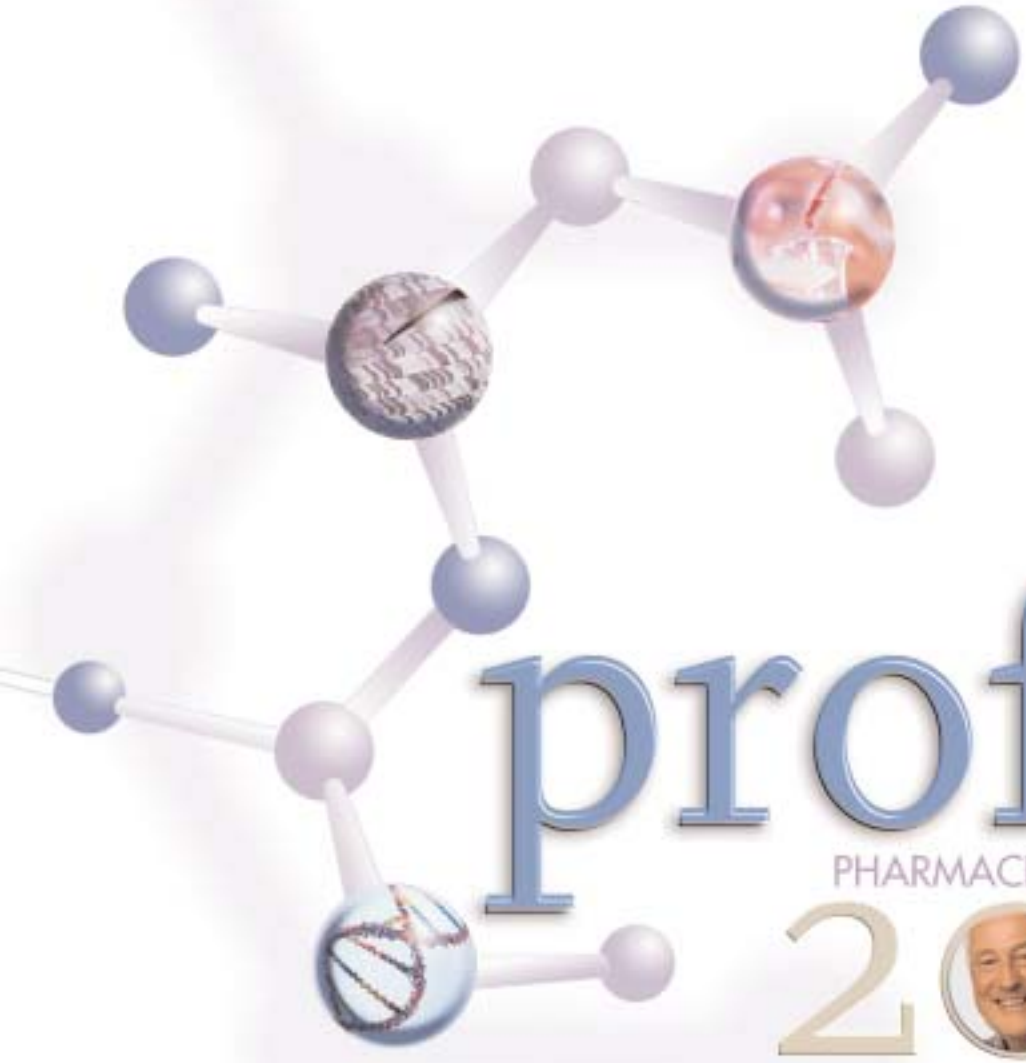


profile

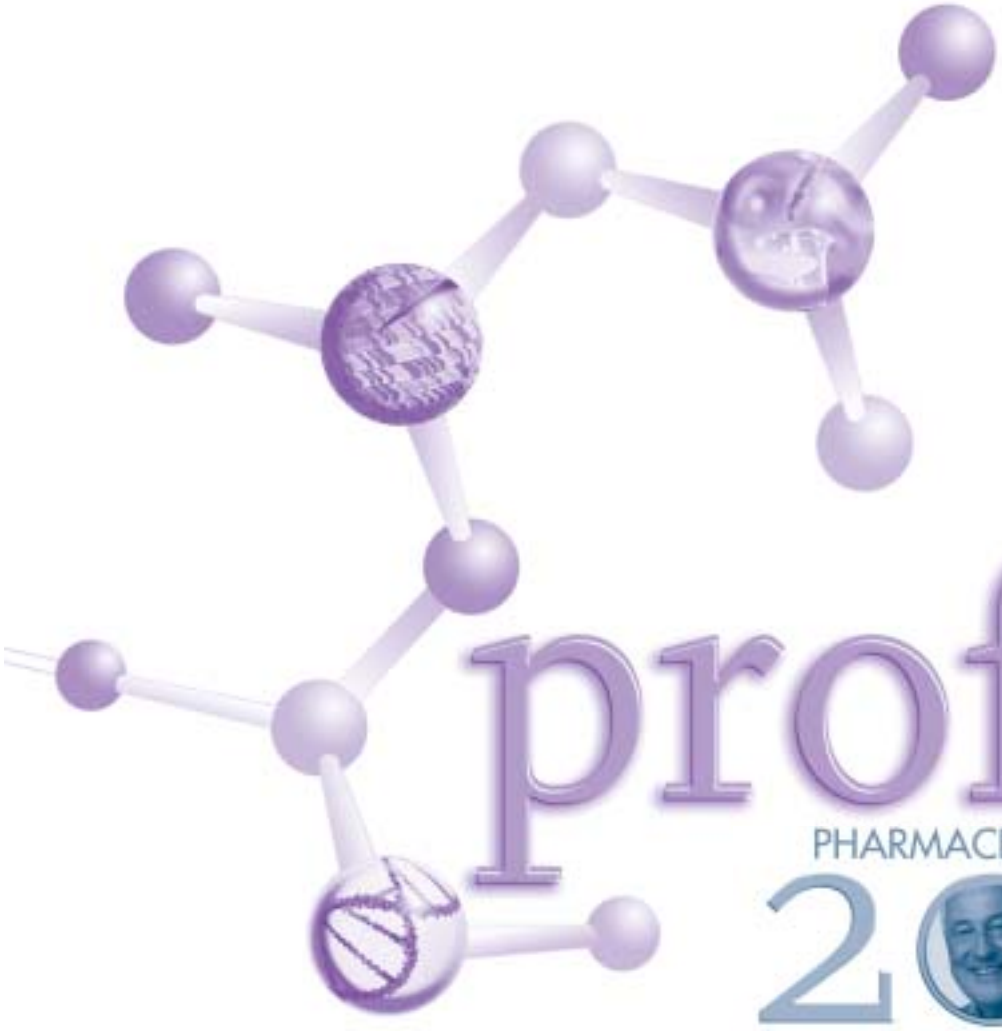
PHARMACEUTICAL INDUSTRY

2004

Focus on Innovation

new medicines. new hope.

PhRMA



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2004

Letter from PhRMA's President and CEO

PhRMA is pleased to present the 2004 edition of the *Pharmaceutical Industry Profile*. 2003 was a historic year as Congress passed and President Bush signed into law the most important, pro-patient Medicare reform in the program's 38-year history. Providing Medicare beneficiaries with insurance coverage that offers affordable access to medicines is essential to high-quality and efficient care. The work done by Congress and the President in creating this benefit will make a real difference in millions of patients' everyday lives, as 10 million seniors gain drug coverage for the first time and many millions more obtain better coverage than they had before. Better access to treatments that, for example, help avoid heart attacks and stroke or ease the suffering of depression is both good health care and good economics.

This year's *Profile* focuses on innovation. Using cutting-edge science and technology, pharmaceutical research company scientists are driving medical progress. The products of that innovation, new medicines, allow patients to live longer and healthier lives. Now Medicare beneficiaries will have much better access to that innovation that is so important to their health and well-being.

The 2004 *Profile* also presents new data from our 2003 PhRMA membership survey, which describes the vigor with which companies are pursuing new medicines. In addition, the *Profile* provides information, as well as perspectives from thought leaders, on how public policy affects both patient access to and the development of new and better medicines. Last, it outlines PhRMA's positions on important policy questions.

This *Profile* is primarily a statistical report, but behind those figures are faces: the tens of millions of patients in this country and around the world who are being helped and healed every day by medicines. These faces are what drive all of us fortunate enough to work in America's pharmaceutical research industry.

Alan F. Holmer
President and CEO

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Summary Highlights

This *Profile* outlines the innovation taking place in the laboratories of America's pharmaceutical research companies and describes the importance of maintaining the pace of innovation to patients, their families, and the American economy.

The Process of Innovation

Patients rely on medical progress to improve their health and well-being. Pharmaceutical research companies engage in large-scale, intensive research to help achieve medical progress.

- Pharmaceutical research companies employ large numbers of scientists who work on the cutting edge of science and technology to discover and develop new and better medicines.
  - On average, it takes scientists, physicians, engineers, and other researchers between 10 and 15 years and costs more than $800 million to do the research and testing to bring a new medicine to patients.
- Scientists working in the American laboratories of pharmaceutical research companies lead the world in research into new and better medicines for patients. In the 1990s the United States surpassed Europe as the leading site for pharmaceutical research and development (R&D).
  - Americans are also conducting more pharmaceutical-related research in universities and public institutions than their European counterparts. However, private-sector investments in R&D in the United States dwarf public funding.
  - In 2003, members of PhRMA spent an estimated $33.2 billion on pharmaceutical R&D—a sizeable increase over the previous year.

The Products of Innovation

The new medicines resulting from innovation offer increasingly better treatments and health care options for patients. New medicines also help curb overall health care costs by often reducing the need for hospitalization and more invasive procedures, such as surgery, or by delaying nursing home admission.

- The products of innovation include hundreds of new medicines that allow patients to live longer and healthier lives.
  - New medicines are now available to treat conditions such as Alzheimer's disease, heart disease, schizophrenia, sickle cell anemia, AIDS, and cancer. These medications not only help keep patients out of the hospital and delay nursing home admission, they also provide economic benefits by reducing the need for more expensive treatments and keeping workers on the job.
    - Each additional dollar spent on newer medicines saves $4.44 on hospitalizations.
    - New medicines generated 40 percent of the two-year gain in life expectancy achieved in 52 countries between 1986 and 2000.
- Innovative medicines remain a small share of health care spending in the United States despite medicines' growing role in medical treatment. In the United States 10.5 cents of every dollar spent on health care is attributed to prescription drugs, and 7 cents of that total is spent on brand-name medicines.
  - Medicines also account for a small share of health maintenance organization (HMO) premiums. Only 14.8 percent of managed care premiums were spent on prescription medicines in 2003.

Access to Innovation

Patients must have access to medicines to reap the benefits of innovation.

- Some strategies employed to control costs reduce patients' access to medicines.
  - In Medicaid, restrictive formularies and "prior authorization" can make it difficult for patients with varying medical needs to get the medication that works best for them.
- Other programs, such as disease management, may result in increased spending on prescription drugs, but that spending helps improve patient access and care and reduce other forms of health care spending.
- Many patients remain untreated or are undertreated, despite the existence of medicines to treat their conditions. According to a study by RAND Health, nearly half of all adults in the United States fail to receive recommended care.
- Providing medicines to patients who are underinsured or uninsured is critical to improve access.
  - One way PhRMA member companies are working to make medicines available to patients who cannot afford them is through company-sponsored patient assistance programs (PAPs). In 2003, an estimated 6.2 million Americans received medicines free of charge through company PAPs.

Incentives for Innovation

Competitive markets and patents provide incentives for innovation, while price controls stifle access to medicines and innovation.

- In countries where governments impose price controls on prescription drugs, patients must wait as long as two additional years for medicines to clear the regulatory process and become available to patients.
- Government-imposed price controls also limit the incentives for research and discovery of new medicines. If price controls were in place in the United States between 1980 and 2001, economists estimate that between 330 and 365 new medicines would not exist today.
- Another policy important to supporting innovation is the government's granting of patents. Patents encourage innovation by allowing inventors a limited opportunity to recoup their investments in research and further science by making ideas and discoveries public.

The Future of Innovation

Scientifically, the future of American pharmaceutical research and innovations for patients is promising. To achieve that promise, however, public- and private-sector leadership must continue to support policies that encourage and sustain research and avoid policies that will slow the pace of innovation.

THE PROCESS OF INNOVATION: R&D IN AMERICA'S HIGHEST TECHNOLOGY COMPANIES

I

1 PROCESS OF INNOVATION

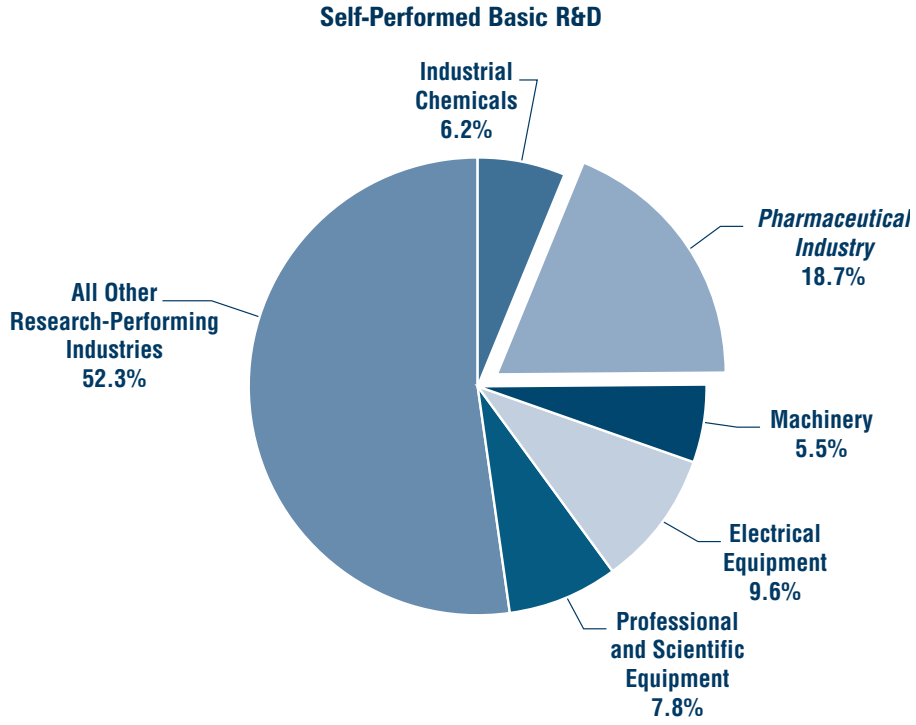
Every day, more than 70,000 scientists are working in the laboratories of pharmaceutical research companies. These scientists toil for long hours and years to invent new and better medicines to maintain health and treat disease. Their work takes them to the edge of scientific discovery and requires them to advance the state of technology. Yet despite considerable inspiration, infrastructure, expertise, diligence, and resource investment, most pharmaceutical research company scientists will never work on a project that results in a new medicine. The nature of science and the process of pharmaceutical innovation offer no guarantees. Discovering new medicines remains a difficult and uncertain enterprise.

