

Smokeless tobacco and oral cancer, the curious history of a "fact"

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Background

Smokeless tobacco (ST) use (which currently refers primarily to snuff dipping) is widely believed to have health consequences similar to those from smoking, and in particular, to be a major risk factor for oral cancer.

This, it turns out, is not true. What is true:

Smokeless tobacco is so much less harmful than smoking that they should not even be compared, and the claims about oral cancer risk are not well supported.

As a result of the widespread misunderstanding, we are missing a **huge opportunity for harm reduction**: We should be encouraging tobacco users to use ST rather than cigarettes.

Sweden has seen smoking rates fall dramatically as ST has become more widely used. The result is the expected drop in smoking related diseases, including lung cancer rates less than half that of the U.S.

The Royal College of Physicians [2002] has suggested that it is time to consider such a harm reduction strategy. The number of other public health advocates supporting such a strategy is increasing.

Indeed, ST appears to offer a best-case scenario for harm reduction: Even for the worst plausible health effects of ST, the reduction in risk for life threatening disease compared to smoking is clearly more than 90%, and quite possibly more than 99%.

The research leaves no room for doubt about the reduction in risk. Studies have looked for associations between the use of ST and a variety of cancers and other diseases. The only claim that has stuck is that ST causes oral cancer. Even if the worst plausible claims about that association were true, the risk from ST would still be only about 1% of that from cigarettes, and harm reduction would still be a promising strategy.

But the evidence is far from providing clear support for even the claim of oral cancer risk.

Curious

The belief that ST is a major risk factor for oral cancer (OC) is a major impediment to a harm reduction strategy. This should not be – even with a high relative risk for OC, the total absolute risk for ST compared to cigarettes would be small (OC has a low absolute risk; smoking causes many diseases at high absolute levels). Nevertheless, the belief in that high relative risk makes it very difficult to promote harm reduction, so it is worth carefully examining the basis of that belief.

The current best evidence (see below) actually provides strong support for the claim that ST causes very little or zero risk for OC. The strongest scientifically legitimate claim that can be made based on the evidence is something like, "ST might cause OC, and a few of the studies on the topic have found a positive association" or perhaps better, "the evidence does not let us rule out the possibility that there is some small risk of OC from ST."

How has this translated into a universal belief that the risk is large and clearly established?

History

In 1986, the U.S. Surgeon General released a report declaring that ST causes OC. The year before, the WHO's International Agency for Research on Cancer (IARC) made a similar claim as part of a broader report. These claims were based on case reports, a single toxicology study (many other toxicology studies found no link), a collection of very underpowered epidemiologic studies (some of which provided weak support for the claim, but most of which had major flaws, such as not controlling for smoking and drinking), and a single adequately powered epidemiologic study [Winn, et al., 1981].

It seems unlikely the Surgeon General and IARC reports would have been issued had it not been for the Winn study. Thus, the official declarations that there is a causal link were effectively based on a single study.

Furthermore, an oft repeated position of government and other public health officials is that the matter was settled in 1986, and there is no need to revisit it, implying that our belief should be based on the one study in perpetuity, whatever other evidence might exist.

The Winn study was conducted in the 1970s based on exposure to a somewhat different product (dry snuff from the early- and mid-20th century, rather than modern moist snuff, which contains much lower levels of the chemicals that are believed to be carcinogenic) and a non-representative population (mostly elderly Appalachian women). But most importantly, it was just one study with clear limitations.

Fact

Since the publication of the Surgeon General's report, there has been substantially more new epidemiologic research on the subject than existed in 1986, and it tends to support the claim that there is little or no association. In particular, the two high powered and high quality published studies [Lewin et al., 1998; Schildt et al., 1998], which study an exposure much more relevant to current products than Winn, provide strong support for the *lack* of an association.

Furthermore, several of the studies that purport to show a positive association do so by picking out a non-representative subgroup with an elevated relative risk, and the Winn article exaggerates its findings through the choice of subgroups [see Phillips's poster, "Publication bias *in situ*," tomorrow].

It is not necessary to debate the accuracy of how the studies reported their data or the relative quality of different studies: Even if the Lewin and Schildt studies did not exist and the studies with positive findings were taken at face value, it might be that most of the evidence would be seen as supporting the claim, but

even then the evidence would be too thin to make definitive statements and declare the matter settled.

"Fact"

Yet despite the majority of evidence supporting a conclusion that there is very little or no risk, the claim of a large causal association is taken as fact among experts and lay people. The authors of this poster have told hundreds of people, including educated lay people, clinicians, and public health experts, about what the literature actually says about ST and OC. Only one (a practicing dentist) was aware of the truth; the rest found it quite surprising. Indeed, the authors were unaware of the truth until each started doing research in the area.

