



# The other Surgeon General's report: history of the U.S. public health response to air pollution, cigarette smoking, and lung cancer

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**Abstract:** The 1964 report of the U.S. Surgeon General on Smoking and Health is widely recognized as one of the most important documents for public health in the second half of the 20th century. However, less widely appreciated is that there was another Surgeon General's report, released 2 years before the report on smoking and health, focused on air pollution. Both air pollution and cigarette smoking, and their relationship with lung cancer, were receiving widespread media attention throughout the 1950s and 1960s. Both issues also generated public debate and political controversy, as well as influence from industry stakeholders. However, the Surgeon General and the Public Health Service had little authority to take action on either problem. The prevailing political view at the time was that health issues were primarily a matter for State and local governments, not for federal intervention. But as the evidence mounted and public alarm grew, these reports served as an impetus for new legislation and federal action to address both cigarette smoking and air pollution. The 1962 Surgeon General's report on air pollution played a critical role in the development of legislation to establish the first U.S. national air pollution control program in the 1960s. While this paper focuses on the U.S. experience, similar discussions and development of regulations were occurring in other countries at the time as well, such as in the UK, and the debate sheds light on the challenges of translating science into public health action.

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Both cigarette smoking and ambient air pollution are established causes of lung cancer. However, because cigarette smoking accounts for a majority of the global lung cancer burden, the role of ambient air pollution has historically been somewhat neglected. Yet ambient air pollution has received renewed attention recently in the news media and in discussions of the global burden of non-communicable diseases (1). In fact, news reports on air pollution now frequently place the risk in relation to cigarette smoking (2).

Today's policy and regulatory mechanisms for controlling both cigarette smoking and air pollution began in the

1960s. At the time, scientific evidence and public concern were on the increase. And scientists and policy makers faced similar questions, in the context of both cigarette smoking and air pollution, regarding the interpretation of novel epidemiologic evidence for environmental causes of chronic disease and how such evidence should be translated into action.

The 1964 report of the U.S. Surgeon General on Smoking and Health (3). is widely recognized as one of the most important documents for public health in the second half of the 20<sup>th</sup> century. The report received enormous publicity when it was released. *Newsweek* lauded it as

“monumental” and subsequently the report has been named by the New York Public Library as one of the top 100 books of the 20<sup>th</sup> century (4). Surgeon General Luther Terry, who released the report, made the Surgeon General into a public figure, no longer an anonymous government official. And the report is still frequently referred to today as marking the point where a definitive conclusion was made for smoking as a cause of lung cancer.

However, less widely appreciated is that there was another Surgeon General’s report, released 2 years before the report on smoking and health, focused on air pollution (5). The air pollution report has not had the same historical longevity, but it did play a critical role in the development of legislation to establish the first national air pollution control program in the 1960s. Both air pollution and cigarette smoking, and their relationship with lung cancer, were receiving widespread media attention throughout the 1950s and 1960s. However, the Surgeon General and the Public Health Service (PHS) had little authority to take action on either problem. Additionally, the prevailing view at the time was that health issues were primarily a matter for State and local governments, not for federal intervention (6). But as the evidence mounted and public alarm grew, these reports served as an impetus for new legislation and federal action to address both cigarette smoking and air pollution.

It was not until after the release of the two Surgeon General reports that the focus finally shifted to taking action to reduce harmful exposures. The paper reviews published literature, official reports, and tobacco industry documents released through litigation to analyze how scientists and health officials responded to the emerging evidence on cigarette smoking and air pollution in the U.S. in the 1950s and 1960s and, in particular, the role that two reports of the Surgeon General had. While this paper focuses on the U.S. experience, similar discussions and development of regulations were occurring in other countries at the time as well, such as in the UK (7).

### **Federal response on air pollution in the 1950s**

There was very little attention in the U.S. to air pollution as a serious public health threat until the smog episode at Donora, Pennsylvania in 1948, where at least 20 people died and thousands suffered adverse respiratory effects. U.S. Steel’s zinc works and steel and wire plant were regular sources of pollutants in Donora, a situation that was exacerbated by a temperature inversion in late October that trapped the smog over Donora for several days (8).

