



ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Economic Impact Analysis

Proposition 71 California Stem Cell Research and Cures Initiative

Prepared by:

Laurence Baker
Associate Professor, Health Research and Policy
Stanford University

Bruce Deal
Managing Principal
Analysis Group, Inc.

September 14, 2004

I. Report Overview

A. Introduction

This study provides an economic analysis of the costs and benefits associated with Proposition 71, the Stem Cell Research and Cures Initiative. The study was conducted by Dr. Laurence Baker, Associate Professor of Health Research and Policy and Chief of Health Services Research at the Stanford University School of Medicine, in conjunction with Analysis Group, Inc., a national economic and financial research firm with offices in Los Angeles, San Francisco, Menlo Park and major cities throughout the United States. Bruce Deal, Managing Principal of Analysis Group, co-authored the study.

Proposition 71 authorizes a total of nearly \$3 billion in tax-free, general obligation state bonds to support stem cell research at California hospitals, medical schools, universities and other research institutions over 10 years. The Initiative defers principal and interest payments on the bond during the first five years, from 2005 through 2009. Bond payments of about \$200 million per year would begin in 2010 and continue until 2039, creating a bond payback period of 30 years. The total payback cost with interest on the bonds is estimated by the authors at about \$5.4 billion.¹

The investments in stem cell research and research facilities made possible by Proposition 71 are expected to generate revenues for the State of California from new income and sales taxes. Proposition 71 could also produce new royalty revenues and tax revenues resulting from expanding economic activity in the biotechnology industry. By leading to new treatments for just a few of the more than 70 diseases and conditions that scientists believe could be treated or cured with stem cells, Proposition 71 has the further potential to provide significant reductions in California's health care spending costs, which now amount to more than \$110 billion per year.

B. Key Conclusions of the Economic Analysis of Proposition 71

In even the modest scenarios examined, Proposition 71 provides total state revenues and health care cost savings of between \$6.4 billion and \$12.6 billion during the payback period, generating a 120% to 236% return on the investment made in the research.

Thus, Proposition 71 is capable of paying for itself during the payback period alone with the possibility of continuing to generate billions of dollars in revenues and savings for the State of California for decades after that.

Specific revenues and savings that are modeled include:

- a) ***Direct income and sales tax revenues of at least \$240 million*** from the Initiative's spending on research and research facilities.
- b) ***Additional income and sales tax revenues of from \$2.2 billion to \$4.4 billion*** if Proposition 71 could bring about even a 2.5% to 5% increase in private investments and

¹ A report addendum to be released in the future will report both costs and benefits taking into account inflation and the time value of money.

research activity in the California biotechnology industry by making California a world leader in stem cell research.

- c) **Direct health care cost savings to the State government of at least \$3.4 billion to \$6.9 billion**, based on modest assumptions that the research would reduce state spending by at least 1% to 2% for the care and treatment of patients suffering from six medical conditions that scientists believe could benefit from the development of new stem cell therapies, including stroke, heart attack (acute myocardial infarction), insulin dependent diabetes, Parkinson's disease, spinal cord injury, and Alzheimer's disease.
- d) **Additional billions in health care costs savings for California businesses, citizens and other payers of health care costs.** California's total health care spending costs now exceed \$110 billion per year, including direct state government costs, costs funded by federal programs, insurance companies, employers, and individual citizens. In addition to providing billions in savings to the State government, new stem cell therapies could reduce costs to other health care cost payers by \$9.2 to \$18.4 billion based on 1% to 2% cost savings for the six conditions considered.
- e) **State royalty revenues of from \$537 million to \$1.1 billion**, resulting from the provisions in Proposition 71 that give the state an opportunity to share in royalties resulting from research funded by the Initiative.

If Proposition 71 leads to major advances in health care treatments, overall economic benefits to the State could be more than 7 times the cost of the Initiative.

