

Testimony

Before the

Subcommittee on Labor, Health and Human Services, Education, and Related Agencies

Committee on Appropriations

United States Senate

Fiscal Year 2016 Budget Request

**Statement of
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Mr. Chairman and Members of the Committee:

I am pleased to present the President's fiscal year (FY) 2016 budget request for the National Cancer Institute (NCI) of the National Institutes of Health (NIH). The FY 2016 budget request for NCI is \$5,098,479,000, which is \$148,083,000 more than the FY 2015 enacted amount of \$4,950,396,000.

NCI FY 2016 Overview

Precision Medicine is a promising, marquee initiative for NCI for FY 2016. With the additional resources in the FY 2016 budget, NCI can broadly advance and successfully integrate the many disciplines – including genomics, informatics, pharmacology, and cancer biology – required to launch a new era of Precision Medicine, with a long-term goal of improving outcomes for patients with all types of cancer.

However, the FY 2016 NCI budget supports a wide range of research priorities in other areas as well. The NCI research portfolio encompasses three broad areas:

- basic research, including genetics, cell biology, immunology, cancer pathogenesis, and other fields
- translational and clinical sciences to prevent, screen, and diagnose cancer, and to develop and test drugs, biomarkers, imaging technologies, diagnostics, and radiotherapies
- population sciences, including epidemiological, environmental, and behavioral studies

While many of these disciplines will experience profound changes based on the new understanding of cancer that is driving Precision Medicine, others will continue to depend on more traditional approaches to research. Thanks to the support of this Subcommittee, your funding for these traditional approaches has yielded important results during the past decade and has helped to decrease cancer mortality rates, to improve our ability to manage the symptoms of cancer, and to monitor the prevalence of cancers and the factors that confer the risks of cancers.

Continued research funding across all these disciplines is essential to achieve further progress into understanding the causes and mechanisms of cancer, preventing cancer, and strengthening cancer screening. Likewise, funding all these disciplines is essential to produce tangible clinical benefits for the many Americans suffering from cancer, those at risk of cancer, and the growing population of cancer survivors.

The NCI research portfolio is very broad with many important priorities, and I would like to highlight a few of these areas – prevention, screening, basic science, and environmental factors – in addition to the Precision Medicine Initiative.

Prevention and Screening: Preventing cancer and screening for cancer have long been central priorities within NCI's mission. Prevention takes many forms, such as controlling tobacco use, vaccinating against cancer-causing viruses such as human hepatitis B virus and human papillomaviruses, limiting exposure to sunlight, and regulating exposure to carcinogenic substances such as asbestos. These priorities have contributed to reducing the incidence and the mortality rates of many cancers. Population-wide screening for certain cancers can have a substantial impact on mortality, and NCI continues to support research to advance this important area.

The experience with lung cancer – the most common cause of death due to cancer in the United States – serves as a good example of progress in prevention and the benefits of cancer screening. Between 2001 and 2010, there was a 25 percent decrease in male death rates and an eight percent decrease in female death rates due to lung cancer. Most of these reductions are related to decreased tobacco consumption in the United States. In the area of screening, the National Lung Screening Trial (NLST), which studied more than 50,000 patients who were current heavy smokers or former heavy smokers, found that helical computed tomography (CT) screening could reduce lung cancer mortality for these patients. NLST results have led the U.S. Prevention Services Task Force and the Centers for Medicare and Medicaid Services to endorse helical CT screening for patients with smoking histories similar to those who participated in NLST.

We know there are other promising opportunities in the areas of screening and prevention, as the 2014 report of the President's Cancer Panel points out. In particular, the 2014 report emphasized that increased use of HPV vaccines could dramatically reduce the incidence and mortality of several types of cancer, including cervical, anal, and oropharyngeal cancers. NCI continues to

invest heavily in cancer screening and prevention because substantial additional progress is possible. For example, NCI-supported research has identified the ability of HPV-based screening to reduce the risk of developing cervical cancer to a greater degree than traditional Pap smear screening.

However, despite progress in these and other areas, too many Americans face a cancer diagnosis, and far too many are dying from the disease. It is estimated that more than 600,000 people in the United States will die from cancer in 2015 and that there will be more than 1.6 million new cases. In addition, our progress in preventing, diagnosing, and treating cancers is not universal for all forms of the disease. Although mortality rates for many cancers have decreased, mortality rates for certain cancers have actually increased. For example, death rates from liver cancer increased by about 20 percent between 2001 and 2010. Thus, much work remains.

Basic Research: In the area of basic research, NCI hopes to discover clues that will lead to new approaches to preventing, screening, diagnosing, and treating cancer. We know that cancers are disorders of cell growth, cell survival, and other cell behaviors, fueled largely by changes in genes. Therefore, NCI continues to make substantial investments in many fundamental aspects of cell biology and genetics, recognizing that basic biological science is essential to understand cancers.

For example, we have known for several decades that much of a cell's RNA contains the messengers that instruct the cell to make its proteins. Through more recent research, we have discovered that cells contain other forms of RNA that are not translated to make proteins. Instead, they directly regulate the expression of many genes that do encode proteins. Many of these regulatory "non-coding" RNAs can influence the behavior of cancer cells. We are intensely studying the roles that these and other regulators may have and their relationship to cancer. Such research may yield a more profound understanding of how a normal cell becomes a cancer cell, as well as new ways to classify and treat cancers.

