

ducts an in-depth calculation of the impact of consumption of the product on the consumer within his current and historical environment. Alcohol short-circuits this assessment by pharmacologically augmenting a signal indicating the difference between the predicted value of the reward and the observed reward, such that the circuit mistakenly calculates that it underestimated the value of consuming alcohol regardless of whether the drinker was helped or hurt as a result of drinking. As the brain corrects its 'underestimates', it increases expectations about the value of alcohol consumption. This leads the drinker to overvalue alcohol and thus favor working harder to obtain alcohol, even if the product provided no objective or subjective benefit to the user. While other products undergo strict evaluations of their worth by the brain's reward circuitry, alcohol 'cheats' by reprogramming the circuit to rate it as better than expected regardless of the actual effects on the user or original expectations.

These neurobiological results demonstrate that the alcohol industry's profits derive in part from a form of trickery. Their product includes a chemical that directly distorts the brains' decisions about how much work to devote to consuming their product—thus ensuring that people will pay more to get the product than the product is worth. Were an industry to play the same trick outside the brain (e.g. use a computer virus to reprogram purchasing systems to overcharge for their product), the practice would probably be declared illegal and governments would intervene. It seems unlikely that consumers or other producers would allow the alcohol industry this unfair advantage if they understood it.

In light of these effects, intervention by alcohol industries to prevent recommendation or implementation of regulation on alcohol marketing is, as Giesbrecht notes, unethical. Were alcohol purchasing governed by the same decision-making processes as all other products, then singling out alcohol for tighter regulation than other potentially unhealthy products would be unfair. However, alcohol bypasses brain processes that limit purchasing and consumption to levels commensurate with the consumers' personal benefit from the product. Thus, regulation of alcohol sales only compensates for pharmacological effects of alcohol on purchasing decisions. With this argument, whether alcohol benefits or harms the consumer is irrelevant; alcohol should be regulated to correct for purchasing induced by 'tricking' brain reward circuits. Policy-level intervention does not penalize alcohol industries for the harm that results from consumers' misuse of alcohol; it simply levels the playing field so that alcohol industries do not have an unfair market advantage. Punishing one group for another's mistakes is generally not appealing, but ensuring fair competition is a commonly held goal, and may make for a more persuasive argument for policy interventions.

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TO EDUCATE OR NOT TO EDUCATE: IS THAT THE QUESTION?

Norman Giesbrecht makes a compelling case for a dramatic reduction of conventional approaches to alcohol education, reflecting their ineffectiveness in altering the toll of alcohol [1]. The argument is familiar to students of tobacco control, where the empirical evidence on the ineffectiveness of school health education is by now voluminous [2]. Some would argue that the tobacco industry's enthusiasm for and support of educational strategies makes the empirical evidence redundant. The tobacco industry has supported youth antismoking education for over two decades [3]; its web pages now brazenly tout the dangers of smoking [4,5]; and several companies have devoted hundreds of millions of dollars to their own televised youth antismoking campaigns [6]. Would they do this if they believed such efforts were effective in cutting off the future supply of smokers? Of course not. Indeed, recent research concluded that Philip Morris' 'Think. Don't smoke' campaign actually increased youth's propensity to be open to the idea of smoking [6]. Would one expect less from the Masters of the Advertising Universe known as Marlboro?

As Giesbrecht observes, not all forms of education and persuasion are born equal. We should devote resources only to those that are demonstrably effective. Some forms clearly work. Substantial, sustained, professionally designed counteradvertising campaigns can reduce smoking (but note the critically important adjectives) [7]. The American Legacy's truth campaign has proved a useful tool to reduce youth smoking, quite possibly second in effectiveness only to increased taxation [8].

The original education and persuasion tools in the antismoking campaign in the United States worked quite well. In the early 1950s, articles in the *Reader's Digest* (most notably 'Cancer by the Carton' [9]) drew the pub-

lic's attention to the seminal research linking smoking to lung cancer [10]; adult per capita cigarette consumption declined sharply for the next 2 years [11]. The first Surgeon General's report on smoking [12], released in January 1964, caused a firestorm of publicity; per capita consumption plummeted 15% during the first 3 months thereafter. The difficulty in quitting smoking (and staying quit), combined with the resourcefulness of the tobacco industry in responding to the threat, diminished the impact. Nevertheless, by the end of the year consumption was 5% below its 1963 level, which proved to be its all-time peak. The televised Fairness Doctrine antismoking advertisements from mid-1967 to 1970 were associated with the first-ever 4-year decline in cigarette smoking [11].

One can find varying levels of effectiveness within a single form of education and persuasion. The warning labels on US cigarette packs go virtually unnoticed by smokers. However, the new warning labels popping up in countries such as Canada, occupying large proportions of the front and back of packs and including graphic illustrations of the damage wrought by smoking, may well be discouraging smoking [13].

Despite the myriad forms, when we speak of education our minds jump to school health education. This is where the research leads many thoughtful, and objective, observers to disparage 'education'. The best-designed interventions, well-funded and managed by knowledgeable, dedicated researchers, occasionally indicate a positive short-term impact [2]. They do not reflect the greater reality, however: harried, under-resourced teachers, ill-informed about tobacco, challenged with competing educational demands (for which they are better trained), who present antismoking units once, with no 'booster shots' in subsequent years. It is hardly surprising that such efforts are ineffective.

And yet, abandoning even this least empirically supported form of education could, in some contexts, prove unwise and counter-productive. Giesbrecht warns of the coming storm in India and China, where increasing alcohol and tobacco abuse will undoubtedly accompany increasing affluence. Were I the global tobacco policy czar, would I scrap school health education on tobacco in the developed world? Yes. Would I kill it off in India and China? Probably not. When the definitive sociology of western antismoking campaigns is written, I suspect it will feature something like this: a period of education and persuasion convinced the high-education classes to reject smoking. The political elites, these folks shaped their nation's antismoking norms and, subsequently, laws. As norms and laws changed, the behavior of the lower-education classes followed.

Education, in its various forms (quite possibly even including school health education), may have been nec-

essary to set the stage for the 'more productive' interventions we in tobacco control have come to know and love. There may well be a necessary (if not sufficient) role for the traditional forms of education in the world's emerging nations in which the worst of the epidemics of tobacco- and alcohol-produced disease and death have yet to be experienced.

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