MEANINGS & MOTIVES
Experts Debating Tobacco Addiction

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Over the last 50 years, tobacco has been excluded from and then included in the category of addictive substances. We investigated influences on these opposing definitions and their application in expert witness testimony in litigation in the 1990s and 2000s. A scientist with ties to the tobacco industry influenced the selection of a definition of addiction that led to the classification of tobacco as a "habituation" in the 1964 Surgeon General's Advisory Committee report. Tobacco was later defined as addictive in the 1988 surgeon general's report.

Expert witnesses for tobacco companies used the 1964 report's definition until Philip Morris Tobacco Company publicly changed its position in 1997 to agree that nicotine was addictive. Expert witnesses for plaintiffs suing the tobacco industry used the 1988 report's definition, arguing that new definitions were superior because of scientific advance. Both sides viewed addiction as an objective entity that could be defined more or less accurately. (*Am J Public Health.* 2008;98:1793–1802. doi:10.2105 AJPH.2007.114124)

WHEN 7 TOBACCO INDUSTRY chief executive officers (CEOs) swore before the US Congress in 1994 that nicotine was not addictive, were they lying? What was meant by "addiction"? Addiction is a concept widely used in medicine and by the lay public. It holds important implications for systems of regulation, health care, modes of treatment, industry, litigation, and criminal justice. So how have definitions of addiction been reached?

Over the last 50 years, tobacco has been excluded from and then included in the category of addictive substances. We examine contradictory definitions of addiction used in litigation against tobacco companies during the 1990s and 2000s. We trace the origins of these definitions and some of the influences on their formation. (Throughout, we refer to "tobacco" rather than "nicotine" since understanding of the role of nicotine changed during this period.)

These definitions were developed in the mid-20th century at official committees of the World Health Organization (WHO) and the US Surgeon General's Advisory Committee (SGAC). We studied the committees' reports, and in 2006, S.G.M. interviewed scientists serving on one of these committees and in the field, including Charles LeMaistre, one of two surviving members of the SGAC; Donald Shopland, a library technician supporting the committee; and Jerome Jaffe, a psychiatrist researching addiction who later became the head of President Richard Nixon's Special Action Office for Drug Abuse Prevention. Internal tobacco industry documents from the Legacy Tobacco Documents Library, University of California, San Francisco, were also analyzed.

Using testimony from lawsuits against tobacco companies, we examine how these definitions of addiction and their classifications of tobacco have been operationalized. Our focus is not on academic or clinical definitions of addiction, but rather on the application of influential policy documents (the WHO and the surgeon generals' reports) in arguments both in support of and in opposition to legal claims against the tobacco industry. These cases had a major role in public health through the regulation and industry behavior they heralded.

We examined the testimony of 8 scientists, evenly divided between witnesses for plaintiffs and defendants (the tobacco companies), for their views on addiction and how tobacco should be classified. Transcripts were identified from the Legacy Tobacco Documents Library's Tobacco Depositions and Trial Testimony Archive, which reaches up to 2003. As far as possible, for each expert witness, we examined one transcript dating before and one after October 13, 1999, when Philip Morris, as part of a major public relations effort, publicly changed its stance from denying smoking was addictive to openly declaring it to be so. (Liggett changed its position on March

20, 1997.)[1] This allowed us to consider whether the industry-employed defense witnesses changed their views when their employers did. The selected transcripts included substantial discussion of smoking addiction; if the discussion was brief, a third transcript was added.