Given the promise of stem cell research, cost reductions of 10% or more in the six conditions considered are possible through significant improvements in therapies. Savings of 10% on health care costs would lead to additional saving to Californians of \$92 billion and increase the total economic benefits to the State of Proposition 71 to 750% of cost.

Proposition 71 will create thousands of new jobs in California.

Direct spending from the Initiative will generate thousands of additional jobs in California. Additional growth in the biotechnology industry could generate additional jobs. In total, between 5,000 and 22,000 new jobs on average per year could be created; the total number of job-years (one job for one year = one job-year) ranges from 360,000 to 673,000.

This analysis shows significant potential economic benefits of Proposition 71. However, it should be noted that the primary social benefit from Proposition 71 is its potential to improve the health and save the lives of millions of Californians who now suffer – or will eventually suffer – from diseases and injuries that could be treated or cured with new stem cell therapies whose development could be enabled or accelerated by Proposition 71. This benefit cannot readily be quantified by economic analysis, and has not been included in the study.

II. Executive Summary

A. Overview

On behalf of Californians for Stem Cell Research and Cures, Dr. Laurence Baker, Associate Professor of Health Research and Policy and Chief of Health Services Research at the Stanford University School of Medicine and Bruce Deal, Managing Principal with Analysis Group, Inc., have been retained to analyze the financial impact of Proposition 71 (the Stem Cell Research and Cures Initiative, or the “Initiative”) on the people of California and the State budget.

Proposition 71 would authorize the issuance of \$3 billion in State general obligation bonds to fund stem cell research in California over 10 years.² The measure would establish the California Institute for Regenerative Medicine (“Institute”) to use the proceeds from the sale of the bonds to issue grants and loans for stem cell research and research facilities, as well as to provide oversight of stem cell research activities funded by this measure.

While Proposition 71 has significant economic costs and benefits, its central goal is not specifically economic in nature, but rather is to contribute to improvements in health. The concept of public funding of health-related research is well-established in the United States, with billions of dollars each year spent funding basic and later-stage research designed to improve human health. The benefits of this research have been significant and have improved the length and quality of life for millions of Americans. Were Proposition 71 to accelerate the discovery of beneficial new therapies, it could produce important benefits for Californians and others throughout the United States, and even the world, in the form of improved length or quality of life for individuals with affected health conditions as well as their family members, friends, and community members. We do not attempt to quantify the potentially large, but often intangible, benefits of this type that could result from successful research under Proposition 71.

This report does not directly address the political context of Proposition 71 or the fundamental need for the funding, though these issues may be important. The Legislative Analyst’s Office reports that in 2002 the Federal government dedicated more than \$180 million in funding for adult stem cell research. At the same time, the Federal government also places restrictions on funding for research and limits the availability of embryonic stem cells, prompting arguments that this type of initiative is essential.

We also do not directly investigate the scientific aspects of stem cell research. As economists, we have relied on information obtained from published literature and from conversations with medical and scientific experts as to the potential for development of new stem cell-based therapies. This information is clear on two points. First, there appears to be great potential in stem cell research for the development of new and powerful medical therapies. Some studies from respected research institutions have shown positive proof of concept in important therapy areas, and some respected researchers report the possibility of new therapies emerging within the next several years. Second, the success of these therapies is in most cases yet to be demonstrated, thus further research (and funding) is required before the potential of stem cells will be fully understood or developed.

² The interest expense incurred during the initial years would be included in the 30 years general obligation bonds issued during the later years of the program.

Despite uncertainties about whether or when the promise of stem cell research will be realized, our conversations with a variety of experts have led us to the conclusion that the potential for successful therapies is strong enough to warrant analysis of the type we undertake here. With that in mind, we also believe it prudent to keep in mind the difficulties and challenges associated with the research. Even in our models that are correspondingly modest in their expectations for research successes, Proposition 71 appears capable of producing large economic benefits.

Our report examines the costs to the State of the principal and interest on the bonds, as well potential benefits from various sources. The net cost to the State will be the costs less benefits.

