Susan Blumenthal, M.D.

Public Health Editor at HuffPost and Former U.S. Assistant Surgeon General

Posted: November 17, 2010 10:13 AM

How Science Is *Crucial* To Improving Health Worldwide

Research is medicine's field of dreams from which we harvest new findings about the causes, treatment and prevention of disease. During the 20th century, the triumph of public health and medical interventions as a result of investments in research significantly improved the health and well being of people living in our country. In 1900, the average life expectancy for Americans was just 48 years and the major causes of death then were infectious diseases and, for women, also complications of childbirth. Since then, food and water safety, improved hygiene and sanitation, vaccines, antibiotics, and other medications, better nutrition and improved access to health care extended Americans' average lifespan by more than 30 years. That's a 40 percent increase in lifespan in one century--what a remarkable achievement! This represents a greater increase than occurred in the prior 200,000 years that the human species has existed!

As a result, nations are facing a chronic disease epidemic with rising rates of heart disease, cancer, stroke, diabetes, and neurodegenerative illnesses like Alzheimer's. These chronic illnesses now account for 87 percent of deaths in the United States and nearly 50 percent of mortality and disability in low- and middle-income countries (LMICs). The combined toll taken by chronic diseases with that of infectious illnesses such as HIV/AIDS, malaria, TB and influenza (accounting for one out of four deaths worldwide), represent international enemies that rob citizens of good health , damage economies as a consequence of lost productivity and escalating health care costs, and threaten national security.

This is why science matters. By generating new knowledge and fueling innovation, science provides solutions to national and global health challenges. And that is why I am honored to be included in this year's Rock Stars of Science campaign, a philanthropic initiative supported by the Geoffrey Beene Foundation and GQ magazine. This educational initiative shines a spotlight on science and scientists, underscoring the urgent need for increased investments in research to find cures for the diseases that devastate people's lives, strategies to promote better health, as well as to attract young people to careers in medical and public health research and practice. The campaign does this by pairing doctors with rock stars, highlighting the synergies of both professions, in the December, 2010 issue of GQ magazine and online. You see, rock stars and scientists share passion, creativity, and the thrill of discovery. Where musicians use their minds, instruments and voices to create new rhythms, researchers use science and technology to make the music of medicine: new discoveries that improve health and eradicate disease.

The campaign draws attention to the fact that in order for the United States to continue making significant improvements in the quality of our lives and in longevity as well as to remain competitive in an increasingly technology-driven global economy, our country must strengthen its investments in science and support a new generation of researchers. Research is the foundation for all medical and public health interventions. Over the past 50 years there has been an explosion of new knowledge and revolutionary changes in the practice of medicine driven by science and technology.

In fact, more has been learned about health and disease in the past 50 years than in the entire history of medicine. This transformation over the past half century in knowledge about our health has been driven by two major discoveries: the semi-conductor in 1947 that led to the development of computers, and of DNA in 1953 that led to the emergence of a new field, genetic medicine, which is illuminating the very building blocks of life. In 2003, scientists completed mapping the human genome -- a monumental accomplishment that resulted from an international scientific collaboration begun in 1990.

Learning more about genes is leading us to a better understanding of disease, earlier detection of illness, and to the development of designer drugs targeting specific genetic misspellings so that certain illnesses might not have to develop in the first place. It has also produced a new field of personalized medicine where interventions are targeted to the molecular mechanisms and biological signature of a person's illness. For example, much like antibiotics revolutionized the treatment of infectious diseases, in the war against cancer (a disease that will affect 1 out of 3 people in their lifetimes), a whole new generation of therapies is being designed based on new knowledge about what gives cancer life in the first place. New treatments are being developed to trick cancer cells into self-destructing. Other strategies include targeting the genes that tell cancer cells to divide and turning them off. Still other approaches include medications that choke off the blood supply that cancer cells need to grow (a process called angiogenesis) as well as monoclonal antibodies and vaccines to boost the immune system to fight cancer more effectively as well as to prevent the disease from ever occurring in the first place.

