

# '95% less harmful'? Exploring reactions to quantitative modified risk claims for snus and e-cigarettes

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## ABSTRACT

**Objectives** Studies examining perceptions of 'modified risk tobacco product' (MRTP) messages for e-cigarettes and smokeless tobacco have indicated consumers want statistics and quantification of harm reduction. However, limited research exists on reactions to quantitative MRTP messages.

**Design** We conducted 12 focus groups in the USA in 2019—6 focused on e-cigarette messages and 6 on snus messages. Eight groups were with current smokers (ages 21–66) and four with young adult (ages 18–25) non-smokers (n=57). Participants discussed messages stating that use of snus and vaping products have been estimated by scientists to be about 90% and 95% less harmful than smoking cigarettes, respectively.

**Results** Several participants agreed the messages strongly communicated that the products are less harmful than cigarettes, were attention getting and could be 'convincing'. However, participants expressed scepticism about the source and accuracy of the stated figures, and some noted the claims could be misleading and attractive to young people. Comments also reflected some claim misunderstandings (eg, that e-cigarettes only pose a 5% chance of harm). Participants also agreed that stating e-cigarette risks 'are unlikely to exceed 5% of cigarette smoking harms' was confusing and less impactful than the '95% less harmful' wording.

**Conclusions** Quantitative claims suggesting high levels of reduced risk when comparing e-cigarettes or smokeless tobacco/snus relative to cigarettes may be successful in gaining attention and being persuasive for some audiences, particularly, if from more credible sources. However, message developers, users and evaluators should be mindful of message limitations and aim to mitigate unintended consequences.

## INTRODUCTION

Although quitting all tobacco and nicotine products is the safest way to reduce harm from smoking, harm reduction approaches may include encouraging smokers unable or unwilling to quit all nicotine products to switch to less harmful alternatives.<sup>1–3</sup> Snus and electronic cigarettes (or 'e-cigarettes') are two types of international products considered to have reduced or modified risks (MR), and thus potential for harm reduction (ie, be potential 'MR tobacco products').<sup>2–6</sup> Snus is a type of low nitrosamine smokeless tobacco (SLT) long used in Scandinavian countries and has been associated with lower risks for several diseases relative to smoking, including lung cancer, oral cancer, respiratory disease and heart disease.<sup>6–13</sup> E-cigarettes are newer products for which potential long term health

risks are not known, but studies and reviews have suggested that smokers who completely switch to e-cigarettes can reduce their exposure to numerous toxicants, suggesting their harm reduction potential.<sup>5 14–16</sup>

However, research across several countries also suggests that many smokers mistakenly perceive these products to be as harmful as cigarettes rather than less harmful, prompting calls for better relative-risk communication.<sup>17–24</sup> In some countries, 'MR' messages about non-combusted products are already in use or being considered.<sup>25</sup> For example, in the US one snus brand has received regulatory authorisation to make a claim about reduced disease risks<sup>6</sup> and claims for other smokeless brands are under review.<sup>26</sup> Health Canada previously commissioned research to study potential claims for authorised use by e-cigarette companies.<sup>27</sup> And in the UK, Public Health England (PHE) has included the message that e-cigarettes are 'at least 95% less harmful than smoking' in public statements and health campaigns.<sup>28 29</sup> The quantitative MR message used by PHE is notable given that previous qualitative studies have suggested consumers desire specific information in MR messages, including statistics and quantification of harm reduction magnitude.<sup>27 30–32</sup> Although a few qualitative studies have begun exploring some quantitative claims about reduced exposure to constituents (eg, 'cigarette smoke contains nine times more toxic ingredients than e-cigarette vapour'),<sup>27 30</sup> we are not aware of any qualitative studies that have examined consumer understanding and perceptions of quantified MR claims (such as the '95% less harmful' message).

