

*Minnesota Partnership for  
Biotechnology and Medical Genomics*

---

ECONOMIC  
QUANTIFICATION  
STUDY

Final Extended Report  
May 2004

# Economic Quantification Study

## Final Extended Report

### May 2004

---

#### Overview

Health care and the life sciences comprise one of the largest sectors of the United States' \$10 trillion economy: 13 percent. This \$1.3 trillion slice spent on health care is only expected to grow, reaching 17 percent by 2010 and more than 20 percent by 2040. This will continue a decades-long trend; in 1945 health care spending was only 4 percent of the U.S. economy. The rising cost of health care will be one of the greatest economic challenges in our current century.

The scientific promise of biotechnology and genomics will change medicine forever, in ways that were previously inconceivable. The field's potential for early diagnosis and treatment of diseases could reduce the suffering of patients not only in the U.S. but throughout the world and result in significant cost savings. Important medical discoveries already have been made by research institutions and private business in the biotechnology sector. Annually, \$11 billion is invested in research and development, not including funds expended on higher education and other nonprofit organizations. In fact, between 1993 and 1999, the biotech industry doubled in size, producing revenues of \$20 billion directly and \$27 billion indirectly.

It is within this framework that Tripp Umbach Healthcare Consulting was retained in October 2003 to quantify the potential range of economic impact of the Minnesota Partnership for Biotechnology and Medical Genomics. The goals of this study included:

- Evaluating the nature and extent of other state and multi-institutional partnerships;
- Quantifying the importance and benefits of investing in biotechnology to the state of Minnesota; and
- Describing longer-term health care benefits and cost savings for Minnesota related to investing in biotechnology and medical genomics.

## Methodology

To calculate the economic impact of the Partnership and biotechnology spin-offs in the state of Minnesota, Tripp Umbach Healthcare Consulting used a methodology derived from the original set of research tools and techniques developed for the American Council on Education (ACE).<sup>1</sup> The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated spatial area.

Tripp Umbach utilized a forward-linkage modeling methodology to measure the potential impact of the Partnership and biotechnology spin-offs in the state of Minnesota. Traditional economic impact studies are based on direct spending and re-spending within the economy (multiplier effect) driven from the institution itself. Forward-linkage models measure the broader impacts that occur or may occur in the economy as a result of the research and development activities of an institution – beyond the traditional direct and indirect impact. Examples of forward-linkage impacts include businesses that spin-off of research activities, to new and existing businesses, and sponsored research relationships.

In order to complete these economic projections Tripp Umbach researchers developed a series of 36 customized economic impact models based upon numerous assumptions. The basic architecture of these models is the methodology most widely accepted within the industry. Due to the complexity of measuring the impact of biotechnology and medical genomics, Tripp Umbach researchers developed a series of customized economic impact models showing the economic, employment and government revenue impacts of both the Partnership and potential business spin-offs.

Economic impact projections were calculated for three distinct time periods: 2010, 2015 and 2020; and three distinct scenarios: low, mid and high range. The linear cash flow models developed for this project represent annual, point-in-time economic impact projections. Tripp Umbach assumed that the \$70 million allocated to the Partnership by the state of Minnesota will be appropriated in 2005 and distributed beginning in 2006 in increments of \$14 million<sup>2</sup>.