Epidemiologist Clarence Mills reported that the death toll could have been much higher if the fog had persisted (9). Additionally, Los Angeles experienced numerous smog episodes during the late 1940s, which led to the creation of the first air pollution control program (10). New York and other cities were soon to face similar challenges.

In response, representatives in congress from California and other affected areas began pushing for a federal response to the air pollution problem. In December 1949 President Truman established an Interdepartmental Committee on Air Pollution, coordinated by the Secretary of the Interior, to study the problem. The Committee organized the First U.S. Technical Conference on Air Pollution in May 1950 in Washington, DC. In a message to the conference, President Harry S. Truman noted that pollution control was primarily a local matter, but that the federal government should lead research into the problem (11). The conference produced an 850 report of proceedings covering a wide range of aspects of the air pollution problem (12). However, at this point there was limited data on the health burden of air pollution exposure or technical knowledge about how to effectively regulate or control harmful pollutants.

It was not until 5 years later that there was significant federal action on the problem. In his January 1955, President Dwight D. Eisenhower called on congress to increase appropriations to the PHS for studies on air pollution and methods of control (13). The Air Pollution Control Act (1955 P.L. 159), the first national legislation on air pollution, was passed by congress and signed into law later that year. The law authorized the Surgeon General of the PHS to conduct investigations, publish reports, and provide technical assistance to State and local government agencies and also provided for \$5 million in funding each year for 5 years to support research grants and contracts. The law also resulted in the creation of an air pollution office within the PHS to provide coordination and oversee research grants and projects (14).

On November 18–20, 1958, the PHS held its first National Conference on Air Pollution in Washington, DC. The conference included high-level participation from government, academia, and industry to discuss scientific findings and strategies to control air pollution (15). Presentations at the conference summarized a growing body of evidence linking urban air pollution exposure to cancer and other health effects. A nationwide air sampling study set in motion by the 1955 Air Pollution Act was now providing valuable data. Epidemiologist and occupational health expert Thomas Mancuso of the Ohio State Department of

Health argued that air pollution was a likely contributor to urban lung cancer, emphasizing that urban areas were associated with higher lung cancer incidence even after accounting for cigarette smoking (16). Surgeon General Leroy E. Burney offered a stern warning that the nation would “invite disaster” if it failed to act against air pollution. He urged that the evidence was already sufficient to support remedial action and that control measures should not wait until the case is proved beyond any doubt (17). The conference generated headlines in the national news— “US links cancer to air in cities”, “Dirty air linked to cancer – aid seeks health drive”, “smog is termed a cancer cause”.

A 1959 PHS pamphlet titled “The Air We Live In: The Health Effects of Air Pollution” was published to provide general information to the public on the issue. The text noted the rise in lung cancer and the evidence on cigarette smoking, but noted “*less widely publicized is the fact that mortality rates for lung cancer among urban dwellers are significantly higher than among strictly comparable rural groups, smoking habits notwithstanding.*” While the text stopped short of making any definitive causal conclusion, it did state that “*this admittedly fragmentary evidence points unmistakably to a relationship between air pollution and lung cancer which demands further exploration and study.*” (18).

### **Cigarette smoking and the tobacco industry response**

Meanwhile, the evidence for cigarette smoking as a major cause of lung cancer was growing steadily throughout the 1950s and received substantial media attention. By 1955 some public health scientists were claiming that the evidence, mostly from epidemiologic case control studies, was sufficient to claim a causal relationship between smoking and lung cancer and warranted warnings to the public (19,20). However, in January 1955, Surgeon General Leonard Scheele was quoted as stating that the evidence implicating cigarette smoking was insufficient, as other factors, such as air pollution, may be involved, and the PHS would take no special action at that time (21).

