Study: US tobacco-control efforts prevented nearly 800,000 cancer deaths between 1975 and 2000

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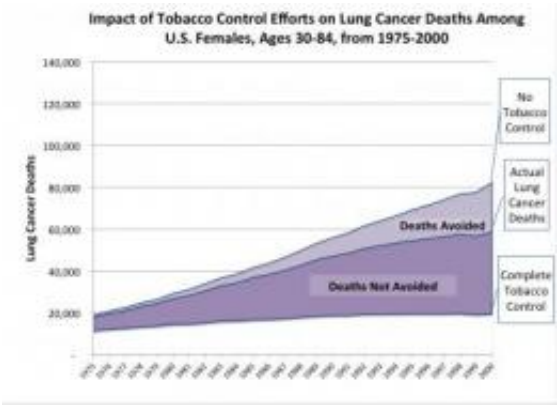


This line chart plots lung cancer death rates from 1975-2000, under the three scenarios discussed in a paper by researchers supported by the National Cancer Institute. This chart provides data for US Women. Credit: National Cancer Institute

Twentieth-century tobacco control programs and policies were responsible for preventing more than 795,000 lung cancer deaths in the United States from 1975 through 2000, according to an analysis funded by the National Cancer Institute (NCI), part of the National Institutes of Health.

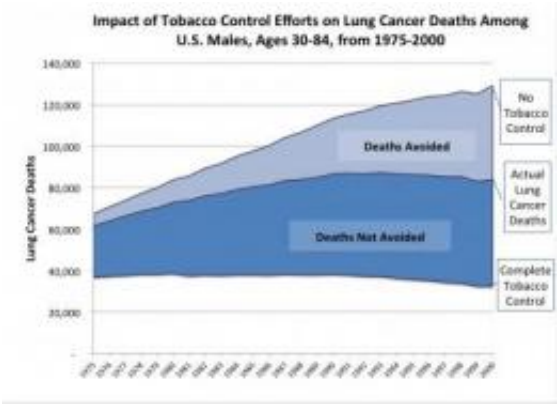
If all cigarette smoking in this country had ceased following the release of the first Surgeon General's report on smoking and health in 1964, a

total of 2.5 million people would have been spared from death due to lung cancer in the 36 years following that report, according to the analysis. The results of this study were published online March 14, 2012, in the *Journal of the National Cancer Institute*.

"These findings provide a compelling illustration of the devastating impact of tobacco use in our nation and the enormous benefits of reducing rates of smoking," said Robert Croyle, Ph.D., director of the Division of Cancer Control and Population Sciences at NCI. "Although great strides have been made, we cannot relax our efforts. The prevention and cessation of tobacco use continue to be vital priorities for the medical, scientific, and public health communities."

The researchers, part of the NCI-sponsored Cancer Intervention and Surveillance Modeling Network (CISNET), utilized a comparative modeling approach in which they constructed detailed cigarette smoking histories for individuals born from 1890 through 1970, and then related the histories to lung cancer mortality in mathematical models. Using these models, the researchers were able to estimate the impact of changes in smoking patterns resulting from tobacco control activities on lung cancer deaths during the period from 1975 through 2000. Since the 1964 report, tobacco control efforts in the United States have included restrictions on smoking in public places, increases in cigarette excise taxes, limits on underage access to cigarettes, and efforts to increase public awareness of the hazards of smoking.

"This is the first attempt to quantify the impact of changes in smoking behaviors on lung cancer mortality based on detailed reconstruction of cigarette smoking histories," said lead author Suresh Moolgavkar, M.D., Ph.D., of the Fred Hutchinson Cancer Research Center in Seattle. "The methods that were developed as a part of this research should prove to be invaluable to other researchers investigating the adverse health impacts of cigarette smoking."



This line chart plots lung cancer death rates from 1975-2000, under the three scenarios discussed in a paper by researchers supported by the National Cancer Institute. This chart provides data for US Men. Credit: National Cancer Institute

In the study, the researchers created three scenarios. In the first, called actual tobacco control, they used data on actual smoking behaviors of men and women in the United States. The second, called no tobacco control, predicted smoking behaviors that would have existed if no tobacco control policies were put in place. In the third, called complete tobacco control, the researchers examined the possible outcome if all smoking in the United States had ceased as of 1965, the first full year after the 1964 Surgeon General's Report on Smoking and Health was released.