In this study, we explored reactions to quantitative claims which stated that using snus and vaping products have been estimated to be 90% and 95% less harmful than cigarette smoking, respectively, as has been suggested in previous international expert review studies,<sup>3–5 33 34</sup> and similar to the e-cigarette message used in the UK. Two previous expert panels estimated the risk of low-nitrosamine SLT (such as snus) to be about 5%–10% as harmful as cigarettes (considering a range of harm including morbidity, mortality and dependence),<sup>4 33</sup> and one of these estimated e-cigarettes to be about 4% as harmful.<sup>4</sup> A 2016 review by the Royal College of Physicians in the UK supported this e-cigarette estimate and stated that the long term health risks associated with e-cigarettes 'are unlikely to exceed 5% of those associated with smoked tobacco products.'<sup>3</sup> A 2015 report commissioned by PHE stated that 'there is a need to publicise the current best estimate that



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using e-cigarettes is around 95% safer than smoking,<sup>34</sup> and a 2018 PHE follow-up review concluded that ‘stating that vaping is at least 95% less harmful than smoking remains a good way to communicate the large difference in relative risk unambiguously so that more smokers are encouraged to make the switch from smoking to vaping.’<sup>5</sup>

To contribute to the literature on this topic, we examined perceptions of these quantitative MR statements with adult smokers, the main intended audience of MR messages for harm reduction purposes. We also included young adult (YA) non-smokers (following recommendations for MR claim research)<sup>35 36</sup> given that exposure to such messages may produce no harm reduction benefit for this group while potentially introducing harm if messages are misperceived as suggesting those products are safe and lead to product use. Research also suggests younger non-smokers are more likely to initiate MR products than older non-smokers.<sup>37 38</sup> This study was conducted in the USA, where snus is available but infrequently used to date<sup>39 40</sup> and where e-cigarettes have helped some smokers quit,<sup>14 41</sup> but are most frequently used by young people.<sup>14</sup>

## METHODS

### Participants and recruitment

We explored reactions to the 90%/95% claims as part of a broader focus group study that also examined other MR messages.<sup>32</sup> Six groups focused on snus claims and six on e-cigarette/vaping claims (12 groups total). Within each set of six groups, four groups included adult current smokers (ie, smoked 100 cigarettes and now smoke every day or some days) and two with YA non-smokers. Given discussion of multiple messages, groups sizes were kept small (with 3–6 participants per group)<sup>42 43</sup> (N=57 participants, 32 smokers, 25 YA non-smokers). Across all groups we aimed to recruit participants who were not current regular (ie, daily) users of e-cigarettes or SLT, although they may have used these in the past or be occasional users. Due to recruitment error, one smoker in the snus groups did indicate daily SLT use and one smoker in the e-cigarette groups indicated daily e-cigarette use. Another smoker in the e-cigarette groups reported occasional e-cigarette use during screening, but daily use during the session. Inclusion criteria also included being at least 18 years old and able to read and speak English.

Groups were held on campus of a large northeastern US public university. Participants were recruited from postings on a website (Craigslist), University employee listservs, and flyers in local neighbourhoods. Groups were conducted between August and October 2019.

### Study procedures and analyses

In each group, participants viewed and discussed three main ‘base’ claims about snus or e-cigarettes (and some variations of each) one at a time. Messages were presented to participants as text-only statements on an overhead projector and in individual packets. When presented, messages were not attributed to any particular source, and participants were told at the beginning of the session that the statements they were going to view could potentially be used in channels like tobacco company advertisements as well as educational campaigns by health related organisations. The first base claim was a qualitative MR claim indicating that switching to snus can ‘greatly’ reduce risk for several diseases, or that switching to e-cigarettes can ‘greatly reduce harms to your health’. The second base claim was a modified exposure claim indicating that snus or e-cigarettes contain fewer harmful chemicals than cigarette smoke. Responses to these