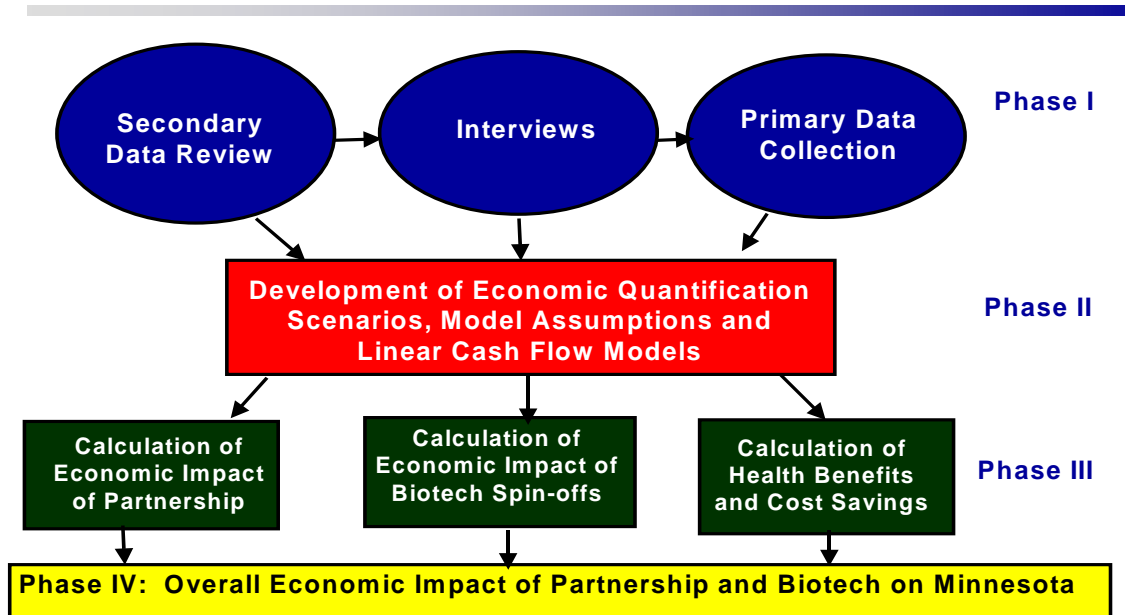
---

<sup>1</sup> Caffrey, J., and Isaacs, H. *Estimating the Impact of a College or University on the Local Economy*. American Council on Education, 1971.

<sup>2</sup> Tripp Umbach assumed that the funding allocated to the Partnership by the state in 2005 and disbursed in 2006 will act as a catalyst to grow the Partnership and biotech start-ups in the state resulting in the economic projections presented in 2010.

The research process was conducted in four phases: Phase I: Data Collection; Phase II: Economic Quantification Scenario, Model and Assumption Development; Phase III: Calculation of Economic Quantification of the Partnership, Business Spin-offs and Health Benefits and Cost Savings; and Phase IV: Calculation of the Overall Economic Impact of the Partnership and Biotech on Minnesota.

## Overview of Research Process



Economic projections for each scenario (low, mid, high) and time period (2010, 2015, 2020) are based upon a specific and detailed set of assumptions. Each assumption is based upon secondary data research, primary research and Tripp Umbach industry expertise<sup>3</sup>.

<sup>3</sup> These models are projections and assumptions of possible outcomes of the Partnership and state of Minnesota's commitment to attracting biotechnology into the state of Minnesota. It is noteworthy that while Tripp Umbach is confident in the model construction and projections presented herein, shifts in the overall economic climate in the state and nation, changes in state governmental policy toward biotechnology and biotechnology industry shifts are not calculated or accounted for in this study. The projections presented in this study are based upon the State and Partnership moving forward to make biotech an increasingly important industry sector in the State of Minnesota.

*Key assumptions for all models and all scenarios include:*

- Each Scenario assumes that the state of Minnesota commits an initial \$70 million in funding to the Partnership.<sup>4</sup>
- Each Scenario assumes that additional funding from outside organizations such as foundations, private business and other sources will be obtained by the Partnership.
- Each Scenario assumes that funding will be leveraged to generate R&D funding from other sources such as the federal government (leveraged funding), primarily by the attraction of National Institutes of Health (NIH) research support.
- Each Scenario is based on the assumption that the Partnership will continue to exist beyond 2010.
- Each Scenario assumes that an increase in the number of biotechnology spin-offs in the state of Minnesota will occur as a result of the Partnership and the state of Minnesota's commitment to developing the biotechnology sector.
- Each Scenario shows employment impact and a return on investment for the State of Minnesota from the low to high range.
- These Scenarios include both policy recommendations and revenue projections that need to work in concert with one another in order to produce the desired result – Minnesota as a Center of Biotechnology.

---

<sup>4</sup> State funding is allocated in 2005 and disbursed over a 5-year period beginning in 2006. The economic impact models include the initial state allocation of \$70 million to the Partnership disbursed in increments of \$14 million from 2006 to 2010.

