

PROGRESS IN BIOMEDICAL RESEARCH

Sources of Information on Recent Accomplishments

Research in the biomedical sciences has generated a wealth of new discoveries that are improving our health, extending our lives and raising our standard of living. In order to assess this progress and realize the full potential presented by these breakthroughs in medical research, it is essential that this information about recent accomplishments, current efforts and future opportunities reach a broad audience of interested citizens and policy makers.

In summarizing these advances, however, it is necessary to consider the information needs of various groups. To assist people seeking information about progress in biomedical research, the Federation of American Societies for Experimental Biology (FASEB) has identified some easily accessible sources. The compilation presented below, while by no means comprehensive, represents an introduction to some of these information sources, focusing on material available through the Internet.

Some of the benefits of biomedical research can be seen with traditional measures of health and well-being, such as morbidity and mortality rates. Americans, and people around the globe, are living longer and are less likely to succumb to many of the scourges of the past. Better diagnostics also mean that many illnesses are identified sooner, and with this improved diagnosis comes a better prognosis for treatment and recovery. Thus, for many diseases, the rates of incidence are not dropping but the outlook for the victims has dramatically improved. Victims of many diseases live fuller, better lives due to improved methods of treatment. Quality of life is much harder to summarize in a single statistic, but the benefits are real and extremely important to the victims of disease and their families.

For some purposes, it is helpful to have information on the economic cost of illness and estimates of the savings from recent innovations or from anticipated progress. The cost of medical services can be calculated using current prices and future costs can be estimated with assumptions about inflation and utilization. More inclusive measures, attempting to include lost income and quality of life, are more difficult to produce and interpret but may prove valuable to those seeking a more comprehensive economic profile. Government investment in basic research has fueled the growth of new industries that further benefit that nation's economy.

Some of the most profound advances, e.g., the isolation of human stem cells and the mapping of the human genome, have just begun to demonstrate their vast therapeutic potential. The return on the investment in basic research may not be apparent for several years, presenting an obstacle to short-term analysis and the effort to link outcomes to specific investments. While no single measurement can quantify the magnitude of the benefits, the following compilation of sources suggests starting points for the challenge of substantiating the benefits of biomedical research.

From Government Agencies:

- Title: Select Research Advances at NIH from 1887 to 2000
Source: DeWitt Stetten, Jr., Museum of Medical Research at the NIH
URL: <http://history.nih.gov/exhibits/history/index.html>
Annotation: A brief description of NIH's Research Advances with historical sources.
- Title: NIH Fiscal Year 2007 Congressional Justification Overview
Source: NIH Office of Budget
URL: <http://officeofbudget.od.nih.gov/ui/2007Budget.htm>
Annotation: NIH's justification of its budget for FY 2007.
- Title: NIH Spending History
Source: NIH Office of Budget
URL: <http://officeofbudget.od.nih.gov/UI/SpendingHistory.htm>
Annotation: A summary of how the agency has spent its money from 1983-2005.
- Title: Investments, Progress and Plans: Selected Examples from FY 1999 – 2003
Source: NIH
URL: <http://www.nih.gov/about/investments.htm>
Annotation: Describes some of the scientific progress that has resulted from the NIH's investment of additional funds. It is grouped into broad areas that present innovative strategies for the diagnosis, treatment and prevention of diseases.
- Title: Disease-specific Estimates of Direct and Indirect Costs of Illness and NIH Support FY 2000
Source: NIH
URL: <http://ospp.od.nih.gov/ecostudies/COIreportweb.htm>
Annotation: Contains cost estimates for diseases and conditions identified by the various Institutes within NIH and provides a history of NIH funding support for each disease area from 1992-2001.
- Title: NIH GPRA Assessment Working Group of the Advisory Committee to the Director FY 2003 Plan/FY 2001 Report
Source: NIH Office of Evaluation
URL: http://www1.od.nih.gov/gpra/gpra_nih_c.htm
Annotation: Presents a three-year picture, from fiscal year 2001 to fiscal year 2003, of NIH's program plans, performance expectations and recent accomplishments.
- Title: Biomedical Research Results in Direct Benefits
Source: The National Institutes of Health (NIH) Undergraduate Scholarship Program
URL: http://www.lrp.nih.gov/about/intramural/biomed_results.htm
Annotation: Basic facts about the number of lives spared and the amount of money saved as a result of biomedical research.
- Title: CDC National Center for Health Statistics

Source: Centers for Disease Prevention and Control
URL: <http://www.cdc.gov/nchs/nhis.htm>
Annotation: Includes data on vital events, information on health status, lifestyle, exposure to unhealthy influences, the onset and diagnosis of illness and disability and the use of health care.