**Table 1** Quantitative modified risk (MR) claims discussed during focus group sessions

Message type	Snus groups (n=6)	E-cigarette groups (n=6)
Quantitative MR base claim	If you smoke, consider this—scientists have estimated that using snus exclusively is about 90% less harmful than smoking cigarettes.	If you smoke, consider this—scientists have estimated that using vaping products exclusively is about 95% less harmful than smoking cigarettes.
MR claim variations		
Use of lower no	Ask: What if this didn't say 90% but a lower number (eg, 30%? 50%–70%?) Asked in: ▶ Three smoker groups. ▶ 1 YA non-smoker group.	Ask: What if this didn't say 95% but a lower number (eg, 30%? 50%? 70%) Asked in: ▶ Four smoker groups. ▶ 1 YA non-smoker group.
With reference to more specific type of risk reduction (ie, death)	Scientists have estimated that using snus exclusively is about 90% less likely to result in death from tobacco use compared with smoking cigarettes. Asked in: ▶ Two smoker groups. ▶ 1 YA non-smoker group.	Scientists have estimated that using vaping products exclusively is about 95% less likely to result in death from tobacco use compared with smoking cigarettes. Asked in: ▶ Two smoker groups. ▶ 2 YA non-smoker groups. 95% less likely to result in death from a tobacco-related disease compared with smoking cigarettes. ▶ Asked in two smoker groups.
With alternative framing (e-cigarette smoker groups only)		If you smoke, consider this—scientists have estimated that the harms of using vaping products exclusively is unlikely to exceed 5% of the harm of smoking cigarettes. ▶ Asked in all four smoker groups.
YA, young adult.		

messages have been described elsewhere.<sup>32</sup> The present analysis focuses on the third base claim discussed, which, depending on product group, stated that scientists have estimated that using snus or vaping products exclusively is about 90% (snus) or 95% (vaping) less harmful than smoking cigarettes (see table 1).

To facilitate discussion, participants were asked to rate this message on a scale of 1–10 about (1) how clearly it communicated that the product is less harmful than smoking, (2) whether it is clear and easy to understand, (3) how clearly it communicates that there are still harms associated with the product and (4) how much it would encourage them to completely switch to the product (in smoker groups) or start using the product (in YA groups). After initial discussion of this base claim, groups also discussed some message/wording variations of it (time permitting), including reactions to replacing 90%/95% with a lower number (eg, 30%, 50%) and an alternative claim version with more specific wording—‘90%/95% less likely to result in death from tobacco use’ or ‘from a tobacco related disease’ (table 1). Smokers in the e-cigarette groups also considered a version with different framing (‘...using vaping products exclusively is unlikely to exceed 5% of the harm of smoking cigarettes,’) (table 1). Procedures were adapted from a study conducted for Health Canada exploring reactions to concept e-cigarette/vaping MR messages.<sup>27</sup>

During debriefing, the Principal Investigator (PI) explained that the statements were concept messages and not approved for use by industries in the USA, reviewed known risks about snus and e-cigarettes, underscored the importance of switching completely for potential harm reduction benefits, and provided a list of smoking cessation resources. Because the e-cigarette groups were in progress during an outbreak of e-cigarette or vaping product use-associated lung injury (EVALI) in the US during the fall of 2019,<sup>44</sup> debriefing in these groups also consisted of a handout and discussion about EVALI information and recommendations from the US Food and Drug Administration and Centers for Disease Control at that time. Each participant received a US\$50 gift card.

We used a thematic analysis approach to analyzing the data. Sessions were transcribed and then preliminary research memos were written by two research team members who participated in the sessions (OAW and MR) based on initial observations during the sessions (the first opportunity to 'get to know the data') and repeated transcript readings.<sup>45</sup> During this iterative process of reading and note-taking, a list of thematic and content codes was developed, and guide describing the codes. Data extracts in the research memos were annotated with these draft codes to further exemplify them. After discussion and agreement on these codes and definitions by OAW and MR, OAW independently coded four transcripts using Atlas.ti qualitative software and MR reviewed these coded transcripts. After discussing any disagreements, MR independently coded the remaining transcripts. Drafts of the results were then further developed, revised and refined based on reviews of the coded transcripts (by OAW and MR) and agreement that the results narrative fairly represented the data.<sup>45</sup> Illustrative quotes were selected (in some cases edited for brevity and clarity) to exemplify emergent themes and response patterns.