<b>BROAD SCENARIO AND MODEL ASSUMPTIONS</b>		
<b>Low Range</b>	<b>Mid Range</b>	<b>High Range</b>
Limited New Successful Company Start-Ups (<5)	Moderate New Successful Company Start-Ups (5-15)	High New Successful Company Start-Ups (>15)
Limited Expansion in Venture Capital \$3-\$4 million (annually/ per company)	Moderate Expansion in Venture Capital \$8 -\$13 million (annually/ per company)	High Level Expansion of Venture Capital \$12 -\$23.6 million (annually/ per company)
Impact of State Funding on Partnership R&D  \$1 State: \$0.50 Additional Funding: \$1 Leveraged <sup>5</sup> Funding (with continued state funding)  \$1 State (2010), \$0 State (2015, 2020): \$0.50 Additional Funding: \$1 Leveraged Funding (without continued state funding post 2010)	Impact of State Funding on Partnership R&D  \$1 State: \$0.50 Additional Funding: \$1.5 Leveraged Funding (with continued state funding)  \$1 State (2010), \$0 State (2015, 2020): \$0.50 Additional Funding: \$1 Leveraged Funding (without continued state funding post 2010)	Impact of State Funding on Partnership R&D  \$1 State: \$0.50 Additional Funding: \$2 Leveraged Funding (with continued state funding)  \$1 State (2010), \$0 State (2015, 2020): \$0.50 Additional Funding: \$1 Leveraged Funding (without continued state funding post 2010)
No Special Incentives to Biotechnology Companies	Tax Benefit to Biotechnology Companies Beyond Other Companies	Direct Capital and Training Grants in Addition to Tax Benefits for Biotechnology Companies
No Encouragement for New or Existing Companies to Interface with Partnership	Promotion of the Partnership to New and Existing Companies.	Active Promotion of the Partnership and Financial Incentives for Participation in Partnership Initiatives
State in Low-Risk Environment  No Special Focus on Biotech	State in Medium-Risk Environment  Basic Incentive Package to New and Existing Biotech Businesses	State in High-Risk Environment  Expanded Incentive Package to Attract and Retain Biotech Businesses
Minnesota Not a Biotech Center	Minnesota has Medium-Range Success in Biotech	Minnesota is a Leader in Biotech

Since the initial commitment of state funding will expire in 2011, Tripp Umbach completed economic projections for the Partnership without further state support included into the funding mix. These calculations were made to show the viability of the Partnership as a stand-alone entity.

<sup>5</sup> Leveraged funding is based on the addition of state funding and additional funding received by the Partnership.

## The Competition for Biotechnology Leadership

Nationally, competition is intense to develop viable biotech sectors. Together, 41 states are spending well into the billions of dollars to stimulate and leverage the development of biotechnology within their borders. For example, neighboring Wisconsin's biotechnology industry has grown dramatically since the late 1980s – 30 percent of its biotech companies were established in just the past five years. Moreover, the state's bioscience researchers are bringing in \$500 million in grants and awards from outside Wisconsin. Currently biotech represents 3 percent of all manufacturing in the state, and in sum, the industry contributes approximately \$5 billion to Wisconsin's economy<sup>6</sup>.

There is, however, a wide spectrum of investment among individual states. Several states that had earmarked tobacco settlement money for bioscience research efforts have rescinded some of these funds in order to offset state budget deficits. Since September 11, 2001, budget pressures have slowed overall state spending in this arena; however, recent evidence suggests that this situation may be changing. An assessment of current state activities reveals that each state will need to establish its own competitive advantage in order to attract sufficient scientific talent and investment dollars, and develop the necessary infrastructure necessary for a long-term commitment to a viable biotech sector.

## Minnesota Snapshot

Health care services accounted for more than \$12 billion of Minnesota's Gross State Product as recently as 2001<sup>7</sup>. Within the health care sector, the biosciences currently are a significant segment in terms of economic value and quality jobs: as of the year 2000, more than 10,500 Minnesotans worked in biological science occupations. Additionally, Minnesota higher education institutions award 1,735 degrees annually in the life and biological sciences<sup>8</sup>.

The top five biotechnology and related companies in Minnesota, based on annual revenue, include Medtronic, 3M Health Care, Guidant Corp., Land O'Lakes Agricultural Services, and Ecolab<sup>9</sup>. As demonstrated by this grouping, biotechnology in Minnesota encompasses aspects of the agriculture and chemical fields, in addition to health and medical care businesses. Further, many medical device firms in the state are exploring new advances in biotechnology to enhance devices and improve drug delivery. Between 1997 and 2001, Minnesota companies registered 2,500 patents in biotechnology and related fields<sup>10</sup>.

---

<sup>6</sup> Source: Newman, Judy. *Biotech Thrives in Wisconsin*. The Wisconsin State Journal. October 26, 2003.

<sup>7</sup> Source: *State Government Initiatives in Biotechnology 2001*. Technology Partnership Practice Battelle Memorial Institute and State Science and Technology Institute. September 2001.

<sup>8</sup> Source: Ibid.

<sup>9</sup> Source: *Cultivating New Growth: A Profile of Minnesota's Biotechnology Companies*. Minnesota Department of Trade & Economic Development, February 2003.

<sup>10</sup> Source: *Minnesota's Biotechnology and Related Industries: A Fact Sheet for Businesses*. Minnesota Department of Trade & Economic Development, 2003.