B. Economic Costs of Proposition 71

The funding costs of Proposition 71 can be readily quantified.³ For purposes of our analysis, we have identified three relevant time periods.

1. Years 1 – 5

During the first five years of the Institute, funds would be committed to new dedicated research facilities (\$300 million), research grants (\$1.25 billion), and program administration (up to 3 percent of the initial bond proceeds to fund overhead, and up to an additional 3 percent for grant administration). During this period, the cost of the bonds to the State budget is insignificant as the principal on the loans is deferred and the interest is paid through bond proceeds rather than by the State General Fund.

2. Years 6 – 14

During years 6 – 14 of the program, the remaining funds (for a combined total of \$3 billion) would be spent on research programs. (All facilities spending takes place in years 1 – 5). During this second period, the cost to the State budget is both the interest on the funds spent and the beginning of the 30-year principal repayment.

3. Years 15 – 35

The entire \$3 billion is projected to be spent in years 1 – 14. During years 15 – 35 of the program, there would be no additional funds spent from the amount authorized by the Initiative. In this final period, the cost to the State budget is both interest and principal, as the borrowings in years 1 – 14 would be repaid in full by the end of year 35.

We estimate total principal costs of approximately \$3.0 billion and interest costs of \$2.4 billion over the 35 year life of the program, for a total cost of \$5.4 billion.

C. Economic Benefits of Proposition 71

We have identified four areas where Proposition 71 could generate economic benefits for the people of California and the State budget. These are briefly summarized below; each area receives

³ For simplicity, we generally report all figures in the Executive Summary without adjusting for the time value of money over future periods (“discounting”). A report addendum will be released in the future detailing the costs and benefits after adjusting for inflation and the time value of money.

more complete treatment in the full report. Under the scenarios we model, Proposition 71 could generate economic benefits to the State of California that exceed the costs of the funding, potentially by a significant amount.

1. Tax Revenues Generated by Proposition 71 Spending

The first area where Proposition 71 would generate economic benefits is from the income and sales tax revenues generated by the \$3 billion in Initiative spending. Our estimates are based in part on analysis done using IMPLAN, an economic modeling program used by various agencies of the State of California.⁴ We estimate that during the first five years of the program, the additional tax revenues generated by the spending from Proposition 71 would be just under \$73 million, resulting in an overall ratio of \$1.30 in tax revenue to \$1 in interest expense. In other words, Proposition 71 would not create a net negative impact on the State budget during this period.

Over the 14-year initial funding period of the Initiative, we estimate new tax revenue to the State of \$240 million, or 4.5 percent of the overall program cost. The new spending on facilities, research, and administration would be enough to create approximately 2,900 new jobs on average during years 1 – 5, increasing to 3,700 new jobs on average by years 6 – 14, for a total of 47,000 job-years over years 1 – 14.

We assume no further tax revenues after year 14, when disbursements under the Initiative would end. Similarly, we assume no job creation from this source beyond year 14.

2. Tax Revenues Generated by Additional Biotechnology Economic Activity in California

The second area where Proposition 71 could generate economic benefits is from the income and sales tax generated by additional private biotechnology economic activity in California. Biotechnology is already a major industry in California, a state that has approximately 12 percent of the U.S. population,⁵ and nearly 40 percent of the U.S. life sciences companies.⁶

Proposition 71 could generate economic benefits by attracting additional activity in the life sciences industry. Proposition 71 could encourage companies that exist today, or would have been created anyway, to locate in California. Perhaps more importantly, Proposition 71 could create biotechnology activity that would not have otherwise existed. Many industry experts believe that stem cell research is among the most promising new areas of biotechnology research, attracting a great deal of private interest and investment. By providing a stable, significant funding base, Proposition 71 could facilitate further investment by private companies in stem cell research and

⁴ IMPLAN clients include the California State Departments of Finance, Transportation, and Water Resources, according to: “Client Listing,” Minnesota IMPLAN Group Inc., available at <http://www.implan.com/references.html>.

