



Smoking

THE SORDID HISTORY OF MANIPULATING PUBLIC PERCEPTIONS OF SCIENCE

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This story highlights three tactics of science misinformation and disinformation efforts: pretense of larger support in science than is actually the case, fabrication of a fake scientific controversy, and demanding unreasonable standards of evidence. See our website article [Features of Science Misinformation/Disinformation Efforts](#) for more information regarding these tactics.

Brian began smoking in the early 1960s at the age of eight, and he was smoking a pack of cigarettes a day by the time he was 11. Brian was far from alone at the time, as he reported that his parents and everyone else around him also smoked. At age 35, Brian had a heart attack, but he survived. Eleven years later, he was diagnosed with chronic obstructive pulmonary disease (COPD). Despite his health issues, Brian continued to smoke until he was 55, at which point his cessation made him eligible for a needed heart transplant that he received several years later. However, years of smoking had caused other damage, resulting in a diagnosis of lung cancer, and the removal of part of a lung. As he had before, Brian fought through the disease, but by that point, his health issues had consumed much of his adult life and forced his wife to stop working to help take care of him (CDC, 2021). Tragically, Brian's story is all too common. Even worse, when he was first learning to light up cigarettes as a young child, most scientists studying the health effects of smoking—including many of those working for cigarette manufacturers—already knew about the array of grave dangers that cigarettes posed. Why then did the public take so long to widely accept what the scientific community had already reached consensus on long before?

Rise of perplexing trends

At the turn of the 20th century, cigarettes were an uncommon sight in the United States. Americans consumed only 54 cigarettes per person each year in 1900 (Burns et al., 1997), which lagged far behind the use of cigars and chewing tobacco during that era (McInerney & Dougherty, 2020). However, in the ensuing decades, cigarette smoking experienced a dramatic increase related to the confluence of

numerous factors, including the gradual lifting of taboos against women smoking (Ernster, 1988), the invention of safety matches, the fact that American soldiers received free cigarettes during both world wars (Burns et al., 1997), and extensive tobacco industry advertising.

As the popularity of cigarette smoking exploded, doctors and scientists noticed some perplexing medical trends. In 1900, lung cancer was still a rare condition, with only 140 cases of it having been published in medical journals (Proctor, 2012). Professors of medicine saw the disease so infrequently that some regarded cases as once-in-a-career encounters for their students to witness (Proctor, 2012). However, within decades, lung cancer prevalence had already begun to dramatically increase, with an estimated 8,000 new cases a year diagnosed by 1940 (Dorn, 1943). Rather than the disease disappearing, the United States unexpectedly found itself hurtling towards a public health crisis that doctors could not yet fully comprehend.

Converging evidence and response strategy

The correlation between smoking and lung cancer that seems so evident today was not lost on medical researchers in the early 20th century. In fact, as early as 1912, Isaac Adler identified smoking as a possible cause of lung cancer (Proctor, 2012). However, many researchers during the first few decades of the 20th century were skeptical of studies implicating cigarettes because no causal mechanisms could yet explain the correlations being posited (Burnham, 1989). Part of the problem was that cancer itself was still very poorly understood (Burnham, 1989). As a

result, numerous potential causes of lung cancer were still being suggested well into the 1920s, including the effects of the 1918 influenza pandemic, air pollution, and asphalt dust from newly paved roads (Burnham, 1989; Proctor, 2012). Johannes Fibiger even received a Nobel Prize for his work demonstrating that parasites caused cancer—research that was unable to be replicated and therefore later deemed questionable (Hajdu & Darvishian, 2013).

NATURE OF SCIENCE CONNECTIONS

Science is not satisfied with well-established relationships (i.e., scientific laws), even those that make accurate predictions. Science seeks a deeper understanding (i.e., theories) that explain why those relationships exist.

Despite the limited medical knowledge of the era, advances were being made, and Hajdu and Darvishian (2013) assert that the period from 1910 to 1940 was a critical formative period that transformed how we view cancer.

NATURE OF SCIENCE CONNECTIONS

What we know affects how we see the world and the questions that we ask about it. As scientists' views of cancer changed, so too did their research questions, methods of inquiry, and in the case of cancer— attempts to treat it.