In 2003, the state of Minnesota, under the leadership of Gov. Tim Pawlenty, formed a 19-member Biosciences Council to guide the State's biotech initiative. It championed several proposals, including: a joint biotech research effort by the University of Minnesota and Mayo Clinic (\$2 million was allocated by the Minnesota Legislature in 2003; a further \$70 million requested over the next five years is pending approval); research parks that offer bioscience companies a tax refuge and the opportunity to work with University and Mayo researchers; and the stimulation of investment in bioscience companies, perhaps by leveraging some of the \$39 billion in assets managed by the State Board of Investment.

### **A Strong Foundation**

Many states will have to invest significant resources to attract scientific talent and develop a biosciences infrastructure to simply be competitive with where Minnesota stands today, due to the investments already made in biotechnology and medical genomics by the University of Minnesota and Mayo Clinic. Although Minnesota did not have a state-sponsored biotechnology initiative prior to 2003, the scientific leadership and substantial investments made by these two world-class institutions allow Minnesota to move forward in the biosciences from a position of strength. Many other states begin their efforts from a position of comparative weakness.

Together, Mayo Clinic and University of Minnesota already have invested nearly \$500 million in genomic medicine. The Minnesota Partnership for Biotechnology and Medical Genomics works to combine these institutions' unique, complementary strengths in basic research and clinical applications.

The University has made strategic investments in biosciences and counts molecular and cellular biology among its top academic areas of focus. It has committed more than \$40 million to faculty recruitment and retention, targeting the fields of genomics, cell biology, biochemistry and neurosciences. In supporting its work in the biosciences arena, the University has established a number of institutional centers: biomedical genomics; human genetics and proteome analysis; computational genomics and bioinformatics supercomputing; molecular and cellular therapeutics; stem cell research; magnetic resonance research; drug design; and others. Additionally, the University boasts the nationally renowned Center for Bioethics, and has established a Consortium on Law and Values in Health, Environment and the Life Sciences.

Mayo Clinic has invested \$150 million to develop a digital database of more than 4 million confidential patient records and 10 million tissue/serum samples. This unique resource holds enormous promise for deciphering the genetic links to disease. No other U.S. institution possesses a similar database, nor can it be replicated. The Clinic's work in heart failure research, neurodegenerative diseases, magnetic resonance imaging for cancer and cardiovascular disease, and pharmacogenomics positions Mayo on the cutting edge of medicine. As a result of these focus areas and others, and its outstanding commitment to patient care, Mayo Clinic is one of the world's most respected health care and research institutions.

Together, these two institutions have a complementary mix of expertise with little duplication, and the potential to attract the best scientific talent. They exhibit a strong synergy between the practical clinical application focus of Mayo Clinic and bioscience and information technology at the University of Minnesota.

In addition to housing two of the country's top research institutions, Minnesota is a renowned destination for medical care, and the health care and medical technology industries are major contributors to the state's job base. Minnesota's track record of entrepreneurship and commerce creates a breeding ground for new biomedical and biotechnology companies, and the state's well-educated workforce provides a strong talent and labor pool. Further, Minnesota's legal and technological industries provide important financial support and expertise. Minnesota currently, therefore, has several critical components in place to facilitate its emergence as a leader in biosciences.

### **Opportunity for Growth**

With its existing scientific base and premier research institutions, Minnesota has the potential to become a leader in the emerging field of biotechnology and medical genomics. Moving Minnesota into a competitive position for future world-class biotechnology leadership, however, will involve several potential actions.

1. **Encourage collaboration to draw upon institutional strengths.** Through the establishment, in 2003, of the Minnesota Partnership for Biotechnology and Medical Genomics, the University and Mayo Clinic have brought together a synergistic mix of scientific expertise. Together they likely will attract more NIH grants and private research funds than they could separately. Additionally, Minnesota has a history of attracting venture capital for new and expanding companies; as recently as 2002, the state's medical device and biotechnology industries received more than 40 percent of the venture capital coming into Minnesota. A successful collaboration in biotechnology and medical genomics must be in place for the Partnership's full impact on the state of Minnesota to be realized.
2. **Assist in providing specialized laboratory space.** Additional research space is needed for Partnership fellows, students, and researchers. The Governor and the Biosciences Council have recommended \$20 million in state financing from the 2004 Minnesota Legislature to construct additional laboratory space for the Partnership. The proposal is to build three additional floors on the Stabile Building, a 10-story facility that opened in 2000 on the Mayo Clinic campus in Rochester. Mayo Clinic will contribute \$11 million of current infrastructure to the project, an alternative that offers significant cost savings for the State and the geographic location to maximize cross-fertilization of the intellectual and scientific talents of leading researchers acting as co-investigators. State support for the laboratory and equipment needs of the Partnership is imperative to its future success.
3. **Provide research funding leverage.** Ongoing funding for this project is critical, and developing a model for providing such funding outside the annual state budget process must be a high priority. Additionally, a long-term funding commitment demonstrates to

new businesses and those looking to relocate to Minnesota that the State is committed to the biosciences industry. A stable source of leveraged funding is imperative for biotech growth.