From Idea to Treatment: The Long, Uncertain R&D Process

According to data from the National Science Foundation, pharmaceutical product development comprises one of the most research-intensive sectors in the United States.[1] [Figure 1.1] The industry is one of the largest employers of scientists in the United States[2]—and its success or failure relies heavily on their ability to make breakthroughs.

On average it takes 10 to 15 years and costs more than $800 million to advance a potential new medicine from a research idea to a treatment approved by the Food and Drug Administration (FDA).[3] That means that for more than a decade, scientists, engineers, and physicians strive every day in laboratories and hospitals searching for a new discovery and a way to deliver those new medicines to patients. It may entail trying to understand how to turn a key gene on or off. Researchers may test thousands of chemicals for biochemical activity in the body. It might involve attempting to create a completely new chemical compound, one so unique that the U.S. government grants its inventor a patent. Each year, pharmaceutical research company scientists earn FDA approval

Figure 1.1 **Pharmaceutical Research Companies Comprise One of America's Most Research-Intensive Sectors**



Source: National Science Foundation, Research and Development in Industry, 1998. As quoted by: PriceWaterhouseCoopers, The Critical Roles of R&D in the Development of New Drugs (Washington, DC: PWC, 2001).

for a number of new medicines that offer millions of patients better health care options.

The research doesn't end with the understanding of how a gene works or the creation of a new molecule—scientists must then transform those discoveries into medicines. The chemicals and biologics must be safe and work as they should when ingested. They must be engineered so that the body absorbs them in the proper quantities and transports them to their sites of action.

Even after a medicine is discovered, teams of engineers, biologists, chemists, and physicists must spend long hours figuring out how to mass produce the results achieved by an individual scientist at his or her lab bench. Often promising experiments are not replicable on a large scale. The research may fail because it is not possible to manufacture the drug safely or to the proper specifications.

Teams of physicians must study the effects of a new medicine on patients to discover whether it really works in a population and works without causing unacceptable side effects. Clinical trials may take years, and involve thousands of patients and procedures. On average each new trial requires many procedures and increasingly larger numbers of patients.[4]

After a decade or more of the scientists', engineers', and physicians' efforts, still only one out of five medicines that enter clinical trials is approved for patient use by the FDA. The process is long, risky, fraught with failure, and ultimately expensive. Failure at the clinical trial stage could completely nullify 15 years of painstaking work by pharmaceutical research company scientists.

New Chemotherapy: 19 Years from Idea to Approval

In 2000 the FDA approved a new chemotherapy treatment, Mylotarg®, for patients with relapsed acute myelogenous leukemia. The approval came 19 years after scientists at Lederle Labs, now Wyeth, first discovered a microorganism in a soil sample that produced a powerful anticancer substance called calcicheamicin.

Scientists learned that calcicheamicin destroys cell DNA, which results in the cell's death. Thus, in theory, targeting it to cancerous cells could eliminate them. In developing any cancer treatment, a key challenge is finding a way to kill cancer cells while minimizing or avoiding damage to the body's other healthy cells. However, calcicheamicin's exceptionally high toxicity (between 1,000 and 10,000 times more toxic than traditional anticancer medicines) meant that scientists had to find a novel way to deliver the drug only to cancer cells.

Before concentrating on making the medicine safe for patient use, the pharmaceutical researchers first had to figure out how to make large quantities of calcicheamicin for experimentation. During the next five years, they worked to understand its structure and how to stabilize it.

The team spent the next three years trying to develop a "linker" molecule that would bind tightly to the calcicheamicin to deliver it directly to cancer cells without releasing it in the bloodstream. Although they found linkers that worked in animals, they had problems converting them to a form usable in humans. Working virtually around the clock, only stopping for a break on Christmas day, the pharmaceutical research company scientists tested 35 linkers before finding one that worked. Finally, in 1995, 14 years after discovering calcicheamicin, the new medicine Mylotarg® entered human clinical trials. After nearly five years of successful clinical trials, the FDA approved the medicine for widespread patient use.

The story of Mylotarg® and its inventors is not unusual. Their efforts represent the significant time and dedication pharmaceutical research company scientists devote to finding new and better treatments for patients and their work to further advance science. These scientists did more than invent a cancer-curing medicine, they proved a scientific concept—that an anticancer drug can be attached to an antibody and targeted specifically to cancer cells.

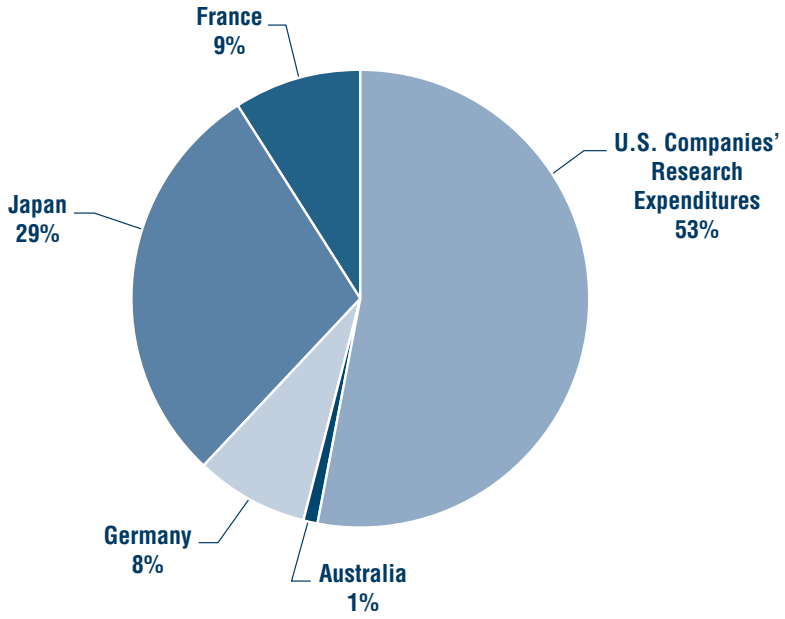
Each year, PhRMA presents the Discoverers Award to scientists whose research and development of medicines have greatly benefited humankind, and whose dedication and interest in improving the quality of life exemplify the best in research today. The 2003 Discoverers Award was presented to Dr. George Ellestad, Director, Biological Chemistry, Dr. Phillip Hamann, Principal Research Chemist, and Dr. Janis Upeslacis, Director, Chemical Sciences, all of Wyeth, for their creation of Mylotarg®.

Investing in Innovation: America Leads the World

The United States is the world leader in pharmaceutical research, supported by data from the Organisation for Economic Co-operation and Development (OECD). [Figure 1.2] During the 1990s, the United States surpassed Europe as the leading site for pharmaceutical research and development (R&D).[5] European pharmaceutical research companies are relocating their labs to the United States in increasing numbers.[6]

According to the European Federation of Pharmaceutical Industries and Associations, "The European pharmaceutical industry is losing competitiveness as compared to the U.S.

Figure 1.2 **American Pharmaceutical Research Companies Lead the World in R&D**



For the year 2000, OECD reported the percentage of Gross Domestic Product (GDP) allocated to pharmaceutical R&D for five industrialized nations. This chart depicts the percentage of total R&D spent in those five countries alone by pharmaceutical research companies in each country.

Source: Organisation for Economic Co-operation and Development, R&D expenditures in the pharmaceutical industry as a percentage of GDP and BERD5, 2001 OECD, ANBERD database, June 2003.

industry and there is a process of concentration of R&D into North America."[7] In 1999, European pharmaceutical companies spent only 59 percent of their worldwide R&D in the European Union, down from 73 percent in 1990. The United States was the main beneficiary of this shift in R&D expenditures.[8] The increased concentration of research efforts in the United States is reflected by the fact that 8 of the top 10 medicines by sales originate from the United States, compared to 2 from Europe.[9]

Concerned about Europe falling behind the United States in pharmaceutical innovation, the Directorate General Enterprise of the European Commission prepared a report on competitiveness in the pharmaceutical research industry to assess the situation. Among the Directorate's findings was that in the 1990s, U.S. pharmaceutical research companies gained "clear and growing leadership" in terms of generating new medicines that dominated the world market for prescription drugs.[10]

Americans are also conducting more pharmaceutical-related research in universities and public institutions as compared to their European counterparts.[11] However, according to the National Institutes of Health (NIH), public dollars are not funding the research leading to new medicines. In fact, only 4 of the 47 top-selling drugs considered by NIH in its study to determine if American public investments were funding new drug development were developed in part with NIH funding, and none was developed solely with public funds. For example, academic scientists might use NIH dollars to discover how two genes interact to cause a disease, but a scientist in a pharmaceutical research company lab will discover how to create a medicine to regulate those genes, thus inventing the treatment or cure for a disease.

"Translating scientific knowledge and understanding into meaningful medicine is what we do—and it's what makes our industry unique."

Miles D. White
Chairman and CEO, Abbott Laboratories

The greatest satisfaction I have as the chief executive of a global pharmaceutical company is hearing from people whose lives have been saved or made better by the continual process of discovery that defines our industry. Yet, for every letter or phone call I receive from grateful patients, it seems I learn of others who continue to wait for the discovery that will help treat their particular condition. These are things that drive me, and the hundreds of thousands of employees of America's pharmaceutical companies.

Translating scientific knowledge and understanding into meaningful medicine is what we do—and it's what makes our industry unique. During the past half century we have made remarkable progress in advancing human health. We've cured common infections that once resulted in serious illness and even death; we've made giant strides in treating cardiovascular disease and leukemia; and we have transformed HIV/AIDS from a death sentence into a chronic disease. These and other breakthroughs have resulted in better quality of life and in increased life expectancy throughout the world.

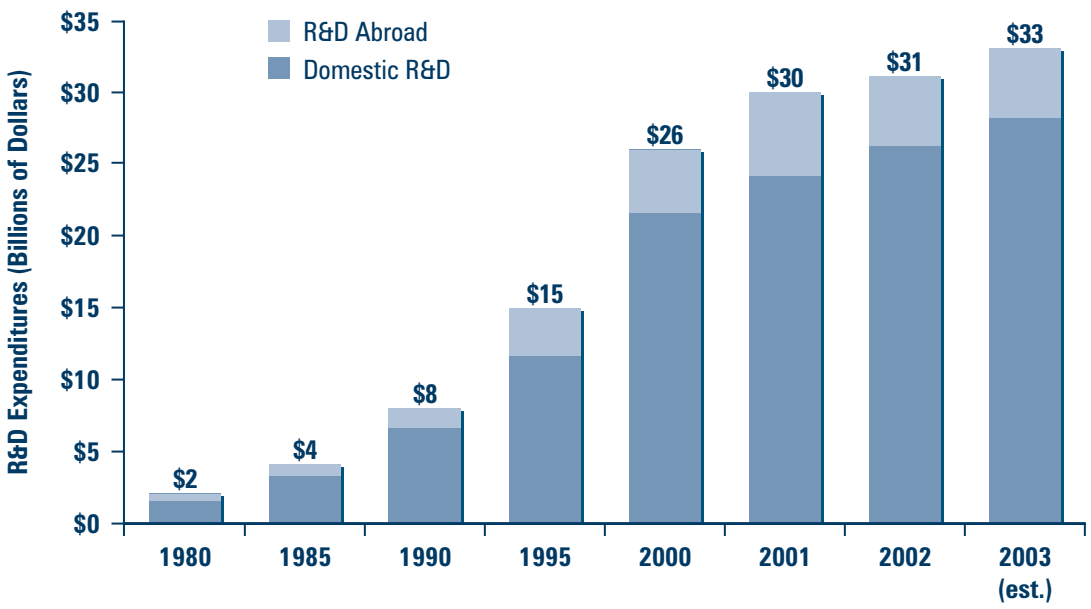
But our work is far from complete. We continue in passionate pursuit of treatments for the most elusive diseases, including cancer, multiple sclerosis, and Alzheimer's. We find ourselves confronted with new and deadly opponents like SARS. These are the riddles our scientists are working to solve as they explore new scientific frontiers and apply advanced discovery technologies in ways their predecessors never imagined.

We're grateful that people the world over are as passionate as we are about saving and improving human life. We understand that we are held to ever higher standards in pursuing this mission. And we are fully committed to working with academia, government, and others on tough issues, including finding effective and constructive ways to make the medicines we discover more accessible and affordable to patients.