Title: National Vital Statistic Reports - Preliminary Data on deaths for the year 2004
Source: CDC
URL: <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/prelimdeaths04/preliminarydeaths04.htm>
Annotation: This Report contains data on life expectancy, leading causes of death, and infant mortality for the year 2004.

Title: United States Health Expenditures
Source: CDC
URL: <http://www.cdc.gov/nchs/fastats/hexpense.htm>
Annotation: Contains both fast statistics and comprehensive data on health expenditures and links to comprehensive data on health expenditures.

Title: The Economics of Diabetes Mellitus: An Annotated Bibliography
Source: CDC
URL: [www.cdc.gov/diabetes/pubs/pdf/biblioIndex\(titles\).pdf](http://www.cdc.gov/diabetes/pubs/pdf/biblioIndex(titles).pdf)
Annotation: Contains a comprehensive bibliography of abstracts relating to the economics of diabetes.

Title: National Center for HIV, STD and TB Prevention Divisions of HIV/AIDS
Prevention HIV/AIDS Surveillance Report 2001
Source: CDC
URL: <http://www.cdc.gov/hiv/stats/hasr1301.htm>
Annotation: Includes tables that present trends in estimated annual AIDS incidence from 1996 through 2000, by U.S. region, race/ethnicity and exposure category.

Title: Electronic Orange Book: Approved Drug Products With Therapeutic Evaluations
Source: Food and Drug Administration
URL: <http://www.fda.gov/cder/ob/default.htm>
Annotation: Identifies drug products approved on the basis of safety and effectiveness by the FDA under the Federal Food, Drug and Cosmetic Act.

Title: Potential Benefits of the Human Genome Research Project Research
Source: Oak Ridge National Laboratory
URL: <http://www.ornl.gov/hgmis/project/benefits.html>
Annotation: Describes some current and potential applications of genome research and provides links to more detailed information.

Title: Biomedical Research Benefits
Source: Lawrence Livermore National Laboratory

URL: http://www.llnl.gov/str/pdfs/07_00.2.pdf
Annotation: Describes the use of accelerator mass spectrometry (AMS) for biomedical research at Livermore and describes how AMS came to be used as a method for tracing the passage of chemicals throughout the human body.

From Professional Societies and Academic Institutes:

Title: Medical Innovation in the Changing Healthcare Marketplace: Conference Summary (2002)
Source: National Academy of Sciences
URL: <http://search.nap.edu/books/0309084164/html/>
Annotation: Presents the summary of the conference, “Medical Innovation in the Changing Healthcare Marketplace,” held by National Academies Board on Science, Technology and Economic Policy (STEP) and the Board on Health Care Services, convened June 14-15, 2001 in Washington, D.C.

Title: U.S. Industry in 2000: Studies in Competitive Performance. Washington, DC: National Academy Press. Chapter: Pharmaceutical and Biotechnology, pp 363-398
Source: National Academy Press. Authors are: Iain Cockburn, Rebecca Henderson, Luigi Orsenigo and Gary P. Pisano
URL: <http://books.nap.edu/books/0309061792/html/363.html#363>
Annotation: Discusses the impact of public policy and government investment in basic research in creating the growth of the pharmaceutical industry.

Title: Medical Research, Technology, and Improved Health Care. Chapter 28
Source: American Association for the Advancement of Science (AAAS) Science and Technology Policy Yearbook 2001
URL: <http://www.aaas.org/spp/rd/ch28.pdf>
Annotation: Based on the remarks of Donald A. Young (chief operating officer and medical director of the Health Insurance Association of America) at the 25th Anniversary AAAS Colloquium on Science and Technology Policy, held April 11–13, 2000, in Washington, D.C.

Title: Various Reports
Source: Tufts Center for the Study of Drug Development
URL: <http://csdd.tufts.edu/>
Annotation: An independent, academic, non-profit research group affiliated with Tufts University that provides strategic information for drug developers, regulators and policy makers on improving the quality and efficiency of pharmaceutical development, research and utilization.