4. **Resist the pressures to impose requirements, restrictions and costs that would render Minnesota noncompetitive.** If state requirements for new development become too burdensome, Minnesota will be noncompetitive relative to other states that have a more progressive vision. A number of regional efforts are underway, featuring multiple institutions and academic medical centers operating in collaboration and independently: Boston, San Francisco, Chicago, the Baltimore-Washington corridor, and Pittsburgh are home to such multi-institutional clusters.
  
5. **Create an environment that encourages and facilitates existing business expansion and new business formation.** There must be a commitment to this initiative beyond annual state support for research. Further, it must set in place intellectual property provisions and tax incentives to support efforts in biotechnology and medical genomics. Specific areas in which Minnesota can capitalize on its strengths are in the agricultural and industrial biotech sector and hybrid medical devices. Success in this arena will take a sustained commitment from the State and its public and private institutions.

**The Economic Potential is Significant**

Three scenarios were modeled to quantify potential economic benefits for the purposes of this study. Each scenario assumes that the state of Minnesota commits an initial \$70 million in funding to the Partnership<sup>11</sup>. Each scenario shows a return on investment for the state of Minnesota from the low to high range, across three benchmark years: 2010, 2015 and 2020. The overall impact of the Partnership and biotech spin-offs on the state of Minnesota in 2010 could range from \$88.8 million (low-range scenario) to \$769.2 million (high-range scenario). In 2015, the overall impact could range from \$64.7 million (low-range) to \$1.38 billion. The overall economic impact of the Partnership and Biotech Spin-offs in 2020 could range from \$102.3 million (low-range scenario) to \$2.5 billion (high-range scenario).

<b>Annual Overall Economic Impact of Partnership and Biotech Spin-Offs<sup>12</sup></b>			
	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Low</b>	\$88,821,954	\$64,697,481	\$102,345,648
<b>Mid</b>	\$319,285,242	\$511,257,552	\$884,896,371
<b>High</b>	\$769,256,216	\$1,377,210,238	\$2,499,189,493

<sup>11</sup> The initial \$70 million in State funding is used in each of the scenarios as a catalyst for the future growth of the Partnership. The \$70 million is committed in 2005 and is disbursed in 2006 for a five-year period in increments of \$14 million for all scenarios.

<sup>12</sup> The overall economic impact of the Partnership and biotech spin-offs equals both direct and indirect business volume. Direct impact is defined as the sum of total expenditures for capital, goods and services, and staff spending within in the study area. It also includes out-of area spending from patients and visitors. Indirect impact is defined as the standard multiplier as recommended by American Council on Education representing the re-spending taking place in the study area

These scenarios (low, mid and high range) also are predicated upon the assumption that additional funding to the Partnership will come from other sources, specifically leveraged funding (federal dollars attracted to the Partnership to fund further R&D) and additional funding from other sources such as foundations, private business and other outside sources to be identified by the Partnership. The economic and employment impact of the Partnership is based upon the Partnership’s continued funding of research projects in the biotechnology and medical genomics field<sup>13</sup>. Additionally, these scenarios include both policy recommendations and revenue projections that need to work in concert with one another to produce the desired result of Minnesota as a center for biotechnology.

Tripp Umbach assumed that post-2010 no additional funding would be provided to the Partnership by the state of Minnesota. It is expected that the Partnership will be self-sustaining after the initial \$70 million state funding allocation. The table below depicts the amount of state funding, additional funding and leveraged funding factored into the economic impact models.