Unsurprisingly, suspicions that cigarettes were to blame for lung cancer and other diseases also increased among scientists from 1930 to 1950. The shift in sentiment was driven not only by a greater understanding of cancer in general, but also due to numerous studies that supported a causal relationship between cigarettes and lung cancer. For example, Angel Roffo reported in 1931 that tobacco distillate spread on the skin of rabbits caused tumors (Proctor, 2012). Researchers in the 1930s also noted that the cilia that helped remove particulates from human lungs could be killed by cigarette smoke (Proctor, 2012). The field of medicine came to better understand and accept epidemiological studies as an investigatory tool during this period (Burnham, 1989), and numerous such studies were then published that concluded that cigarette smokers were more likely to get lung cancer than non-smokers (Proctor, 2012). Finally, work by Roffo and others led to the identification of carcinogens in

tobacco tar, such as benzopyrene (Proctor, 2012). Such studies demonstrate how scientific research from at least four different areas was beginning to converge during this era on cigarette smoking as the cause of the lung cancer epidemic: (1) Population studies, (2) animal research, (3) cellular pathology, and (4) chemical analysis of cigarettes (Proctor, 2012).

NATURE OF SCIENCE CONNECTIONS

As more studies converge to support a scientific idea, confidence in it generally increases. That is particularly the case when the research utilizes different study designs and methods. Coherence among studies from different scientific disciplines is therefore one of the strongest forms of support for an idea.

By the early 1950s, cigarette smoking in the U.S. had reached record levels, and the tobacco industry recognized that it could no longer simply deny scientific research that identified its products as the cause of numerous health-related issues. Particularly concerning for cigarette manufacturers were a series of high-profile articles written for consumers during this time that highlighted the dangers of smoking. One example was a December 1952 article in *Reader's Digest* summarizing the research regarding the likely impacts of smoking for its broad base of subscribers (Heath, 2016). In 1953, both *Life* and *Time* magazine published articles that discussed a study in which tumors were produced on mice by applying tobacco tar to their skin—a particularly damning article given that the scientists who conducted the work had concluded that they were confident “beyond any doubt” that cigarettes were causing cancer (Heath, 2016; Proctor, 2012).

The tobacco industry's fears in 1953 were compounded by the results of work that their own scientists had secretly conducted. For instance, chemists working for Brown and Williamson independently verified the presence of carcinogenic benzopyrene in cigarettes in 1952 (Proctor, 2012). R.J. Reynolds had one of their chemists review 78 studies related to smoking and cancer, which led him to conclude in 1953 that, “data tend to confirm the relationship between heavy and prolonged tobacco smoking and incidence of cancer of the lung” (Cummings et al., 2007). The American Tobacco Company covertly conducted animal research to determine whether the paper or the tobacco in

cigarettes was carcinogenic and determined that the tobacco was to blame (Proctor, 2012).

In response to the growing crisis, the leaders of six of the top cigarette manufacturers in the United States met at the Plaza Hotel in New York City in December of 1953 to discuss the situation (Brandt, 2012; Cummings et al., 2007; Heath, 2016; Proctor, 2012). Invited to the meeting was John Hill, of the public relations firm Hill & Knowlton, who provided an overview of how the tobacco companies should proceed (Brandt, 2012; Samet, 2016). Hill understood that a direct attack on the science or scientists connecting smoking and cancer would be unlikely to succeed, because science was held in high regard, and the move would be viewed as self-serving. The public would therefore undoubtedly just disregard anything they said on the matter. Instead, Hill argued, the tobacco companies should promote themselves as advocates of science (Brandt, 2012). The suggestion was ingenious—the tobacco companies would call for *more* research into the connection between cigarettes and cancer, thereby making them appear as if they were trying to look out for consumers by funding work that would sort out a *supposedly* contentious issue within

the scientific community (Brandt, 2012). Directly funding scientific work would also allow the cigarette manufacturers to associate themselves with prestigious scientists, universities, and scientific journals, and to have more influence over the work being done. The tobacco executives agreed to hire Hill & Knowlton, and work immediately began to enact their plan (Brandt, 2012).

