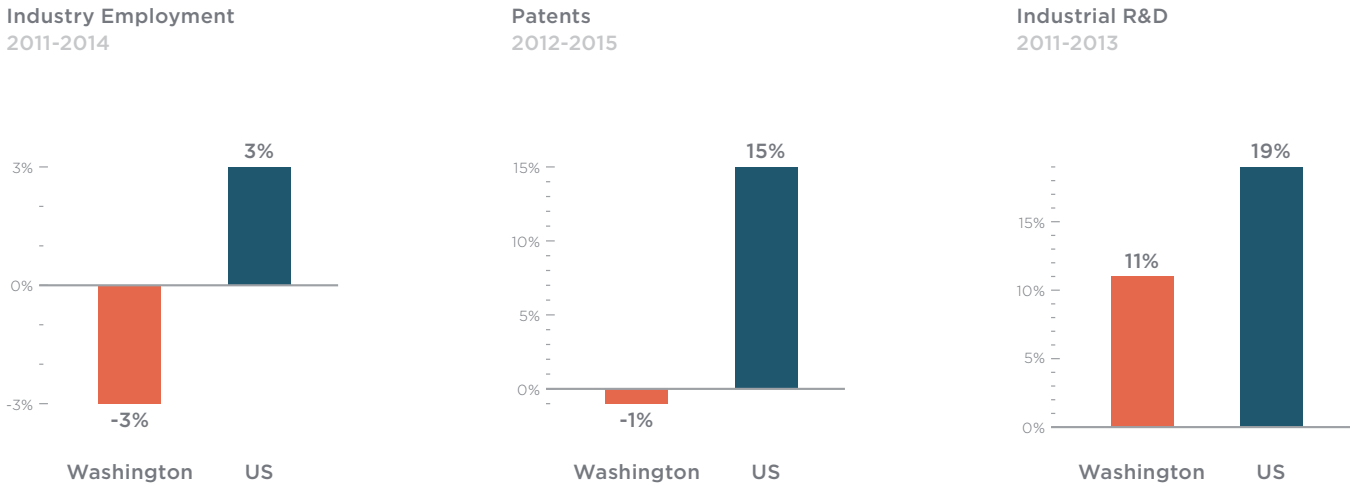
³ Economic impacts reported from the LSDF website: http://www.lsdofa.org/about_grantees.

⁴ Life science industry employment includes significant overlap with the global health sector; though the *Landscape Study* developed for the Washington Global Health Alliance has found the global health sector recorded net job growth during the 2009–2013 period.

⁵ To provide context and further insights into the performance of Washington in this study, comparisons are made against both the nation and a set of comparison or benchmark states representing a mix of states identified as competitors, aspirational targets, and regional peers. These seven states include Colorado, Georgia, Maryland, Massachusetts, North Carolina, Oregon, and Texas.

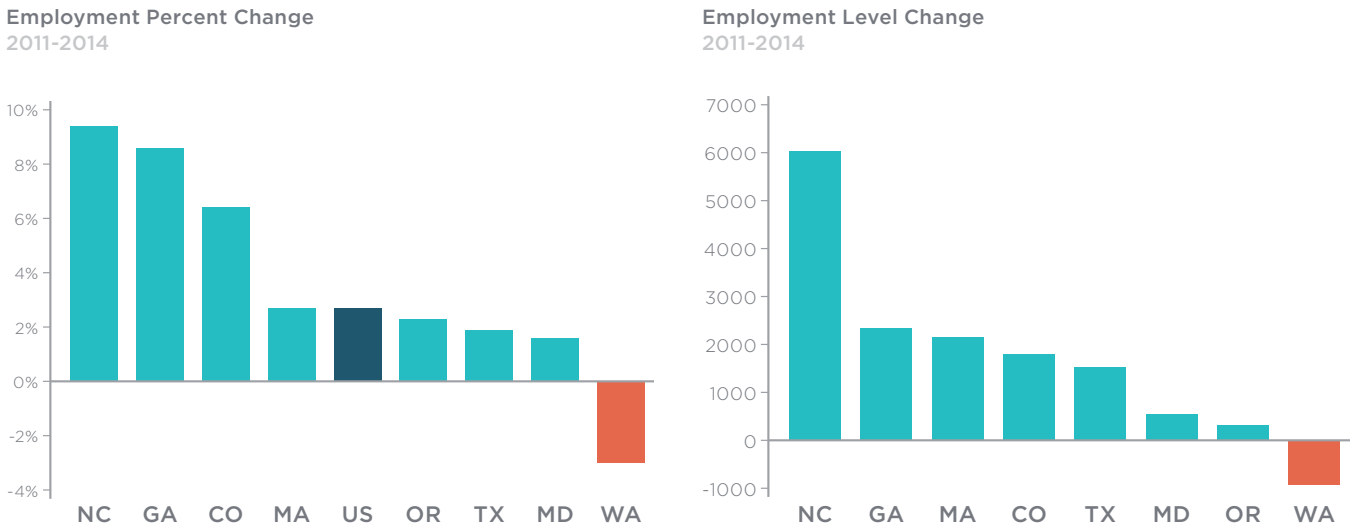
WARNING SIGNS OF ECONOMIC STAGNATION

FIGURE 5: Warning Signs of Stagnation in Life Sciences and Global Health in Washington



Source: TEconomy Partners' analysis of U.S. Bureau of Labor Statistics, QCEW data, enhanced file from IMPLAN; Thomson Reuters Thomson Innovation patent analysis database; National Science Foundation Business R&D and Innovation Survey.