DEFINING ADDICTION

What constitutes "addiction" and "dependence" has varied across time,[2] between national contexts,[3] and between substances.[4] In the 18th century, the idea began to emerge that drunkenness was not a moral or religious weakness but a disease that required medical attention. In 1804, the British doctor Thomas Trotter was the first to describe habitual drunkenness as a mental illness, and he likened the effects of spirits to the use of opium.[5] The term "addiction" was in widespread medical use by the early 20th century. As it became an accepted concept in medical and lay discourse, it began to replace such terms as "habit," "inebriety," and "morphinomania," and its definition also changed.[6]

Scientific and medical ideas about addiction have been heavily influenced by their context, which includes perceptions of normalcy, associated harm, and how the substance is regulated. For instance, in 18th- and early 19th-century England, opium was sold in ordinary grocers' shops and used for a number of problems that were not neatly divided into medical and nonmedical, as drug use is today. At this time, most of the population lacked formal health care, and self-medication was the norm. Infectious disease epidemics, variable water quality, overcrowding, and poor housing led to frequent illnesses and chronic pain. Opium relieved diarrhea, cough, pain, and insomnia in addition to its euphoric effects. Opium use was "normal." It was given to children and adults, providing both mental and physical relief, the medicinal effects shading imperceptibly into the social ones.[7] Aspirin did not come onto the market until 1899 or the sedative barbiturates until 1906.[8] In this context, addiction to opium was not a major concern.

Tobacco executives swear that nicotine is not addictive, April 14, 1994, to the House of Representatives Committee on Energy and Commerce.

Source. Stephen Crowley/*The New York Times*/Redux.

EXCLUDING AND INCLUDING TOBACCO

Tobacco is a relative latecomer to the addiction model. In Britain, a major policy report from the Royal College of Physicians referred to tobacco addiction in 1962.[9] The US surgeon general described smoking as a "habituation" rather than an addiction in 1964. The WHO's *International Classification of Diseases* first included tobacco dependence as a diagnostic category in 1977, and the American Psychiatric Association followed suit in 1980.[10]

However, the idea that regular tobacco smoking was difficult to give up was not new in the late 20th century. Lay views of tobacco addiction were common, and fringe health practitioners early in the 20th century, such as John Harvey Kellogg, saw it as equivalent to other drugs: "The confirmed cigarette smoker is as thoroughly enslaved as is the opium smoker or the alcohol inebriate. He is a 'dope' fiend . . . an addict, and often requires the same restrictive measures to secure reclamation as does the confirmed alcoholic or opium habitué."[11] Meanwhile, US tobacco companies maintained a united position that tobacco was not addictive until 1997.

THE SURGEON GENERAL AND TOBACCO ADDICTION

In January 1964, the SGAC published its report *Smoking and Health*.[12] Best known for its strong statements on cancer, the report also described tobacco as causing "habituation" rather than "addiction." It used verbatim definitions

John Harvey Kellogg (1852–1943), who compared tobacco smoking with opium addiction.

Source. Courtesy of the Community Archives of Heritage Battle Creek, Battle Creek, Michigan.

from the WHO published in 1957,[13] in which "drug addiction" involved intoxication, an overpowering desire to continue taking the drug and to obtain it by any means, a tendency to increase the dose to maintain the effect (tolerance), and a psychological and physical dependence on the drug, with adverse effects on both the individual and society. "Drug habituation" did not include intoxication, tolerance, or physical withdrawal symptoms, and it focused on detrimental effects to the individual. It characterized the urge to use a drug as "a desire" but "not a compulsion" for the "sense of improved well-being which it engenders."[12,13] The WHO revised its definition in 1964, dropping the habituation–addiction split and replacing it with the single term "dependence."

It was not until 1988 that the surgeon general publicly changed position by devoting an entire report to "nicotine addiction," basing its definition on criteria from the American Psychiatric Association, the National Institute for Drug Abuse, and the 1964 WHO revision. The 1988 surgeon general's report used the terms "addiction" and "dependence" synonymously.[14] Its three main conclusions were that tobacco was addicting, nicotine was the drug in tobacco that caused addiction, and the pharmacological and behavioral processes that determined tobacco addiction were similar to those for heroin and cocaine.[15]

HOW THE DEFINITIONS WERE REACHED

The WHO's 1957 definitions, and possibly their inclusion in *Smoking and Health*, were influenced by concerns about how they would be used in the wider world beyond science and medicine. The WHO was concerned with the definitions' use in shaping international drug control policy. In the SGAC, one influential member may have been motivated to protect the interests of tobacco companies.