QUESTION 1

Calls for more research appear harmless and may even be appropriate. But how can such calls also be effectively used in misinformation/disinformation efforts?

Weaponizing skepticism

In January 1954—around the time that Brian (the individual featured at the beginning of this story) was born—cigarette manufacturers published a full-page advertisement in 448 newspapers in 258 cities across the United States (Brandt, 2012; Cummings et al., 2007; Warner, 1991). The “[Frank Statement](#)”

acknowledged that some researchers had linked cigarette smoking to cancer, but it emphasized that many possible causes of cancer existed, scientists disagreed on what the causes of cancer were, the link between cigarette smoking and cancer was unclear, and the statistics used in many studies were questionable. The advertisement then explained that even a potential connection to cancer was deeply concerning to cigarette manufacturers and that they, therefore, were forming the Tobacco Industry Research Committee (TIRC) to investigate the matter, which would be overseen by a Scientific Advisory Board (SAB) composed of prestigious, neutral scientists (Brandt, 2012).



RED FLAG

Pretense of larger support in science

Misinformation/disinformation efforts often create organizations that sound like official research entities in order to boost the legitimacy of their arguments and to sow confusion among the public. The tobacco industry was particularly prolific at utilizing this strategy, as they created the Tobacco Industry Research Committee (TIRC)—later renamed the Council for Tobacco Research (CTR), the Center for Indoor Air Research (CIAR), and the Tobacco Institute (TI).

The TIRC was created later that year, with a retired tobacco executive serving as its chairman, and Hill & Knowlton in full control of the organization's operation (Brandt, 2012; Courtwright, 2005). The influence of the public relations firm also extended to the supposedly neutral SAB, which Hill & Knowlton formed by seeking out researchers who were known skeptics—and ideally those who also smoked cigarettes (Brandt, 2012). When the TIRC received grant proposals, employees screened the documents, and then passed on a limited number to the SAB to decide whom to fund (Brandt, 2012). Projects that received TIRC funding therefore usually investigated general issues related to cancer instead of examining the effects of cigarette smoking (Brandt, 2012). Over time, the TIRC developed a network of scientists working as informants who provided them with summaries of professional conferences and when potentially damaging research was going to be published (Brandt, 2012). The TIRC was then able to respond—usually the same day that a paper was published—with a rebuttal designed to undercut the public's confidence

in the research and perpetuate the illusion of scientific uncertainty (Brandt, 2012; Courtwright, 2005). When the TIRC made such a press release, they sought media attention, exploiting journalists' preference for controversial issues and providing both sides of contentious issues—even though the connection between cigarette smoking and cancer was already widely agreed upon within the scientific community (Brandt, 2012).



RED FLAG

Fabrication of a fake science controversy

Central to misinformation/disinformation efforts is creating the *illusion* of a scientific controversy to confuse the public. Note how consensus had already been reached among relevant scholars during this era that cigarettes caused cancer, yet the tobacco industry was still actively working to portray the scientific community as divided—a deadly deception that they would continue to fruitfully employ for decades.

While the cigarette manufacturers were working to develop a false narrative of controversy and doubt, the scientific work being done—both within and outside of the tobacco industry—continued to support the link between smoking and an array of diseases. In 1954, a major study published in *JAMA* put forward a *causal* relationship between cigarette smoking and heart disease and cancer (McInerney & Dougherty, 2020). Dozens of carcinogenic chemicals were identified in cigarette smoke throughout the remainder of the 1950s, leading the research director at Philip Morris to note in 1961 that “practically every class of compounds in cigarette smoke” contained carcinogens (Proctor, 2012). British American Tobacco sent three scientists to the United States to determine the opinion of their researchers regarding whether cigarette smoking causes cancer, and all but one of the scientists they spoke with maintained that a causal connection did exist (Cummings et al., 2007). That same year, Liggett and Myers Tobacco Company received a report that acknowledged the presence of carcinogenic and poisonous chemicals in cigarettes (Cummings et al., 2007).

