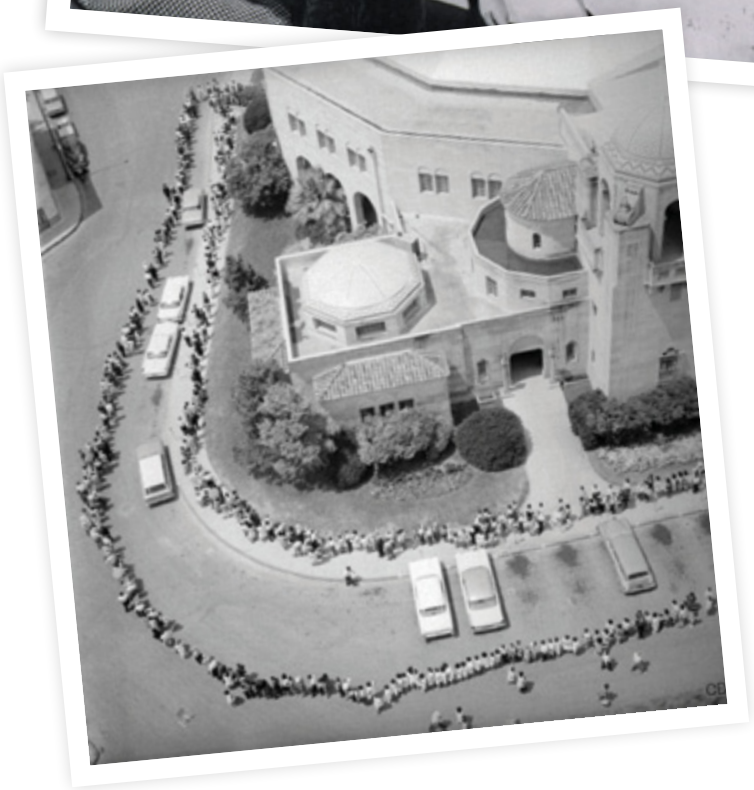
# Foreword to 2012 Jordan Report

*Anthony S. Fauci, M.D., National Institute of Allergy and Infectious Diseases, National Institutes of Health*

In 1981 the National Institute of Allergy and Infectious Diseases (NIAID) recognized the critical role vaccines have played in preserving human life and human health by initiating the Program for the Accelerated Development of Vaccines. The goal of this program was to build on 20th century vaccine triumphs against such important infectious diseases as diphtheria, measles, pertussis, poliomyelitis, tetanus, yellow fever, and others. Conceived of by NIAID scientist John R. Seal (1912–1984), the new program was ably directed for 6 critical early years by William S. (Bill) Jordan (1917–2008). After retirement in 1987, Dr. Jordan stayed involved with NIAID, and particularly in vaccine research, for another 20 years, time enough to teach and influence a new generation of NIAID scientists who today continue the tradition in support of the vaccine goals first articulated in 1981.

Progress in vaccine development is periodically reviewed and published by NIAID scientists in what has come to be called, with the affection and admiration of his colleagues, *The Jordan Report*. Drs. Seal and Jordan are sadly no longer with us, but after an eventful 30 years the initiative they started remains healthy and vigorous. As discussed in greater depth in this report, progress in vaccine development has moved continuously forward, sometimes leaping ahead while at other times seeming to crawl. Looking back at the challenges of 30 years ago, however, it is undeniable that there have been remarkable achievements. We now have licensed vaccines against *Haemophilus influenzae* type B and pneumococcal types that cause high childhood morbidity and mortality, against hepatitis A and B, against rotaviruses, and against varicella. We also have improved vaccines against such diseases as influenza and pertussis, and passive immunotherapy against respiratory syncytial virus (RSV) in newborns.

In addition to technological advances in making vaccines, including protein conjugation of bacterial polysaccharides, DNA vaccines, viral chimeras, viral vectors, and other novel platforms, the last 30 years also have been characterized by noteworthy advances in delivering vaccines to the developing world. Public health programs, supported by governments and energetic philanthropic foundations, have had extraordinary



Top: A grade school boy, held by a young woman wearing a safety patrol belt, is about to receive an immunization from a nurse (circa 1940). Courtesy of the National Library of Medicine

Bottom: Aerial view of a crowd awaiting polio immunization at a city auditorium in San Antonio, TX (1962). Courtesy of CDC/Mr. Stafford Smith

success in reducing childhood mortality. Poliomyelitis is now on the brink of elimination, and global measles mortality has been markedly reduced in recent years, with eradication a possibility. New vaccines against rotaviruses, which kill half a million children annually, are already having an important beneficial effect in the developing world and promise an enormous impact in reducing mortality in coming years. Vaccines against pneumococci and *Haemophilus influenzae* type B already have saved millions of lives. Clearly, the last 30 years have been a triumph for both vaccine technology and public health disease prevention programs that rely on these vaccines.