In 1957 a Study Group on Smoking and Health put out a consensus statement on the issue. The group included members of the American Cancer Society (ACS), the American Heart Association, the National Cancer Institute (NCI), and the National Heart Institute. The group’s conclusion was strongly worded: “*The sum total of scientific evidence establishes beyond a reasonable doubt that cigarette smoking is a causative factor in the rapidly increasing incidence of*

*human epidermoid carcinoma of the lung.*” While they stated that more research would be beneficial, they agreed that the evidence was already “*adequate for considering the initiation of public health measures*” by official and voluntary agencies. In their review of the evidence, they addressed potential alternative explanations for the rise in lung cancer, including air pollution (22).

Following the Study Group report, Surgeon General Leroy Burney released a statement on July 12, 1957, that “*the Public Health Service feels the weight of the evidence is increasingly pointing in one direction: that excessive cigarette smoking is one of the causative factors in lung cancer.*” By this time, new evidence was available from laboratory studies and long-term cohort studies (23). At the same time, Burney acknowledged that cigarette smoking was likely not the only causal factor and that more research was needed into air pollution and other probable causes (24). The statement made the front page of the *New York Times*, which described it as a shift in PHS policy from a recognition of a statistical association to a suggestion of causation (25). However, Burney avoided making any recommendations for action to reduce smoking. A few weeks later Burney appeared on the Reporters Roundup radio show in Washington, DC to discuss the findings. As he reiterated the conclusion that smoking is one of the causative factors of lung cancer, the interviewer asked: “*Do you think people should quit smoking?*” Burney, who smoked a pipe, replied “*No, sir, I do not believe they should quit smoking.*” (26).

As the evidence continued to mount, Burney produced a second statement in 1959, now declaring smoking to be “*the principle [sic] etiological factor in the increasing incidence of lung cancer.*” Moreover, the paper concluded that “*the individual person’s risk of lung cancer can best be reduced by the elimination of smoking.*” (27).

Meanwhile, the tobacco industry sought to counter the evidence implicating cigarettes. In newspaper articles and congressional hearings, Clarence Cook Little, scientific director of the Tobacco Industry Research Committee (TIRC), was often afforded the opportunity to provide a response to statements on the dangers of smoking. Little frequently highlighted the possible role of environmental causes of lung cancer, including air pollution as an alternative explanation for rising lung cancer rates (28). By 1958, tobacco industry public relations representatives were actively tracking press coverage of air pollution and cancer (29). TIRC Chairman Timothy Hartnett noted encouragingly that an increasing number of factors were being associated with lung cancer incidence, including air

pollution. In support, he cited Burney's recent statement to the National Conference on Air Pollution that there was definitive evidence for air pollution as a cause of lung cancer (30).

When Burney's 1959 statement was released, the tobacco industry mounted a vigorous challenge. Carl T. Hicks, President of the Tobacco Growers Information Committee, Inc., was quoted in the news: "*The surgeon general admits that air pollution as well as many other factors are also suspected causes of lung cancer. However, he has the affrontery to concentrate his fire on smoking.*" Burney's statement came out shortly after the so-called "Thanksgiving Cranberry Scare", when the Secretary of Health, Education and Welfare set off a nationwide panic after a batch of cranberries from the Pacific Northwest had tested positive for a carcinogenic herbicide. Congressmen from tobacco growing states seized on this episode to challenge PHS statements to the public as alarmist (31). The news media gave equal time to both sides of the cigarette debate, sometimes reproducing verbatim industry talking points challenging the science on smoking and lung cancer. The headlines following Burney's statement summarized: "*New smoking-cancer furor; U.S. Surgeon, industry disagree*", "*Surgeon General links smoking to cancer, industry is skeptical; Dr. Burney's charge in rise of disease is called old and unsupported.*" (32). The industry's efforts succeeded in sowing doubt in among the public.

### The science of air pollution and lung cancer

Apart from the question of whether cigarette smoking could be called a "cause" of lung cancer, scientists were also divided during the 1950s over the relative importance of cigarette smoking versus air pollution for the lung cancer burden. Some scientists raised concern that the focus on cigarettes and cancer threatened to close off other avenues of research prematurely and obscure the potentially important impact of environmental causes of lung cancer.