Title: Cost of Illness by Disease
Source: The Center for Health Policy, Law and Management, a component of Duke University’s Terry Sanford Institute of Public Policy

URL: <http://www.hpolicy.duke.edu/cyberexchange/coi.htm>
Annotation: Methodology and cost of illness for several disease categories, including Alzheimer's, depression, diabetes, and stroke.

From Non-profit Advocacy Groups:

Title: The Benefits of Biomedical Research
Source: Federation of American Societies for Experimental Biology
URL: <http://opa.faseb.org/pages/PolicyIssues/benefitsbiomedical.htm>
Annotation: An annotated report providing examples of benefits in terms of increasing life expectancy and decreasing health-care costs.

Title: Ad Hoc Group for Medical Research Funding - FY 2007 Proposal
Source: Ad Hoc Group for Medical Research (coalition of 300 advocacy, professional, industry and patient oriented groups)
URL: <http://www.aamc.org/research/adhocgp>
Annotation: A justification for this group's recommendation that Congress provide the NIH with a 5% increase in FY07.

Title: Exceptional Returns: The Economic Value of America's Investment in Medical Research
Source: The Lasker Foundation
URL: <http://www.laskerfoundation.org/reports/pdf/exceptional.pdf>
Annotation: A study that economically quantifies the benefits of medical research in terms of longer life and increased quality of life.

Title: An Investment in Research Saves Lives and Money
Source: Lasker Foundation
URL: http://www.laskerfoundation.org/reports/onep_reports.html
Annotation: A series of one-page disease specific reports on the benefits of medical research.

Title: The Health of Nations: The Contribution of Improved Health to Living Standards
Source: The Lasker Foundation
URL: <http://www.laskerfoundation.org/reports/pdf/economic.pdf>
Annotation: A 1999 report by Yale University economist William D. Nordhaus.

Title: Biomedical Research Benefits You
Source: Partners In Research
URL: http://www.pirweb.org/pir03f_benefits.htm
Annotation: Argues that animal research has played a critical role in medical advances and describes how children continue to benefit from research.

Title: Talking Points
Source: Research!America
URL: <http://www.researchamerica.org/media/points.html>

Annotation: A series of advocacy talking points that discuss establish spending priorities, economic benefits, recent discoveries, research possibilities and a primer on how research is funded.

Title: Biomedical Research: The People, the Process, the Promise

Source: Northwest Association for Biomedical Research

URL: <http://www.wabr.org/research/people.html>

Annotation: A document designed to increase the public's understanding of biomedical research.

Title: The Economic Significance of the Oklahoma Medical Research Foundation

Source: Oklahoma Medical Research Foundation

URL: <http://www.omrf.org/OMRF/Information/EconomicDevelopment.pdf>

Annotation: A report on the impact of OMRF on the state of Oklahoma.

Title: Know the Facts

Source: The California Society of Biomedical Research

URL: <http://www.ca-biomed.org/csbr/know.php>

Annotation: A Web primer for the public on biomedical research that includes a breakdown of facts vs. myths concerning animal research.

Title: Where Would We Be Without Biomedical Research?

Source: The North Carolina Association for Biomedical Research

URL: http://www.ncabr.org/biomed/FAQ_animal/faq_animal_11.html

Annotation: Part of FAQs, states that biomedical research has netted, among other things, treatments, surgical procedures and vaccines that have improved our quality of life.

From Trade Associations:

Title: The Economic Contributions of the Biotechnology Industry to the US Economy

Source: Biotechnology Industry Organization (BIO)

URL: <http://www.bio.org/speeches/pubs/ernstyoung.pdf>

Annotation: Presents the estimates of the significant financial contributions of the biotechnology industry to the U.S. economy and to revenues collected by the federal, state and local governments.

Title: Everywhere You Look: Biotechnology Touches Your Life

Source: BIO

URL: <http://www.bio.org/speeches/pubs/everywhere.pdf>

Annotation: Discusses how nearly every person is reaping the benefits of biotechnology, whether it comes from hepatitis vaccination, coffee filters, or clothing.

Title: Biotechnology's Impact on Disease of the Elderly: A White Paper.

Source: BIO

URL: http://www.bio.org/speeches/pubs/white_paper.pdf

Annotation: Describes the costs of eight age-related illnesses and also examines some of the biotech medicines on the market and in development to treat the diseases and details their impact on patients' quality of life and health-care expenditures.