In order for us to be able to continue our invaluable work, we must be able to invest in research and have our intellectual property rights preserved. We will remain ever mindful that ours is much more than a business; it is a mission in which the ultimate outcome results in longer, higher quality lives—lives that lead to letters from the person who now will live to see a grandchild grow, spend another birthday with a loved one, contribute something to society, touch someone in a special way, or simply enjoy a little bit more of what the world has to offer.

Miles D. White
Chairman and Chief Executive Officer
Abbott Laboratories

Figure 1.3 **Research and Development Continues to Grow**



Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Conclusion

Last year pharmaceutical research companies spent $33 billion on research to develop new and better medicines, a 7 percent increase from the previous year. [Figure 1.3] Over time, this investment will yield new medicines that will make progress in better treating a range of diseases that impose large direct and indirect costs on patients and society.

Endnotes

[1] National Science Foundation, Research and Development in Industry, 1998. As quoted by: PriceWaterhouseCoopers, *The Critical Roles of R&D in the Development of New Drugs* (Washington, DC: PWC, 2001).

[2] *Ibid.*

[3] J. A. DiMasi, R. W. Hansen, and H. G. Grabowski, "The Price of Innovation: New Estimates of Drug Development Costs," *Journal of Health Economics* 22 (2003): 151–185.

[4] DataEdge analysis of comprehensive clinical trials database including more than 140,000 investigations capturing discrete protocol and cost factors. Approximately 700 individual disease indications were stratified by average number of procedures within the clinical trial protocol.

[5] European Federation of Pharmaceutical Industries and Associations, *Pharmaceutical Industry Chartbook* (Brussels, Belgium: EFPIA, 2001).

[6] R. Goldberg, "The Suffocation of Innovation: When the Left Fights Progress, Fight Back," *National Review,* 30 June 2003; "Pharmaceuticals: European Industry Flexes Its Muscles," *European Report,* 29 May 2003; J. Lowenbach, "Will Chief Risk Officers Find Opportunity in a Reinvigorated European Research & Development Sector? Contract Services," *Pharmaceutical Technology,* 1 October 2002; "Pharmaceutical Development Centre to Close," *Espicom Business Intelligence,* 19 May 2003.

[7] European Federation of Pharmaceutical Industries and Associations, *op. cit.*

[8] *Ibid.*

[9] A. Gambardella, L. Orsenigo, and F. Pammolli, *Global Competitiveness in Pharmaceuticals: A European Perspective,* report prepared for the Directorate General Enterprise of the European Commission (Brussels, Belgium: Enterprise of the European Commission, November 2000).

[10] *Ibid.*

[11] *Ibid.*

THE PRODUCTS OF INNOVATION: BETTER HEALTH CARE OPTIONS

2

2 PRODUCTS OF INNOVATION

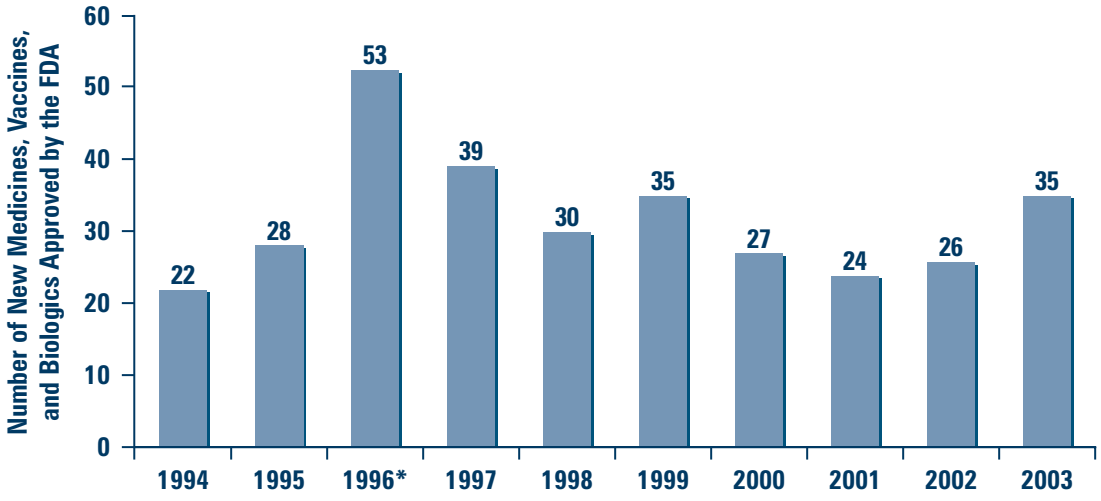
The innovation taking place in pharmaceutical research company laboratories leads to new and better treatments for disease. The products of this innovation will allow millions of patients to live longer, better, and more productive lives. New medicines also help curb overall health care costs by often reducing the need for hospitalization and more invasive procedures, such as surgery, or by delaying nursing home admission. The combination of innovation in new medicines and a shift to prescription medications as preferred medical intervention means that spending on prescription drugs has increased. However, spending on medicines remains a small portion of overall health care spending, particularly in light of the value that these medicines provide.

Revolutionizing Patient Care

Since 1990, pharmaceutical research company scientists have invented and developed more than 300 completely new medicines, vaccines, and biologics approved by the Food and Drug Administration (FDA) to treat more than 150 conditions,[1] ranging from infectious diseases to chronic diseases—and from diseases affecting millions of patients to those afflicting less than 200,000 people.[2] [Figure 2.1]

Recent pharmaceutical research company advances are helping to meet the emerging diabetes epidemic, save the lives of cancer patients, and forestall the terrible burden of Alzheimer's. The progress made in reducing death rates from heart disease and stroke, for example, is saving the lives of more than 1 million Americans each year.[3] In addition, pharmaceutical research company scientists have created new medicines for a number of serious but rare conditions such as Fabry's disease, cystic fibrosis, sickle cell anemia, and a number of rare cancers.[4] The sidebar, "A Decade of Innovation," details specific examples of new drug development.

Figure 2.1 **Pharmaceutical Research Company Scientists Earned FDA Approval for an Average of 32 New Medicines a Year Over the Past Decade***



**A larger than average number of approvals in 1996 reflects the implementation of the Prescription Drug User Fee Act (PDUFA).*

Source: U.S. Food and Drug Administration, January 2004.

Innovation Creates Less Expensive Alternatives to Surgery and Hospitalization

Medical literature today includes countless studies demonstrating medicines' ability to help patients avoid hospitalization and invasive surgery, or delay the need for long-term nursing home care. In addition to improving patient quality of life and giving physicians more options to tailor treatment to the needs of individual patients, the use of new medicines also reduces overall health care costs. For example, by preventing complications, side effects, and symptoms, new medicines drastically reduce the need for hospitalization. In fact, for each additional dollar spent on new medicines, the savings on hospital spending is $4.44.[5]

Furthermore, pharmaceutical research company scientists have developed new medicines to treat a number of gastrointestinal disorders over the past two decades. Since these medicines have become available to patients, the need for surgical procedures to correct ulcers has slowed, and today ulcer surgery is a relic of the past.[6]

A new Alzheimer's drug slows the progression of cognitive decline, allowing patients to maintain their independence longer and delay entering a nursing home by an average of 30 months.[7] Nursing home care is more costly than in-home care, so this delay can significantly reduce health care expenditures—and the economic and emotional burden on both patient and caregiver.

The health of AIDS patients is not only improved by new medicines, but those medicines also reduce the need for costly hospital care. After the introduction of highly active antiretroviral therapy (HAART) for the treatment of AIDS, pharmaceutical expenditures increased by about 33 percent, while hospital expenditures decreased by about 43 percent. Overall, total health care expenditures decreased by 16 percent (between 1996 and 1998).[8]

New medicines to reduce the incidence of breast cancer can help women avoid later

A Decade of Innovation

Today, patients who would have faced death or disability a few years ago have treatments options available to help them live healthier, more productive lives. A small sampling of these innovations are as follows:

- Patients suffering from Alzheimer's disease (AD), a neurological condition that leads to cognitive decline among older people, had few treatment options until the past decade, when the FDA approved five new medicines to treat AD and slow impairment. The latest, approved in 2003, is part of a new class of drugs and is the first approved treatment for moderate to severe AD. New medicines are still greatly needed to stem the enormous costs of AD because the number of cases continues to rise.
- High blood pressure can lead to stroke, blindness, heart problems, and kidney damage. Since 1995, pharmaceutical research company scientists have developed two new classes of blood pressure medications, angiotensin-II antagonists and selective aldosterone receptor antagonists. These new medicines improve blood pressure control with individualized treatment plans and fewer side effects. Today, 17 new medicines are in development to broaden the treatment options for high blood pressure patients.
- Schizophrenia is an incapacitating mental illness that impairs the patient's sense of reality, reduces the ability to relate to people, and, in many cases, causes hallucinations. New atypical antipsychotic medicines treat schizophrenia with fewer problematic side effects than older drugs, which makes them easier for patients to tolerate and continue taking. As a result, many people with schizophrenia can now lead more normal, independent lives.

For further information about pharmaceutical developments to treat a broad range of conditions, see PhRMA's publication "Decade of Innovation."

chemotherapy and surgery. Because of the high-technology science needed to develop these new prescription drugs, the medication costs as much as $1,050 a year. However, surgery, chemotherapy, or other invasive treatments for women suffering from breast cancer may cost as much as $14,000 a year.[9] [Figure 2.2]

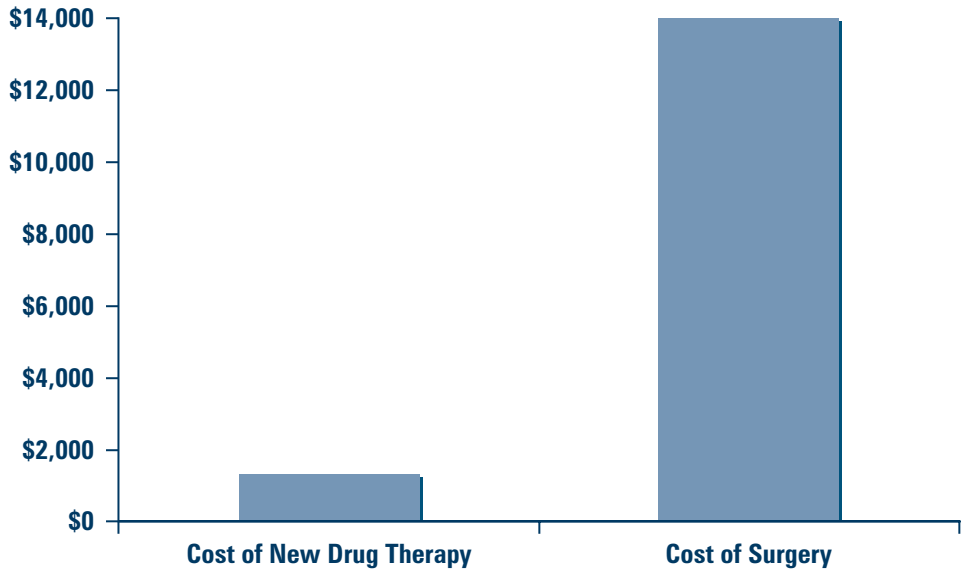
New Medicines Increase Life Expectancy

Medicines invented by pharmaceutical research company scientists have played a significant role in the life expectancy gains made in the United States and around the world. Recent research in *Health Affairs* concluded that new medicines generated 40 percent of the two-year gain in life expectancy achieved in 52 countries between 1986 and 2000.[10]

"[O]ver the last century, the value of gains in life expectancy seen in the U.S. is greater than the total value of all the measured growth in our economic output. New drugs are no small part of this medical miracle…. And for the developing countries of the world, the health improvements have been even more valuable. Drug treatments for infectious diseases and other illnesses of the developing world have permitted even greater gains in life expectancy in developing nations than in countries like the U.S. Consequently, innovation in drugs and other medical treatments is helping to reduce the worldwide economic inequality that has long resulted from health inequality."[11]

—Mark McClellan, M.D., Ph.D., Commissioner, U.S. Food and Drug Administration

Figure 2.2 A New Breast Cancer Medicine Helps Women Avoid the Need for Surgery and Lowers Total Treatment Costs



Source: M. Kondracke, "Investing Billions in Health Research Can Save Trillions," Roll Call, 25 May 2000.

In many cases new medicines and vaccines help prevent disease, in addition to those that may cure or alleviate previously fatal or debilitating conditions. For example, new medicines contributed to the decline in U.S. HIV/AIDS death rates. Since the mid-1990s, when pharmaceutical research company scientists developed a new wave of medicines to treat HIV/AIDS (protease inhibitors and combination drug therapy), the U.S. death rate from AIDS dropped about 70 percent.[12]

A recent article in *The Washington Post* stated that cancer has become a "chronic disease much like asthma, diabetes, and, more recently, AIDS" as a result of new diagnostic techniques and innovative medicines. Today there are three million more cancer survivors than there were a decade ago. The chance of surviving for five years after diagnosis has risen by 10 percentage points over the past two decades to 62 percent today.[13]

Scientists Are Discovering Medicines to Improve Quality of Life

New and better medicines are not only extending more people's lives, but also giving them higher quality, more productive years. A recent study[14] found that risks for chronic disabilities such as stroke and dementia have declined sharply. The authors concluded that, if this trend continues, Medicare spending could actually stop increasing. Scientists at the National Institute of Aging, which sponsored the study, said the decline probably resulted from factors that included new drugs for heart problems and other illnesses and advances in prescription drugs and medical technology.

Another recent study found that children with asthma who enrolled in a comprehensive disease management program that included appropriate medications experienced significant quality-of-life improvements. As their symptoms decreased and their capacity for activity rose, they reported greater emotional well-being.[15]

"We produce the bulk of the world's medical miracles because we do not quit; because we make room for the greatest minds and wildest ideas…because we are willing to finance hope."