Many challenges remain, however. The last decade in particular has seen a discouraging resurgence of anti-vaccine sentiment in the United States and other countries. Fortunately, the proven importance of vaccines increasingly is being articulated in the media, on the Internet, and in other forums by leaders in medicine and public health and by other concerned and informed citizens. An effective HIV vaccine still eludes us. Yet we are making progress, achieving a modest level of protection with a two-step vaccine regimen in a large clinical trial and addressing fundamental issues in HIV vaccinology, such as the identification of neutralizing epitopes on the HIV envelope and use of these epitopes as immunogens through structure-based vaccine design. Progress on vaccines to prevent other high-burden diseases has been frustratingly slow, although here, too, we are moving forward with a growing pipeline of novel vaccines against dengue, malaria, and tuberculosis, among others.

Much has changed globally since the Program for the Accelerated Development of Vaccines was initiated 30 years ago. In that era, one could walk into almost any village in a poor country and see children crippled by poliomyelitis, as well as children only spottily vaccinated with a few intermittently available vaccines or, all too commonly, never vaccinated at all. Such situations still occur, but much less frequently, and the tide seems to be turning rapidly. Vaccines against infectious diseases have become a major component of personal and public health, and indeed of modern human existence, worldwide. In 2010, the Bill & Melinda Gates Foundation called for a Decade of Vaccines to support research, development, and delivery of lifesaving vaccines to the world's poorest nations. NIAID and other global health leaders have joined this initiative, which seeks to dramatically reduce child mortality and save millions of lives by 2020.

Some of the successes we have enjoyed and the challenges we now face are highlighted in this report. After 30 years, it has become clear that vaccines will remain critical to human health for the foreseeable future and that development and deployment of vaccines will remain a key challenge to research, public health, and clinical practice.


People standing in line at a polio immunization station outside a local grocery store in Columbus, Georgia (1961). Courtesy of CDC/Charles N. Farmer

# Tribute

*Carole A. Heilman, Ph.D., National Institute of Allergy and Infectious Diseases, National Institutes of Health*

I would like to dedicate this edition of *The Jordan Report* to the memory of its beloved namesake, Dr. William S. Jordan, who passed away in 2008. With his passing, we lost a man of great vision, brilliance, and goodness. Dr. Jordan was tireless in his quest to improve human health through the development of new and improved vaccines for use against myriad diseases, including many that affect children. He leaves behind a lasting legacy that is boundless in its sheer impact. The change effected by Dr. Jordan has saved the lives of countless people worldwide. His commitment was unwavering as he advocated for the development of vaccines and treatments against all preventable diseases, including neglected tropical diseases and malaria. His leadership and enthusiasm were inspirational to those who were fortunate enough to know or work with him.

Dr. Jordan's distinguished career in the field of preventive medicine spanned more than 60 years as a practicing physician, dedicated teacher, and noted infectious disease researcher. "There are few names in vaccine research as recognizable, and few who have contributed as much to this life-saving field, as William Jordan," said Herman R. Shepherd, founder of the Sabin Institute, when presenting Dr. Jordan with the 2004 Sabin Award. Dr. Jordan's 32-year tenure at the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, was one of great progress. He was the creator of and chief advocate for a new effort, which he dubbed the "Accelerated Development of Vaccines." He sensed that the advancing pace of discovery would yield many new ideas for vaccines of all kinds.

It was the synergy of new science and the practical application of that science in the form of new vaccines and other interventions that motivated Dr. Jordan and those around him. By creating *The Jordan Report*, Dr. Jordan established what is considered by many in the scientific community to be one of the most complete references available on vaccine research and development today. Simply stated, William S. Jordan was indeed a significant force behind what we now consider modern-day vaccinology. He will be missed.

This report is dedicated to the memory of Dr. William Jordan, a pioneer in vaccine research. Courtesy of Case Western Reserve University Medical School

BIOGRAPHY OF

# WILLIAM S. JORDAN, M.D.

Bill had the unique ability to sense what was possible and create opportunities to move the field forward. He will be sorely missed.

—Anthony S. Fauci, M.D., *Director, National Institute of Allergy and Infectious Diseases, NIH*

Dr. William Jordan, a leading vaccine researcher and advocate and former Director of the NIAID Microbiology and Infectious Diseases Program, passed away on March 11, 2008.