## RESULTS

About 65% of participants were female, 50% were white (23% Asian, 16% Black/African American, 11% other race) and 12% Hispanic. Highest level of education completed varied as follows: high school degree or completion of General Educational Development tests (30%); some college or technical school (32%); at least college degree (37%). Smokers' average age was 44 (range 21–66) and YAs' average age was 20 (range 18–25). Most smoker participants (84%) smoked daily and for at least 10 years (80%). Most (81%) smokers and 56% of YAs had tried e-cigarettes/vaping before; fewer said they now vaped some days (smokers, 25%; YAs, 20%) or daily (n=2 smokers, 6%). About 23% of smokers and 8% of YAs had ever tried SLT - 3 smokers (10%) indicated they now use SLT some days and 1 smoker indicated daily SLT use.

Across smoker and YA groups, participants agreed that the 95%/90% less harmful claim clearly communicates that using e-cigarettes/snus is less harmful than smoking and easy to understand, and several smokers had favourable immediate reactions, noting the claim would capture their attention:

...this sentence would definitely make me swap out cigarettes for vapes. I'd like to know where it's less harmful. Is it just in the lung? Is it heart disease? ...is it things that go along with smoking in general? Just as a sentence by itself, it would catch my eye. (e-cigarette group, female smoker)

Several participants reacted favourably because they felt it provided a more 'precise' or specific picture of how much less harmful the product was, and was perceived by some as providing 'facts' or 'evidence':

It's giving me a percentage of less harmful than cigarettes...Those are pretty good percentages...I do like it because it gives me some facts. (snus group, female smoker)

Some smokers and YAs also noted that the 95%/90% less harmful claim seemed more eye-catching and impactful than the other harm and exposure reduction claims viewed earlier during the sessions:

This is the best one yet. I think the 90 percent thing is really bold and clear, and that puts the image in your head right away of how much snus are better than cigarettes. I don't think the other ones achieve that... (snus group, male YA)

The number jumps out at you before all the other words ...and the rest of the sentence almost doesn't matter anymore. It's just that 95 percent less, and that's what you end up focusing on. So I mean there's a lot of power in that. (e-cigarette group, female YA)

## Statement understanding and interpretation

Several participants across groups noted that they thought the 95%/90% less harmful claims suggested that e-cigarettes or snus are 'a lot safer' or 'way better' than cigarettes, exposed you to fewer carcinogens, were less likely to cause you to 'die early' and less likely 'to give the bigger diseases that are associated' with smoking, such as lung illnesses and cancer ('95% better chances of not getting lung cancer,' female smoker). However, some smokers and YAs noted that the statement was too vague and did not specify what type of harms were reduced:

...And to say that it's 95 percent less harmful, harmful to what? Your health, to the environment, to other people? ...I also don't think it's very clear .... (e-cigarette group, female smoker)

Participants across groups (including YAs) generally correctly understood what the phrase using snus or vaping products 'exclusively' was intended to mean ('I think it just means you're not using any other tobacco products, you're just using snus,' male smoker). However, several participants made comments that suggested they did not correctly understand or were confused by the numeric information:

I completely dislike the percentage. A lot of the people they cannot understand percentage, so the information will not be as clear. If you give me a number of 7000 or whatever numbers, perfect. Percentages? (snus group, female smoker)

Some participants also appeared to misinterpret the number to suggest their absolute risk of harm:

There's a ten percent that will cause damage to my body. (snus group, female smoker)  
...it said, '95 percent. There's five percent still harmful to your health... (e-cigarette group, female YA)

## Believability issues

Across groups, participants also noted that even though the statement clearly communicated reduced harm and 'sounded good', they did not necessarily believe it. Several smokers and YAs were sceptical about the magnitude of the number (95%/90%), which appeared to detract from its believability (see box 1, A). For e-cigarettes, this also seemed influenced by the fact that e-cigarettes require inhalation:

I don't think it seems believable...Makes no sense to me. You're still putting something into your lungs... (e-cigarette group, female smoker)