The role of sex and gender differences in these interventions and in the causes, presentation and prevention of disease are being elucidated and is one of the most important frontiers of research in the 21st century. It is a field that I am proud to have helped advance through research initiatives, advocacy, the use of technology, including the establishment of initiatives such as the National Centers of Excellence on Women's Health at academic centers across the United States, the National Women's Health Information Center, and the " From Missiles to Mammograms" initiative that transferred DOD, CIA, and NASA imaging technology used for intelligence and space exploration to improve breast cancer detection.

A Prevention Revolution

Over 2000 years ago, Hippocrates wrote, "prevention is preferable to cure." For centuries, we have spoken about the importance of prevention, yet only 3-5 percent of America's $2.6 trillion health care budget was spent on it in recent years. That is why today, more than ever, a prevention revolution is needed given that 50 percent of the cause of the ten leading killers of Americans, including heart disease, stroke, cancer and diabetes, are linked to lifestyle and behavioral factors. Furthermore, 75 percent of health care costs in the U.S. are associated with preventable factors including smoking, obesity, lack of physical activity, and alcohol abuse.

More research is required on the environmental factors that affect health including what has changed in our homes, workplaces and the atmosphere such as pollution, environmental toxins,and climate change that may be contributing to rising rates of some diseases in our lifetimes. Public health research addresses the key role that behavioral, social and environmental factors play in illness and improves our understanding of the causes, treatment and prevention of disease. Through the identification of risk-enhancing and protective factors, this research develops and evaluates interventions to prevent chronic and infectious diseases as well as injuries, including strategies to improve health over the long-term. Public health research is also a critical component of the science of health care delivery, identifying methods to change health behaviors -- not just of patients, but of doctors, nurses, and the system in which health care services are delivered.

In this regard, a new field of comparative effectiveness research is emerging to inform medical decision -- making by evaluating a broad range of interventions to help produce better outcomes, safety and quality services at a lower cost. This field of study is an important component of determining the most cost-effective medical and public health interventions, serving as an important ingredient for helping to guide practice standards, accelerating health systems redesign and encouraging innovation in health delivery. The development and dissemination of such information will have enormous benefits for increasing the effectiveness and efficiency of clinical practice and our health care system where currently patients receive the right treatment only 55 percent of the time.

Furthermore, we must decrease the 15 year science to service gap that currently exists from the time of a new discovery in the laboratory to its wide dissemination and adoption into community practice. In the Information Age, why shouldn't the science to service gap be reduced to a nanosecond? Science cannot save people unless we apply what we know. That is where information technology has a critical role to play. By building a 21st century health information infrastructure with electronic medical records, clinical decision support tools, remote monitoring of chronic disease, telemedicine, and the use of mobile phones for health research, consumer participation and to aid clinical practice, patients and providers can be connected almost instantaneously to state-of-the-art information and real time expertise to improve their health.

What the World Needs Now Is Research

In an interconnected world where 2 million people cross national borders every day, the transmission of an infectious disease like AIDS or pandemic flu, the spread of obesity and tobacco use, as well as food and water safety, do not respect country boundaries. And that is why increased investments in global health research are essential for humanitarian, economic and national security reasons. In some nations, because of deaths from AIDS and other infectious diseases, people's life-spans are shrinking to what they were in medieval times. One-fifth of children around the world have a shorter life expectancy than their siblings born 15 years ago as a result of HIV/AIDS. Premature death from AIDS, TB, and malaria leads to lost productivity and political instability.