Dr. Jordan had a distinguished career in preventive medicine as a physician, teacher, and researcher in infectious diseases. A graduate of the University of North Carolina and, in 1942, Harvard Medical School, Dr. Jordan devoted his professional life to advancing research on infectious diseases and gave impetus to national and global disease prevention strategies by promoting research on vaccine development. His medical research career began in 1947 at the Department of Preventive Medicine at Western Reserve University in Cleveland. There, he played a pivotal role in the landmark Cleveland Family Study, a comprehensive, long-term study that examined illness patterns in families and is considered an epidemiological classic. The study identified respiratory infections and viral gastroenteritis as the most common causes of illness in those families and noted the importance of the family setting on transmission, as summarized in the book *Illness in the Home.* Dr. Jordan's laboratory also contributed advances on pandemic influenza and adenoviruses.

In 1958, Dr. Jordan joined the University of Virginia, where he chaired the Department of Preventive Medicine. He was later honored by the University through the establishment of the William S. Jordan, Jr., Professorship of Medicine in Epidemiology. Dr. Jordan also served as the director of the Armed Forces Epidemiological Board's commission on acute respiratory diseases and later became dean of the University of Kentucky College of Medicine. He spent a sabbatical year at the London School of Hygiene and Tropical Medicine.

From 1976 to 1987, Dr. Jordan served as Director of the Microbiology and Infectious Diseases Program (now the Division of Microbiology and Infectious Diseases) at NIAID. Under Dr. Jordan's direction, vaccines for hepatitis B, *Haemophilus influenzae* type B, and pneumococcal pneumonia became available and major strides were made in influenza vaccine development. After serving as Program Director, Dr. Jordan remained a close and trusted advisor to NIAID for more than two decades. A key part of his mission at NIAID was stimulating vaccine research. He launched NIAID's Program for the Accelerated Development of Vaccines in 1981 and created an internal annual report to review progress in vaccine research—and the report evolved into what is now known as *The Jordan Report.*

## IN MEMORY OF DR. ROBERT M. CHANOCK

Dr. Robert M. Chanock, world-renowned virologist and former chief of the Laboratory of Infectious Diseases at the National Institute of Allergy and Infectious Diseases (NIAID), died on July 30, 2010. He was 86 years old.

Dr. Chanock began his research career working under Dr. Albert Sabin at Children's Hospital Research Foundation in Cincinnati in the early 1950s. He joined the NIAID Laboratory of Infectious Diseases in 1957, where he and colleagues were the first to identify and characterize human respiratory syncytial virus (RSV), the most common cause of serious lower respiratory tract disease in infants and children worldwide. He and his research group subsequently developed and brought to Food and Drug Administration (FDA) licensure an antibody to prevent RSV disease in high-risk infants, and they were instrumental in the further development and licensure of the first nasal spray influenza vaccine.

Dr. Chanock and colleagues also discovered the four parainfluenza viruses (important causes of childhood respiratory disease), isolated new strains of rhinovirus and coronavirus (causes of the common cold), and isolated and characterized *Mycoplasma pneumoniae* (a cause of bacterial pneumonia). He and his colleagues helped develop an FDA-approved vaccine against the respiratory pathogen adenovirus and initiated studies on hepatitis viruses and gastroenteritis viruses that led to the development and licensure of vaccines for hepatitis A and rotavirus. Dr. Chanock also began an ambitious program in his laboratory to develop vaccines against dengue fever, which is still ongoing today.

"Dr. Chanock's innumerable contributions to the understanding of viral diseases helped make the world a healthier place for millions of people," said Dr. Anthony S. Fauci. "His work has had a profound impact on many in the scientific community."

## IN MEMORY OF DR. EDWIN D. KILBOURNE

Dr. Edwin D. Kilbourne, a virologist who developed a reliable method to manufacture influenza vaccines, died on February 21, 2011. He was 90 years old. Dr. Kilbourne was a principal advisor to the U.S. government on influenza, and his innovations contributed to the development of the annual influenza vaccine.

In 1960, Dr. Kilbourne discovered that after he mixed different strains of influenza that grew readily in eggs, the strains would recombine and create an effective vaccine that would grow rapidly and be tailored to virus strains expected to circulate during a particular influenza season. Dr. Kilbourne's lab was a leader in this novel technology, which produced one of the first genetically engineered vaccines.

Dr. Kilbourne, who spent most of his career as a medical research scientist in New York, was involved in every aspect of preparing vaccines for the influenza season. He taught his pioneering vaccinology techniques to researchers at the National Institutes of Health and elsewhere. Without his efforts, the United States may not have had an annual influenza vaccine—or its development might have been delayed for years or even decades. His contributions to this field are truly immeasurable.