The "fact" is clearly well established.

It is not difficult to understand why it is so well established. As anyone who follows current national politics knows, if you repeat a claim often enough, regardless of a lack of evidence to support it, people start to take it as fact. The many voices making the claims about ST and OC create an illusion of overwhelming evidence. Government agencies, health and medical organizations, and advocacy groups present the OC risk as fact and typically suggest that the resulting risk makes the health implications of ST use comparable to those of smoking.

Until a year ago the CDC's website contained the blatantly false claim that the answer to "Is smokeless tobacco safer than cigarettes?" is " NO WAY!" [Kozlowski and O'Conner, 2003]. Kozlowski and O'Conner report that (thanks to their challenge), CDC changed this from literally false to merely misleading. They kept the answer (and its punctuation), but changed the question to "Is smokeless tobacco safe?" Kozlowski and O'Conner go on to report that at the time of their writing (and, as we found in our web search, at the time of this writing), the Substance Abuse and Mental Health Services Administration (part of U.S. DHHS) website still contained the statement "Question: Isn't smokeless tobacco safer to use than cigarettes? Answer: No."

Why do these misleading statements seem to dominate public perception? A reading of the popular, policy, and scientific literature suggests that a few opinion leaders have a pattern of citing only each other, the Surgeon General's report, and Winn, while other organizations cite these sources and the opinion leaders. The illusion of broad and deep evidence, then, all goes back to the findings of a single study and systematically ignores the strong evidence to the contrary.

Study of Information Available on the Internet

To examine the extent to which the many available sources of popular information trace their claims to a small number of sources and systematically ignore the larger body of contrary data, we performed a systematic review of popular sources of information. This review looked at websites that implicitly purport to deliver a public service message about the risk of ST and health, in particular OC. While websites do not contain all popularly available information, we consider this a fairly comprehensive review for several reasons:

- Most Americans who would do a proactive search for information on this topic would probably start with a web search.
- Most organizations who have a stated position on the topic, particularly those actively trying to influence popular opinion, have a web page that reflects their claims. (We could not identify any major players on this topic who do not.)
- Even if the web search were to miss major sources of popular information, there is no reason to believe it is unrepresentative of the total body of popular information.

Study Methods

We performed a Google search for [tobacco AND cancer AND (smokeless OR snuff OR dip OR spit OR chew OR chewing)], the latter disjunction covering most of the synonyms for "smokeless". We conducted the search on 3 May 2003 and stored the results offline so that we were working from a single permanent list.

The search yielded 124,000 page hits. Google's filter (which eliminates similar pages, including most (but not all) similar multiple page hits at a single domain, as well as many less popular pages that are not good matches to the search terms) narrowed this to 763 hits. Using the filter, an algorithm that we cannot know the exact details of, to narrow the search to a manageable quantity means that we cannot know the exact sampling mechanism.

The exact sampling properties are not important for our purposes, and we have no reason to believe it produced an unrepresentative picture of the information available. (Any unrepresentativeness would have to be quite large to change the results, given how clear they were.) Any unrepresentativeness would not be among the topic results. Since the population includes the top results from the Google search (and far more of them than any sane person would actually read), the sites in our population probably include almost every site someone would

find if they did a search. Our mental model of the search process was that we were imitating the information gathering process that a typical educated, non-expert American might use. Such an individual would likely only look at a few or maybe a few dozen of the first sites coming up on a search engine, so our population is almost certainly a superset of this.

We were interested in public service sites (as implicitly self-defined, without an attempt on our part to judge what is a genuine public service) which state an organization's own opinion about ST and OC. Thus, our protocol eliminated hits that were commercial (selling tobacco products or methods for quitting tobacco); news sites (including newspaper-type sites and clipping services); search-engine-type sites and others that just provide links; sites from South Asia (because the products dipped there contain other major ingredients have a fundamentally different epidemiology from Western moist snuff); or scientific literature (journals and conference abstracts).

Eliminating these and the double counting from organizations that were duplicated (some domains that showed up more than once on the search list; local chapters of national organizations; some organizations with multiple websites), left **366 domains**.

For each of these, we searched the site (the entire domain, not just the page hit from the search) for statements about the health effects of ST and collected the results. To search within a domain, we used whatever strategies appeared appropriate for that particular site, ranging from looking at every page we could find a link to (for sites that focused on ST and health), to following all relevant text or index links from the page hit from our search (for sites that covered multiple topics), to using internal (site-only) search engines (for large domains with myriad information, such as American Cancer Society (ACS) or NCI). The sites were reviewed as they existed at the time, with the review taking place between 4 May 2003 and yesterday.