<b>Partnership Funding Assumptions</b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Partnership State Funding<sup>14</sup></b>	\$14.0 million	\$0	\$0	\$14.0 million	\$0	\$0	\$14.0 million	\$0	\$0
<b>Partnership Additional Funding</b>	\$7.0 million	\$8.1 million	\$9.4 million	\$7.0 million	\$8.1 million	\$9.4 million	\$7.0 million	\$8.1 million	\$9.4 million
<b>Partnership Leveraged Funding</b>	\$21.0 million	\$8.1 million	\$9.4 million	\$31.5 million	\$12.2 million	\$14.1 million	\$42.0 million	\$16.2 million	\$18.8 million
<b>Partnership Total Funding</b>	\$42.0 million	\$16.2 million	\$18.8 million	\$52.5 million	\$20.3 million	\$23.5 million	\$63.0 million	\$24.3 million	\$28.2 million

<sup>13</sup> The basis of employment numbers for the Partnership models originates from the Minnesota Partnership for Biotechnology and Medical Genomics, Mayo Clinic and University of Minnesota, Business Plan (Exhibit A, page 11), October 1, 2003. It states that two to six collaborative research projects would be funded in Phase I. Tripp Umbach assumed that with state funding disbursement beginning in 2006 for Phase II that additional projects would be funded. The employment numbers are based upon the number of primary investigators per research project, and that each primary investigator would hire staff to assist them.

<sup>14</sup> Tripp Umbach assumes that the state of Minnesota is no longer providing any funding to the Partnership post-2010.

**Economic Quantification Study  
Final Extended Report**

Tripp Umbach calculated both direct<sup>15</sup> and indirect<sup>16</sup> employment numbers for the Partnership and for biotech spin-offs for all scenarios and all benchmark years. In 2010, under the low-range scenario, the Partnership potentially could generate 1,201 new direct and indirect jobs. In 2010, under the mid-range scenario the Partnership could create 1,932 new jobs, and under the high-range scenario in 2010, 3,215 new jobs could be created.

The overall employment generated by the Partnership and biotech spin-off companies (direct and indirect) in 2010, under the low-range scenario is projected to be 1,448. In 2010, under the mid-range scenario the state could potentially gain 4,363 new jobs and in the high-range (2010), 10,543 new jobs could be create in the state of Minnesota.

<b>Partnership Employment<sup>17</sup></b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Partnership Direct Employment</b>	352	136	158	440	170	197	573	221	256
<b>Partnership Indirect Employment</b>	849	448	704	1,492	1,551	2,438	2,642	2,751	3,812
<b>Total Partnership Related Employment</b>	1,201	584	862	1,932	1,721	2,635	3,215	2,972	4,068
<b>Business Spin-off Employment<sup>18</sup></b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Biotech Spin-off Direct Employment</b>	60	108	189	200	480	920	1,000	2,720	4,840
<b>Biotech Spin-off Indirect Employment</b>	187	307	490	2,231	4,410	7,880	6,328	13,307	25,328
<b>Total Biotech Related Employment</b>	247	415	679	2,431	4,890	8,800	7,328	16,027	30,168
<b>Overall Employment of the Partnership and Biotech Spin-off Employment (Direct and Indirect Jobs)<sup>19</sup></b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Total Employment of the Partnership and Biotech Spin-offs</b>	1,448	999	1,541	4,363	6,611	11,435	10,543	18,999	34,236

<sup>15</sup> Direct employment equals the total number of FTEs who are employees of the biotech spin-offs and the Partnership.

<sup>16</sup> Indirect employment equals the total number of FTEs who work for businesses that provide support services to the business spin-offs and the Partnership within the state of Minnesota.

<sup>17</sup> Employment numbers represent a snapshot of the level of staffing by the Partnership and biotech spin-offs for a given year.

<sup>18</sup> Employment numbers represent a snapshot of the level of staffing by the Partnership and biotech spin-offs for a given year

<sup>19</sup> Employment numbers represent a snapshot of the level of staffing by the Partnership and biotech spin-offs for a given year

**Biotech Start-ups and Venture Capital**

In addition to the economic impact of the Partnership, Tripp Umbach modeled successful biotech start-ups in the state of Minnesota. Tripp Umbach assumed that, as a result of the Partnership’s research activity and the state of Minnesota’s increased support of biotechnology, in 2010 four biotech start-ups (low-range scenario) to 20 biotech start-ups (high-range scenario) could emerge. In 2015, six biotech start-ups (low-range scenario) to 32 (high-range scenario) may be present. Beginning in 2020, nine (low-range scenario) to 44 (high-range scenario) could be formed in the state of Minnesota. Tripp Umbach assumed an 85 percent failure rate of biotech start-ups.<sup>20</sup>