Pathologist Paul Kotin, assistant professor at the School of Medicine at the University of Southern California (USC), was conducting studies on mice in the early 1950s with a grant from the PHS. He had taken atmospheric samples collected by the Los Angeles County Air Pollution Control District and then painted the backs of C57 black mice with the extracts, a procedure that was used to test the carcinogenicity of chemical agents, including cigarette smoke condensate. Kotin felt the case against air pollution as a cause of lung cancer was much stronger than that for cigarette smoking. At the Rocky Mountain Cancer

Conference in 1954 he stated that his studies suggested that air pollution may be up to 20,000 times more potent as a carcinogen than cigarette smoke (33). In 1955 he told the American College of Chest Physicians that known factors were not sufficient to account for rising lung cancer incidence, noting "*I seriously question whether cigarettes, per se, would be capable of producing cancer of the lungs.*" (34). He later suggested that cigarette smoking might have a role as an irritant, increasing susceptibility to carcinogens from other sources, such as pollution (35).

Wilhelm C. Hueper, chief of the Environmental Cancer Section at the NCI from 1948 until his retirement in 1964, focused much of his career on environmental and occupation causes of cancer. He remained skeptical about the importance of cigarette smoking as a cause of lung cancer, at least in part because he saw it as a distraction from industrial causes of cancer (6). In fact, Hueper wrote an entire monograph explaining why industrial exposures provided a better explanation of rising lung cancer than patterns of cigarette smoking. For example, he cited the increased lung cancer mortality in urban areas exposure to higher pollution and explained that higher lung cancer mortality in men could be explained by occupational factors (rather than the fact that men were more likely to smoke) (36). As with Kotin, Hueper was frequently quoted in the news media commenting that cigarette smoking could not explain the majority of lung cancer mortality (37).

The ACS took an agnostic stance on discussions about the causes of lung cancer at the time. At a November 1957 lung cancer research conference hosted by ACS in Virginia Beach, David A. Wood, ACS President, urged the participants to avoid "like the plague" discussions about "proof" on the role of cigarette smoking in lung cancer. He stated: "*We all have strong if not intense opinions on this matter, but I submit that in the absence of absolute or acceptable proof, we will gain nothing by airing our personal beliefs on this particular subject.*" However, in other areas, such as around air pollution, "*speculation should be uninhibited.*" (38). The ACS also supported a science writers' tour of cancer research centers. Kotin's laboratory at USC was among the sites the journalists visited, highlighting the importance of pollution, rather than cigarettes, in lung cancer. "*Lung cancer lurks in the polluted air you breathe, not in the cigarette smoke you inhale,*" read the tag line of one article (39). Another article advised readers not to worry about cigarette smoking, but rather to "*stop breathing-or at least stop breathing the polluted air of large industrial cities.*" (40).

During the 1950s and early 1960s PHS leaders

continued to express uncertainty about the relative importance of cigarette smoking versus air pollution in explaining lung cancer trends. For example, when a group of public health voluntary organizations petitioned the new administration of President John F. Kennedy to take action on tobacco, leaders at the National Institutes of Health and the Department of Health, Education and Welfare cautioned that there was disagreement over how much of the lung cancer burden was due to smoking. They recommended against any action other than continuing to study the problem (6). And statements from PHS leaders continued to highlight a substantial role for air pollution in lung cancer. Robert J. Anderson, Assistant Surgeon General, wrote in a 1962 article that deaths from lung cancer in metropolitan areas were twice as high than the national average and that cigarette smoking alone could not explain these differences (41).

## Two reports of the Surgeon General

Starting in 1961 it fell to new Kennedy Administration to address both cigarette smoking and air pollution. Surgeon General Burney was replaced by Luther Terry in March 1961. Initially there was little indication the new administration would take further action on either issue. However, the Surgeon General was mandated by congress to produce a report on air pollution. Thus, in June 1962, almost 2 years before the January 1964 report on smoking and health, the Surgeon General transmitted a 450-page report on motor vehicles, air pollution, and health to congress.