J. D. Kleinke, Medical Economist & Author
Chairman, Health Strategies Network

I sit down to write a few words about the value of medical innovation, about the good economic and public health news associated with the progress we have made over the past decade against cancer, HIV, heart disease, mental illness, and dozens of other diseases. But I am distracted by a fax on my desk. It is the five-page lab report of a close friend, aged 39, whose body has suddenly turned against her: A blood clot chokes her leg from hip to ankle; the joints of her fingers have swollen to the point where she cannot close her hands; she is wracked with fever, fatigue, and crushing pain in every joint. She faxed me the report because she thought I might be able to explain it with more candor than her doctors. They have suggested much but said little with any certainty, added two new medications to the three she is already taking, and ordered more tests. But in concert with her symptoms, those numbers, benchmarks, and acronyms on the report spell one thing: lupus.

There is no cure for lupus, a cruel autoimmune disease that attacks and retreats with the capriciousness of rheumatoid arthritis, multiple sclerosis, and sickle cell anemia. After her initial "flare" has done its damage, this mother of two young children will awaken every day bracing for the next debilitating onslaught. She will have access to several medicines to mediate lupus' symptoms and minimize its destruction, and each will be worth 10 times its cost by precluding her need for more intensive medical care. But for the disease itself, we do not have a cure. Yet. This is where we will leave the conversation a few days from now, after my friend's doctors have told her what I already know. We do not have a cure, I will tell her, not yet. But many of the same people behind those benchmarks in her lab report are working hard on finding one—directly, indirectly, and often inadvertently—in hundreds of government, academic, hospital, and industry labs. The sheer hopefulness that their efforts inspire will lift us from the grim realities of the report, will rouse her doctors from their chastened silence when they break the news, will enshroud my friend like the wings of an angel through the agonies of her next attack.

This is who we are in America when something as unfair and vicious as lupus strikes. We strike back—with science, hard work, money, and an innate belief that we can and will right the terrible wrongs that nature too often inflicts on our bodies and minds. Yes, our progress is expensive, especially when viewed in an economic vacuum. It places those tasked with running our public and private health plans in the horrendous position of trying to arbitrate cost, appropriateness, and value. And in the short run, it puts great economic pressure on all of us. But our unwillingness to give up the fight against something like lupus is a big part of what defines us as a nation. We produce the bulk of the world's medical miracles because we do not quit; because we make room for the greatest minds and wildest ideas; because we have always dreamed of a better life for ourselves and our children; because we are willing to finance hope.

J. D. Kleinke
Medical Economist and Author
Chairman,
Health Strategies Network

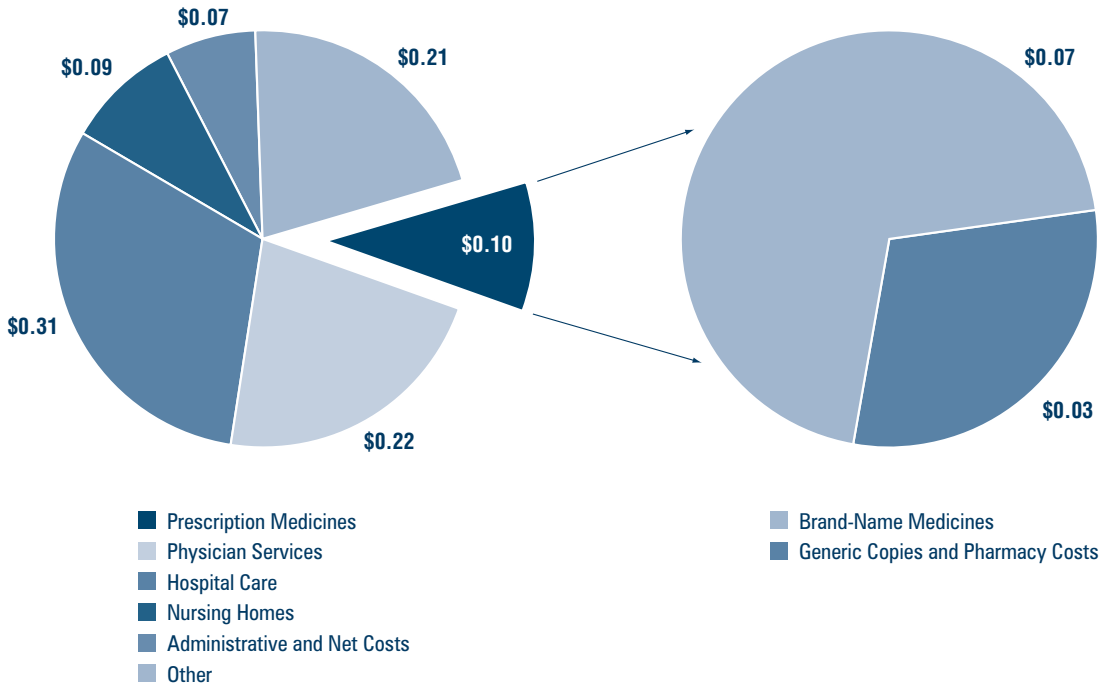
As Role of Medicines Has Grown, Spending on Medications Has Increased—But Innovative Medicines Are Only a Small Portion of Total Costs

As patients and health care professionals have turned increasingly to medications as cost-effective alternatives to invasive surgery and hospitalization, spending on prescription medicines naturally has increased—from 10 cents to 10.5 cents of every dollar spent on health care in the United States between 2001 and 2002.[16] This 10.5 cents includes more than the innovative brand-name medicines invented in pharmaceutical research company labs; it also includes the cost of generic copies and pharmacies. In fact, innovative brand-name medicines only account for 7 percent of total health care spending. [Figure 2.3]

In 2003, health maintenance organizations (HMOs) responding to the Milliman USA 2003 HMO Intercompany Rate Survey had average premiums of $238.70 per member per month (PMPM). Of this amount, outpatient prescription medicines accounted for just $35.43 PMPM—or 14.8 percent. According to the industry-wide survey data, HMOs in 2003 spent slightly more on outpatient prescription medicines ($35.43 PMPM) than on administrative costs ($33.94 PMPM).[17]

Although prescription medicines often are portrayed as the main driver of rising health care costs, this is not the case. A January 2004 *Health Affairs* article reported that in 2002, prescription drugs accounted for only 16 percent of total health care spending increases.[18]

Figure 2.3 **Prescription Medicines Are a Small Fraction of Total U.S. Health Care Spending; Brand-Name Medicines Equal Only 7 Cents on a Dollar**



Source: Centers for Medicare & Medicaid Services, "National Health Expenditures," 8 January 2004, http://www.cms.gov/statistics/nhe (9 January 2004).

Source: R. E. King and D. N. Muse, Components of Pharmaceutical Expenditures, prepared for PhRMA, Winter 2004.

New Medicines Strengthen the Economy

In addition to over 70,000 scientists, the pharmaceutical research industry directly employs more than 315,000 Americans.[19] New medicines also benefit the economy by increasing worker productivity and reducing absenteeism. A growing number of studies are finding that many types of medicines—including those for depression, migraines, diabetes, and allergies—help boost worker productivity. For example, the National Committee for Quality Assurance stated that "if every American with depression received care from a health plan or provider that was performing at the 90th percentile level, employers would recoup as many as 8.8 million absentee days per year."

Conclusion

Over the past decade, the new medicines pharmaceutical company researchers have discovered have transformed the very nature of health care, allowing millions to live longer, better, and more productive lives. The products of innovation provide the solutions to caring more efficiently and effectively for an aging population.

Endnotes

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[2] So-called orphan, or rare, diseases: "The term rare disease or condition means any disease or condition which (a) affects less than 200,000 persons in the U.S. or (b) affects more than 200,000 persons in the U.S. but for which there is no reasonable expectation that the cost of developing and making available in the U.S. a drug for such disease or condition will be recovered from sales in the U.S. of such drug." Food and Drug Administration, "OOPD Program Review," http://www.fda.gov/orphan/progovw.htm (accessed 19 November 2003).

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[4] J. Henkel , "Orphan Products: New Hope For People With Rare Diseases," FDA Consumer Special Report, January 1995, http://www.fda.gov/fdac/special/newdrug/orphan.html (accessed 19 November 2003).

[5] F. R. Lichtenberg, *The Impact of New Drug Launches on Longevity: Evidence from Longitudinal, Disease-Level Data From 52 Countries, 1982–2001,* National Bureau of Economic Research Working Paper No. 9754 (Cambridge, MA: NBER, June 2003).

[6] M. McClellan, "Speech Before the First International Colloquium on Generic Medicine," 25 September 2003, http://www.fda.gov/oc/speeches/2003/genericdrug0925.html (accessed 18 November 2003).

[7] G. Provenzano, "Delays in Nursing Home Placement for Patients with Alzheimer's Disease Associated with Treatment with Donepezil May Have Care Cost Saving Implications," *Value in Health* 4, no. 2 (2001): 158.

[8] S. A. Bozzette et al., "Expenditures For the Care of HIV-infected Patients In the Era of Highly Active Antiretroviral Therapy," *New England Journal of Medicine* 344 (2001): 817–823.

[9] M. Kondracke, "Investing Billions in Health Research Can Save Trillions," *Roll Call,* 25 May 2000.

[10] Lichtenberg, *op. cit.*

[11] M. McClellan, "Speech Before the First International Colloquium on Generic Medicine," 25 September 2003, http://www.fda.gov/oc/speeches/2003/genericdrug0925.html (accessed 18 November 2003).

[12] CASCADE Collaboration, "Determinants of Survival Following HIV-1 Seroconversion After the Introduction of HAART," *The Lancet* 362 (2003): 1267–1274.

[13] R. Stein, "From Killer to Chronic Disease: Drugs Redefine Cancer for Many," *The Washington Post,* 29 January 2003.

[14] K. G. Manton and X. Gu, "Changes in the Prevalence of Chronic Disability in the United States Black and Nonblack Population Above Age 65 from 1982 to 1999," *Proceedings of the National Academy of Sciences of the United States of America,* 8 May 2001.

[15] P. J. Munzenberger and R. Z. Vinuya, "Impact of an Asthma Program on the Quality of Life in Children in an Urban Setting," *Pharmacotherapy* 22, no. 8 (2002): 1055–1062.

[16] Centers for Medicare & Medicaid Services, "National Health Expenditures," 8 January 2004, http://www.cms.gov/statistics/nhe (accessed 9 January 2004).

[17] Milliman USA, *2003 HMO Intercompany Rate Survey* (2003).

[18] K. Levit et al., "Health Spending Rebound Continues in 2002," *Health Affairs* 23, no. 1 (2004): 147–159.

[19] National Science Foundation, Division of Science Resources Statistics, *Survey of Industrial Research and Development: 2000* (Arlington, VA: NSF, 2000).

ACCESS TO INNOVATION

3

3 ACCESS TO INNOVATION

Ultimately, innovative medicines only make a difference when patients have access to them and use them. As the sidebar "Fulfilling the Promise of Innovation" shows, underutilization of effective new medicines is a serious concern that limits the potential public health impact of pharmaceutical discoveries. Strategies to contain pharmaceutical costs have led to less access to needed medicines for patients. However, some important programs that broaden access to innovative medicines illustrate the positive impact of this approach.

Preferred Drug Lists and Prior Authorization: Key Barriers for Accessing Innovation

In recent years, many Medicaid programs have instituted preferred drug lists (PDLs), which specify the reimbursable medicines physicians can freely prescribe. Drugs not on the PDL are reimbursed only if a patient's doctor first obtains special permission from the insurer to prescribe the drug (known as "prior authorization"). Although the intent of this mechanism is to control costs, the result has been less access to needed medicines for patients. Prior authorization and restrictive PDLs limit a physician's ability to choose the most appropriate medicine(s) for the patient. Yet one size does not fit all when it comes to medicines because individual differences in drug response are common. As a recent article in the *New England Journal of Medicine* notes, "It is well recognized that different patients respond in different ways to the same medicine."[1]

Access Restrictions Particularly Harm Medicaid Patients

Access restrictions are particularly onerous for low-income patients, who lack the resources to pay for innovative medicines out of pocket. If the most appropriate medicines for them are not on the PDL, they face fighting their way through the bureaucracy of prior authorizations

Fulfilling the Promise of Innovation

Use of medicines is increasing as more patients take medicines for a broader range of conditions. This is indicative of new medicines offering new treatment options (e.g., Alzheimer's and chemotherapy-induced anemia) and changing standards of medical care that call for earlier use of medicines to prevent the progression of disease, use of combination therapy rather than a single medicine, and improved therapies. Nonetheless, increasing use of medicines is often cited in policy debates as indicating widespread overuse of medicines.

In fact, while only limited research indicates overuse of prescription drugs, there is much evidence that large numbers of patients underuse needed medical care, including prescription medicines, for many serious health conditions. Such underuse is not limited to patients without health insurance or prescription drug coverage—it clearly afflicts patients who have health insurance with prescription drug coverage.

On June 26, 2003, *the New England Journal of Medicine* published "The Quality of Health Care Delivered to Adults in the United States," which is perhaps the most ambitious and comprehensive survey of utilization patterns ever undertaken. The study, which was conducted by RAND Health and funded by The Robert Wood Johnson Foundation, found that *nearly half of all adults in the United States fail to receive recommended health care.*[2] Only 45 percent of patients with diabetes received the care they needed; only 68 percent of patients with coronary artery disease received recommended care; only 45 percent of heart attack patients received medications that could reduce their risk of death; only 54 percent of patients with colorectal cancer received recommended care; and less than 65 percent of patients with high blood pressure received recommended care. [Figure 3.1]

According to the RAND researchers, "the deficiencies in care…pose serious threats to the health of the American public that could contribute to thousands of preventable deaths in the United States each year."