<b>Business Spin-offs and Venture Capital</b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Number of Successful Biotech Spin-off Businesses<sup>21</sup></b>	4	6	9	10	16	23	20	32	44
<b>Average Annual Biotech Venture Capital Amounts Per Company<sup>22</sup></b>	\$3.0 million	\$3.5 million	\$4.0 million	\$8.0 million	\$10.2 million	\$13.0 million	\$12.0 million	\$16.8 million	\$23.6 million
<b>Average Number of Staff per company<sup>23</sup></b>	15	18	21	20	30	40	50	85	110
<b>Average Annual Salary per employee<sup>24</sup></b>	\$65,000	\$76,000	\$88,000	\$65,000	\$76,000	\$88,000	\$65,000	\$76,000	\$88,000

Beginning in 2010, Tripp Umbach projects that biotech companies and spin-offs of the Partnership each would receive \$3.0 million (low-range scenario) to \$12.0 million (high-range scenario) in venture capital to be used for capital expenditures, goods and services, and salaries. Beginning in 2015, venture capital could surpass \$3.5 million per company and reach nearly \$16.8 million (aggressive); and in 2020, venture capital amounts could reach \$4.0 million and nearly \$23.6 million, respectively.

<sup>20</sup> Tripp Umbach assumed an 85% failure rate based on the following factors: 1) Post-genomic sciences R&D start-ups are more science driven and precise than other types of business start-ups, thus they are less prone to failure; and 2) Source: *Biotechnology Industry Survey*. Standard & Poor, January 2004.

<sup>21</sup> Tripp Umbach assumes that all the ideas generated as a result of state support for biotechnology and research activity from the Partnership will allow Minnesota to foster biotech start-ups and spin-offs. Tripp Umbach assumes an 85 percent failure rate going into 2015 and 2020. Tripp Umbach assumes that new businesses will be added in 2015 and 2020. Source: *Biotechnology Industry Survey*. Standard & Poor, January 2004.

<sup>22</sup> Source: *Trends in Venture Capital Funding in the 1990s*. USBA Office of Advocacy, August 1997.

<sup>23</sup> Source: *Cultivating New Growth: A Profile of Minnesota's Biotechnology Companies*. State of Minnesota, Department of Trade & Economic Development. February 2003.

<sup>24</sup> Source: *Bioscience Leading the Way to a Stronger Economy*. Connecticut's Bioscience Clusters 6th Annual Economic Report, June 2001. Source: *Cultivating New Growth: A Profile of MN's Biotechnology Companies*. State of Minnesota, Department of Trade & Economic Development. February 2003.

**Government Revenue**

In order to quantify the financial returns to the state of Minnesota, the models include a government revenue impact component,<sup>25</sup> which calculates the indirect government revenue received by the state of Minnesota from the Partnership and biotech spin-offs. In 2010, the low-range scenario shows that the state could receive \$4.9 million in indirect revenues from the Partnership and biotech spin-offs and by 2020 could receive \$5.6 million. The Partnership and biotech spin-off government revenue projections in the mid-range scenario could range from \$17.5 million in 2010 to \$48.5 million in 2020. The indirect government revenue impact generated by the Partnership and biotech spin-offs in the high-range scenario could reach as high as \$42.2 million in 2010 and by 2020 could equal \$106.6 million.

<b>Annual Government Revenue (Indirect)</b>									
	<b>Low Range</b>			<b>Mid Range</b>			<b>High Range</b>		
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Partnership Government Revenue</b>	\$4.0 million	\$2.1 million	\$3.3 million	\$7.0 million	\$7.3 million	\$11.4 million	\$12.4 million	\$12.9 million	\$17.9 million
<b>Biotech Spin-off Government Revenue</b>	\$.9 million	\$1.4 million	\$2.3 million	\$10.5 million	\$20.7 million	\$37.1 million	\$29.8 million	\$54.0 million	\$88.6 million
<b>Total Indirect Government Revenue</b>	\$4.9 million	\$3.5 million	\$5.6 million	\$17.5 million	\$28.0 million	\$48.5 million	\$42.2 million	\$66.9 million	\$106.6 million

**Health Care Cost Savings**

Not insignificantly, Partnership research that results in innovative diagnostic tools, novel treatment options, and earlier disease diagnoses likely will reduce health care cost expenditures while improving the overall health of Minnesotans. The Partnership’s four initial research projects focus on cardiovascular disease, cancer, Alzheimer’s disease, and obesity. The economic impact modeling completed by Tripp Umbach shows that even a 1 percent reduction in costs to treat these diseases in Minnesotans will equal millions of dollars in cost savings to the State.

In summary, the State’s commitment to biotechnology has the potential to pay steady dividends with regard to health care improvements, venture capital investments, new jobs and increased state revenues.