By 1962—around the time that then eight-year-old Brian was beginning to smoke—an R.J. Reynolds scientist wrote in an internal report that research establishing cigarette smoking as a hazard to human health was “overwhelming,” whereas evidence to the contrary was minimal (Cummings et al., 2007). The

tobacco industry reports reflected what had been widely acknowledged among scientists and public health experts for nearly a decade, as evidenced by warnings issued by cancer authorities in the United States, Norway, Sweden, Finland, Denmark, the Netherlands, and the United Kingdom during the mid-1950s. During this period, “medical attention shifted from the question of ‘whether’ to the question of ‘how’—and what to do about it” (Proctor, 2012).



NATURE OF SCIENCE CONNECTIONS

Skepticism is critical to the normal functioning of science. Without reasoned doubt, scientists would uncritically accept every novel idea, leading to an unstable, wildly oscillating base of scientific knowledge. However, as new ideas become increasingly well supported, most scientists are generally won over. The idea may then flourish as those scholars fruitfully use it to conduct research. However, some scientists continue to resist ideas long after the vast majority of colleagues have been persuaded of their veracity. As the debates and research within the field move on with new ideas, resistant scientists are generally left behind. Skeptics who are falling behind the field are invariably found whenever significant changes are occurring in science. Placing too much stock in the views of individual scientists—even those with good credentials—can therefore be dangerous, since the views being espoused may not represent the best available knowledge within the field. Determining the consensus view within the scientific community is crucial to identify misinformation/disinformation efforts and make informed decisions about socio-scientific issues.

QUESTION 2

Why is fabrication of a fake science controversy so easy to accomplish for those spreading misinformation/disinformation?

Despite facing overwhelming scientific evidence linking cigarettes to cancer, and an estimated 39,000 Americans dying due to lung cancer in 1960 alone (Survey, 1985), the tobacco industry's plan was succeeding. By 1961, annual cigarette consumption in the United States had soared to an estimated 4,025 cigarettes per person—nearly 75x higher than in 1900 (Brandt, 2012). As Brandt (2012) notes:

With each passing year, skepticism concerning the relationship between smoking and cancer was increasingly dominated by industry resources and public media. Doubt was no longer a matter of culture or training but the carefully crafted centerpiece of an industry effort to sow confusion and heighten debate through explicit attempts to disrupt the process of normative science. (p.68)

As predicted, scientists who received funding from the TIRC generally would not express an opinion on tobacco's health effects, thereby effectively silencing potential critics (Brandt, 2012). Cigarette manufacturers continued to tout the millions of dollars that they were giving researchers, even though they failed to acknowledge that those studies generally were not actually investigating the effects of cigarette smoking (Brandt, 2012). When studies funded by the tobacco industry did investigate the health impacts of cigarette smoke, they unsurprisingly were more likely to reach conclusions that were favorable towards cigarettes than non-industry funded studies (Barnes & Bero, 1998). Hill & Knowlton privately boasted in 1962 that, "From time to time, man-on-the-street interviews ask about the smoking question. In almost every one of these, there will be a quotation that is almost an exact paraphrase of some statement issued for the tobacco accounts" (Brandt, 2012). The cigarette manufacturers had managed to effectively cast doubt on legitimate scientific research and take control of the narrative surrounding the health risks of smoking.

A downfall...of sorts

In 1964, the Surgeon General of the United States released a report based on the review of over 7,000 studies that outlined the medical hazards of smoking (Heath, 2016). The report merely restated what the vast majority of scientists had long recognized, but nonetheless, it resulted in an estimated 5% reduction in cigarette consumption (Warner, 1977). The report also marked the beginning of anti-smoking campaigns that attempted to, among other goals, introduce warning labels on cigarettes and regulate tobacco advertising (Ernster, 1988).



RED FLAG

Demanding unreasonable standards of evidence

The tobacco industry attempted to enact unreasonable demands for what would qualify as acceptable epidemiological evidence. Requiring such unrealistic standards of evidence for studies that they oppose is a classic misinformation/disinformation tactic.