Title: 2006 Industry Profile

Source: Pharmaceutical Research and Manufacturers of America (PhRMA)

URL: <http://www.phrma.org/files/2006%20Industry%20Profile.pdf>

Annotation: Includes discussions on the life-saving value of medicines and new drugs in development; provides the most recent data on the pharmaceutical industry's investment in R&D.

Title: Measuring Up: Research and Development Counts in the Chemical Industry (2001)

Source: The Council for Chemical Research

URL: <http://www.ccrhq.org/news/studyindex.html>

Annotation: Argues that the chemical industry is a major economic force in the United States, accounting for the largest trade surplus of any non-defense related sector and 10 percent of all U.S. manufacturing.

Additional Articles and Publications:

Title: The Economic Value of Medical Knowledge

Source: Kevin M. Murphy and Robert Topel, University of Chicago (1998, revised 2001)

URL: <http://gsbwww.uchicago.edu/fac/kevin.murphy/research/murphy&topel.pdf>

Annotation: Develops an economic framework for evaluating the social benefits of medical research.

Title: The role of research in countering bioterrorism.

Source: Anthony Fauci

URL: <http://www.nap.edu/books/0309082536/html/220.html>

Annotation: Summarized from Dr. Fauci's presentation at a National Academy of Sciences Conference titled, "Biological Threats and Terrorism: How Prepared Are We? Assessing the Science and Our Response Capabilities," held Nov. 27-29, 2001.

Title: Biomedical Research: Opportunities and Innovations

Source: Robert Topel

URL: <http://www.laskerfoundation.org/ffpages/topelsen.htm>

Annotation: Testimony of Mr. Topel in hearings before the Senate Committee on Health, Education, Labor and Pensions, May 10, 2001.

Title: Prospects for a Bioeconomy: The Biomedical Industry and Regional Economic Development

Source: Prepared by Dr. Cinda-Herndon King/PTEI & Richard S. Seline/New Economy Strategies Status and trends, November 1, 2000

URL: <http://www.new-econ.com/pdf/04-NationalBioclusterReport.pdf>

Annotation: Provides a basic perspective on trends in biomedical technology and the status and outlook for the biomedical industry; offers an inventory and perspective on state, regional and university-based economic development initiatives capturing the benefits of the second wave of biotechnology innovation.

Title: Measuring the Incremental Cost of Clinical Cancer Research.

Source: Rand

URL: <http://www.rand.org/publications/MR/MR1169/>

Annotation: Documents the design and methods of the Cost of Cancer Treatment Study (CCTS), an ongoing effort to obtain precise and generalizable estimates of the direct care costs of patients who participate in National Cancer Institute-sponsored clinical cancer trials.

Title: The Application of Biotechnology to Industrial Sustainability

Source: Organization for Economic Co-operation and Development

URL: <http://www1.oecd.org/publications/e-book/9301061e.pdf>

Annotation: Presents a broad collection of case studies on biotechnology applications in industrial processes for government policy makers.

Title: Medical Technology in an Era of Limits (Executive Summary)

Source: Annetine C. Gelijns Ph.D. and Nathan Rosenberg, Ph.D. (Robert Wood Johnson Foundation Investigator Awards: Author Series V.1, i.5)

URL: <http://www.ihhpar.rutgers.edu/rwjf/publications/default.asp?l=2&t=2&i=16>

Annotation: Examines the process through which new medical procedures, devices and drugs are generated and disseminated and considers the role of academic medical centers in innovation.

Title: Beyond Borders 2006: Ernst & Young's Global Biotechnology Report

Source: Ernst & Young

URL:

http://www.ey.com/global/content.nsf/International/Biotechnology_Report_2006_Beyond_Borders

Annotation: Celebrates the 30th anniversary of the biotechnology sector and provides an overview of investment, employment, and product development in biotechnology.

Title: Kids4Research

Source: Funded in part by the American Association for Laboratory and Animal Science

URL: <http://www.kids4research.org>

Annotation: Provides information to students, teachers, and parents on responsible laboratory animal care and use in biomedical/biological research, testing and education and information on the benefits of such research to animals, humans, and the environment.

Title: News article: "Does Science Drive the Productivity Train?"

Source: Science magazine

URL: <http://opa.faseb.org/pdf/Science25August2000.pdf>

Annotation: Article written by David Malakoff that appeared in an August 2000 issue of *Science* and discusses the measurement problems in evaluating economic benefits of research.