We identified any stated sources for those claims, including other organizations and specific documents. We expected to find that, to the extent that sites identified their sources, they would trace back to the aforementioned publications and a few opinion-leading organizations (NCI, ACS), widely cited by other sites.

We also identified any statements that ST was substantially less harmful than smoking or that claims about it causing OC are less than clearly established to estimate the portion of the total that these represent. Additionally, we looked for numbers or other specific scientific claims that could be traced to a specific

source. Finally we looked for anything we judged to be an interesting and unexpected pattern of information.

Result: Guilt by association

The clearest result of our review is confirmation of the impression that the risk from ST is widely conflated with the risk from cigarettes.

Almost every site had one version or the other of the above "NO WAY!" statements.

Many stated, in one way or another, that ST is as dangerous as (or occasionally even more dangerous than) smoking. This is clearly false.

The vast majority of sites offered a version of the claim that "ST is not a 'safe' alternative to cigarettes." Notwithstanding the lack of compelling evidence about any disease association, this is likely true (almost nothing is perfectly safe, after all). However, when the statement is made without any caveats about how much *safer* ST really is or about the very thin evidence of any risk from ST all, the message is that ST and cigarettes are comparably dangerous. Making a literally true statement that will inevitably cause the audience to believe something false is functionally and ethically equivalent to making the false statement.

Result: A consistent party line

We found realistic information about the risks from ST, either with regard to OC or more generally, at only a few sites. The message from over 98% of the sites in our population failed to acknowledge the low risk compared to smoking, let alone the limited evidence that there is any risk of life threatening disease at all.

This notably includes all government sites (if we set aside a few scholarly or technical reports that are posted at those sites but not likely to be found in a casual search for the government's position), all the popular medical information sites (which appear to be major, well-trusted sources of information), and most of the scientific authorities.

(We offer the caveat that we may have measurement error due to possibly not reading every relevant page of a website. We are, however, unlikely to have missed any statement that was prominently displayed as part of an organization's main message about ST.)

Exceptions to the party line

There were a small number of websites that provided accurate and balanced information, noting that the link to OC is equivocal, the overall health risk from ST is limited, or harm reduction is a viable strategy. (These are represented in purple in Figure 2.)

Two were thanks to the leading researcher on ST as a harm reduction tool, Brad Rodu, Professor at the University of Alabama at Birmingham: the UAB site and his personal domain (www.drrodu.com). Rodu has written extensively on ST and harm reduction, and has been recommending for a decade that smokers switch to ST. Any balanced presentation of information ought to cite him and his main body of work. Almost no one does (see below). The drrodu.com site is arguably commercial in that it is aimed at helping smokers quit and advertises his book that advocates harm reduction using ST for "inveterate" smokers; however, since the site is aimed primarily at selling the idea rather than the book we chose to include it in our population.

The UAB and drrodu sites provide extensive balanced information, aimed at a popular audience. However, they appeared as the 408th and 625th entries on our list of 763, indicating that they are not "popular" (in particular, are not linked to by many other sites), and that they would not likely be viewed by someone following links from a search. (Most people searching the web look at only the first ten or maybe twenty matches for a search, so the chance of these sites being among those a curious layperson would find is small.)

An exact accounting of other university sites is difficult. Various accurate reports by university researchers exist in the literature, and many are available on the web, though often as scientific papers or technical reports not meant for popular consumption. Our search strategy found such papers at Loyola University and UCLA, though neither was the particular page hit that Google listed and required performing a search within the site. It seems unlikely these would have been found by an interested individual.

Among non-university sites providing balanced information, the highest in our list, at number 120, was the American Council on Science and Health, which published a point-counterpoint, with one side written by Rodu and Philip Cole.

At number 491 was ASH (Action on Smoking and Health) from the U.K., an anti-smoking organization whose policies include a support of harm reduction. In particular, that site contains a recent report, written by the ASH director and other European public health experts, calling for a revision of current European Union policies toward ST (which is partially banned in the EU) and replacing it with better, evidence-based regulation. The report includes a particular emphasis on the Swedish experience and the potential for harm reduction.

A few other balanced sources that do not meet our inclusion criterion can be found on the web (a handful of news articles that quote people with conflicting opinions, including several from Rodu and from last week's hearings in the U.S. House of Representatives on harm reduction; a few scholarly papers). But it does not appear that there is a large body of popularly-accessible balanced information that was lost because of our exclusion criteria.

That's it. In a result that astonished us, even given our prior knowledge about the pattern of misinformation, it was almost impossible to find balanced information without already knowing where to look for it.

