 NIH...  
Turning Discovery Into Health

**OUR HEALTH**

NIH-funded research can have powerful effects on the health of the nation and the world. Discoveries have led to new ways to treat, diagnose, and prevent illness.

The following represent some key areas in which NIH-funded discoveries have helped to make people healthier:

*A Americans are Living Longer*

- Between 1970 and 2013, the **life expectancy of the average American increased** by eight years, from 70.8 to 78.8.¹
- Between 1969 and 2013, **the death rate in the U.S. for all causes has decreased by 43%**, from 1279 per 100,000 people to 730.²

*Babies are Being Born Healthier*

- In 1960, 26 of every 1,000 babies born in the United States died before their first birthday. By 2013, that rate had **fallen to under 6 per 1,000 babies**.³ This is thanks in large part to NIH research on reducing preterm births, neonatal mortality, and other complications.
- Since the mid-1990s, NIH research has informed implementation of HIV testing and preventive interventions that resulted in a **more than 90% decrease in the number of children perinatally infected with HIV in the United States**, according to CDC.⁴
- NIH-funded research has found that **women with lupus can expect a safe pregnancy if their disease is inactive**,⁵ and has helped to identify which lupus patients are at risk for the most severe pregnancy complications.⁶

*Heart Disease, Stroke, and Diabetes Are Less Deadly*

- Deaths from heart disease **fell 67.5%** from 1969 to 2013, through research advances supported in large part by NIH.⁷
- The Framingham Heart Study and other NIH-supported research have identified **risk factors for heart disease**, such as cholesterol, smoking, and high blood pressure. This work has led to new strategies for preventing heart disease.
- In 1995, an NIH-funded clinical trial established the **first FDA-approved treatment** for the most common type of stroke,⁸ the drug tissue plasminogen activator (tPA).
- Since 1950, **the stroke mortality rate has decreased by 79%**,⁹ due in part to NIH-funded research on treatments and prevention.

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Despite the increasing prevalence of diabetes in the U.S., from 1969 to 2013 the death rate for adults with diabetes declined by 16.5%.\textsuperscript{10} Between 1990 and 2010, the rates of major diabetes complications dropped dramatically, particularly for heart attacks, which declined by 68%, and stroke, which declined by 53%.\textsuperscript{11} These improvements are due largely to clinical trials supported by NIH.

NIH’s Diabetes Prevention Program has shown that lifestyle changes, such as diet and physical activity, can lower the risk of developing type 2 diabetes by 58% in adults at high risk for the disease.\textsuperscript{12}

\textit{Advances in Preventing and Treating Cancer}

The death rate for all cancers combined has been declining since the early 1990s for adults and since the 1970s for children. Overall cancer death rates have dropped by about 1.5% per year, or nearly 15% in total from 2003—2012. The American Cancer Society estimates that 1.7 million cancer deaths were averted from 1991—2012 (nearly 1.2 million in men and 512,100 in women) by improvements in cancer treatment, detection, and prevention.\textsuperscript{13}

Between 2003 and 2012, breast cancer death rates for women declined by about 2% per year, or nearly 20% in total. Breast cancer is the most common cancer in the United States (excluding non-melanoma skin cancer). NIH-supported research has helped identify major breast cancer subtypes and led to the development of treatments that are tailored to the cancers’ specific molecular profiles.\textsuperscript{14}

Lung cancer is the second most common cancer\textsuperscript{15} and the leading cause of cancer-related death in both men and women in the United States. NIH-funded research has contributed to lowering the lung cancer death rate by 2.75% per year in men and 1.4% per year in women between 2003 and 2012.\textsuperscript{16} New targeted therapies such as erlotinib (Tarceva) and crizotinib (Xalkori) have led to dramatic responses in people whose lung cancers harbor particular genetic mutations.

Prostate cancer is the second leading cause of cancer-related death among men in the United States. NIH-supported research has improved treatments for prostate cancer. Partly because of these advances, between 2003 and 2012, the prostate cancer death rate dropped by 3.5% per year, or nearly 35% in total.\textsuperscript{17}

Due in part to groundbreaking NIH research, three FDA-approved vaccines, Cervarix, Gardasil, and Gardasil 9, are now available to prevent infection by human papillomaviruses (HPV) that can cause cervical cancer.

Thanks to the development of Gleevec\textsuperscript{®}, supported in part by NIH, patients with a new diagnosis of chronic myelogenous leukemia (CML) can now expect to live an essentially normal lifespan.\textsuperscript{18}

Research in cancer immunotherapy has led to the development of several new methods of treating cancer by restoring or enhancing the immune system’s ability to fight the disease. As researchers develop new approaches to overcoming tumor avoidance of immune destruction and new methods for identifying antigens on tumor cells that can be targeted most effectively, immunotherapy is becoming an integral part of precision medicine.\textsuperscript{19}
Fighting Infections

- In the early 1980s when the HIV/AIDS epidemic began, people infected with the virus were not likely to live longer than a few years. Thanks to an unprecedented collaborative effort between NIH and industry, today:
  - **Treatments can suppress the virus** to undetectable levels.
  - A 20-year-old HIV-positive adult living in the United States who receives these treatments is expected to live into his or her early 70s, nearly as long as someone without HIV.20
  - **Death rates have dropped more than 62%** between 1987 and 2013.21

- The **haemophilus influenza type B (Hib) vaccine** has reduced the cases of Hib, once the leading cause of bacterial meningitis in children, by more than 99%.22

- NIH intramural researchers played a crucial role in developing the first licensed **hepatitis A vaccine**, contributing to a **92% decline in hepatitis A rates** since 1995.23