The WHO was established in 1948 as a specialized agency of the United Nations, the latter having responsibility for international drug control. The distinction between "habit" and "addiction" was formed with an eye to policy questions: addictive drugs were subject to international controls, whereas habit-forming substances only required national controls and warnings.[16] This created a number of inconsistencies. For instance, barbiturates were characterized as habit-forming at lower doses and addictive at higher doses, yet controls over their supply did not vary by dose. Sociologist Robin Room noted that by the WHO's 1957 definitions, alcohol was addictive, yet the United Nations had no intention of bringing it under international controls.[17]

The 1957 WHO definition reflected a scientific paradigm of addiction based on alcohol and opiates, which have dramatic withdrawal syndromes. Users also experienced chronic intoxication, and their drug use was problematic both for society and themselves. Addicts were considered mentally ill, requiring psychiatric care. The WHO's 1964 change reflected a merging of the psychological and physical, depathologizing the behavior and removing societal and contextual concerns from the definition. Intoxication and tolerance were not considered necessary criteria for dependence.

In an interview with S.G.M., Charles LeMaistre revealed that the text of *Smoking and Health* was finalized by mid-1963. The WHO Expert Committee did not meet until December of that year. According to LeMaistre, as they deliberated on the addiction issue, members of the SGAC were unaware that the WHO was about to change its definition. However, Maurice Seevers, who chaired the SGAC subcommittee on tobacco and addiction, was also a member of the WHO Expert Committee. It is unknown whether Seevers was aware that the WHO was about to change its definitions.

USING THE WORLD HEALTH ORGANIZATION DEFINITIONS

In October 1962, Surgeon General Luther L. Terry announced the appointment of 10 scientists to his Advisory Committee on Smoking and Health. Members were selected from names submitted by federal agencies, voluntary health organizations, and the tobacco industry.[18] In a written communication with S.G.M. in 2006, Donald Shopland stated that a selection criterion for prospective members was that they had never publicly taken a stand on tobacco and health or dependency.[19] Their task was to review the scientific evidence from an objective standpoint,[20] but the result, according to Shopland, was that the committee relied more heavily on those with expertise in tobacco and addiction, such as Maurice Seevers.

In an interview with S.G.M., Jerome Jaffe said that Seevers was an esteemed professor of pharmacology at the University of Michigan. What is missing from other accounts is that he had received research funding

and held a consultancy from the American Tobacco Company when invited to join the SGAC.[21] He declared the consultancy to the Office of the Surgeon General, resigning for the duration of his committee membership. An internal American Tobacco Company memorandum from E.S. Harlow, assistant managing director for research, to H.R. Hamner, vice president, and W.R. Harlan, managing director of research and development, explained:

> Dr Seevers has written to the Surgeon General accepting a firm appointment to the subject panel. The Surgeon General's office did not feel that Dr Seevers' consulting arrangement with The American Tobacco Company had any bearing on his appointment. However, as he had previously indicated to them it was his intention to resign his consultantship, he is doing so by letter to HRH [Hamner]. After his work on the panel is completed he definitely would like to be re-employed by us as a consultant.[22]

This intention to resume the links suggests that the resignation was largely cosmetic. According to LeMaistre, Seevers convinced the committee that it must use the WHO definitions of "habituation" and "addiction," which classified nicotine as a habit rather than an addiction. Richard Kluger also noted that Seevers was able to persuade the rest of the committee to adopt this definition of addiction because of his dominating personality and the committee's lack of alternative expertise on the subject to challenge his position.[23]

In his interview, LeMaistre recalled that the rest of the committee members considered smoking to be addictive, by which they meant "an overpowering need to place the use of the drug above all other factors" and an inability of some to stop using it, but that they agreed with Seevers that they could not depart from the authority of the WHO's classification. This suggests that at least two competing ideas of addiction were current at that time.