Result: A large edifice on a very small foundation

The large number of organizations making similar statements might sound like a large body of evidence, until we look at the sources for their claims.

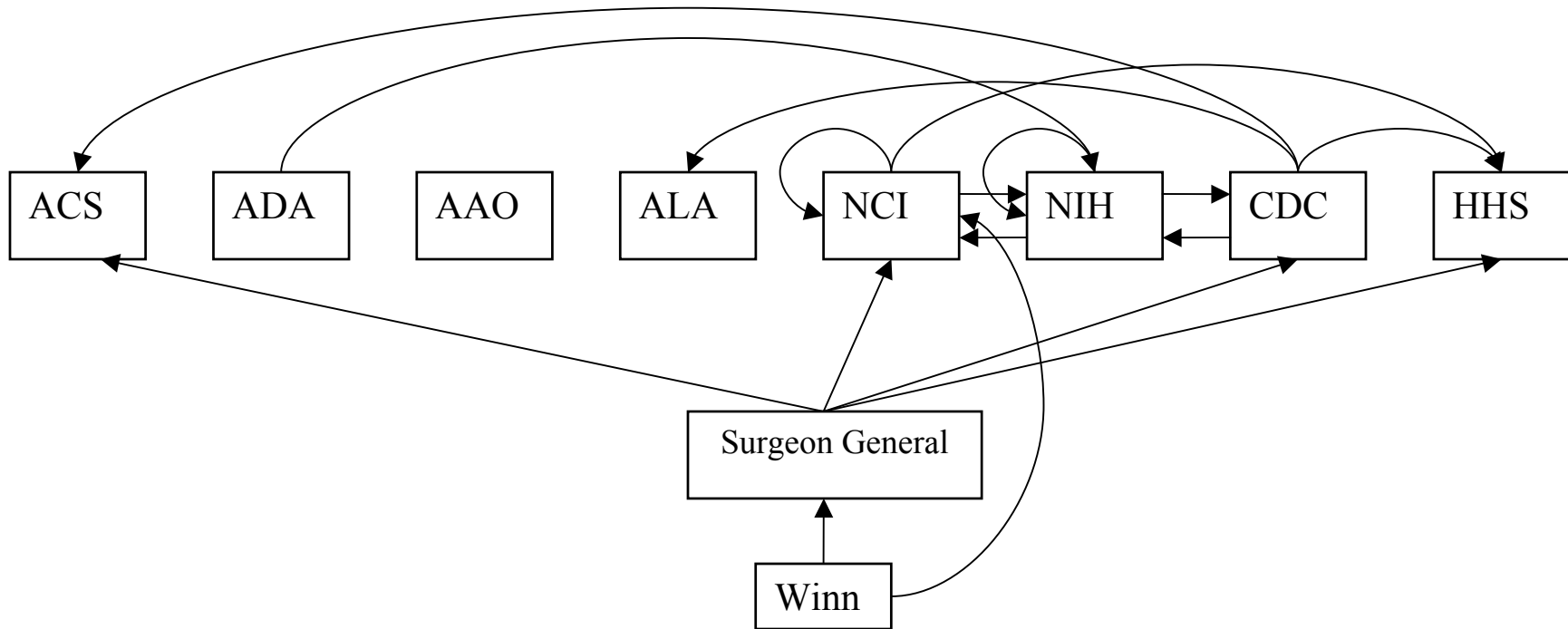
We identified 9 opinion leaders, which we defined as any source (organization or document) that is cited by 5 or more websites in our population. (We originally considered 3 as the cutpoint, but we found that those with 5 or more citations clearly stood out as the genuine opinion leaders and counts of 2 vs. 3 vs. 4 were often ambiguous.) The opinion leaders are listed by name in **Figure 1**, along with arrows representing references to the websites of other opinion leaders.

Observations:

The pattern of mutual inter-referencing among the most-cited sources is clear.

The opinion leaders all deliver a strong anti-ST message, with no acknowledgment that ST is much less harmful than smoking, that the link to OC is far from proven, or that it has not been strongly linked to any other life-threatening disease.

Figure 1



ACS: American Cancer Society

ADA: American Dental Association

AAO: American Academy of Otolaryngology

ALA: American Lung Association

NCI: National Cancer Institute

NIH: National Institutes of Health

CDC: Centers for Disease Control and Prevention

HHS: U.S. Department of Health and Human Services

Surgeon General: 1986 Surgeon General's Report and other references to 'the Surgeon General'

Winn: Winn et al. [1981]

Notes on the chart and definitions of opinion leaders:

Winn (representing Winn et al. [1981]) does not actually qualify as an opinion leader. Even though the paper is substantially responsible for the SG report and most of the reported RR numbers trace to it (see below), Winn and that paper are specifically mentioned only a few times. We include her/the paper in Figure 1 to emphasize the ultimate source of much of the information.