FIGURE 6: Recent Trends in Life Science Industry Employment*, Washington vs. Comparison States, 2011-2014



*Note: Life science industry employment includes significant overlap with the global health sector.

Source: TEconomy Partners' analysis of U.S. Bureau of Labor Statistics, QCEW data, enhanced file from IMPLAN.

Difficulties in generating and attracting top talent.

In the state's life science industry, stakeholders lament the lack of a "critical mass" of companies, which has meant difficulties in attracting management talent to grow emerging companies. In addition, life science industry leaders cite a shortage of specialized talent in regulatory knowledge and functions, and in manufacturing expertise. In the global health sector, talent and workforce are among the top challenges the sector faces.

Gaps in key resources for emerging and growing life sciences and global health companies have been identified. These gaps reflect the full life cycle needed to support innovation, including the following:

- Lack of available and affordable wet-lab space, particularly for emerging ventures and especially in Seattle; and real estate more broadly for both life sciences and global health firms;
- Weaknesses in the depth of entrepreneurial networking and mentoring;
- Limited availability of growth capital and lead venture capital investors beyond seed-stage financing;
- Disincentives of the B&O tax and the burden it places on emerging, but not yet profitable, companies working on product development and strategic alliances.

Industry executives are concerned about the state's commitment to life sciences and global health development. Stakeholders are deeply concerned about their ability to compete with other states and regions that are offering a wide range of incentives, funding opportunities, and other dedicated resources targeted specifically to the life science industry and cite a lack of political support and public awareness of the industry as key challenges.

WASHINGTON HAS DIVESTED WHILE COMPETITOR STATES HAVE LAUNCHED BOLD NEW INITIATIVES

The bar for advancing life sciences and global health innovation and industry development is much higher than for other innovation-led industries. The complexity of translating scientific advances to improve human, animal, and plant health, along with the rigorous regulatory requirements to ensure the efficacy and safety of new life sciences products, results in a lengthy, costly, and uncertain innovation process. These characteristics and challenges to innovation are much different from other technology-based sectors, such as software and applications development, and require committed, long-term partnerships between industry, government, and academia.

To overcome the challenges inherent in these high-risk sectors, other states and regions invest significantly in public-private partnerships. For example, consider the investments of two leading states when it comes to life sciences economic development:

- **Massachusetts:** In 2008, a \$1 billion, 10-year investment in the Massachusetts Life Sciences Initiative was made to advance a comprehensive effort overseen by a new state-sponsored nonprofit known as the Massachusetts Life Sciences Center. Its results are outstanding: 1.4 million square feet of new life sciences facilities, including incubators and accelerators as well as shared-use biomanufacturing facilities; \$115 million in tax credits to over 75 companies that have committed to create more than 3,750 jobs; and 1,900 postsecondary interns placed since 2009 at more than 450 life sciences companies from across more than 160 colleges and universities. Across all of the Massachusetts Life Sciences Initiative efforts, it has been reported that \$3.4 in additional nonstate funding has been leveraged for every \$1 invested.
- **North Carolina:** In 1984, North Carolina developed a unique model for biotechnology-related economic development, centered on the formation of the North Carolina Biotechnology Center (NCBiotech)—a state-funded, private nonprofit

organization. Just from its long-term commitment to biotechnology business development targeting emerging new ventures with a range of financing, NCBiotech-funded companies in 2014 employed 2,188 workers (the most recent analysis available), with the total economic impact supporting 8,945 jobs in North Carolina. Annual revenues resulting from the total economic activity of these companies generate more than three times the tax revenue, an estimated \$44.9 million in state revenues in 2014, than the state's appropriation for NCBiotech of \$13.6 million in 2014.

In addition to these examples of long-term commitments, states like New York are seeking to become major players in the life sciences with major new initiatives. While this study was ongoing, the State of New York announced a major new \$650 million initiative to support the development of biotechnology across the state.⁶ The multifaceted plan's major components include \$250 million in tax incentives for both new and existing industry firms; \$200 million in state grants for lab space; and \$100 million to invest in new early-stage life sciences companies to be matched by \$100 million in support from private-sector partnerships. In addition to the statewide initiative, New York City has also announced a \$500 million, 10-year commitment to life sciences development in the city, bringing the total city and state government investment plans to \$1.15 billion.⁷

Leading life sciences states, and those intent on joining their ranks, are making major investments to not only sustain their position, but accelerate their growth. The investments of many of these states are described in the policy-focused appendix to this report to provide an indication of the breadth, creativity, and scale of the incentives, initiatives, and programs states are putting in place to grow, recruit, and retain life sciences companies in their regions. Based on the analysis, stakeholder interviews, and consultation with the Advisory Council, Washington needs a new playbook for public-private initiatives.