However, over the past 50 years, thanks to investments in global health, we have witnessed more gains in human development than at any time in history. Health care is now reaching the far corners of the world. Smallpox, a disease that had killed millions of people, was eradicated. In the last twenty years, polio infections have decreased 99 percent as a result of global efforts to eradicate this disease. Thanks to advances from global health research, antiretroviral medications to treat HIV/AIDS have been developed that have saved the lives of millions. Soon the results of scientific studies conducted in multiple countries will reveal whether these medications can be taken as a "prevention pill" to stop transmission of the virus before infection. Recent research has also found that a microbicide gel reduced HIV transmission by 40%, providing hope for a prevention technology for women worldwide. And studies are underway to develop new prevention strategies, including vaccines to prevent infection with HIV/AIDS and malaria. The work of PEPFAR, the Global Fund to Fight AIDS, TB and Malaria, and other initiatives are making a lifesaving difference but require increased funding to strengthen their impact. These illness continue to devastate countries as 33 million people are currently infected with HIV, 2 million people die annually from AIDS, 1.7 million from TB, and 1 million from malaria.

Furthermore, the President's Global Health Initiative (GHI) is expanding scientific collaboration with other countries and investing in science and technology to spark a leap forward in development. A critical component of the GHI is investing in the health, education and the rights of women. Currently, a woman dies from childbirth complications every minute globally -- that's 500,000 deaths annually. These lives could be saved with public health interventions that have been developed through investments in research. The initiative underscores that when the health of a woman is improved and she is provided with educational and occupational opportunities, not only will she flourish, but the health and prosperity of families, countries and the world will be enhanced.

But we must do more. Increased investments are needed to foster innovative, collaborative global health research initiatives for health systems strengthening in nations to promote their independence, to increase access to life-saving treatment , to scale up prevention, and to deliver better and more coordinated care as well. Public/private sector partnerships are needed that can respond effectively to global health threats and to promote better health worldwide. Strengthening research, surveillance, monitoring and evaluation are essential to developing effective interventions to advance global health. A critical component of such efforts is training the next generation

of scientists to address global health needs. This will require including an emphasis on global health in medical and scientific university curricula as well as providing funding in order to support the development of interdisciplinary research training. Universities can play an important role by harnessing the talent and interest of young scientists and enabling them to conduct research in international settings.

But scientific breakthroughs and improvements in U.S. and global health don't just happen. They are the result of sustained investments in research at the NIH, CDC, NSF, and other Federal agencies in the United States and in countries around the world as well as in the private sector. Erractic funding for biomedical research has severely crippled the field with below inflation funding at the NIH and other science agencies over the last several years until the $10 billion bolus from the Stimulus Bill. This boost in financial support provided by the American Recovery and Reinvestment Act should be the catalyst for innovative research to come if it marks the beginning of sustained increases in research funding.

That is why we all must be advocates for increased funding to accelerate the pace of progress from scientific discovery, to improve clinical care, and to foster the career development of young scientists.

Science Amnesia
The bottom line: science matters. Our long-term investments in research, in science education, in the career development of researchers and in laboratory infrastructure have produced once-unimaginable discoveries that serve today as significant drivers of America's economic competitiveness, national security and are an engine of societal progress. America's health and economic future lies in science and technology growth and research.

Yet the American public has grown distant from science. Most Americans cannot explain the scientific process -- what it means to form a hypothesis and test it -- and few can name a living scientist. Scientific and medical topics are conspicuously absent in the media: In 2009, science and technology issues represented only 1.6 percent of all news stories in print, online, and on television. For every five hours of cable news, one minute is devoted to science.

Furthermore, we are losing this generation of young Americans to careers other than science, undermining our future innovation and global competitiveness as a nation. America has witnessed a slow, steady erosion in its homegrown scientific talent base. As of 2003, only 12 percent of all college graduates held jobs in the fields of science and engineering. For medicine and public health, training of new professionals must begin at the earliest stage of primary education, and continue through adult life. In the big picture of global competition and societal needs, it is critical for the United States to produce more scientists and engineers in order to sustain its leadership in research. Primary and secondary education systems are currently suffering from a wide variety of challenges: a morass of educational standards; high student-to-teacher ratios; "burnout" of quality teachers; and teacher preparation and compensation disparities. Beyond the secondary level, inadequate preparation in mathematics and science prevents many students from achieving their potential, as do increased costs of science-intensive college and postgraduate education. The nation's research universities are also undergoing financial stress because of recent federal research funding cuts, which typically provide 65% of these institutions' total biomedical research funding.