We found mentions of Rodu's work at six sites in our population, but several of these do not qualify as citations. One was his personal site (and so effectively is the representation of him/his work). Two do not really reference his body of work: one uses him as a source for a single statistic and the other mentioned him only to insist that his opinions are wrong, without presenting his arguments. One of the other websites was UAB, which is arguably another presentation of Rodu's own work. The remaining citations to him are from ASH and the American Council on Science and Health. (Interested readers can find several of his op-eds, including one from this week in the Washington Times, and his recent Congressional testimony on the Web, but none of these showed up in our search.)

The proper level of subdivision of the U.S. government opinion leaders was ambiguous; in particular, some websites reference NCI, some NIH, and a very few reference other specific Institutes. We chose to list NCI as an opinion leader because it was frequently cited by name. We then defined all the rest of NIH as a

single opinion leader, though we considered each Institute an individual site for other parts of our analysis. NCI referencing itself in Figure 1 represents the website citing the position of the Institute as an independent authority. NIH referencing itself represents various Institutes' websites' citing themselves or other Institutes. Because references to the Surgeon General were often ambiguous (not clear if they were to the 1986 report or a particular SG), we consolidated these into a single entity.

Note that when an organization or document is referenced it does not, of course, necessarily refer to anything that appears on the web. Thus, the boxes in the figures need to be thought of as representing the website for most purposes, but the organization or document itself when they are a source – i.e., at the origin of an arrow. For example, the several references to the AAO are clearly not to its website, which contains very limited information.

Our prior expectations about who opinion leaders would be also included the American Medical Association, the American Academy of Pediatrics, and WHO/IARC but none of these turned out to be opinion leaders by our definition. WHO might have qualified but for the elimination of sites that dealt primarily with South Asian products.

Figure 2 includes all the websites in our population. Of these, 128 identified at least one specific source for their claims. All such citations are represented by lines in Figure 2. The opinion leaders and other sources of information appear at the bottom (citations already represented in Figure 1 are omitted).

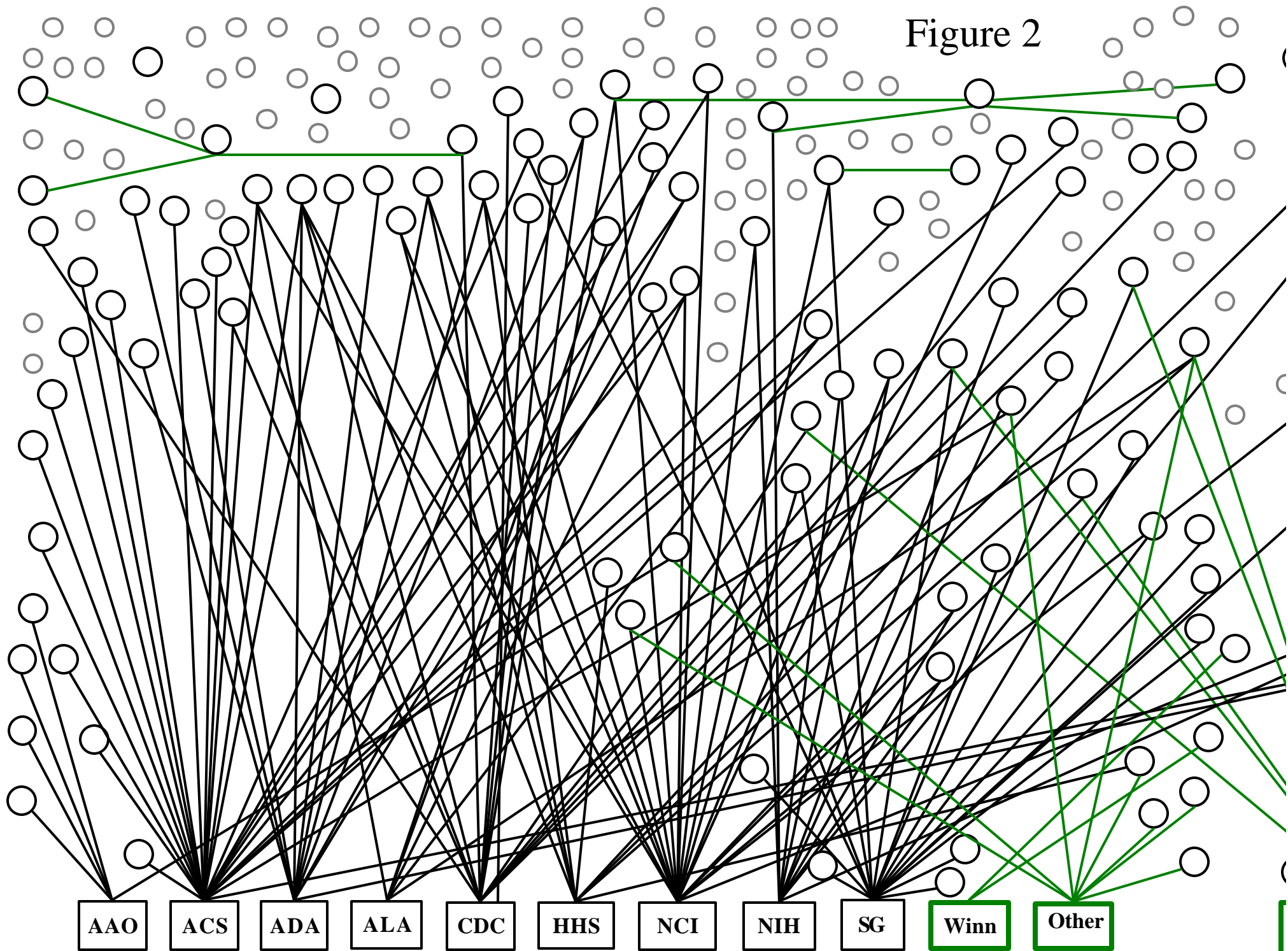
The circles represent the websites in the population.