⁵ “Table 1: Annual Estimates of the Population for the United States and States, and for Puerto Rico: April 1, 2000 to July 1, 2003,” Population Division, U.S. Census Bureau, last revised May 11, 2004, available at <http://www.census.gov/popest/states/tables/NST-EST2003-01.pdf>.

⁶ “California Life Sciences Action Plan: Taking Action for Tomorrow,” Bay Area Bioscience Center, BIOCOM, California Healthcare Institute, Southern California Biomedical Council, Bay Area Council, Larta Institute, Sacramento Regional Technology Alliance, and San Diego Area Regional Technology Alliance, p. 1. This source contains a statewide synthesis of four regional Action Plans.

therapy development to a degree that may not have occurred otherwise.

Additional private biotechnology activity would generate economic benefits for the State of California through 1) new jobs that lead to income taxes paid by workers, and 2) sales tax paid by workers in new jobs and by companies undertaking new research.

Over the Institute's 35 year horizon, we estimate that were Proposition 71 to increase the size of the California life science industry by 2.5 percent relative to our estimated industry baseline size, the tax revenue associated with the additional activity would be about \$2.2 billion, or approximately 41 percent of the total program cost. This amount of new activity would amount to between \$1 and \$2 in additional private activity for every \$1 of public funding during the years in which the public funding is occurring (years 1 – 14). This amount of additional activity would be enough to create approximately 2,400 new jobs on average during years 1 – 5, increasing to a total of 7,500 jobs on average throughout years 6 – 14, and then a total of 11,100 jobs on average by years 15 – 35. Over years 1 – 14 this is equivalent to a total of 313,000 job-years.

Our estimates assume a baseline size of the biotechnology industry that grows over time. Some have argued that without support for further stem cell research, the biotechnology industry would grow more slowly than the baseline we have projected. If this is the case, then implementation of Proposition 71 could generate larger job creation and tax revenues. Overall, we estimate that the life sciences industry in California could account for nearly 400,000 California jobs by the year 2025. Were Proposition 71 to contribute to maintaining strong industry growth instead of decline, it may contribute a significant share of these jobs to the California economy. However, because of the uncertainty surrounding these predictions, we have not attributed any of these “baseline” jobs or tax revenues to Proposition 71 in our calculations.

3. Reductions in Health Costs Resulting from New Therapies

The primary goal of Proposition 71 is to facilitate new medical advances. In addition to the obvious health and quality of life benefits that would be associated with new therapies, there are also potential economic benefits in the form of lower health care costs if conditions that now require expensive treatments could be more efficiently managed. Though new research does not always lead to reduced costs, many of the conditions that are thought to have the greatest potential for stem cell-based therapies are also currently quite expensive to treat. In the simplest scenario, if stem cell research were to lead to new cures for these conditions, the net savings for each patient could be very large. Even if the therapies are not full cures, therapies that delay the onset or reduce the severity of conditions could also generate significant health care cost savings.

Health care cost savings would benefit both the people of California and the State budget. Currently the State budget is directly responsible for approximately 13 percent of total health care spending, comprising the State share of Medicaid (called MediCal in California), State employees and dependents, and various other State programs.⁷ If overall health costs are reduced for those suffering from various conditions, health care spending by the State government will also be reduced.

⁷ “2000 – 2001 State Health Care Expenditure Report,” Milbank Memorial Fund, National Association of State Budget Officers, and the Reforming States Group, available at <http://www.milbank.org/reports/2000shcer/index.html>, accessed September 2, 2004.