Seevers's reported insistence on the WHO definitions may have reflected the interests of the tobacco industry. In 1960, as a member of the American Medical Association's (AMA's) Council on Drugs, Seevers intervened to stop it from issuing a statement against smoking. An internal note from R.K. Heimann, assistant to the president, written to the president and vice president of American Tobacco, described Seevers as "a friend of the Company's Research Department"; Heimann reported that he and another council member with links to the industry had expressed doubt over the evidence for risks from cigarettes. As a result, the Council on Drugs concluded that there was insufficient evidence to issue a statement in support of the "anticigarette theory."[24] Seevers also fed information to American Tobacco on the actions of AMA regarding smoking and health policy discussions in the early 1960s, and he sought the company's advice on nominations to AMA committees.[25]

Seevers could have viewed the scientific evidence linking smoking and lung cancer as insufficient before his involvement with the American Tobacco Company, which then chose him as a consultant because of his existing views. Epidemiological proof of causation in chronic disease was an emerging methodology, and skepticism could be seen as a legitimate response to this evidence prior to 1964.[26] However, there is suggestive but not conclusive evidence of tobacco interests at work in Seevers's view of addiction: in a 1962 paper, he had criticized the WHO's 1957 definitions, stating that "habituation" and "addiction" "are beyond salvage for the scientific description of drug effects and should be abandoned."[27] Given his public misgivings about the 1957 definitions, it is surprising that Seevers was insistent on their use.

Kluger concluded that when the SGAC decided that smoking was only a habit, "the tobacco industry was rewarded for its championing of Seevers as a member of the Surgeon General's elite panel."[28] However, although Seevers was approved by the industry, the American Cancer Society had actually nominated him. In an internal Philip Morris document reviewing scientists suggested for the SGAC, Seevers is described as "an excellent choice; outstanding reputation and very down-to-earth; unless evidence is clear cut he would not go along."[29] Whether or not this endorsement influenced the selection process is unknown.

As historians have observed, the history of a substance partly depends on the perceived status of its users.[30] In the mid-20th century, smoking was normal in society. Several SGAC members smoked, whereas addiction had greater stigma than it has today. Addicts were viewed as incurable and psychologically abnormal, which was hard to align with the large smoking population.[31] Unlike habituation, commented the SGAC,

> It is generally accepted among psychiatrists that addiction to potent drugs is based upon serious personality defects from underlying psychological or psychiatric disorders which may become manifest in other ways if the drugs are removed.[32]

TABLE 1—Defense and Plaintiff Witnesses Quoted in This Article, With Their Qualifications and Affiliations

Name	Qualifications and Affiliations
Defense witnesses	
John Robinson, PhD	Psychologist. Worked at Bowman Gray School of Medicine, Wake Forest University in Winston-Salem, NC, then took a scientific post at RJ Reynolds in 1981. Employed as a senior behavioral scientist and director of smoking behavior and Physiology Division during which time he studied smoking behavior.[36]
Donald DeBethizy, PhD	Toxicologist. Worked for RJ Reynolds from 1985 to 2000, reaching the position of vice president of product evaluation. Also served for 10 years as a science media liaison for the company from 1990. After leaving RJ Reynolds, he went into business developing nicotine analogues in conjunction with RJ Reynolds. Developed and led a Positive Aspects of Nicotine Team project, in which John Robinson was also involved, to defend the industry by creating a debate around smokers' motivations and to fight efforts to classify nicotine as addictive.[37]
Richard Carchman, PhD	Toxicologist, Medical College of Virginia. In 1988 went to Philip Morris, where he rose to the position of vice president of research, development, and engineering until his retirement in February 1999. He then continued as a consultant to the company.[38]
Sharon Boyse (later Blackie), PhD	Psychologist, also trained in pharmacology. Worked for British American Tobacco (BAT) as a senior scientific adviser in London from 1986 to 1991 and from 1994 to 1996 as a consultant to the firm. Late that year, joined Brown and Williamson, a subsidiary of BAT, first as director of scientific affairs and then as director of applied research.[39]
Plaintiff witnesses	
Neal Benowitz, MD	Professor of medicine at the University of California, San Francisco, since 1974—worked at San Francisco General Hospital and had a special interest in pharmacology and toxicology. One of the four editors of the 1988 surgeon general's report.
John Hughes, MD	Board-certified psychiatrist, since 1985 a professor in the Departments of Psychiatry, Psychology, and Family Practice at the University of Vermont. Studied a number of topics related to tobacco and nicotine addiction, including nicotine replacement therapy and the role of motivational advice. A director of University of Vermont's College of Medicine Human Behavioral Pharmacology Laboratory.
Jack Henningfield, PhD	Professor of psychology and psychopharmacology. Carried out extensive work on tobacco and nicotine while at the National Institute for Drug Abuse and was also a professor in the Department of Psychiatry and Behavioral Sciences at Johns Hopkins University School of Medicine. Also held a senior post in the consulting firm Pinney Associates, through which his expert witness work was arranged. One of the four editors of the 1988 surgeon general's report.
Richard Hurt, MD	Professor of medicine at the Mayo Clinic, with expertise in the pharmacology of nicotine and the treatment of nicotine use. Joined the Mayo Clinic in 1973 and took charge of its Nicotine Dependence Center in 1988. The center treated patients trying to stop smoking and carried out research and education. Also conducted research on the activities of the tobacco industry.[40]