- Hepatitis B infection once caused untreatable, fatal illness. Due to intensive vaccination programs based on NIH research, the rate of **acute hepatitis B has fallen by more than 80% since 1980**.24

- A diagnosis of hepatitis C once meant months and months of painful drug injections. Thanks in part to NIH research, there are effective **pills for treating hepatitis C**.25

- NIH intramural scientists were the **first to identify rotavirus**, the most common cause of childhood diarrhea worldwide, in 1974 and partnered with industry to create the **first rotavirus vaccine** in 1998.26

- NIH intramural scientists performed pioneering work to develop the antifungal drugs amphotericin B and fluocytosine, which **treat the most common fungal brain infection in patients with weakened immune systems, including AIDS patients.**27

Understanding Drug Abuse and Addiction

- In the last three decades, scientists funded by NIH have discovered much about the risks and mechanisms that lead to drug abuse and addiction in adolescents. This has informed new approaches to prevention.

- Today, the rate of daily cigarette smoking by teenage students is below 6%, its lowest point since 1975, when the NIH-funded Monitoring the Future (MTF) survey began tracking drug use and attitudes of teens.28

- The same study found that **alcohol use by teenagers is down to its lowest point since 1975.**29

- Between 1996 and 2014, over **26,000 opiate overdoses were reversed** by non-medical personnel using naloxone, developed in large part from NIH research.30

- NIH-supported researchers partnered with a pharmaceutical company to produce a naloxone nasal spray, the **first easy-to-use, non-injectable version of a life-saving treatment for opioid or heroin overdoses.**31

- NIH-supported researchers collaborated with the pharmaceutical industry to develop the drug buprenorphine, the **first drug for opioid addiction that could be prescribed in a doctor’s office** instead of requiring daily visits to a clinic.32
Progress in Treating Lost Neural Function

- As a result of NIH efforts, nearly all infants born in U.S. hospitals in 2010 were screened for hearing loss, up from as few as one-tenth of infants born in 1993, allowing them to get hearing aids or cochlear implants during their developmental years when they will be most helpful.33
- According to the FDA, approximately 324,000 cochlear implants have been implanted worldwide, in roughly 58,000 U.S. adults and 38,000 U.S. children.34 Studies have shown that screening and implantation before the age of 18 months allows more than 80% of children with hearing loss to join mainstream classes with their normal-hearing peers.35
- NIH-supported research has driven the development of hearing aids from the first electronic hearing devices invented in the 1950s to the sophisticated digital devices available today.
- Building on advances in stimulating the nervous system with electricity, emerging neurostimulation technologies have the promise of restoring vision36 and movement after paralysis and traumatic injury.37
- Deep brain stimulation is used to help relieve symptoms of Parkinson’s disease and Obsessive-Compulsive Disorder, thanks in part to NIH-funded research,38 and is currently being tested in other neuropsychiatric conditions, such as treatment-resistant depression and dementia.39

More People Are Surviving Injuries

- In the mid-1970s, burns that covered even 25% of the body were almost always fatal.40 Today, people with burns covering 90% of their bodies can survive.41 NIH-funded research on wound cleaning, skin replacement, infection control, and other topics has greatly improved the chances of surviving catastrophic burns and traumatic injuries.
- From 1969 to 2013, the death rate from unintentional injuries decreased almost 40%, from 65.1 per 100,000 people to 39.2.42
- From 1990 to 2010, the death rate per 100,000 people from motor vehicle traffic injury decreased 39%, from 18.5 to 11.3. Survivors are healthier, with a higher of quality of life. These dramatic advances are due in large part to research.43

Blazing a Path for Innovations in Treatment

- The first human liver transplantation was performed by an NIH grantee in 1967.44
- NIH intramural researchers, in conjunction with several university partners, held the first large clinical trials of lithium as a mood stabilizer, supporting its FDA approval in 1970.45
- NIH intramural scientists developed the first cell-targeted enzyme replacement therapy for Gaucher disease and conducted the first successful clinical trial in 1991, providing a new gold-standard therapy for a rare genetic deficiency.46
- NIH intramural researchers spearheaded studies in the 1940s and 1950s that showed the rate of tooth decay fell more than 60% in children who drank fluoridated water, laying the foundation for a major component of modern dental health.47
NIH intramural researchers pioneered the treatment of the rare disease lipodystrophy using a synthetic form of the fat-derived hormone leptin, which was FDA-approved as a treatment in 2014.48

NIH-funded research helped lead to the development of tofacitinib (approved by the FDA in 2012), the first new rheumatoid arthritis drug in more than a decade that can be taken as a pill (rather than an injection) to slow or halt joint damage.

NIH research led to breakthrough treatments for a family of rare autoinflammatory diseases,49 including familial Mediterranean fever (FMF), neonatal onset multisystem inflammatory disease (NOMID), Tumor Necrosis Factor (TNF) Receptor-Associated Periodic Syndrome (TRAPS), and Deficiency of the Interleukin-1 Receptor Antagonist (DIRA). The NIH Clinical Center conducted much of the genetic research that led to a potential therapy, as well as the clinical trials that proved the therapy could be effective.

NIH maintains the Undiagnosed Diseases Program (UDP), started in 2008, to help connect patients and researchers to find the right diagnosis for tricky diseases. The UDP has received thousands of applications since opening, with approximately 10% of the program’s patients receiving a full diagnosis, and a further 30% gaining partial diagnosis.50

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4 http://www.niaid.nih.gov/topics/HIVAIDS/Understanding/Prevention/Pages/perinatal.aspx
9 Ibid

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