We have focused on 6 of the 70 conditions identified by medical and scientific experts as having the potential to benefit from stem cell research.⁸ These include stroke, heart attack (acute myocardial infarction), insulin-dependent diabetes, Parkinson’s disease, spinal cord injury, and Alzheimer’s disease. We have modeled direct health care costs in the under 65 population, lost work time costs in the 19-64 year old population, and nursing-home costs for all ages associated with these conditions. In our models, a small cost reduction of 1 percent per year in our modeled costs for these six conditions, beginning between years 5 and 15 of the Initiative, depending upon the condition, produces cost savings to all Californians of \$11 billion over the 35 years analyzed. Much of these savings would reduce health spending now paid for by Californians through health insurance or through their out-of-pocket spending. Some of these savings would also benefit the State budget by reducing State spending. Savings to the California State budget alone from reductions in health care spending would be approximately \$3.4 billion over the life of the Initiative, or approximately 64 percent of the program cost.

A 1 percent reduction in costs is modest and is consistent with only limited success in developing therapies. This could occur even if stem cell research were to produce only small gains, such as mitigating symptoms of disease or delaying onset of more serious symptoms for a short time. Were stem cell research to achieve greater successes, gains could be much larger. For example, if a stem cell therapy were to reduce the costs associated with insulin-dependent diabetes in California by half, beginning in year 6, this alone would produce savings of \$122 billion to California as a whole, and \$24 billion to the State budget over the 35 year life of the Initiative.⁹ When we model reductions in health care costs of even 2 percent rather than 1 percent, we estimate savings to all Californians of \$23 billion, and savings to the State of \$6.9 billion. Modeling a more aggressive scenario in which 10 percent savings are realized for these 6 conditions would yield reductions in spending of \$114 billion for all Californians and reductions of \$34 billion for the State.

We note that these cost savings could underestimate the full benefits to all Californians, because they focus on only 6 conditions and so do not include the benefits of reduced costs for many other diseases and conditions that could potentially benefit from stem cell therapies. In addition, these estimates do not include various other costs, such as care provided by non-paid family members and caregivers.

Our analysis fits within the context of work examining the returns to investment in health research and development. While exact precedents for the type of research envisioned by the Initiative are difficult to identify, there are more general examples of health research producing large gains for society. In many cases, the gains for society at the broadest level have resulted when research produces new therapies for conditions that had previously had no therapeutic treatment. These can lead to substantial improvements in health and quality of life, though often in return for additional health spending. In other cases, particularly serious conditions that create significant costs but lack effective therapies, successful research can be cost-reducing.

For example, studies by the National Institutes of Health (“NIH”) have analyzed the benefits of

⁸ Proposition 71, Initiative, Section 2. Findings and Declarations, <http://rs192.securehostserver.com/~curesfor/initiative.php>.

⁹ For the purposes of this report, insulin dependent diabetes includes type 1 diabetes and late onset diabetes in adults (LADA).

medical research spending, reporting a number of cases where relatively small investments in medical technology and research have resulted in substantial yearly cost savings, sometimes in the range of 25 – 40 percent return on investment.¹⁰ For example, the National Heart, Lung, and Blood Institute compared medical vs. surgical treatment for people with deferrable coronary artery bypass surgery. The research effort cost \$37 million and estimated savings are \$402 million to \$804 million per year over the period 1974 – 1984 from improved therapy. Another example cited from the National Institute for Allergy and Infectious Diseases concerns the formulation of the Hepatitis B vaccine. Here, the research effort cost \$32 million and estimated savings are between \$74 million and \$148 million per year over the period 1964 – 1981 on average.

While new research is not always cost-saving, and these examples do not ensure this same high level of economic return from all research, they do point to the opportunity for research on high-cost conditions, like those often thought to be amenable to stem cell research, to generate positive economic returns.

4. *Royalties from Discoveries Funded by Proposition 71*

The fourth area where Proposition 71 could provide economic benefits is from royalties associated with commercial applications of patented discoveries funded in total, or in part, through Initiative funds. While it cannot be known at this point what discoveries will be made and what patents will be secured, Proposition 71 includes explicit provisions for the State to share in the gains from any patents or other intellectual property developed with Initiative funding.