Conversely, it was perhaps easier to categorize smokers as addicts in 1988 because the smoking population had become increasingly associated with lower educational attainment and socioeconomic status. Historian Allan Brandt suggests that

> in a culture prone to stigmatize its poor and disfavored, changing perceptions about the 'average smoker' eased the growing attribution of addiction.[33]

ADDICTION IN TOBACCO LITIGATION, 1990 TO 2003

Civil cases against US tobacco companies have been brought by those with diseases linked to smoking, or by their relatives, since at least the 1960s[34]; these cases have partly turned on the question of addiction. Paul Knopick, a senior employee at the Tobacco Institute, reported in a 1980 internal memorandum that Philip Morris's legal advisors had cautioned

> that the entire matter of addiction is the most potent weapon a prosecuting attorney can have in a lung cancer/cigarette case. We can't defend continued smoking as a "free choice" if the person was "addicted."[35]

In litigation, expert witnesses explained the scientific evidence on tobacco and its addiction potential in order to strengthen or diminish the plaintiff's responsibility for smoking.

All defense expert witnesses whose transcripts we examined were scientists employed by tobacco companies. Witnesses for the plaintiffs worked in a variety of settings, including universities and government and as private consultants (Table 1). As connections to the tobacco industry and conflicts of interest have

historically been concealed,[41] we selected only defense experts employed by the industry to be certain of their financial links.

An important point of dispute between plaintiff and defense expert witnesses was their definition of addiction. By the 1990s, many scientific studies suggested that nicotine was addictive by the definitions given in the 1988 surgeon general's report.[42] Before October 1999, however, expert witnesses for the defense frequently invoked the earlier definitions of "habituation" and "addiction" given in *Smoking and Health* in 1964. They claimed that tobacco was merely a habit that could be broken, equivalent to any other pleasurable activity. After October 1999, when most companies had declared tobacco to be addictive, defense experts changed their views in line with their employers.

THE ROLE OF EXPERTISE IN LITIGATION

In an age when the very notion of expertise is contested, its role in litigation remains controversial, even among expert witnesses themselves.[43] Historian David Rothman views the work of expert witnesses as advocacy rather than scholarship but considers both activities equally legitimate. From his own experiences, he concluded that the difference was not in objectivity but rather the focus of the process; in litigation "the scope of analysis is narrowed, the imagination is constrained, and the curiosity, curtailed."[44] Allan Brandt was wary of his scholarship being "dismissed as 'advocacy,'" but he testified to provide what he considered a fuller analysis than that presented by tobacco industry experts.[45] Stephen Hilgartner, in his study of scientists giving advice in policy committees, has described this process as "science on stage," where credibility is produced through a range of theatrical techniques regulating the presentation of information and the relationship between scientists and their audience.[46] Similar methods may be seen in the presentation of expert witnesses in litigation.