In assessing underuse and overuse of health care services, the RAND study included an examination of nine health conditions that require treatment with prescription medicines.[3] RAND determined that there was *underuse of prescription medications in seven of the nine conditions.* Those seven conditions were asthma, cerebrovascular disease, congestive heart failure, diabetes, hip fracture, hyperlipidemia, and hypertension. Asthma, diabetes, hyperlipidemia, and hypertension are considered "high priority" conditions by the Agency for Healthcare Research and Quality (AHRQ) and the Institute of Medicine.[4]

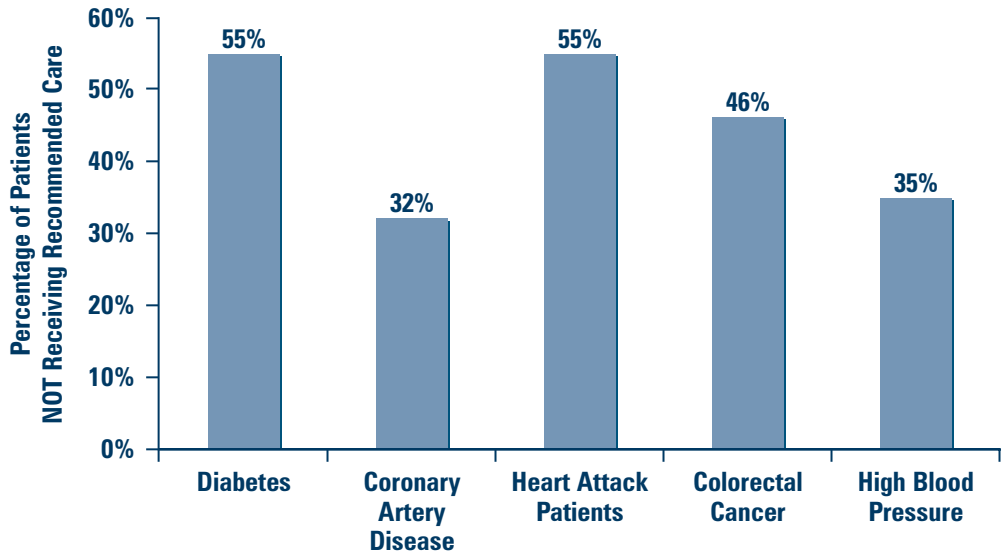
and/or lengthy appeals processes—or doing without.

Yet experience shows that denial of the most appropriate drug therapy ultimately lowers quality of care and increases use of more expensive services, such as hospitalization. For example, clinicians treating patients in Michigan's Medicaid program reported that the prior authorization process was overly burdensome and time consuming for them and their patients. The process also harmed vulnerable Medicaid beneficiaries, such as an HIV/AIDS patient who had to be hospitalized due to a delay in obtaining prior authorization for a necessary medication.[5]

Improving Access to Innovation

While Medicaid PDLs seek to restrict access to medicines, alternative approaches seek to improve quality of care and achieve overall

Figure 3.1 **Nearly Half of All Adults in the U.S. Fail to Receive Recommended Health Care**



Source: E. A. McGlynn et al., "The Quality of Health Care Delivered to Adults in the United States," New England Journal of Medicine 348 no. 26, (2003): 2635–2645.

health cost savings by promoting the correct use of medicines, thereby avoiding the later need for more costly interventions. Increases in expenditures for prescription medicines often help patients lead healthier lives while avoiding expensive hospitalizations, emergency room visits, and long-term care. Disease management programs work to increase patient access to innovative medicines to improve health and reduce overall health care costs.

Disease Management Programs

Patient-focused disease management programs promote appropriate use of pharmaceuticals and medical resource utilization. In these programs, patients receive more intensive education, assistance, and monitoring in following a treatment plan tailored to their needs. Managed care organizations and large employers make up the majority of disease management clients, although some state Medicaid programs also offer them. Disease management programs rely heavily on giving patients access to innovative medicines to reduce health care costs and improve outcomes.

For example, disease management programs, which target patient populations with specific high-cost, high-risk, chronic conditions, have shown that increased spending on medicines that manage disease help reduce surgeries, hospitalizations, and emergency room visits. Patient-focused disease management programs promote appropriate use of pharmaceuticals and medical resource utilization. According to a survey conducted by the Tufts Center for the Study of Drug Development, 42 percent of disease managers find that increased spending on medicines leads to a net cost savings across all health care components.[6]

For example, the CarePatterns® Disease Management Program for diabetes is designed to improve clinical, humanistic, and economic outcomes through the promotion of the American Diabetes Association guidelines. After one year, medical expenditures for participants decreased by $747, or 9.4 percent, from

the baseline period. When participants' actual spending was compared to projected medical spending, savings realized increased to $1,474, or 17 percent, per participant. Conversely, medical spending for diabetics not participating in the program increased by $230, or 3.3 percent, per individual. At the same time, pharmacy spending for program participants increased by 23.5 percent and by 19.7 percent for nonparticipants.[7] Specifically, pharmacy spending for program participants increased from $1,635 to $2,020.[8]

Virginia's Medicaid managed care program is improving clinical outcomes, finances, and patient satisfaction. Sentara, which operates a Virginia Medicaid managed care organization, offers asthma management for high-risk members. Sentara reports a decline in hospital admissions from 74.2 per 1,000 in 1998 to 44.4 per 1,000 for 2003. Sentara estimates overall cost savings for the 400 high-risk asthma members of $209,428. Most of these savings are attributed to a decline in inpatient costs.[9] At the same time, prescription medicine expenses increased from $78,766 to $130,892.[10]

Blue Cross Blue Shield of Minnesota's disease management program administered by American Healthways Inc. provides services to plan members with diabetes, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, asthma, and end-stage renal disease, as well as to plan members with one or more of 11 "impact conditions," such as digestive disorders and low back pain, that can affect an employer's costs and a plan member's quality of life. While the program is estimated to save $36 million to $49 million during the first year of operation, the company also reports that more than 7 percent of plan members with chronic illnesses and 11 percent of members with impact conditions reported decreased days absent from work or school.[11]

Increasing Patient Information

As discussed in the sidebar "Fulfilling the Promise of Innovation," a number of patients do not receive needed medical care. One way that pharmaceutical companies attempt to inform and educate consumers about treatable conditions is through Direct-to-Consumer Advertising (DTCA).

Direct-to-Consumer Advertising

DTCA brings Food and Drug Administration-approved information about prescription medicines to patients and families. Through print and broadcast channels, many people learn about new medications for symptoms they are experiencing. In fact, a national telephone survey of 3,000 adults found that one-quarter of adult patients who had visited their physician after seeing a DTC ad received a diagnosis of a new condition.[12] Some of the most common problems discovered as a result of these visits—high cholesterol, hypertension, diabetes, and depression—are often underdiagnosed and undertreated. [Figure 3.2]

Helping Patients Access Medications

The ability of patients without insurance coverage to access medicines is essential to maintaining health. Pharmaceutical research companies employ a number of programs—issuing discount cards, supporting clinics, donating medicines—to help patients gain access to the medicines they need.

Pharmaceutical Research Companies' Patient Assistance Programs

Pharmaceutical research companies' long-standing patient assistance programs offer another opportunity for patients to access needed prescription medicines. Through these programs,

"Cost containment and stringent utilization controls often hurt access. Prescription drugs are essential to the recovery and continuing health of most people with severe mental illness. Ensuring access to the most effective psychotropic medications is essential."

Margaret Stout
President, National Alliance for the Mentally Ill (NAMI)

Cost containment and stringent utilization controls often hurt access. Prescription drugs are essential to the recovery and continuing health of most people with severe mental illness. Ensuring access to the most effective psychotropic medications is essential.

Appropriate medication is as important to recovery from mental illnesses as it is for recovery from somatic illnesses. It offers the same alternative to more expensive care and treatment in both cases. If policy makers choose to do less for fewer people with mental illness, the cost of this neglect will not only be counted in human suffering, it will reappear in other areas of their budgets and/or in other levels of government.

Policy makers should weigh the costs of any strategy being considered against the anticipated benefits. Medicaid programs must measure the costs and health consequences and identify the risks inherent in a strategy. Cost containment and accountability must go hand in hand.

Rising pharmacy costs must be understood as part of the larger picture associated with the cost of untreated mental illness across society, particularly dramatic reductions in long-term hospitalizations. More importantly, pharmacy costs should be viewed as part of an overall strategy for addressing the high cost of untreated mental illness, including chronic homelessness and "criminalization" that can be reduced through access to effective medication, comprehensive outpatient treatment, and timely short-term inpatient treatment. We need to ensure that people with mental illnesses have adequate medications so fewer people end up being hospitalized longer than necessary, inappropriately incarcerated, or placed at risk of becoming homeless.

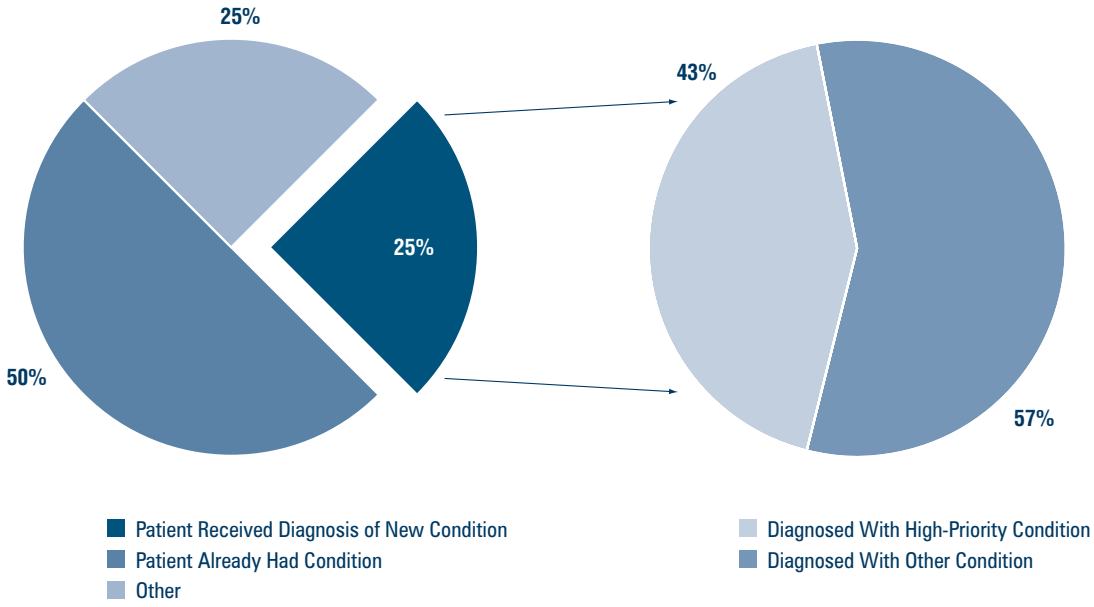
Margaret Stout
President
National Alliance for the Mentally Ill (NAMI)

companies provide prescription drugs free of charge to patients who might otherwise not have access to necessary medicines, such as those who do not have prescription drug insurance coverage or who are underinsured with either private and/or government health plans. Companies also allow physicians, hospitals, community pharmacies, home-health companies, and others to obtain drugs for patients in need.

Patient assistance programs are administered individually by each of PhRMA's member companies. In 2003, an estimated 6.2 million patients received prescription medicines through these programs, more than quadruple the number who received assistance five years earlier (1.5 million in 1998). By the end of 2003, nearly 18 million prescriptions were expected to be filled through the programs.[13] [Figure 3.3]

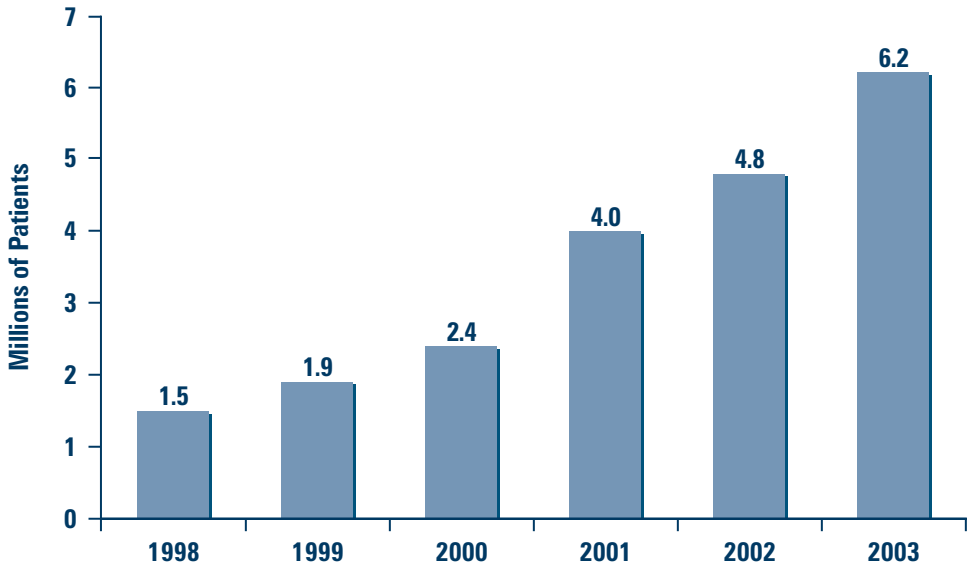
For more information on Pharmaceutical Research Companies' Patient Assistance Programs, please visit www.helpingpatients.org

Figure 3.2 Direct-to-Consumer Advertising Encourages Patients With Undiagnosed Conditions to Visit Their Physicians



Source: J. Weissman et al., "Consumers' Reports on the Health Effects of Direct-to-Consumer Drug Advertising," Health Affairs Web Exclusive, 26 February 2003, http://www.healthaffairs.org (accessed 27 February 2003).