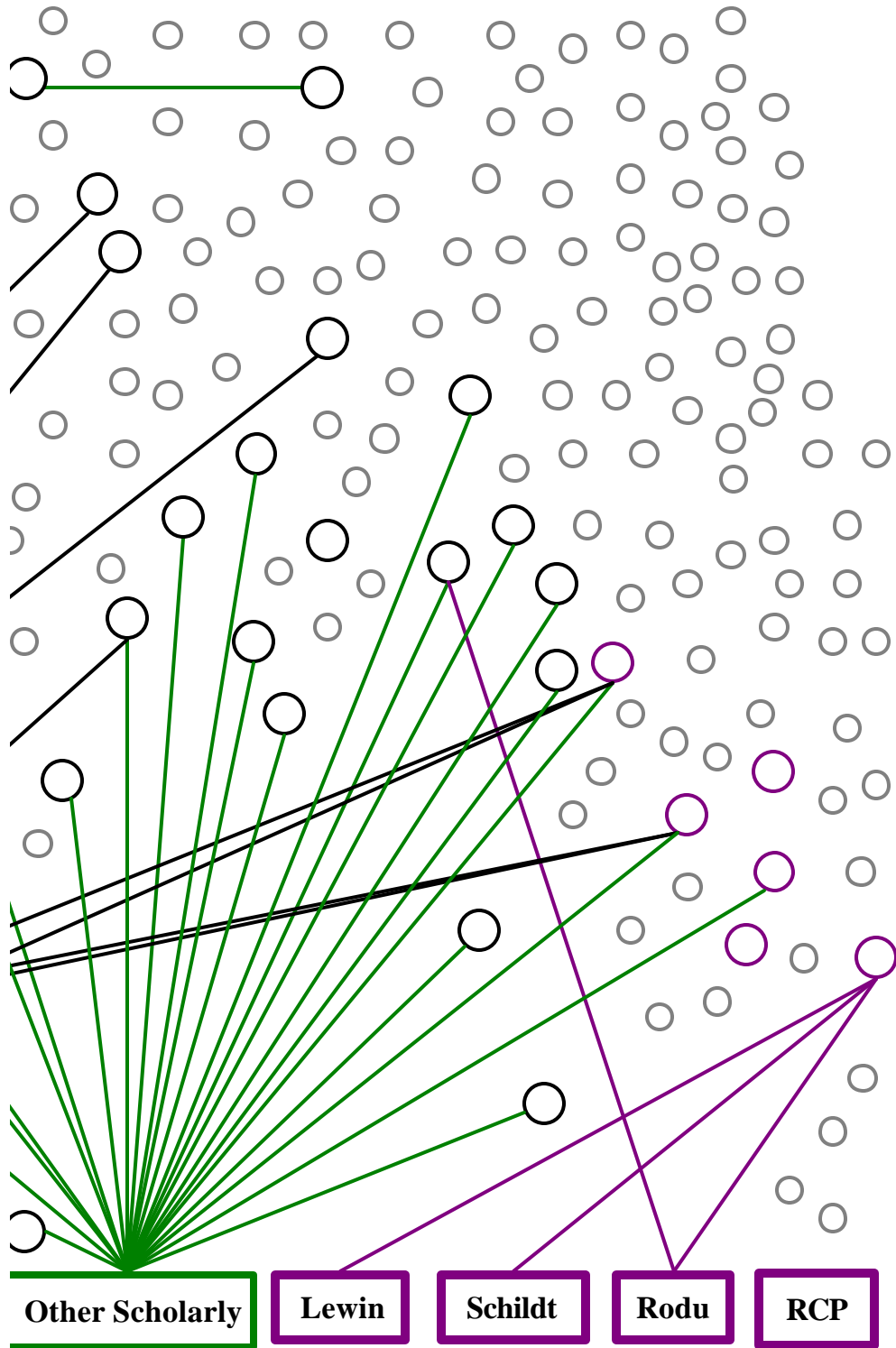
Black lines from circles represent references to one of the opinion leaders.