DEFENSE EXPERT WITNESSES

All four expert witnesses for the tobacco industry whose testimony we examined argued against definitions that characterized tobacco or nicotine as addictive. Two explicitly used the definition of the 1964 SGAC report, although this had been abandoned by the WHO and superseded by the 1988 surgeon general's report. All questioned the role of nicotine in people's difficulty in quitting, although some changed their views in line with Philip Morris's position in October 1999. None argued against the concept of addiction per se, a strategy used by the industry in other arenas.[47]

For example, RJ Reynolds expert witness Donald DeBethizy, a toxicologist, considered in 1997 that the change in definition from the 1964 SGAC report to that of 1988 was because "There was a shift in thinking about what constituted addiction, and the definition was broadened to be able to include nicotine and smoking," which he considered to be a mistake that blurred the distinctions between different types of activities.[48] Similarly, psychologist John Robinson declared in 1991, "I would agree with the '64 Surgeon General's Report which said . . . essentially that the practice of smoking should be labeled a habit or an habituation"; his January 1999 deposition maintained this position.[49] Unfortunately, no post–October 1999 transcript was available for Robinson. In 1997, DeBethizy denied that nicotine was addictive, whereas in 2000 he testified, "[W]ith the definition that's commonly used today, I would believe that nicotine is addictive," that it was a reason people smoked, and that it played a part in smoking behavior.[50]

Before Philip Morris changed its public stance on addiction, toxicologist Richard Carchman told the court:

> All I know is that some people who smoke cigarettes have a hard time quitting. Whether it's related to the nicotine or some other feature of the cigarette, I don't know.[51]

His position changed slightly by 2000:

> I make a distinction between smoking and nicotine . . . nicotine has to be viewed within the context of smoking, not nicotine itself. And smoking is a complex behavior that has attributes to it that can make it difficult for people to stop smoking. Is nicotine a part of it? . . . Yes, it can be.[52]

Sharon Boyse (later Blackie), a British psychologist trained in pharmacology working for British American Tobacco,[53] followed the 1964 SGAC report's definition. She likened smoking to indulgent eating:

> I think there are many things that you enjoy that can be immensely difficult to quit. I do not believe, however, that difficulty in quitting is an indication of whether or not something is addictive. I think people who go on diets have the greatest difficulty in the world giving up cakes and chocolate. But I wouldn't, in my wildest dreams,

> suggest that they are addicted to cakes and chocolate.[54]

After 1999, she appeared more positive toward the 1988 surgeon general's definition, but rejected comparisons with heroin addiction.[55] In 2003, she considered smoking "a very complex behavior" and that people did not smoke purely for the nicotine.[56] Both Carchman and Boyse described tobacco as hard to give up but did not believe this constituted addiction, echoing the SGAC's 1964 observation:

> [C]orrectly designating the chronic use of tobacco as habituation rather than addiction carries with it no implication that the habit may be broken easily.[57]

PLAINTIFF EXPERT WITNESSES

Using the definition of the 1988 surgeon general's report, the four experts for the plaintiffs whose testimony we examined claimed that tobacco produced dependence or addiction. How did these scientists account for the change in definition from 1964 and their preference for the new definition? Neal Benowitz, one of the four editors of the 1988 surgeon general's report, characterized the change as the result of scientific advance. The 1964 SGAC report labeled nicotine habituating because, according to Benowitz, scientists "didn't fully understand the pharmacology of nicotine."[58] He said in 2001 that

> I can't think of [any scientist] in recent times who has used 'habituation.' That was a term that was developed . . . by the World Health Organization in 1957 and really sets up a distinction between that and addiction. That doesn't make physiological sense. So it is not used any more."[59]

John Hughes also explained in 1990 that there were many statements about dependence in previous surgeon general's reports that were no longer true: "[O]ur science is going to disprove a lot of things that we said earlier. It's part of the nature of doing science."[60] In 1994, Hughes repeated his view that the change resulted from scientific progress.[61]