Figure 3.3 Number of Patients Receiving Medicines Through Patient Assistance Programs Has More Than Quadrupled in Five Years



Source: PhRMA, Member Company Patient Assistance Programs Survey 2003, (Washington, DC: PhRMA, November 2003).

Conclusion

As described in Chapter 2, the products of pharmaceutical innovation are revolutionizing health care and providing doctors and patients with new and better tools to treat and cure disease. However, for these innovations to succeed in providing better health outcomes, patients must have access to new medicines. Programs providing health coverage achieve savings through effective use of prescription drugs. Clearly, spending for prescription medicines often helps patients lead healthier lives while avoiding expensive hospitalizations, emergency room visits, and long-term care.

Endnotes

[1] W. Evans and H. McLeod, "Pharmacogenomics—Drug Disposition, Drug Targets, and Side Effects," *New England Journal of Medicine* 348 (February 6, 2003): 538–549.

[2] E. A. McGlynn et al., "The Quality of Health Care Delivered to Adults in the United States," *New England Journal of Medicine* 348, no. 26 (2003).

[3] In the two conditions where "overuse" was found (coronary artery disease and headache), the indicators list medications that are not frequently associated with those particular conditions. For example, in the case of headache (Indicator 15), three of the six medications listed for treatment of severe migraines/headaches are not the first line of drug treatments for that condition. Specifically, Chlorpromazine is used for treatment of schizophrenia, Metoclopramide is used for nausea and vomiting, and Ketorolac is used for acute pain unrelated to migraine in most instances. In the case of coronary artery disease (Indicator 11), Nifedipine should not be used for treatment of acute myocardial infarction (heart attack) as an initial treatment; rather, this medication is indicated for management of chronic stable angina and hypertension as a top calcium channel blocker.

[4] AHRQ "high priority" conditions include cancer, diabetes, emphysema, high cholesterol, HIV/AIDS, hypertension, ischemic heart disease, stroke, arthritis, asthma, gall bladder disease, stomach ulcers, back problems, Alzheimer's disease, and depression and anxiety disorders.

[5] Kaiser Commission on Medicaid and the Uninsured, *Case Study: Michigan's Medicaid Prescription Drug Benefit* (Washington, DC: January 2003).

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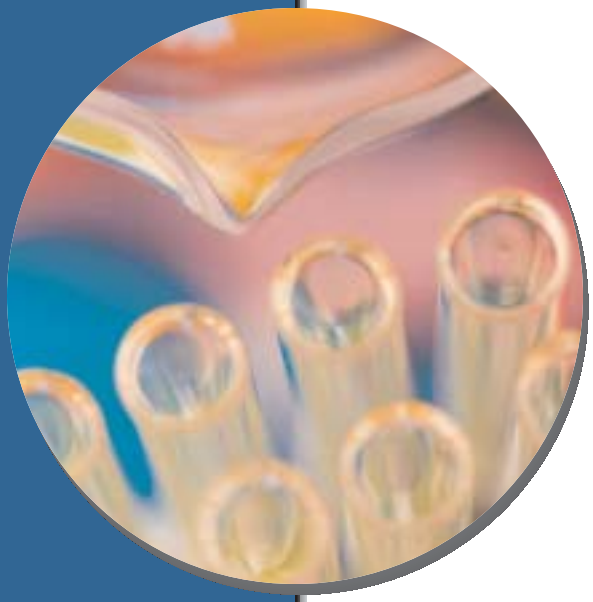
[13] PhRMA, *Member Company Patient Assistance Programs Survey 2003* (Washington, DC: PhRMA, November 2003).

INCENTIVES FOR INNOVATION



4

4 INCENTIVES FOR INNOVATION

As noted in Chapter 1, pharmaceutical innovation is increasingly taking place in American laboratories. One reason for American dominance is the United States' tradition of ingenuity, resourcefulness, and dedication to the importance of innovation. U.S. public policies also provide a fertile climate for invention and discovery. Among the policies that support American pharmaceutical research company innovation are a competitive free market for pharmaceutical products and the patent system. These policies create incentives for continued scientific discovery while also promoting affordability through competition by health plans and generics.

Competitive Market Creates Incentives for Innovation and Access to Medicines

In the United States today, a vigorously competitive pharmaceutical market provides incentives for company scientists to be the first to bring a new product to market and potentially earn rewards after more than a decade of costly research. Pricing through a competitive market also allows innovators to earn returns on successful inventions, thus providing the substantial funds necessary to continue other research projects.

However, in parts of the world where the government controls prescription drug prices, both innovation and patient access to innovation suffer. In many European countries where governments impose prescription drug price controls, patients must wait as long as two years for new medicines to get to market while bureaucrats decide on price levels.[1] Those with life-threatening diseases must either come to the United States for care or wait years for medicines that could save their lives.

Some national health care systems restrict access to a new medicine even after setting its price. In the United Kingdom (UK), a governmental board, the National Institute for Clinical

Excellence (NICE), issues recommendations based on a number of factors (including cost-effectiveness) as to whether the National Health Service (NHS) should make medicines available to patients covered by the government-run health care system. In one case, NICE initially recommended that elderly patients with failing eyesight go blind in one eye first before having access to the medicine that would prevent the blindness altogether in both eyes.[2] The decision was recently reversed, but only after two years of elderly patients being denied medicine that would save their eyesight. Despite the reversal, it will take an additional nine months for the medicine to become available through the NHS. According to patient advocates in the UK, 18,000 patients who could have benefited from the medicine lost their eyesight over the two-year period, and thousands more will go blind before the government health insurance makes the medicine available to patients.[3]

In fact, European price controls often restrict patient access to medicines that American doctors cite as essential for proper patient care. According to Prof. Dr. Oliver Schöffski, Chair for Health Management, University of Erlangen-Nuremberg (Germany), there are huge differences in the access to innovative medicines among the various European countries for about 20 common conditions. For example, in Germany 1 million people suffer unnecessarily from migraines, and in France, 9 out of 10 patients with acute asthma do not receive adequate care.[4] IMS Health statistics show that access to biotechnology medicines is also significantly lower in Europe than in the United States.[5]

The shift of research and development (R&D) investment and the physical relocation of pharmaceutical research laboratories from Europe to the United States (see Chapter 1) underline the significance of free-market policies for producing innovation—and the importance of maintaining them in America. John Vernon of the University of Connecticut estimates that government-imposed price controls in the United States could dramatically reduce investment in R&D and lead to a steady decline in the discovery of new medicines over the next 50 years. In fact, 50 years after price controls are imposed, the number of new medicines brought to patients would be reduced by 60 to 73 percent.[6] Furthermore, if price controls had been implemented between 1980 and 2001, there would be between 330 and 365 fewer new medicines today.[7]

"Patents Provide the Fuel of Interest to the Fire of Genius"

—Abraham Lincoln

Patent Protections Encourage Innovation

Another policy important to innovation is governments' granting of patents as an incentive for research and for inventors to share their discoveries with the public. In the United States, patents are granted according to strict standards by trained Examiners at the U.S. Patent and Trademark Office (USPTO). They are only granted to inventions proved as new, useful, and nonobvious and only provide a limited period of exclusivity to the inventor (20 years in the United States), after which anyone can replicate or use the invention. Because pharmaceutical research company scientists use high technology and cutting-edge science to develop new and better medicines, many of their inventions are patentable.

The patent incentives ensconced in the U.S. Constitution and specified by Congress encourage the development of new medicines by attempting to provide a level of certainty to inventors. If granted a patent, scientists and the companies they work for know that they have a protected period of time in which they may prevent others from selling their invention. The exclusive right to exclude others from selling

"Patients rely on innovation for their health and well-being. Strong patent policies encourage pharmaceutical companies to produce new products . . . "

Henry G. Grabowski, Professor of Economics
Director, Program in Pharmaceuticals and Health Economics
Duke University

Patients rely on the research and development efforts of pharmaceutical companies to deliver new and better treatments for disease. The suggestion that the government could replace the $33 billion R&D effort of the private pharmaceutical industry and produce an equivalent stream of new pharmaceutical products is highly problematic on both economic and public policy grounds.

Economic analyses of the pharmaceutical R&D process indicate that it is very costly and risky, even for large established companies. Most compounds discovered never earn Food and Drug Administration approval. Developing a new medicine is time consuming and expensive, and few products earn revenues equal to or greater than the average cost of R&D. Only a few blockbuster successes cover the losses on many other projects. An important public policy implication is that price controls or patent policies that target the returns to the largest selling pharmaceuticals can have significant adverse consequences for R&D incentives, and thus for patients.

Significant price competition exists in the pharmaceutical marketplace between branded products in the same therapeutic class and between branded products and substitutable generic versions. Generic drugs are in wide use, entering the market as soon as patents expire in increasing numbers, and capturing a growing share of sales soon after market entry. Such competition limits the time in which an innovator can potentially recoup increasing R&D costs, but the ability to set and negotiate prices in a competitive market allows for the returns necessary to continue high levels of R&D investment.

Patients rely on innovation for their health and well-being. Strong patent policies encourage pharmaceutical companies to produce new products and also encourage rapid generic entry when patents expire. Strong patent policies combined with a price-control free market for drug products creates necessary incentives for R&D and continued medical advancement.

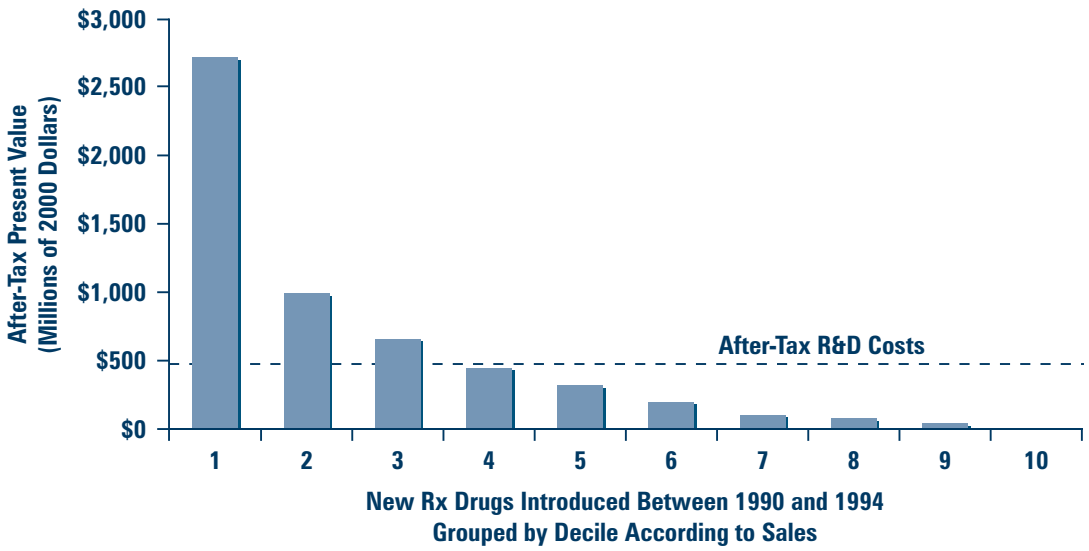
Henry G. Grabowski
Professor of Economics
Director, Program in Pharmaceuticals and Health Economics
Duke University

For additional discussion on this topic, see: Grabowski, H. G., "Patents and New Product Development in the Pharmaceutical and Biotechnology Industries," Georgetown Public Policy Review 8, no. 2 (2003).

the new invention during this time gives them the opportunity to potentially recoup the hundreds of millions of dollars invested in researching and developing a new medicine (see Chapter 1). However, the odds of recouping research expenditures are low. [Figure 4.1]

Under current law, generic drug manufacturers can already infringe unexpired patents in order to prepare their copies for Food and Drug Administration approval and the market, and can—in an increasing number of instances—enter the market with their copies years before patents expire. In fact, a growing number of generics seek to enter the market as quickly as five years after an innovator medicine is approved. Yet pharmaceuticals already have fewer effective years of patent protection than other U.S. products. [Figure 4.2]

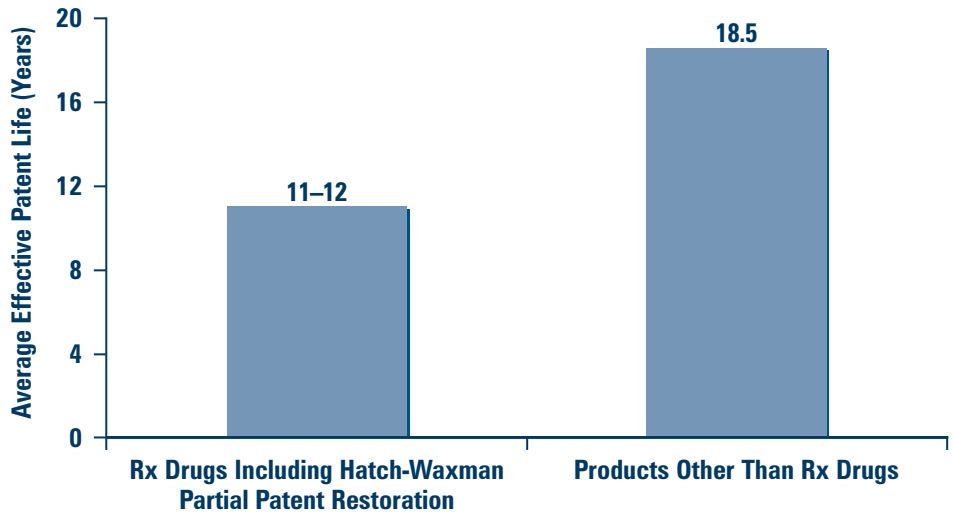
Figure 4.1 Only 3 Out of Every 10 Marketed Rx Drugs Produce Revenues That Match or Exceed Average R&D Costs



Note: The drug development costs cited in this chart are out of pocket after tax in 2000 dollars for drugs introduced between 1990 and 1994. The same analysis found that the total cost of developing a new drug was $802 million.