We do not expect that the research funds will be concentrated in such a way as to fund the entire development of a therapy from discovery through commercialization. Instead, the research funds are more likely to be used in a wide variety of promising areas. To provide a framework for discussion, we estimate that the total amount of research funding in the program is equivalent to the estimated cost the private sector currently would incur to develop 3 – 4 new therapies. If new therapies were to produce revenues akin to other major biotechnology therapies, generating approximately \$3 billion in current revenues per therapy, and applying a 2 percent royalty rate, we estimate that royalty revenues of \$537 million could be possible over the life of the program. Taking inflation into account, on an annual basis, this would be no more than 10 percent of the current amount of annual royalty revenues being realized by Stanford, the University of California system, and the City of Hope Medical Center.

We have also analyzed a scenario in which the state achieves a 4 percent royalty rate (approximately the mean rate observed in university contracts). If this were to happen, revenues would be \$1.1 billion.

D. Conclusion

The tables below summarize potential economic costs and benefits of Proposition 71 in three scenarios: limited therapeutic success, increased therapeutic success, and expanded therapeutic success. These analyses are presented without adjusting for inflation and the time value of money. Estimates including these adjustments for inflation and the time value of money will be presented

¹⁰ Mack, Connie, “The Benefits of Medical Research and the Role of the NIH,” Joint Economic Committee, May 17, 2000, p. 24. Dollar amounts in 1992 dollars.

in an addendum to be released in the near future. Since costs and benefits are both spread out over time, making these adjustments is less significant for this analysis than for projects where costs occur much sooner than future benefits.

1. Case 1: Limited Therapeutic Success

The first case we consider is consistent with only limited success in developing therapies, resulting in a 1 percent reduction in the health care spending we model. New biotechnology activity is assumed to augment the baseline life sciences industry size by 2.5 percent each year. Royalty revenue is calculated using a 2 percent royalty rate. This analysis leads to estimates that the economic benefits of Proposition 71 to the State budget would exceed the costs, with an overall ratio of benefits to costs of 120 percent. These results are summarized in the table below.

In addition to the benefits to the State budget, there are additional benefits to families and businesses in California from reduced health care costs. With a 1 percent savings, these benefits total \$9.2 billion over the 35 year life of the program. In addition, a total of 360,000 job-years would be created for California residents, with an average of 5,200 – 11,200 jobs per year over the life of the program.

Table 2.1
Total Program Costs and Benefits – Case 1: Limited Therapeutic Success
 (\$ Millions)

	Phase 1 Years 1-5	Phase 2 Years 6-14	Phase 3 Years 15-35	Total
Economic Costs to State Budget	\$56	\$1,289	\$4,010	\$5,355
Economic Benefits to State Budget				
1) Tax revenues from Proposition 71 direct spending	73	167	-	240
2) Tax revenues from 2.5% increase in life sciences activity	54	355	1,796	2,206
3) Cost savings from 1% reduction in State spending on 6 conditions	-	382	3,062	3,444
4) Royalty revenues using 2% royalty rate	-	10	527	537
Total	127	914	5,385	6,426
<i>Percent of Total Costs</i>	<i>227%</i>	<i>71%</i>	<i>134%</i>	<i>120%</i>
Additional Benefits to Californians Not Included in State Budget*				
Health care cost savings from 1% cost reductions	-	1,136	8,043	9,180
<i>Percent of Total Costs</i>	<i>0%</i>	<i>88%</i>	<i>201%</i>	<i>171%</i>
Estimated Jobs Created (One job for one year = one job year)				
Job years from Proposition 71 direct spending	14,272	33,209		47,480
Job years from Increase in life sciences activity	11,967	67,732	233,148	312,847
Total	26,239	100,940	233,148	360,328

* These are savings from the reduction in direct spending and lost work time on the 6 conditions that are not included in the State budget but benefit Californians overall.