Both Hughes and Benowitz agreed that altered perceptions of addiction also accounted for the definition's change. In 1997, Benowitz remarked that in 1964,

> people thought of addicts as being totally crazed and out of their mind and violent and criminal. There was a very stereotypical description of addiction then which is different than now.[62]

Hughes added that in the 1920s and 1930s,

> most people, and unfortunately the medical profession of which I'm a part of, thought that alcoholism was a willful disorder that there was no such thing as alcohol dependence, these were just weak-willed people . . . the same sorts of things have happened with other drugs that we've recognized as being drugs of dependence over time.[63]

Hughes and Benowitz presented these changes in attitude as the result of greater enlightenment, with substance use and addiction having an objective reality that had to be described as accurately as possible.

Jack Henningfield and Richard Hurt also appearing for the plaintiffs, claimed that if the tobacco industry had not kept back its own research from the surgeon general during the 1964 report's preparation, it would have defined nicotine as addictive. Hurt conjectured in 1997 that with access to the internal documents of the tobacco industry, which referred to nicotine as an addicting substance, the SGAC's conclusions might have been different.[64] He argued that the industry's own internal documents would have shown that nicotine caused physical dependence, tolerance, and withdrawal symptoms, thus excluding it from the "habituation" category.[65] However, the lack of intoxication and the absence of perceived pathology among tobacco users would still have been obstacles to use of the WHO classification of addiction.[66]

Henningfield served with Benowitz as a scientific editor on the 1988 surgeon general's report. He recognized that had the concealed industry research been available to the 1964 SGAC, there would still have been obstacles to defining nicotine as addictive but that

> nicotine, as was described in the report, was clearly in a gray area, where judgment calls were made. It was recognized to be an important pharmacological factor in smoking, that met the criteria for what was then called habituating. It was not put into the addicting category.[67]

When asked whether nicotine could even today be classified as addictive by the 1964 SGAC definitions given the chronic intoxication criterion, Henningfield replied, "It depends how heavily they weighted that factor."[67] The four experts for the plaintiffs remained constant in their views before and after October 1999.

SCIENTIFIC DEVELOPMENTS

Nicotine has been the subject of increasingly intensive scientific research since 1964. Could changes in scientific knowledge explain the surgeon general's moving nicotine from a "habit" to an "addiction" in 1988 or the industry's switch in 1999?

In 1980, the first work showing specific nicotine binding sites in the brain appeared,[68] with subsequent findings on the role of nicotine in neurotransmitter systems. This showed that tobacco could act in ways similar to those of addictive drugs. By 1988, the evidence showed a neurobiological basis for addiction, which was referenced in the surgeon general's report of that year.[69]

However, the neuroscience was only one factor of several. In 1980, before these scientific developments, the American Psychiatric Association revised its *Diagnostic and Statistical Manual of Mental Disorders*, introducing diagnoses of "tobacco dependence" and "tobacco withdrawal."[70] These conditions, which were behaviorally based, influenced the definition used in the 1988 surgeon general's report.[71]

Aside from evidence from the 1980s of a neurobiological basis for addiction, there do not seem to be major scientific developments that would explain the industry's position change in 1999. In the 1990s, imaging studies were conducted showing that nicotine affects the brain,[72] but these do not prove addiction. Richard Carchman, former Philip Morris vice president of research, explained his employer's position change when he appeared as an expert witness in the company's defense. Asked whether anything had changed from a scientific perspective between 1994 and 2000 with respect to the addictiveness of cigarette smoking, he replied, "Nothing."[73]