The purple boxes on the right hand side of the figure represent sources that should be cited to provide a balanced picture of the OC risk (and other risks) from ST. They represent the Lewin et al. and Schildt et al. papers, Rodu and his writings, and the recent report by the Royal College of Physicians. (All of these are described above.) The site that references several of these is ASH. The other line to Rodu is UAB.

Green lines represent references to other sources, including organizations that are represented by one of the website circles in the figure, a box representing all other scholarly writing (journal articles other than Winn, Lewin, Schildt, Rodu), and "other" (all identifiable references not fitting into any of the above categories, generally organizations that did not have websites in our population).

Figure 2





Result: Two popular myths

Popular myth: the relative risk is 50

About one fifth of the sites contain an actual number for relative risk, with the prevalence higher among the more popular sites. Some give a value of 4, which is the main number reported from the Winn study. (Sometimes this is presented as a 300% increase, which probably sounds larger to some readers.) This is the largest number that could be considered consistent with the literature, and it could be legitimately offered as a worst plausible case. Not surprisingly, no caveat that this is a worst-case value appears in the websites that give the number. Other websites contain a variety of RR numbers, ranging from 1.5 to 28. The origins of most of these are not clear.

The most popular claim, appearing in a majority of the sites that contain a relative risk number, is a 50-fold increase in OC from ST use. This is a very curious number to be so widely quoted since such a high relative risk falls outside the confidence intervals for even the pessimistic findings about risk from ST. More importantly, a true relative risk of that magnitude would be impossible to miss, yet most studies have not found an elevated risk. Most importantly, given the prevalence of exposure, it would mean that a large

majority of U.S. OC cases should be ST users, which is not close to being the case.

This number is a misinterpretation of one number from the Winn paper. The OR (which is actually 47.5) is for nonsmokers with ≥ 50 years of exposure, restricted to cases with cancer at two anatomic subsites, further restricted by eliminating subjects not meeting certain data requirements. These restrictions eliminate all but 2 of the unexposed cases and thus create a very high OR [see tomorrow's poster, "Publication bias *in situ*," for more information].

Why this misinterpretation is so popular is not clear to us. U.S. Health and Human Services seems to have actively contributed to it: Former Secretary Louis Sullivan has made public statements that include this number and the Substance Abuse and Mental Health Services Administration (in the pamphlet quoted from their website, above) states "Smokeless tobacco users are 50 times more likely to get oral cancer than non-users." The NIH National Library of Medicine's Medline Plus (consumer information) site also contains the statement. However, DHHS is not alone among authorities making this claim – unqualified statements of a relative risk of 50 also appear on at the American Cancer Society and American Dental Association sites.

Popular myth: 75% of attributable risk for OC is ST

Some advocates claim that 75% of U.S. OC cases are attributable to the use of ST, a wildly incorrect statement. Since the total portion of OC cases that even use ST is an order of magnitude lower than this, the claim is clearly absurd. (It is, however, roughly consistent with the 50-fold relative risk, though since it has a completely different history (below), this seems to be a coincidence.) This claim seems particularly popular at clinical dentistry sites. At least one report at the WHO site included a version of this claim, though it does not appear to be an official position of the organization.

This myth seems to result from a series of (willful?) misinterpretations of Blot et. al [1988, p. 3282], who reported that "tobacco smoking and alcohol drinking combine to account for approximately three-fourths of all oral and pharyngeal cancers in the United States." In some sources, including a widely distributed ACS pamphlet from the 1990s, there is a statement attributing the risk to alcohol, smoking, *and smokeless tobacco* (or snuff use specifically). This is, of course, a literally true interpretation of the original statement (as it would be if bubble gum or orange juice were also added to the list), but the way in which it is misleading is obvious. (Also, the "approximate three-fourths" usually morphs into "75%", the overstated precision of which tends to make the finding sound more precise and thus certain.)