The difference between lung cancer deaths in the no tobacco control scenario and the numbers of actual lung cancer deaths provided an estimate of the numbers of lung cancer deaths averted as a result of tobacco control activities. This difference is graphically represented in two charts accompanying this release, based on data from Yale University, which created one of the models used in this analysis. The researchers estimated that, without tobacco control programs and

policies, an additional 552,000 men and 243,000 women would have died of lung cancer in the period from 1975 through 2000.

Similarly, the difference between the no tobacco control scenario and the complete tobacco control scenario provides an estimate of the lung cancer deaths that could have been avoided if everyone who smoked quit in 1965 and no one started smoking. If tobacco control efforts had been completely successful, an additional 1.7 million lung cancer deaths would have been averted from 1975 through 2000. In total, if all smoking had ceased completely in 1965, as many as 2.5 million fewer people would have died from lung cancer (1.6 million men and 883,000 women).

"An overwhelming majority of lung cancer deaths can be prevented by eliminating cigarette smoking," said study author Eric Feuer, Ph.D., chief of NCI's Statistical Methodology and Applications Branch. "The progress that has been made by tobacco control programs and policies in reducing lung cancer deaths represents about a third of the progress that could have been made if all cigarette smoking had ceased in 1965. This finding indicates that, while great strides have been made in tobacco control – averting hundreds of thousands of lung cancer deaths in the United States – continued and enhanced efforts have the potential to avert even more deaths."

The researchers estimations only run through the year 2000 because, for more recent years, sufficiently detailed data were unavailable when the project began. However, it can be inferred that additional lung cancer deaths have been averted since the year 2000, because according to previous research, smoking rates among U.S. adults have continued to fall, dropping from 23.2 percent in 2000 to 20.6 percent in 2008, and leveling off in recent years. Previous research indicates that much of the decrease in smoking rates can be attributed to tobacco control policies. In addition, although beyond the scope of the journal article, rates of

other smoking related cancers, and smoking-related diseases, such as cardiovascular and respiratory diseases, have declined due to tobacco control programs and policies.

In 2011, researchers conducting the National Lung Screening Trial (NLST) found that screening heavy smokers with low-dose spiral CT reduced lung cancer mortality by 20 percent, compared to standard chest X-ray. Even with the potential mortality benefits associated with screening, continued implementation of evidence-based tobacco control policies, programs, and services remains a critical approach to reducing the burden of lung cancer, according to the authors.

CISNET is a consortium of NCI-sponsored investigators who use statistical modeling to improve our understanding of cancer control interventions in prevention, screening, and treatment. This modeling approach, which has been validated in several previous studies, can be used to guide public health research and priorities. The network is working on a project to study the efficacy of lung cancer screening for smokers in different age and exposure level groups, based on the results of benefit for spiral CT screening found in the NLST for heavy smokers.

The results discussed in the paper are based on six different models, developed by members of the CISNET network. The centers that created these models include Erasmus Medical Center, The Netherlands; Fred Hutchinson Cancer Research Center, Seattle; Pacific Institute for Research and Evaluation, Calverton, Md.; Rice University-M.D. Anderson Cancer Center, Houston; Massachusetts General Hospital-Harvard Medical School, Boston; and Yale University, New Haven, Conn. More details about the construction of models will be published in a forthcoming special issue of *Risk Analysis – An International Journal*.

More information: Moolgavkar SH, Holford TR, Levy DT, Kong CY, Foy M, Clarke L, Jeon J, Hazelton W, Meza R, Schultz F, McCarthy W,

Boer R, Gorlova O, Gazelle GS, Kimmel M, McMahon PM, de Koning HJ, Feuer EJ. Impact of the Reduction in Tobacco Smoking on Lung Cancer Mortality in the U.S. over the Period 1975-2000. *JNCI*. Mar. 14, 2012.