Understanding the Role of Environmental and Microenvironmental Factors: A wealth of research supported by NCI and others has determined that cancer develops through a complex interplay of genetic and environmental factors. In some cases, the risk of developing cancer is strongly influenced by inheriting a mutation in a single gene, such as BRCA1 or BRCA2. Mutations in these genes confer a high risk of breast and ovarian cancer. More commonly, however, the genetic background of individuals plays a more subtle role in cancer risk. Although genes can make important contributions to cancer susceptibility, the sum of an individual's exposure to various environmental and lifestyle factors likely accounts for most cancers. Environmental factors such as tobacco use, certain infections, and exposure to ultraviolet light can contribute to cancer risk, as can lifestyle factors, such as obesity, lack of exercise, and an unhealthy diet. Once we identify and understand these risks and exposures, we can often develop effective prevention strategies.

Our understanding of the importance of the tumor microenvironment, which is composed of the noncancerous cells and materials that surround cancer cells in a tumor mass, is also rapidly increasing. For example, we now recognize the importance of immune cells, blood vessels that support tumor growth, and other factors, such as hormonal mediators of cell growth and extracellular matrix proteins that influence tumor cell migration and tumor architecture. Further

research on the components of the microenvironment and their interactions with the tumor will improve our understanding of the interplay between tumors and their hosts. These interactions are likely to be complex but profound, and may hold clues to future prevention, screening, and treatment.

NCI's Precision Medicine Initiative

This is a transformational moment for cancer patients and for cancer research. Thanks to the investments by the Congress in NCI and NIH research, we now recognize that cancers are fundamentally diseases of the genome and that understanding cancer begins by identifying the abnormal genes and proteins that confer the risk of developing cancer, the mechanisms that drive these changes, and the underlying causes of cancer.

After decades of research, we are poised to enter a new era of medical practice where detailed genetic and other molecular information about a patient's cancer is routinely used to deploy effective, patient-specific remedies to treat it. We are entering the era of Precision Medicine.

The increased FY 2016 resources that we request for the Precision Medicine Initiative will allow NCI to make strategically important research advances. Under the Initiative, NCI will assemble and analyze additional genomic data sets to increase our understanding of cancer genomes and their relationship to gene variants that a patient may have inherited. Based on the genomic information we uncover, NCI will test new therapies against childhood cancers and several common adult cancers. NCI will also develop better animal and cell-based models of cancer, study mechanisms of drug resistance, and identify new therapies and therapeutic combinations to overcome drug resistance. NCI will build on what it has already learned in ways that will accelerate the pace of discovery and will deliver important benefits to patients through clinical practice.

The FY 2016 initiative rests on a solid foundation of programs that support and advance Precision Medicine. This foundation includes NCI research related to the causes of cancer, genomics and cancer biology, and molecular pathology, immunology and immunotherapy research, cancer imaging research, and translational and therapeutic studies. NCI will continue this ongoing work as it also supports new and expanded Precision Medicine research with the additional funds proposed in the FY 2016 budget.

Under the Precision Medicine Initiative, NCI will increase funding to four broad areas: 1) clinical trials; 2) drug resistance; 3) preclinical models; and 4) a knowledge system to support Precision Medicine. NCI will conduct the priority activities of the initiative through competitive grants, cooperative clinical research, and research and development contracts. The results of Precision Medicine will apply to all facets of oncology: in diagnostics and therapeutics, in cancer prevention and screening, in how we monitor tumors using molecular analysis and imaging, and how we assess the causes of cancer.

Conclusion

The FY 2016 NCI budget supports core, ongoing biomedical research that will advance scientific discovery and continue to reduce the burden of cancer in America. It will also foster a promising new era of Precision Medicine, in which the medical community routinely uses detailed

molecular information to identify the most effective patient- and tumor-specific approaches to treating cancer. With these resources, NCI can alter the landscape for the practice of cancer medicine, foster standards for molecular medicine in other domains, stimulate development of important new therapies within our Nation's biomedical industries, and enlarge U.S. prestige for its public health leadership and for improving outcomes for cancer patients across the globe.

Douglas R. Lowy, M.D., Acting Director, National Cancer Institute

Dr. Lowy is the Acting Director of the National Cancer Institute (NCI), National Institutes of Health (NIH), and Chief of the Laboratory of Cellular Oncology. He was Deputy Director of NCI from 2010 to 2015. After receiving his medical degree from New York University School of Medicine, Dr. Lowy trained in internal medicine at Stanford University and dermatology at Yale University. He has directed a research laboratory at NCI since 1975, after receiving training as a Research Associate in the National Institute of Allergy and Infectious Diseases. Dr. Lowy is a member of the National Academy of Sciences (NAS) and of the Institute of Medicine of the NAS. For his joint research with John Schiller on technology that enabled the preventive HPV vaccines, he and Dr. Schiller have jointly received numerous honors, including the 2007 Federal Employee of the Year Service to America Medal from the Partnership for Public Service, the 2011 Albert B. Sabin Gold Medal Award, and the 2012 National Medal of Technology & Innovation (awarded in 2014). Dr. Lowy has also received the National Medal of Honor for Basic Research from the American Cancer Society.