Despite being faced with overwhelming evidence against them, the tobacco industry chose to double down on their efforts rather than face a crushing wave of litigation and regulation that they knew would occur if they admitted that cigarettes caused the array of health problems that scientists had linked them to. As a result, when the cigarette manufacturers faced increasing pressure related to secondhand smoke, they created the Center for Indoor Air Research in 1988 (Cummings et al., 2007) and The Advancement for Sound Science Coalition in 1993 (Ong & Glantz, 2001). The tobacco industry often went to great lengths to hide their connections to such organizations, and they were so effective in doing so that their collaborators in the sciences were even sometimes fooled (Ong & Glantz, 2001). One such surreptitious attempt went as far as to try and dramatically raise the acceptable statistical levels of significance for epidemiological studies—so called "good epidemiological practices"—in the hopes of calling into question or even invalidating research related to secondhand smoke (Diethelm, 2009; Francis et al., 2006; Ong & Glantz, 2001). The project was unsuccessful though because professional organizations could not be convinced to make such changes.



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Note how professional organizations refused to accept the "good epidemiological practices" put forth by tobacco industry collaborators. The fact that science is conducted by a global community of scientists provides strong safeguards against undue political, industrial, or other potentially harmful influences—even when some individual scholars are compromised.

Another particularly invasive covert program aimed at secondhand smoke involved tobacco companies utilizing lawyers to obfuscate the hiring of seemingly neutral scientists who had powerful contacts and influence in various regions of the world (e.g., a presidential advisor was recruited in one instance) (Muggli et al., 2003). The "whitecoats," as the tobacco industry insiders would sometimes refer to them, were then told by the cigarette manufacturers' lawyers what positions they were to publicly express at professional conferences (Muggli et al., 2003). At least 81 such scientists were hired by the late 1980s, and around the time that Brian was experiencing his first heart attack, the "whitecoats" were busy with

work that produced over 100 professional presentations, several books, press conferences, meetings with government officials, publication of numerous articles, and legal testimony regarding secondhand smoking (Muggli et al., 2003).

QUESTION 3

Requiring unrealistic standards of evidence is a classic misinformation/disinformation tactic. Waiting for absolute certainty before acting has often been called a fool's game. Why must the bar instead be reliable consensus among the authentic experts in the relevant science disciplines?

While the cigarette manufacturers' misinformation campaign continued, tobacco use grew, peaking in 1982 at 630 billion cigarettes consumed in the United States. Unsurprisingly, cancer rates and resultant deaths also skyrocketed in the United States. By 1986, lung cancer was the leading cause of cancer-related death in the United States (Fontana et al., 1986) with over 125,000 deaths attributed to it that year alone (American Lung Association, 2014). However, in 1994, confidential tobacco industry documents were leaked, revealing that “the tobacco industry had for decades known and accepted the fact that cigarettes caused premature death, considered tobacco to be addictive, and that their programs to support scientific research on smoking and health had been a sham” (Cummings et al., 2007).

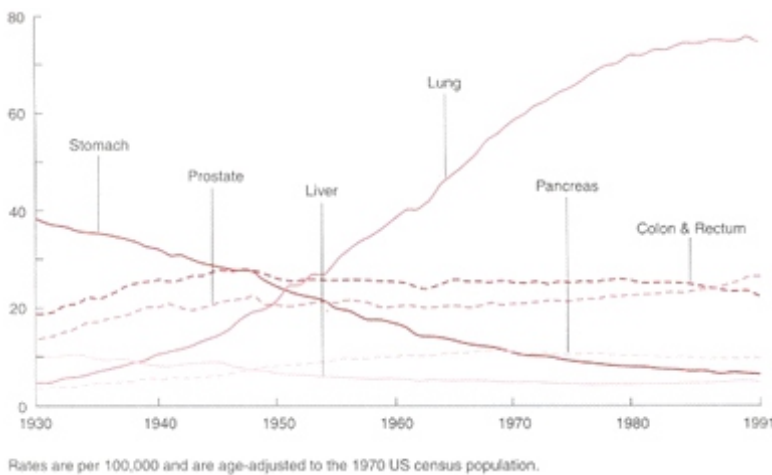
In the subsequent years, more tobacco industry documents came to light that eventually resulted in four of the largest cigarette manufacturers agreeing to an array of terms in 1998 that included paying states billions of dollars in annual fines in perpetuity, releasing millions of private documents, and various advertising restrictions (Public Health Law Center, 2021). The Master Settlement Agreement, as the accord came to be known, also required that the tobacco industry dismantle the TIRC—which had previously been renamed the Council for Tobacco Research in 1964, the Tobacco Institute, and the CIAR (Cummings et al., 2007). In 2006, as Brian was battling COPD, cigarette manufacturers were dealt an additional blow when they were found guilty of violating provisions of the Racketeer Influenced and Corrupt Organizations Act, during which Judge Gladys Kessler stated that (Cummings et al., 2007):