The independence of young investigators also needs to be emphasized. In 1981, that average age of scientists receiving their first NIH grant was 36; today, the average age is 42. As the age at which individuals get their first grant has increased, an age distribution and demographic shift in funding has occurred that favors more established scientists. This phenomenon may discourage young investigators from entering the field as well as impede their career development.

None of these problems is easy to solve, yet all will need to be addressed if the United States is to maintain its global scientific and medical leadership.

Science Matters
Despite the short shrift that science and health issues receive in funding and in the news, most Americans recognize the importance of research to their lives. In fact, according to a recent Research!America survey, 68 percent of Americans are willing to pay more in taxes to support scientific efforts, and 93 percent believe that it is either "very important" or "somewhat important" for the United States to be a global leader in research to improve health . 3 out of 4 Americans also recognize that science, technology, engineering and math (STEM) education is essential to ensuring that the United States remains economically competitive . To the same end, over three-quarters of Americans agree on the importance of creating incentives to encourage people to become nurses, physicians, public health professionals, dentists, and pharmacists.

And this is where the Rock Stars of Science Campaign established by the Geoffrey Beene Foundation in collaboration with GQ magazine plays an important role. By pairing Rock Stars with Rock Docs, this initiative aims to make science rock as a career choice for American youth-- and for adults to better understand how science--and the policies linked to it--affect their lives and our future . The musicians you'll probably know. As for the other people, they're the doctors and scientists whose work has brought us closer to cures and prevention strategies for global health threats including cancer, HIV/AIDS, mental illness, and Alzheimer's disease as well as increased our understanding about sex and racial/ethnic differences in illness. The campaign acknowledges that the doctors might not set your soul on fire like the rock stars featured in the initiative, but the researchers and physicians are lighting up the future with something just as powerful--hope. When it comes to improving our health, science is the music that is played and researchers and doctors are the musicians who are orchestrating a healthier future for us all. Now it's up to the American people and policymakers to provide a resounding chorus of support to accelerate research progress so that America can become the healthiest nation in a healthier world.

Rear Admiral Susan Blumenthal, M.D., M.P.A. (ret.) is the Huffington Post Public Health Editor. She is also the Director of the Health and Medicine Program at the Center for the Study of the Presidency and Congress in Washington, D.C., a Clinical Professor at Georgetown and Tufts University Schools of Medicine, Chair of the Global Health Program at the Meridian International Center, and Senior Policy and Medical Advisor at amfAR, The Foundation for AIDS Research. Dr. Blumenthal served for more than 20 years in senior health leadership positions in the Federal government in the Administrations of four Presidents, including as Assistant Surgeon General of the United States, the first Deputy Assistant Secretary of Women's Health, as a White House Advisor on Health, and as Chief of the Behavioral Medicine and Basic Prevention Research Branch at the National Institutes of Health. Admiral Blumenthal has received numerous awards including honorary doctorates and has been decorated with the highest medals of the US Public Health Service for her pioneering leadership and significant contributions to advancing health in the United States and worldwide. She is the recipient of the 2009 Health Leader of the Year Award from the Commissioned Officers Association. Admiral Blumenthal was recently named a 2010 Rock Star of Science.

Research assistance for this article was provided by:
Sophie Turrell, a recent graduate of Yale University, is a Research Associate at the Center for the Study of the Presidency and Congress in Washington, D.C.
Brigitte Hurtubise, a recent graduate of the University of Pennsylvania, is a Health Policy Fellow at the Center for the Study of the Presidency and Congress in Washington, D.C.
Julianne Brown, a student at the George Washington University School of Public Health and Health Services, is a Health Policy Fellow at the Center for the Study of the Presidency and Congress in Washington, D.C.