Source: H. Grabowski, J. Vernon, and J. DiMasi, "Returns on Research and Development for 1990s New Drug Introductions," Pharmacoeconomics 20, suppl. 3 (2002): 11–29.

Figure 4.2 Effective Patent Life: Rx Drugs vs. Other Products



Source: H. Grabowski and J. Vernon, "Longer Patents for Increased Generic Competition in the U.S.: The Waxman-Hatch Acts After One Decade," Pharmacoeconomics 10, suppl. 2 (1996): 110–123; American Intellectual Property Law Association, testimony of Michael K. Kirk on H.R. 400 before House Subcommittee on Courts and Intellectual Property, 26 February 1997.

Conclusion

To maintain American dominance in the research and discovery of new and better medicines and to maintain the superior level of access that American patients have to new medicines as compared to patients in other countries, policy makers should refrain from imposing governmental price controls on prescription medicines and continue to support strong patent incentives.

Endnotes

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THE FUTURE OF INNOVATION

5

5 FUTURE OF INNOVATION

Over the past several decades, scientists working in the laboratories of pharmaceutical research companies have invented and discovered a steady stream of new and better medicines, advanced our scientific and technological capabilities, and improved our knowledge of disease. The work of these scientists is far from over.

In some labs geneticists are striving to unlock the secrets of the human genome and to develop new scientific techniques for regulating the genes that cause disease. In other labs chemists are developing new and more efficient ways to combine chemical compounds to produce new treatments for patients. Engineers and computer scientists are designing robots to screen new compounds for biochemical activity and design new and faster computers and applications to analyze data on potential drug targets. Biologists are trying to understand and replicate the complex structure of proteins and looking for new tools to combat antibiotic-resistant bacteria and bioterrorism agents.

Scientifically, the future of American pharmaceutical research and innovations for patients is promising. To achieve that promise, however, public- and private-sector leadership must continue to support policies that encourage and sustain research and avoid policies that will slow the pace of innovation. These negative policies include limiting patent incentives, imposing price controls, and using other mechanisms that restrict patient access to new and better medicines. Specific priorities for policy makers include the following:

- **Recognize the growing role of pharmaceuticals in medical care:** Prescription drugs save lives, alleviate suffering, and improve the quality of life. They also often reduce the need for other more invasive and expensive treatments. A narrow focus on the cost of drugs, without regard to their value and their role in the health system as a whole, would discourage innovation and harm the prospects for health advances.

- **Focus on quality care:** Better quality patient care often is more efficient care. For example, large percentages of patients with conditions such as diabetes, depression, hypertension, and high cholesterol are not receiving needed care, yielding worse health outcomes and higher overall costs. Focusing on promoting solutions that improve quality will lead to better results for patients and more affordable medical care.
- **Support cost-control strategies that do not arbitrarily restrict drug access:** Instead of focusing on reducing the prescription drug line item, some health plans are emphasizing disease management programs, which recognize the value of medicines in both improving patient care and offsetting other health care expenditures. Furthermore, a competitive market provides greater opportunity for access to medicines. As the experience in Europe shows, price controls stifle innovation and compromise patient access to effective new medicines.
- **Maintain patent incentives in the United States and strengthen patent incentives worldwide:** Reject policies that would shift the balance from research to generic copies. Establish the legitimacy of intellectual property protection for medicines in all countries of the world.
- **Maintain a strong industry-government partnership for research:** Established mechanisms for cooperative public/private research have hastened commercialization of technologies that otherwise might never have been used.

APPENDIX: DETAILED RESULTS FROM THE PhRMA ANNUAL MEMBERSHIP SURVEY

List of Tables

R&D, PhRMA Member Companies

Sales, PhRMA Member Companies

Table 1
Domestic R&D and R&D Abroad**, PhRMA Member Companies: 1970–2003

(dollar figures in millions)

Year	Domestic R&D	Annual Percentage Change	R&D Abroad**	Annual Percentage Change	Total R&D	Annual Percentage Change
*2003	$27,407.1	6.8%	$5,808.3	8.4%	$33,215.4	7.1%
2002	25,655.1	9.2	5,357.2	-13.9	31,012.2	4.2
2001	23,502.0	10.0	6,220.6	33.3	29,772.7	14.4
2000	21,363.7	15.7	4,667.1	10.6	26,030.8	14.7
1999	18,471.1	7.4	4,219.6	9.9	22,690.7	8.2
1998	17,127.9	11.0	3,839.0	9.9	20,996.9	10.8
1997	15,466.0	13.9	3,492.1	6.5	18,958.1	12.4
1996	13,627.1	14.8	3,278.5	-1.6	16,905.6	11.2
1995	11,874.0	7.0	3,333.5	***	15,207.4	***
1994	11,101.6	6.0	2,347.8	3.8	13,449.4	5.6
1993	10,477.1	12.5	2,262.9	5.0	12,740.0	11.1
1992	9,312.1	17.4	2,155.8	21.3	11,467.9	18.2
1991	7,928.6	16.5	1,776.8	9.9	9,705.4	15.3
1990	6,802.9	13.0	1,617.4	23.6	8,420.3	14.9
1989	6,021.4	15.0	1,308.6	0.4	7,330.0	12.1
1988	5,233.9	16.2	1,303.6	30.6	6,537.5	18.8
1987	4,504.1	16.2	998.1	15.4	5,502.2	16.1
1986	3,875.0	14.7	865.1	23.8	4,740.1	16.2
1985	3,378.7	13.3	698.9	17.2	4,077.6	13.9
1984	2,982.4	11.6	596.4	9.2	3,578.8	11.2
1983	2,671.3	17.7	546.3	8.2	3,217.6	16.0
1982	2,268.7	21.3	505.0	7.7	2,773.7	18.6
1981	1,870.4	20.7	469.1	9.7	2,339.5	18.4
1980	1,549.2	16.7	427.5	42.8	1,976.7	21.5
1979	1,327.4	13.8	299.4	25.9	1,626.8	15.9
1978	1,166.1	9.7	237.9	11.6	1,404.0	10.0
1977	1,063.0	8.1	213.1	18.2	1,276.1	9.7
1976	983.4	8.8	180.3	14.1	1,163.7	9.6
1975	903.5	13.9	158.0	7.0	1,061.5	12.8
1974	793.1	12.0	147.7	26.3	940.8	14.0
1973	708.1	8.1	116.9	64.0	825.0	13.6
1972	654.8	4.5	71.3	24.9	726.1	6.2
1971	626.7	10.7	57.1	9.2	683.8	10.6
1970	566.2	-----	52.3	-----	618.5	-----
Average		**12.8%**		**16.6%**		**13.4%**

*Estimated

**R&D Abroad includes expenditures outside the United States by U.S.-owned PhRMA member companies and R&D conducted abroad by the U.S. divisions of foreign-owned PhRMA member companies. R&D performed abroad by the foreign divisions of foreign-owned PhRMA member companies is excluded. Domestic R&D, however, includes R&D expenditures within the United States by all PhRMA member companies.

***R&D Abroad affected by merger and acquisition activity.

Notes: All figures include company-financed R&D only. Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 2
R&D as a Percentage of Sales, PhRMA Member Companies: 1970–2003

Year	Domestic R&D as a % of Domestic Sales	Total R&D as a % of Total Sales
*2003	17.7%	15.6%
2002	18.4	16.1
2001	18.3	16.7
2000	18.4	16.2
1999	18.2	15.5
1998	21.1	16.8
1997	21.6	17.1
1996	21.0	16.6
1995	20.7	16.7
1994	21.9	17.3
1993	21.6	17.0
1992	19.4	15.5
1991	17.9	14.6
1990	17.7	14.4
1989	18.4	14.8
1988	18.3	14.1
1987	17.4	13.4
1986	16.4	12.9
1985	16.3	12.9
1984	15.6	12.1
1983	15.8	11.8
1982	15.4	10.9
1981	14.7	10.0
1980	13.1	8.9
1979	12.4	8.6
1978	12.1	8.5
1977	12.3	9.0
1976	12.2	8.9
1975	12.5	9.0
1974	12.1	9.1
1973	12.3	9.3
1972	12.4	9.2
1971	12.0	9.0
1970	12.3	9.3

*Estimated

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 3
Domestic R&D and R&D Abroad**, PhRMA Member Companies: 2002–2003

(dollar figures in millions)

	2002	*2003
R&D Expenditures for Human-Use Pharmaceuticals		
Domestic	$25,363.2	$27,088.6
Share	81.8%	81.6%
Abroad**	$ 5,264.4	$ 5,712.4
Share	17.0%	17.2%
Total Human-Use R&D	**$30,627.6**	**$32,801.0**
Share	98.8%	98.8%
R&D Expenditures for Veterinary-Use Pharmaceuticals		
Domestic	$ 291.8	$ 318.5
Share	0.9%	1.0%
Abroad**	$ 92.8	$ 95.9
Share	0.3%	0.3%
Total Vet-Use R&D	**$ 384.6**	**$ 414.4**
Share	1.2%	1.2%
TOTAL R&D	**$31,012.2**	**$33,215.4**
	100.0%	100.0%

*Estimated

**R&D Abroad includes expenditures outside the United States by U.S.-owned PhRMA member companies and R&D conducted abroad by the U.S. divisions of foreign-owned PhRMA member companies. R&D performed abroad by the foreign divisions of foreign-owned PhRMA member companies is excluded. Domestic R&D, however, includes R&D expenditures within the United States by all PhRMA member companies.

Notes: All figures include company-financed R&D only. Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 4
R&D By Geographic Area*, PhRMA Member Companies: 2002

(dollar figures in millions)

Geographic Area*	Dollars	Share
Africa		
Africa	$ 14.4	0.0%
Americas		
United States	$25,655.1	82.7%
Canada	304.5	1.0
Latin America (South and Central America, Mexico, and all Caribbean nations)	113.4	0.4%
Asia-Pacific		
Asia-Pacific (except Japan)	$ 79.2	0.3%
India and Pakistan	3.1	0.0
Japan	706.4	2.3
Australia		
Australia and New Zealand	$ 80.0	0.3%
Europe		
France	$ 378.8	1.2%
Germany	401.2	1.3
Italy	232.2	0.7
Spain	125.3	0.4
United Kingdom	1,324.9	4.3
Other Western European	1,453.6	4.7
Central and Eastern Europe (Cyprus, Czech Republic, Estonia, Hungary, Poland, Slovenia, Bulgaria, Lithuania, Latvia, Romania, Slovakia, and Malta)	91.4	0.3
Other Eastern European (including Russia and the Newly Independent States)	13.4	0.0
Middle East		
Middle East (Saudi Arabia, Yemen, United Arab Emirates, Iraq, Iran, Kuwait, Israel, Jordan, Syria, Afghanistan, Turkey, and Qatar)	$ 24.5	0.1%
Uncategorized	$ 10.8	0.0%
TOTAL R&D	**$31,012.2**	**100.0%**

*R&D Abroad includes expenditures outside the United States by U.S.-owned PhRMA member companies and R&D conducted abroad by the U.S. divisions of foreign-owned PhRMA member companies. R&D performed abroad by the foreign divisions of foreign-owned PhRMA member companies is excluded. Domestic R&D, however, includes R&D expenditures within the United States by all PhRMA member companies.

Notes: All figures include company-financed R&D only. Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 5
Domestic R&D By Function, PhRMA Member Companies: 2002

(dollar figures in millions)

Function	Dollars	Share
Prehuman/Preclinical	$10,481.6	33.8%
Phase I	1,490.2	4.8
Phase II	2,968.1	9.6
Phase III	6,286.4	20.2
Approval	2,455.0	7.9
Phase IV	3,855.2	12.4
Uncategorized	3,493.7	11.3
TOTAL R&D	**$31,012.2**	**100.0%**

Notes: All figures include company-financed R&D only. Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 6
Domestic R&D Scientific, Professional, and Technical Personnel By Function, PhRMA Member Companies: 2002

Function	Personnel	Share
Prehuman/Preclinical	30,555	40.4%
Phase I	4,465	5.9
Phase II	6,431	8.5
Phase III	16,670	22.0
Approval	5,235	6.9
Phase IV	7,867	10.4
Total R&D Staff	**71,223**	94.1%
Supported R&D Nonstaff	4,472	5.9
TOTAL R&D PERSONNEL	**75,695**	**100.0%**

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 7
Domestic Sales and Sales Abroad**, PhRMA Member Companies: 1970–2003

(dollar figures in millions)