The conclusions of the air pollution report were modest on the connection to lung cancer. The report described statistical studies comparing lung cancer mortality across different cities and urban versus rural conditions, noting that the patterns recorded could not be entirely explained by differences in smoking prevalence. However, more direct evidence of the impact of pollution on cancer was sought as well through animal models. In particular, the report noted that while previous studies inducing cancer in animals had required implantation of specific carcinogens, in the case of air pollution a successful animal model had recently been developed. In the new model, developed by Kotin, animals, who had previously been exposed to influenza, were exposed over time to inhalation of ionized gasoline and subsequently developed squamous cancer of the lung similar to that found in humans. *“It would appear, therefore, that there is evidence that air pollutants, related to vehicular emissions, play a role, at*

*least as a co-factor, in the production of lung cancers under these conditions,”* the report concluded (42).

At same time, plans for a committee on smoking and health were just beginning. On June 7, 1962, Surgeon General Luther Terry issued a statement that he would appoint an advisory committee to study and evaluate the evidence on smoking and health and make recommendations (43). The same day, the Tobacco Institute release a response, noting that the industry welcomed a “factual” review of the evidence involving “all possible factors”. And Timothy V. Hartnett, Chairman of the TIRC, warned that *“studies or conclusions that consider only one factor—such as smoking—tend to oversimplify complex health problems and mislead the public.”* In particular, he noted that the PHS had recently released a report describing evidence of air pollution as a cause of lung cancer (44).

On July 25, 1962, the Surgeon General met with representatives from federal agencies, professional and voluntary health organizations, and the tobacco industry to discuss the planned advisory committee. A statement released by the PHS noted that Surgeon General Terry had explained that the study would be concerned not only with tobacco, but *“all other factors which may be involved”* including air pollution and automobile exhaust. The effort was to have two distinct phases: (I) assess the nature and magnitude of the health hazard, and (II) provide recommendations for action. The initial committee would deal only with the first piece (45). Minutes of the first meeting of the Advisory Committee suggest that consideration would be given to “modifying factors” such as air pollution (46). And an HEW press release about the meeting suggested that the inquiry would indeed include possible contributing factors such as air pollution (47).

The tobacco industry closely monitored the progress of the committee as well as evolving discussions on air pollution. However, the tobacco industry was cautious in directly addressing the evidence on air pollution and lung cancer. While industry statements often cited the evidence for other environmental factors as possible causes of lung cancer, they deliberately avoided making any definitive statements about the evidence. Within the R.J. Reynolds Tobacco Company, Alan Rodgman, a senior research executive, wrote a detailed 26-page summary of the 1962 Surgeon General report on air pollution and health, to H. H. Ramm, Vice President and General Counsel. He cautioned that *“great care should be taken in stressing these data with respect to air pollutants”* as the data were parallel to those put forward to link cigarettes to lung cancer. Thus, any criticism

leveled at the evidence on smoking and lung cancer “*is equally applicable to the lung cancer-air pollution theory.*” (48).

In the end, the 1964 Smoking and Health report had very little to say on the role of air pollution. In the introduction to the report, the committee outlined their process. They acknowledged that at their first meeting, in November 1962, the group had envisioned taking an “*encyclopedic approach*” including “*all relevant aspects of air pollution*”. However, they found this approach to be impractical within a reasonable time frame and, thus, focused their inquiry on the core questions around tobacco smoking. In the chapter on lung cancer, the report briefly discusses occupational exposure and urban air pollution as contributing causes, suggesting that the majority of the lung cancer burden can be accounted for by cigarette smoking. The only conclusion offered here is that “*the intensity of urbanization or industrialization may have a residual influence on lung cancer mortality.*” (3).

### Evidence to action

The Surgeon General’s 1962 report on air pollution is not as widely remembered as the 1964 report on smoking and health. Both reports played an important role in raising awareness on important public health issues, and they were both eventually followed by federal action of some form. Both reports also served, at least in part, as a response to public pressure to address health threats which had received broad attention in the media. And the authors of both reports were forced to grapple with the challenges of evaluating evidence of cause and effect in the context of environmental factors and chronic disease, particularly lung cancer. Both reports discuss in their introductory material the limitations of traditional approaches to etiology, developed in studies of infectious disease, for environmental causes of chronic disease. And both reports drew on a mix of laboratory animal studies and human epidemiology. However, the 1964 smoking and health report applied a more formalized approach, articulating specific criteria used in reaching causal conclusions.