<sup>25</sup> The government revenue impact is the indirect government revenue paid to the state of Minnesota; it is calculated in each of the three scenarios for the years 2010, 2015 and 2020. Indirect government revenue is the tax paid by business spin-off and Partnership staff, and by the businesses that provide support services to the biotech companies and the Partnership. Indirect government revenue is based on the total economic impact of the business spin-offs and Partnership on the state. The types of taxes paid to the state include: individual and corporate income, sales, property and motor vehicle fuel-related. Any direct government revenue would be that paid directly by the business spin-offs and the Partnership to the state of Minnesota and is not calculated in the impact models presented herein.

## Conclusions

Tripp Umbach has formed the following conclusions with respect to the potential of State assistance in a biotechnology and medical genomics Partnership between the University of Minnesota and Mayo Clinic.

1. Nationally, competition is intense among states to develop viable biotech sectors. States are making biotech investments because of the future economic opportunity in this rapidly developing field – and the potential is extremely large.
2. Minnesota currently is competitive in biotechnology and medical genomics because of the substantial investments already made by, and scientific leadership of, the University of Minnesota and Mayo Clinic, and private sector development by Minnesota business enterprises. Yet achieving the maximum economic impact for the state of Minnesota in the biosciences will take a sustained commitment from the State, both members of the Partnership and the private sector.
3. Because of the narrowing window of opportunity to compete in the biotech field and the longer lead time required to achieve success, Minnesota must make investments today in order to yield the desired economic long-term benefits. Without a viable state biotech initiative, it is unlikely Minnesota will be able to compete with other states to emerge as a leader in biotech and medical genomics. Further, the absence of a State biotech initiative and long-term support exposes the University of Minnesota and Mayo Clinic to a drain of scientific talent, NIH research grants, philanthropic-sponsored research and venture capital to other states that are aggressively building programs and a biotech infrastructure.
4. Minnesota clearly has an opportunity to emerge as a leader in biotechnology, and the future of biosciences development within the state is contingent on three major factors:
  - Ability of the University of Minnesota and Mayo Clinic to successfully engage their respective strengths into a synergistic research partnership.
  - Willingness of the state of Minnesota to help construct additional laboratory space.
  - The State's ability to appropriate a stable and sustained source of research funding to leverage existing research investments and attract new grants from other sources.
5. In addition, the State should resist the pressure to impose requirements, restrictions and/or costs that would render Minnesota noncompetitive, and must support a favorable business and tax environment for existing biotech business expansion and new business formation.

6. Quantifiable economic impacts of the Partnership and biotech spin-offs in the mid range scenario include an economic impact of \$319.3 million annually and approximately 4,363 new direct and indirect jobs within the state of Minnesota in 2010; and more than 10,543 new direct and indirect jobs and an annual net new economic impact of \$769.3 million in 2010 under the high range scenario.

The Minnesota Partnership for Biotechnology and Medical Genomics will generate valuable economic benefits for Minnesota. Short-term, it will create significant economic activity and high-value new employment related to research spending. In the mid-term, the Partnership may transfer valuable research to create growth in existing Minnesota businesses that have capabilities and business lines related to biotechnology and health care. Looking into the future, the State can expect development of new start-up businesses and jobs created through intellectual property transfer and venture capital funding.

**Glossary of Terms**

<b>Business Volume Model</b>	Calculates capital account, goods and service, staff and out-of-area patient and visitor spending, as well as the value of business property and inventory.
<b>Government Revenue Model</b>	Calculates the amount of indirect tax (e.g., income, sales) received by the government from Partnership-related and Biotech Spin-off-related businesses and populations.
<b>Total Business Volume Impact</b>	Direct impact multiplied by indirect impact multiplier.
<b>Direct Business Volume Impact</b>	Sum of total expenditures for capital, goods and service, staff and out-of-area patients and visitors spending.
<b>Indirect Business Volume Impact</b>	Standard multiplier as recommended by American Council on Education representing the re-spending taking place in the study area.
<b>Total Employment</b>	Direct employment plus indirect employment.
<b>Direct Employment</b>	Total FTEs employed by the Partnership and Biotech Spin-offs.
<b>Indirect Employment</b>	Total number of FTEs who work for businesses that provide support services to the Business Spin-offs and the Partnership within the state of Minnesota.
<b>Capital Account Expenditures</b>	A five-year average of spending on equipment, buildings and land.
<b>Goods, Services and Supplies Expenditures</b>	Total non-capital and non-payroll spending for the 12-month period of the study (2003).
<b>Total Expenditures by Staff</b>	Sum of spending for rental housing and non-housing items by those residing in the area and general spending in-area by those not residing in the area.