...the trial record amply showed a conspiracy to make false, deceptive, and misleading public statements about cigarettes and smoking from at least January 1954, when the Frank Statement was published, up to the present. (p.1072)

The toll on human life in the United States from smoking has been staggering. Between 1964 and 2014, the Surgeon General estimates that 20 million Americans died from smoking—fifteen times more than all of the combined deaths from every war in which the United States has been involved (Heath, 2016). Of those 20 million people, 2.5 million died from secondhand smoke, and 100,000 were babies who died from issues related to parental smoking (U.S. Department of Health and Human Services, 2014). Recent estimates still implicate cigarette smoking in the deaths of nearly 500,000 Americans each year (Heath, 2016). While those numbers are nearly unfathomable, they fail to capture the millions more Americans such as Brian who have had their lives, and the lives of their loved ones, profoundly impacted by smoking-related diseases that they managed to survive, at least for a while.

Misinformation/disinformation does not change how nature works

The tobacco industry's efforts to create confusion about the science underlying the health concerns of cigarettes was just one element within a broader disinformation/misinformation campaign that included, among many other strategies, extensive lobbying, highly effective and expensive



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

Figure 1. Death rates of American males due to various types of cancer (Vaporciyan et al., 2003).

marketing, and careful manipulation of nicotine delivery from cigarettes—often in ways that were known to be undetectable to government testing techniques (Hurt & Robertson, 1998). However, the insidious and pervasive influence of cigarette manufacturers on science was unprecedented in its nature and scope and highlighted ways that research was vulnerable to industry influence—ways that would later be exploited by others to sway public opinion. Those dangers to science must be acknowledged, but despite a decades-long misinformation campaign bankrolled by multibillion-dollar corporations, the scientific community managed to withstand the assault. Consensus regarding the health impacts of smoking did not waver, as converging lines of evidence from thousands of studies solidified the dangers of cigarettes. As time progressed, peer review increasingly identified questionable research sponsored by the tobacco industry.

become increasingly common in recent years. Elaborate misinformation such as what was produced by the tobacco industry is exceedingly difficult for non-experts to identify. That is why focusing on position statements from reputable professional organizations that put forth well-established science ideas is critical to being able to learn what the *consensus* views are among scientists. This helps prevent being fooled into thinking that individual or minority views that have been amplified by media sources are representative of the position that is supported by the best available evidence. What to do with that knowledge is for policymakers and individuals to decide.



NATURE OF SCIENCE CONNECTIONS

Misinformation/disinformation efforts do not change how nature works. While science is a human enterprise and thus open to error, the community of scientists around the world mitigate bias and correct error. The result is knowledge that is worthy of public trust in making personal and socio-scientific decisions.

Moreover, scientific safeguards related to industry funding and disclosure of conflicts of interest have

QUESTION 4

Why is the consensus position among the community of scientists with the appropriate expertise the best safeguard against science disinformation/misinformation?

In addition to utilizing consensus scientific statements, readers should be mindful of the warning signs of misinformation/disinformation efforts when reading about socio-scientific issues. This is particularly important as some authors (e.g., McInerney & Dougherty, 2020) are already expressing concerns that misinformation tactics employed by cigarette manufacturers are being reused to cast doubt about the health risks of e-cigarettes.

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