CONCLUSIONS

To sum up, "addiction" or "dependence" are malleable concepts situated in specific social, political, and scientific contexts, but the parties involved in litigation spoke more as if they were universal scientific truths to be unveiled or denied. At the same time, expert witnesses for each side used different definitions. Experts appearing for the defendants favored the 1964 SGAC report's conclusion that tobacco smoking was a habituation rather than an addiction, a definition taken from the WHO's 1957 report, which in turn was influenced by concerns about international drug control policy, not just "scientific" inquiry. Despite the alternative understandings of addiction in scientific currency at the time, the use of the WHO definitions was largely encouraged by Maurice Seevers, who had links with the tobacco industry. Whether or not the 1964 SGAC report's conclusion that tobacco was habit-forming rather than addictive was the result of the tobacco industry's influence is difficult to determine. The plaintiffs' experts used the 1988 surgeon general's report definition, which was based on criteria from the American Psychiatric Association, the National Institute for Drug Abuse, and the revised 1964 WHO definition. Clearly, to the scientist, whether or not tobacco is addictive depends on the definition used and how it is applied. Although using different definitions, all the expert witnesses argued from a positivist framework and used the same source as an authority: the US surgeon general.

And what of the seven CEOs testifying before Congress? It seems that at least one of them may have been using the older WHO definition of addiction. James Johnston, chairman and CEO of RJ Reynolds Tobacco Company, declared that "cigarettes and nicotine clearly do not meet the classic definition of addiction. There is no intoxication."[74]

Were these standpoints equally valid? Addiction is a flexible concept that depends on social priorities as well as scientific findings. Scientific inquiry in turn is shaped by these social priorities. Our study suggests that such flexibility and changes over time can be manipulated or exploited for political and economic interests. It seems likely that the defense witnesses' preference for the older definition was influenced by a desire to protect their employers.

In the world of illicit drugs, where commodities are produced and distributed through criminal sources, civil litigation against drug suppliers is absent. Researchers do not receive funding from these sources, and the idea of separating "habit" and "addiction" has been discarded. This in part has resulted from moves away from an addiction paradigm based around alcohol and opiates and physical withdrawal syndromes to one that emphasizes craving. Laboratory science has shown that psychological and physical addiction cannot be separated, because they influence each other.[75]

The tobacco companies' expert witnesses changed their positions on the validity of the 1988 surgeon general's report definition and the importance of nicotine only after their employers had reversed their public position on the addictiveness of tobacco and nicotine. This happened at a time when there were no major changes in the scientific knowledge of addiction. Such a process could be termed "corporate science," where conclusions are based on "top down" organizational policy decisions rather than drawn from scientists' empirical research.

It is harder to say whether the plaintiff witnesses' definition was influenced by their worldly concerns, such as an opposition to the role of the tobacco industry in the spread of tobacco-related disease, or involvement in the medical treatment of tobacco use. The plaintiffs used the most up-to-date definition at the time of trial, which would be consistent with their stated beliefs that scientific progress led to changes in the definition over time. Certainly their view that tobacco was addictive preceded their involvement in litigation: two of them had used this definition since at least 1988, when they had introduced it into the surgeon general's report. The extent to which a researcher's scholarship may be influenced by his or her service as an expert witness is a question that remains to be explored.

Plaintiff experts' views could be characterized as arising from scientific, industrial, and social changes that resulted in the perception of tobacco use as an addiction. But was this adoption purely the result of scientific progress, as plaintiff witnesses contend? Since the 1964 SGAC report was published, tobacco smoking has become more stigmatized and addiction has become less so in many Western countries. The medical profession and the pharmaceutical industry have developed clinical treatments of tobacco addiction, medicalizing a behavior that was considered normal in the 1950s and 1960s for all levels of society. It has therefore become easier to perceive smoking as a medical condition similar to illicit drug use. We do not suggest that the plaintiff expert witnesses were directly influenced by economic interests as the defense witnesses were, but science cannot be detached from the social structures and beliefs of which scientists are a part. Although it may not be possible to detach science from social structures, efforts can be made to separate scientific processes from unabashed self-interest. We should continue to examine carefully the meaning behind commonly used terms, the interests of those defining them, and the social contexts in which definitions are created. ■

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Contributors

S. G. Mars originated and designed the study, carried out the research and analysis, and led the writing of the article. P. M. Ling supervised the study, contributed to the analysis and interpretation of the data, and assisted with the writing. Both authors contributed to the review, revision, and approval of the final article.

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Human Participant Protection

This study was approved by the University of California, San Francisco, Committee on Human Research.

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