2. Case 2: Increased Therapeutic Success

In the second scenario, we have analyzed each of the areas with different assumptions. For the Proposition 71 spending tax revenues, the estimates are unchanged. For biotechnology growth, we have assumed that Proposition 71 augments the baseline industry size by 5 percent each year rather than 2.5 percent. For health cost reduction, we have used a 2 percent savings rather than 1 percent. This is consistent with more successful therapies than in Case 1. We understand that this is the minimum success target identified by the Proposition 71 Committee. Two percent reductions in spending could be achieved without large therapeutic breakthroughs, and are also well below the cost savings returns identified in reviews of successful NIH research funding efforts. For royalty revenues, we have used 4 percent rather than 2 percent royalty rates. These results are summarized in the table below, and show an overall ratio of benefits to costs of 236 percent.

With a 2 percent savings, the additional benefits to families and businesses in California from reduced health care costs totals \$18.4 billion over the 35 year life of the program. In addition, a total of 673,000 job-years would be created for California residents, with an average of 7,600 – 22,200 jobs per year over the life of the program.

Table 2.2
Total Program Costs and Benefits – Case 2: Increased Therapeutic Success
 (\$ Millions)

	Phase 1 Years 1-5	Phase 2 Years 6-14	Phase 3 Years 15-35	Total
Economic Costs to State Budget	\$56	\$1,289	\$4,010	\$5,355
Economic Benefits to State Budget				
1) Tax revenues from Proposition 71 direct spending	73	167	-	240
2) Tax revenues from 5.0% increase in life sciences activity	108	711	3,592	4,411
3) Cost savings from 2% reduction in State spending on 6 conditions	-	764	6,123	6,887
4) Royalty revenues using 4% royalty rate	-	19	1,054	1,073
Total	181	1,662	10,769	12,612
<i>Percent of Total Costs</i>	<i>324%</i>	<i>129%</i>	<i>269%</i>	<i>236%</i>
Additional Benefits to Californians Not Included in State Budget*				
Health care cost savings from 2% cost reductions	-	2,273	16,087	18,359
<i>Percent of Total Costs</i>	<i>0%</i>	<i>176%</i>	<i>401%</i>	<i>343%</i>
Estimated Jobs Created (One job for one year = one job year)				
Job years from Proposition 71 direct spending	14,272	33,209		47,480
Job years from Increase in life sciences activity	23,934	135,464	466,296	625,695
Total	38,206	168,672	466,296	673,175

* These are savings from the reduction in direct spending and lost work time on the 6 conditions that are not included in the State budget but benefit Californians overall.

3. Case 3: Expanded Therapeutic Success

Finally, we also considered estimates of the benefits under a third scenario in which larger therapeutic breakthroughs are realized. In this scenario, the assumptions for life sciences activity and royalty revenue remain the same as in the second case at 5 percent and 4 percent, respectively. The health cost savings are adjusted upward for the 6 conditions to 10 percent rather than 2 percent. The results, summarized in the table below, are a ratio of benefits to costs of 750 percent.

With a 10 percent savings, the additional benefits to families and businesses in California from reduced health care costs total \$92 billion over the 35 year life of the program. In addition, a total of 673,000 job-years would be created for California residents, with an average of 7,600 – 22,200 jobs per year over the life of the program.

Table 2.3
Total Program Costs and Benefits – Case 3: Expanded Therapeutic Success
 (\$ Millions)