Year	Domestic Sales	Annual Percentage Change	Sales Abroad**	Annual Percentage Change	Total Sales	Annual Percentage Change
*2003	$154,641.6	11.1%	$58,061.6	8.1%	$212,703.2	10.3%
2002	139,136.4	6.4	53,697.4	12.1	192,833.8	8.0
2001	130,715.9	12.8	47,886.9	5.9	178,602.8	10.9
2000	115,881.8	14.2	45,199.5	1.6	161,081.3	10.4
1999	101,461.8	24.8	44,496.6	2.7	145,958.4	17.1
1998	81,289.2	13.3	43,320.1	10.8	124,609.4	12.4
1997	71,761.9	10.8	39,086.2	6.1	110,848.1	9.1
1996	64,741.4	13.3	36,838.7	8.7	101,580.1	11.6
1995	57,145.5	12.6	33,893.5	***	91,039.0	***
1994	50,740.4	4.4	26,870.7	1.5	77,611.1	3.4
1993	48,590.9	1.0	26,467.3	2.8	75,058.2	1.7
1992	48,095.5	8.6	25,744.2	15.8	73,839.7	11.0
1991	44,304.5	15.1	22,231.1	12.1	66,535.6	14.1
1990	38,486.7	17.7	19,838.3	18.0	58,325.0	17.8
1989	32,706.6	14.4	16,817.9	-4.7	49,524.5	7.1
1988	28,582.6	10.4	17,649.3	17.1	46,231.9	12.9
1987	25,879.1	9.4	15,068.4	15.6	40,947.5	11.6
1986	23,658.8	14.1	13,030.5	19.9	36,689.3	16.1
1985	20,742.5	9.0	10,872.3	4.0	31,614.8	7.3
1984	19,026.1	13.2	10,450.9	0.4	29,477.0	8.3
1983	16,805.0	14.0	10,411.2	-2.4	27,216.2	7.1
1982	14,743.9	16.4	10,667.4	0.1	25,411.3	9.0
1981	12,665.0	7.4	10,658.3	1.4	23,323.3	4.6
1980	11,788.6	10.7	10,515.4	26.9	22,304.0	17.8
1979	10,651.3	11.2	8,287.8	21.0	18,939.1	15.3
1978	9,580.5	12.0	6,850.4	22.2	16,430.9	16.1
1977	8,550.4	7.5	5,605.0	10.2	14,155.4	8.6
1976	7,951.0	11.4	5,084.3	9.7	13,035.3	10.8
1975	7,135.7	10.3	4,633.3	19.1	11,769.0	13.6
1974	6,740.4	13.8	3,891.0	23.4	10,361.4	17.2
1973	5,686.5	9.1	3,152.5	15.9	8,839.0	11.5
1972	5,210.1	1.3	2,720.2	10.6	7,930.3	4.3
1971	5,144.9	13.0	2,459.7	18.0	7,604.6	14.6
1970	4,552.5	-----	2,084.0	-----	6,636.5	-----
Average		**11.4%**		**10.5%**		**11.0%**

*Estimated

**Sales Abroad includes sales generated outside the United States by U.S.-owned PhRMA member companies and sales generated abroad by the U.S. divisions of foreign-owned PhRMA member companies. Sales generated abroad by the foreign divisions of foreign-owned PhRMA member companies are excluded. Domestic sales, however, includes sales generated within the United States by all PhRMA member companies.

***Sales Abroad affected by merger and acquisition activity.

Note: Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 8
Domestic Sales and Sales Abroad* By End Use and Customer, PhRMA Member Companies: 2002

(dollar figures in millions)

	Human Use	Vet Use	Total
To Private Sector	$131,203.3	$ 1,300.7	$132,504.0
To Public Sector	6,473.0	159.4	6,632.4
Total Domestic Sales	**$137,676.3**	**$ 1,460.1**	**$139,136.4**
Exports	$ 864.7	$ 61.0	$ 925.7
Foreign Sales	51,293.2	1,478.5	52,771.7
Total Sales Abroad*	**$ 52,157.9**	**$ 1,539.5**	**$ 53,697.4**
TOTAL SALES	**$189,834.2**	**$ 2,999.6**	**$192,833.8**

*Sales Abroad includes sales generated outside the United States by U.S.-owned PhRMA member companies and sales generated abroad by the U.S. divisions of foreign-owned PhRMA member companies. Sales generated abroad by the foreign divisions of foreign-owned PhRMA member companies are excluded. Domestic sales, however, includes sales generated within the United States by all PhRMA member companies.

Note: Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

Table 9
Sales By Geographic Area*, PhRMA Member Companies: 2002

(dollar figures in millions)

Geographic Area*	Dollars	Share
Africa		
Africa	$ 549.8	0.3%
Americas		
United States	$139,136.4	72.2%
Canada	3,415.2	1.8
Latin America (South and Central America, Mexico, and all Caribbean nations)	4,583.7	2.4
Asia-Pacific		
Asia-Pacific (except Japan)	$ 2,560.0	1.3%
India and Pakistan	483.8	0.3
Japan	6,366.9	3.3
Australia		
Australia and New Zealand	$ 1,555.8	0.8%
Europe		
France	$ 5,097.2	2.6%
Germany	4,139.1	2.1
Italy	3,893.4	2.0
Spain	2,522.5	1.3
United Kingdom	3,822.9	2.0
Other Western European	7,090.0	3.7
Central and Eastern Europe (Cyprus, Czech Republic, Estonia, Hungary, Poland, Slovenia, Bulgaria, Lithuania, Latvia, Romania, Slovakia, and Malta)	1,390.8	0.7
Other Eastern European (including Russia and the Newly Independent States)	321.3	0.2
Middle East		
Middle East (Saudi Arabia, Yemen, United Arab Emirates, Iraq, Iran, Kuwait, Israel, Jordan, Syria, Afghanistan, Turkey, and Qatar)	$ 1,362.3	0.7%
Uncategorized	$ 4,542.7	2.4%
TOTAL SALES	**$192,833.8**	**100.0%**

*Sales Abroad includes sales generated outside the United States by U.S.-owned PhRMA member companies and sales generated abroad by the U.S. divisions of foreign-owned PhRMA member companies. Sales generated abroad by the foreign divisions of foreign-owned PhRMA member companies are excluded. Domestic sales, however, includes sales generated within the United States by all PhRMA member companies.

Note: Total values may be affected by rounding.

Source: Pharmaceutical Research and Manufacturers of America, PhRMA Annual Membership Survey, 2004.

PhRMA Annual Membership Survey Definitions of Terms

Research and Development (R&D) Definitions

R&D Expenditures: Expenditures within PhRMA member companies' U.S. and/or foreign research laboratories plus R&D funds contracted or granted to commercial laboratories, private practitioners, consultants, educational and nonprofit research institutions, manufacturing and other companies, or other research-performing organization.

Prehuman/Preclinical Testing: From synthesis to first testing in humans.

Phase I/II/III Clinical Testing: From first testing in designated phase to first testing in subsequent phase.

Approval Phase: From new drug application (NDA) submission to NDA approval.

Phase IV Clinical Testing: Any postmarketing testing performed.

Uncategorized: Represents data for which detailed classifications were unavailable.

Scientific, Professional, and Technical Staff: Full-time employees, as well as full-time equivalents for part-time employees, whose work requires the application of R&D knowledge, skills, and scientific techniques in the life, physical, engineering, mathematical, or statistical sciences as well as persons engaged in technical work at a level that requires knowledge in one of the above-mentioned fields. Does not include persons who have formal training in the sciences but who are not actively engaged in R&D.

Supported Scientific, Professional, and Technical Nonstaff: Persons whose work requires the application of R&D knowledge, skills, and scientific techniques in the life, physical, engineering, mathematical, or statistical sciences as well as persons engaged in technical work at a level that requires knowledge in one of the above-mentioned fields who are supported through contracts or grants to commercial laboratories, private practitioners, consultants, educational and nonprofit research institutions, manufacturing and other companies, or other research-performing organizations located in the United States. Does not include persons who have formal training in the sciences but who are not actively engaged in R&D.

Sales Definitions

Sales: Product sales calculated as billed, free on board (FOB) plant or warehouse less cash discounts, Medicaid rebates, returns, and allowances. These include all marketing expenses except transportation costs. Also included is the sales value of products bought and resold without further processing or repackaging as well as the dollar value of products made from the firm's own materials for other manufacturers' resale. Excluded are all royalty payments, interest, and other income.

Exports to Other Customers: Sales to third parties only, FOB U.S. port. Excludes all intrafirm transactions such as sales or shipments to subsidiaries or affiliates.

Foreign Sales: Sales consummated in foreign countries.

Member Companies

3M Pharmaceuticals
St. Paul, MN

Abbott Laboratories
Abbott Park, IL

Allergan, Inc.
Irvine, CA

Amersham Health
Princeton, NJ

Amgen Inc.
Thousand Oaks, CA

AstraZeneca LP
Wilmington, DE

Aventis
Bridgewater, NJ
Aventis Pasteur
Aventis Pharmaceuticals, Inc.

Bayer Corporation Pharmaceutical Division
West Haven, CT

Berlex Laboratories, Inc.
U.S. Affiliate of Schering AG Germany
Montville, NJ

Biogen IDEC Inc.
Cambridge, MA

Boehringer Ingelheim Pharmaceuticals, Inc.
Ridgefield, CT

Bristol-Myers Squibb Company
New York, NY
Bristol-Myers Squibb Company Worldwide Medicines Group

Eli Lilly and Company
Indianapolis, IN

Fujisawa Healthcare, Inc.
Deerfield, IL

Genzyme Corporation
Cambridge, MA

GlaxoSmithKline
Research Triangle Park, NC

Hoffmann-La Roche Inc.
Nutley, NJ

Johnson & Johnson
New Brunswick, NJ
Advanced Sterilization Products
ALZA Corporation
Centocor, Inc.
Cordis Corporation
DePuy Inc.
Ethicon Endo-Surgery, Inc.
Ethicon Inc.
- Ethicon Products
- Gynecare
- Johnson & Johnson Wound Management

Janssen Pharmaceutica Inc.
Janssen Research Foundation & R. W. Johnson Pharmaceutical Research Institute
Johnson & Johnson Health Care Systems, Inc.
Mitek
Ortho Biotech Products, L.P.
Ortho-Clinical Diagnostics
Ortho-McNeil Pharmaceutical, Inc.
OrthoNeutrogena
Scios Inc.
Therakos, Inc.
Vistakon

Merck & Co., Inc.
Whitehouse Station, NJ
Merck Human Health Division
Merck Research Laboratories
Merck Vaccine Division

Millennium Pharmaceuticals, Inc.
Cambridge, MA

Novartis Pharmaceuticals Corporation
East Hanover, NJ

Organon USA Inc.
West Orange, NJ

Otsuka America, Inc.
San Francisco, CA
Otsuka America Pharmaceutical, Inc.
Otsuka Maryland Research Institute

Pfizer Inc.
New York, NY

Purdue Pharma L.P.
Stamford, CT
The P.F. Laboratories, Inc.
The Purdue Frederick Company

Sanofi-Synthelabo Inc.
New York, NY

Savient Pharmaceuticals, Inc.
East Brunswick, NJ

Schering-Plough Corporation
Kenilworth, NJ

SCHWARZ PHARMA, INC.
Mequon, WI

Serono, Inc.
Norwell, MA

Solvay Pharmaceuticals, Inc.
Marietta, GA
Unimed Pharmaceuticals, Inc.

The Procter & Gamble Company
Mason, OH
Proctor & Gamble Pharmaceuticals, Inc.

Wyeth
Madison, NJ
Wyeth Pharmaceuticals
Wyeth Research

Pharmaceutical Affiliates

No Members currently exist in this category

International Affiliates

ALTANA Pharma U.S.
Florham Park, NJ

Daiichi Pharmaceutical Corporation
Montvale, NJ

Eisai Inc.
Teaneck, NJ

Novo Nordisk Pharmaceuticals, Inc.
Princeton, NJ

Sankyo Pharma Inc.
Parsippany, NJ

Sigma-Tau Pharmaceuticals, Inc.
Gaithersburg, MD

Takeda Pharmaceuticals North America, Inc.
Lincolnshire, IL

Yamanouchi Pharma America, Inc.
Paramus, NJ

Associates: Researchers

aaiPharma Inc.
Wilmington, NC
AAI International Inc.
NeoSan Pharmaceuticals Inc.

Alkermes, Inc.
Cambridge, MA

Amylin Pharmaceuticals, Inc.
San Diego, CA

Celera Genomics Group
Rockville, MD

Celgene Corporation
Warren, NJ

Cephalon, Inc.
West Chester, PA

CIMA Labs Inc.
Eden Prairie, MN

Enzon, Inc.
Piscataway, NJ

Eyetech Pharmaceuticals, Inc.
New York, NY

ICOS Corporation
Bothell, WA

Idenix Pharmaceuticals, Inc.
fomerly Novirio
Cambridge, MA

Isis Pharmaceuticals, Inc.
Carlsbad, CA

Ligand Pharmaceuticals Inc.
San Diego, CA

Maxim Pharmaceuticals, Inc.
San Diego, CA

MGI PHARMA, INC.
Bloomington, MN

Penwest Pharmaceuticals Co.
Patterson, NY

Sepracor, Inc.
Marlborough, MA

Stressgen Biotechnologies
San Diego, CA

Theravance, Inc.
South San Francisco, CA

Vela Pharmaceuticals Inc.
Lawrenceville, NJ

Associates: Contract Research Organizations

Compugen Ltd.
Jamesburg, NJ

Quintiles Transnational Corp.
Research Triangle Park, NC

Associates: Advertising & Communication Services

CommonHealth, L.P.
Parsippany, NJ

Euro RSCG Life Worldwide
New York, NY

FCB Healthcare
New York, NY

HealthSTAR Communications, Inc.
Woodbridge, NJ

IMS HEALTH
Plymouth Meeting, PA

McGraw-Hill Healthcare Information Group
Minneapolis, MN

McKesson Corporation
San Francisco, CA

Medicus Group International
New York, NY

Medi-Promotions, Inc.
Hasbrouck Heights, NJ

MediMedia USA, Inc.
Teterboro, NJ

NDCHealth
Atlanta, GA

PDI, Inc.
Upper Saddle River, NJ

Saatchi & Saatchi Healthcare, Inc.
New York, NY

Thomson Healthcare/Medical Economics
Montvale, NJ

Ventiv Health, Inc.
Somerset, NJ

Associates: Consultants & Drug Discovery Software Firms

Accenture
Philadelphia, PA

Automsoft International
Cambridge, MA

The Boston Consulting Group Inc.
Boston, MA

Dendrite International, Inc.
Bridgewater, NJ

Ernst & Young
New York, NY

J. Scott International, Inc.
Fort Washington, PA

KPMG LLP
Short Hills, NJ

NOP World Health
East Hanover, NJ

TargetRx, Inc.
Horsham, PA