References:

World Health Organization Data and Statistics, United States Mortality. <https://apps.who.int/infobase/Mortality.aspx> accessed Nov. 8, 2010.

Nellie Bristol, "The Killers We Ignore," Global Health Council, Global Health Magazine, Fall 2009. Available at .
American Physical Society, "Recent Activity, FY 2008 Budget Progress," <http://www.aps.org/policy/issues/research-funding/index.cfm> (accessed February 16, 2010).

Elizabeth A. McGlynn, et al., "The Quality of Health Care Delivered in Adults in the United States," The New England Journal of Medicine, 348, no. 26 (2003): 2635-2645. Available at: <http://content.nejm.org/cgi/reprint/ 348/26/ 2635.pdf>

World Health Organization. Poliomyelitis Fact Sheet. .

The Commission on US Federal Leadership in Health and Medicine. A 21st Century Roadmap for Advancing America's Health: The Path from Peril to Progress. Washington, DC: The Center for the Study of Presidency and Congress, 2010.

President Barack Obama. Remarks by the President at the Millennium Development Goals Summit in New York, New York. Speech presented at UN Headquarters, NY, NY, September, 2010. Accessed Nov. 9, 2010. < http://www.whitehouse.gov/the-press-office/2010/09/22/remarks-president-millennium-development-goals-summit-new-york-new-york>
2001 NSF poll, http://www.nsf.gov/statistics/seind04/c7/c7s2.htm accessed Nov. 2, 2010.

Pew Research Center's Project for Excellence in Journalism, 2009. http://features.journalism.org/year-in-the-news/

Nirmala Kannankutty, "2003 College Graduates in the U.S. Workforce: A Profile," National Science Foundation, Division of Science Resources Statistics, (Arlington, VA: NSF 06-304, December 2005). Available at: <http://www.nsf.gov/statistics/infbrief/nsf06304/>.

Roosevelt Y. Johnson, Daryl E. Chubin, and Shirley M. Malcom, "Education and Human Resources in the FY 2010 Budget: Investing in the Future of STEM Education." Research and Development FY 2010, AAAS Report XXXIV: Chapter 4, Intersociety Working Group, American Association for the Advancement of Science (2009). Available at: .

Thomas F. Boat, "Insights From Trends in Biomedical Research Funding," JAMA. 2010;303(2):170-171. Available at: <http://jama.ama-assn.org/cgi/reprint/303/2/170>.; See also E. Ray Dorsey et. al., "Funding of US Biomedical Research, 2003-2008," JAMA, 2010; 303(2):137-143. Available at: <http://jama.ama-assn.org/cgi/reprint/303/2/137>.

Collins, Francis. Scientists Need a Shorter Path to Research Freedom. Published online 6 October 2010 | Nature 467, 635 (2010). < http://www.nature.com/news/2010/101006/full/467635a.html> accessed Nov. 9, 2010.

America Speaks: Poll Data Summary, Volume 10. Alexandria, Virginia: Research!America, Sept. 2009. Accessed Nov. 2, 2010 <http://www.researchamerica.org/uploads/AmericaSpeaksV10.pdf>

America Speaks: Poll Data Summary, Volume 10. Alexandria, Virginia: Research!America, Sept. 2009. Accessed Nov. 2, 2010 <http://www.researchamerica.org/uploads/AmericaSpeaksV10.pdf>

America Speaks: Poll Data Summary, Volume 10. Alexandria, Virginia: Research!America, Sept. 2009. Accessed Nov. 2, 2010 <http://www.researchamerica.org/uploads/AmericaSpeaksV10.pdf>

Mooney, Chris. Science Rocks--If Only it Could Catch America's Attention. Huffington Post, October 27th, 2010. < http://www.huffingtonpost.com/chris-mooney/science-rocksif-only-it-c_b_774540.html>.
<http://rockstarsofscience.org/>