6 See: <http://www.xconomy.com/new-york/2016/12/12/new-york-state-hatches-sprawling-650m-plan-to-foster-biotech/>.

7 For specifics on the New York City investments in life sciences development, see: <http://www.xconomy.com/new-york/2016/12/13/ny-bio-surge-continues-as-de-blasio-unveils-500m-10-year-life-sci-plan/>.

The industry is at a crossroads, and the state needs to take action or risk losing these vibrant, innovative sectors.

Turning the Growth Curve Around

The life science industry and global health sector in Washington are at a critical juncture. To reestablish a position as a high-growth, leading life sciences and global health state, Washington must consider a new playbook for public-private initiatives to address specific challenges facing these industries. **Four broad strategic priorities have been identified:**

1. Reinstate the R&D tax incentives—

Washington is now out of step with leading life sciences states in not having an R&D tax credit and deferral. Additionally, unlike states with corporate income taxes, Washington's business and occupation (B&O) tax on gross receipts is particularly challenging to life sciences companies that face paying taxes against receipts derived from any business activity, often for years before becoming profitable. "Revenue" for such companies typically includes business income from strategic partnerships or technology licensing being invested to develop future products. As a result, Washington's tax structure is among the most challenging in the country for life sciences companies.

2. Support entrepreneurship and company creation statewide—

Washington needs to develop and coordinate resources (both public⁸ and private) to help entrepreneurs and young companies raise capital and successfully launch. This includes ensuring that young companies have access to affordable wet-lab space; sustaining a successful statewide entrepreneurship network to connect industry leaders throughout the state and nation; and deepening the pool of available venture capital.

3. Retain high growth potential mid-sized companies—

Washington currently lacks a "critical mass" of larger, more mature life sciences

companies that help attract seasoned employees and provide stability. Washington needs to do more to retain its home-grown companies that are having success and reaching critical expansion stages of development, though still not profitable. Reinstating the R&D tax incentives is an important step for Washington to remain a competitive location. In addition, addressing the retention and attraction of top talent to help lead the growth of these expanding life sciences and global health ventures is another key challenge for Washington.

4. Attract major corporate innovation centers—

Such centers will leverage Washington's strategic growth opportunities in life sciences and global health through advancing public-private partnerships. This is important for Washington to stay competitive with leading life sciences states that are having notable success in attracting research centers of major biopharmaceutical and medical devices companies to collaborate with their universities and nonprofit research centers.

⁸ In addition to state-level public resources, significant federal Department of Defense resources within the state can and should be leveraged in a greater way.

CONCLUSION

What stands out about the life science industry and global health sector is that it takes many partners to create sustained economic growth and value. Advancing these industries is not simply a matter of companies working on their own to grow through their own innovation-led developments. To go from new discoveries to lifesaving medical innovations calls for a wide range of collaborations across academic scientists, clinicians, health specialists, foundations, entrepreneurs, and investors.

Often overlooked is the critical importance of supportive state and local government partners to serve as a catalyst, investor, facilitator, and enabler via forward-looking policies and programs that create a competitive and high-value business environment. Such sustained government policies and practices are paying off in states across the United States from Massachusetts to North Carolina to Maryland to Colorado to Texas, among others.

The decade from 2001 to 2011 demonstrated this spirit of public-private partnership working effectively to advance Washington's life science industry and global health sector. Since that time, as government policies and programs to support life sciences and global health retreated, Washington has been forced to play a much more limited role in supporting the state's innovation ecosystem. While other states have been actively supporting growth companies, attracting corporate innovation partners, and addressing workforce and talent needs, Washington's competitive position has been eroding.

Washington has much work to do and is falling behind other states in its policies and programs to advance the life sciences. The result is that opportunities for growth may be jeopardized by the lack of public engagement and a high-potential economic development driver, which may simply remain a strong research engine with an underperforming industry sector. While state constitutional limits may require more creative approaches when it comes to public-private collaborations, Washington needs to start by reinstating straightforward policies and programs,

such as the R&D tax incentives that expired in recent years. With new policies, Washington can leverage billions of dollars of federally-funded research and reclaim its position as a top destination for life science and global health development.

Looking forward, this analysis recognizes that perhaps the most important policy change needed in Washington is to recognize that life sciences and global health development is a marathon and not a sprint. It requires sustained long-term commitment and cannot rest on its short-term achievements.