	Phase 1 Years 1-5	Phase 2 Years 6-14	Phase 3 Years 15-35	Total
Economic Costs to State Budget	\$56	\$1,289	\$4,010	\$5,355
Economic Benefits to State Budget				
1) Tax revenues from Proposition 71 direct spending	73	167	-	240
2) Tax revenues from 5.0% increase in life sciences activity	108	711	3,592	4,411
3) Cost savings from 10% reduction in State spending on 6 conditions	-	3,821	30,616	34,437
4) Royalty revenues using 4% royalty rate	-	19	1,054	1,073
Total	181	4,718	35,262	40,161
<i>Percent of Total Costs</i>	<i>324%</i>	<i>366%</i>	<i>879%</i>	<i>750%</i>
Additional Benefits to Californians Not Included in State Budget*				
Health care cost savings from 10% cost reductions	-	11,364	80,434	91,797
<i>Percent of Total Costs</i>	<i>0%</i>	<i>882%</i>	<i>2006%</i>	<i>1714%</i>
Estimated Jobs Created (One job for one year = one job year)				
Job years from Proposition 71 direct spending	14,272	33,209		47,480
Job years from Increase in life sciences activity	23,934	135,464	466,296	625,695
Total	38,206	168,672	466,296	673,175

* These are savings from the reduction in direct spending and lost work time on the 6 conditions that are not included in the State budget but benefit Californians overall.

This Executive Summary summarizes the results of our larger study. The complete study will be released in the near future and will describe in more detail the methodology and data used for the analysis. Under the scenarios considered, the economic benefits to the State of California are greater than the economic costs of the program. Importantly, the non-economic opportunities for improved health and quality of life for Californians and others have not been quantified in this study.

III. About The Authors

Professor Laurence C. Baker, Stanford University

Laurence Baker, Ph.D. is Associate Professor of Health Research and Policy and Chief of Health Services Research at the Stanford University School of Medicine, Fellow of the Center for Health Policy at Stanford University, and Research Associate in the Health Care, Productivity, and Children's programs of the National Bureau of Economic Research in Cambridge, MA. Dr. Baker also holds a courtesy appointment in the Stanford University Department of Economics. Dr. Baker received his M.A. and Ph.D. in Economics from Princeton University in 1994, and his B.A. from Calvin College in Grand Rapids, Michigan in 1990.

Before coming to Stanford, he was a Research Economist at the Robert Wood Johnson Foundation and, briefly, a volunteer consultant to the White House Task Force on Health Reform. He was awarded the Alice S. Hersh Young Investigator Award by the Academy for Health Services Research and Health Policy in 2000. In 1997 and 1999 he received the National Institute for Health Care Management's research prize for his work on managed care. He serves on the editorial boards of Health Services Research and Medical Care Research and Review.

His main research interests are in the area of health economics, particularly the effects of financial incentives and organizational structures on the delivery of health care and health care spending. He has written numerous journal articles and book chapters in this area, including extensive work on managed care and its effects on health care costs, health outcomes, and the health care delivery system. His other areas of interest include health care regulatory policy, health care technologies, efforts to improve quality in health care, and effects of policies that affect the Medicare and Medicaid programs.

Bruce F. Deal, Managing Principal, Analysis Group

Mr. Deal is a Managing Principal with Analysis Group, Inc., a national economic and statistical consulting firm. Mr. Deal serves as director of the economics practice in the firm's Menlo Park, California office. He holds a Master in Public Policy (M.P.P.) degree from Harvard University's Kennedy School of Government. He also holds an undergraduate degree in economics from Pacific Lutheran University.

Mr. Deal serves as an expert in litigation and non-litigation matters covering a variety of practice areas, including antitrust, finance and securities litigation, damages, and business valuation. Mr. Deal's industry experience includes healthcare, insurance, technology, telecommunications, and others. Prior to joining Analysis Group, Mr. Deal spent several years as a Senior Consultant and Manager with Arthur Andersen. In this position, he provided financial and management consulting services primarily to hospitals, physicians, and other clients.

Mr. Deal has taught economics and analytic methods to graduate students at Harvard University and has consulted on national economic policy issues to the government of Indonesia through the Harvard Institute for International Development.

The authors are gratefully acknowledge the assistance of all contributors to this project including Howard Birnbaum, Alan Meister, Brian Kim, Sara Filipek, Eric Wu, Katariina Tuovinen, Lisa de Simone, Sabrina Lee, and Maryna Marynchenko.