Many statements then go a step beyond the misleading conjunction and attribute the 75% to ST alone (or sometimes in conjunction with alcohol, but not smoking). This is a very curious distortion: from a published result that leaves little attributable risk for ST to a claim that ST accounts for most of the attributable risk.

Conclusions

Widespread repetition of a claim can create a perception among both lay people and experts that the claim is clearly true. It is easily shown that support for the claim that ST causes OC is, at best, highly equivocal. But the repetition has created a "fact".

A review of hundreds of sources of popular information confirms our prior impression that a small amount of actual information has been turned into a flood of claims, while the larger amount of information that shows that these claims are misleading is ignored.

It is difficult to interpret this pattern as anything other than a systematic effort by governmental and other authorities to perpetuate misinformation. This is inexcusable.

As the title of this poster points out, this widespread misinformation is an interesting phenomenon in the history of science. It is also killing people.

The "fact" has obscured the indisputable truth that ST is much less harmful than cigarettes. Millions of smokers do not know that they could switch to ST and dramatically reduce their chances of dying from their tobacco use.

The public health party line about tobacco can be characterized as "quit or die". The truth about ST makes clear there is another option. Health officials, particularly those in public service, have an affirmative ethical duty to make the truth known, both because it is the truth and because it would save lives.

It is difficult to justify keeping the truth from people, even when it might be harmful; it is clearly unjustified when it would be beneficial. There are no credible claims that telling people the truth would lead to net harm. [For more information on these points, see recent testimony by the first author and by Rodu, and other recent writing by Rodu.]

Last week, two U.S. House of Representatives committees held hearings that dealt with the possibility that ST could be used in a harm reduction strategy. However, Surgeon General Carmona testified that "There is no significant scientific evidence that suggests smokeless tobacco is a safer alternative to cigarettes," and went on to say, without nuance or caveat, "Smokeless tobacco does cause cancer." The hearings might be a positive development, but without concerted action by public health leaders to promote harm reduction, it is quite likely that someone searching for information a year from now will find the SG's statements and nothing else from these hearings.

REFERENCES

Blot WJ, McLaughlin JK, Winn DM, Austin DF, Greenberg RS, Preston-Martin S, Bernstein L, Schoenberg JB, Stemhagen A, Fraumeni JF. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Research*. 1988;48:3282-3287.

International Agency for Research on Cancer. Tobacco habits other than smoking; betel-quid and areca-nut chewing; and some related nitrosamines. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, vol. 37. Lyons: World Health Organization, International Agency for Research on Cancer, 1985.

Kozlowski LT, O'Connor RJ. Apply federal research rules on deception to misleading health information: An example on smokeless tobacco and cigarettes. *Public Health Reports*, 2003;118:187-192.

Lewin F, Norell SE, Johansson H, Gustavson P, Wennerberg J, Bjorklund A, Rutqvist LE. Smoking tobacco, oral snuff, and alcohol in the etiology of squamous cell carcinoma of the head and neck; a population-based case-referent study in Sweden. *Cancer*. 1998;82:1367-1375.

Phillips CV. Written testimony for hearings by U.S. House Subcommittee on Commerce, Trade, and Consumer Protection and U.S. House Committee on Government Reform, 3 June 2003 (available in the Congressional Record or from the author).

Rodu B. News you can't use. Op-ed, *The Washington Times*, 8 June 2003 (available at washingtontimes.com).

Rodu B. Prepared witness testimony, U.S. House Subcommittee on Commerce, Trade, and Consumer Protection, 3 June 2003 (available at energycommerce.house.gov).

Royal College of Physicians. Protecting smokers, saving lives; the case for a tobacco and nicotine regulatory authority. London: Royal College of Physicians, 2002

Schildt EB, Eriksson M, Hardell L, Magnuson A. Oral snuff, smoking habits and alcohol consumption in relation to oral cancer in a Swedish case-control study. *International Journal of Cancer*. 1998;77:341-346.

Surgeon General's Advisory Committee on the Health Consequences of Using Smokeless Tobacco. The health consequences of using smokeless tobacco. U.S. National Institutes of Health Publication No. 86-2874. Washington: United States Public Health Service, 1986.

Winn DM, Blot WJ, Shy CM, Pickle LW, Toedo A, Fraumeni, JF. Snuff dipping and oral cancer among women in the southern United States. *New England Journal of Medicine*. 1981;304:745-749.