There were also significant differences in the conditions under which the two reports were created and in how they were framed and presented to the public. The air pollution report was mandated by law as a report to congress, rather than to the general public or health officials. In contrast, the smoking and health report was initiated by the Surgeon General (at the direction of the White House) in direct response to pressure from health organizations and

questions from the media. The air pollution report was produced by staff of the Division of Air Pollution of the PHS, led by Chief Vernon G. MacKenzie. The smoking and health report, instead, was produced by an outside committee of experts. In fact, Surgeon General Terry had no direct involvement in the deliberations or conclusions of the committee. Moreover, he sought to appoint scientists who had expressed no prior opinion on the subject, and various stakeholders, including the tobacco industry, were given the opportunity to propose or veto potential members (49). Terry also effectively used the media to gain substantial attention for the committee’s conclusions, holding a major press conference for its release (50).

In the years leading up to the publication of the two reports, federal health authorities had resisted taking direct action to control cigarette smoking and air pollution. Indeed, during the 1950s and into the 1960s there was ongoing debate, over any role for the federal government beyond simply sharing information or providing technical assistance to local officials. Under the Eisenhower Administration in the 1950s, this role was viewed as limited. Eisenhower, in his 1955 State of the Union address, asserted that the federal government “*should perform an essential task only when it cannot otherwise be adequately performed.*” (51). Thus, when Surgeon General Leroy Burney was questioned by congress after his first official statement on smoking and health, he insisted that the responsibility of the PHS was limited to providing facts to state health agencies, but not to “*go all out on a campaign and put stickers on cigarettes and certain other things.*” (52). Similarly, as legislation was being proposed in the late 1950s to strengthen the PHS’ authority over air pollution, there was a lack of consensus within the administration over what this role should be. PHS leaders themselves opposed expanding their authority beyond research and technical assistance (53).

The situation did not substantially change with the arrival of the Kennedy Administration in 1961. HEW Secretary Anthony J. Celebrezze opposed further action on smoking: “*I firmly believe that it is not the proper role of the federal government to tell citizens to stop smoking.*” (54). And in remarks to the PHS’ 1962 conference on air pollution, he proposed that “*the primary tasks of providing adequate health, education, and welfare measures and facilities are a responsibility of the state and local governments.*” He referred back to his own experience as Mayor of Cleveland where the local government took the lead on reducing emissions from a steel plant (55). In fact, the American Medical Association, which generally opposed federal intervention in health at

the time, took a stronger position in support of Federal authority over air pollution than government officials themselves (56). While President Kennedy himself endorsed new air pollution authority for the PHS, there continued to be internal debate within the administration over the extent of the federal role in air pollution (53).

The two reports provided an important impetus to enact legislation and expand the federal government's authority over air pollution and cigarette smoking. The first federal legislation to include provisions for the control of air pollution was the Clean Air Act of 1963, which established a program within the PHS to support new technologies for pollution control and to support local and state governments in developing control programs. The 1965 Motor Vehicle Air Pollution Control Act further authorized the federal government to set emissions standards for automobiles. By 1970, all 50 U.S. states had air pollution programs and a growing network of ambient monitoring stations. Meanwhile, the smoking and health report was followed by the 1965 Cigarette Labelling and Advertising Act, which mandated the first Surgeon General's warning to appear on cigarette packages: "*Caution: Cigarette Smoking May Be Hazardous to Your Health.*" The Act also called for an annual report to congress on the health consequences of smoking and led to the creation of a National Clearinghouse on Smoking and Health within the PHS. These laws continued to be strengthened and amended over the years, and today's regulatory controls for cigarettes and air quality are the products of decades of effort. Yet two reports of the Surgeon General were central in beginning this process.

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