## Box 1 Believability-related reactions to quantitative snus and e-cigarette modified risk claims

**A. Scepticism about the high stated magnitude of lower risk**

- ⇒ 'I don't think it seems believable. How can you say it's 95% less harmful than smoking cigarettes when 100 percent would be not smoking at all? Makes no sense to me. You're still putting something into your lungs...' (e-cigarette group, female smoker).
- ⇒ 'It just seems like a really, really stark difference between smoking cigarettes and vaping, and from what I know about vaping, I know that it like easily gets you an addiction, and it still exposes you to harmful chemicals. So like...95% less harmful is a really large difference.' (e-cigarette group, female young adult (YA)).
- ⇒ 'I mean, do they actually know that, that it would be 90% less harmful?' (snus group, female smoker).
- ⇒ '...I usually just really—all tobacco products together as just equally being harmful, so just seeing that this is 90% less harmful, it's just surprising to me...I wouldn't believe it at first glance no.' (snus group, female YA).

**B. Scepticism based on product unfamiliarity or perceived novelty**

- ⇒ 'I mean it's always for the reason being that knowledge wise it's only been out for a few years. How would they know already?' (e-cigarette group, male smoker).
- ⇒ '...how do they already know that it's not gonna be harmful to anybody? I mean, I never heard of it so how many people use this stuff? I don't know. I just don't get it.' (snus group, male smoker).

**C. Scepticism about the source of the cited estimates**

- ⇒ '...Who's the scientist and who are these people?' (e-cigarette group, female smoker).
- ⇒ '...it says less harmful, 95%. I don't know who came up with that. I don't know if it's necessarily true. Pretty sure it's not...' (e-cigarette group, female smoker).
- ⇒ '...it could possibly be one of these scientists who get paid by these guys. It's impressive but I don't know if it's believable...' (snus group, male smoker).

**D. Scepticism that claims sounds like a 'sales pitch' or 'marketing tactic'**

- ⇒ 'It just goes back to me thinking that 'please buy our products' basically.' (e-cigarette group, male smoker).
- ⇒ '... 'using vaping products exclusively', that was a trigger word for me because it sounds like a marketing thing as opposed to an actual scientific fact.' (e-cigarette group, female smoker).
- ⇒ 'I feel it's like the Tylenol commercials, when they say two out of three doctors recommends Tylenol. It's just advertising and over exaggerations to me like they do with every product. So that doesn't mean much to me reading that.' (snus group, female smoker).

**E. Scepticism about the terms 'estimated' or 'about'**

- ⇒ 'So the first word that I stopped at was estimated 'cause scientists really don't know. They're just estimating. That's a guess.' (e-cigarette group, female smoker).
- ⇒ 'It sounds good, but it also says estimated... you don't want your money estimated... You don't want your paycheck estimated, so why would you want something about your health to be 'estimated?'' (e-cigarette group, female smoker).
- ⇒ '...why would scientists be estimating, anyway? Isn't that their job to figure it out?'' (snus group, female smoker).
- ⇒ 'I don't like that they used the word 'estimated' and 'about', because it just makes it seem not believable. Like it makes it seem like kind of made that up...' (e-cigarette group, male YA).

**F. Scepticism about e-cigarette claim because of news about e-cigarette and vaping related lung illnesses (EVALI)**

- ⇒ 'I think it's a bit hard to believe, but that just might be bias because we've seen so much of it lately on the news, but again, it's really concerning that people are using it for that short of a time, and you're having such a great health impact that that just makes me feel like, okay, so what if it is 95% less? There's still a big risk. People are still being harmed.' (e-cigarette group, female YA).
- ⇒ '...I'm trying to be objective that if I didn't hear anything in the news about what vaping does, the recent information.' (e-cigarette group, female smoker).

Believability was also related to lack of product familiarity/perceived novelty, and some scepticism and questions about the source of the statistics and their intentions. Some noted that the claims sounded like a sales pitch or a 'marketing' tactic (box 1, B–D). For some participants across groups, statement believability also related to use of the word 'estimated' or 'about' in the claim (box 1, E). However, some acknowledged that this seemed honest and at least could give people a 'ballpark' idea:

...maybe it's not actually 90, it might be 80, but it's not 20. So, you know, it's giving me at least a ballpark. (snus group, female smoker)

For some, e-cigarette statement believability was also influenced by recent news reports about vaping and lung related illnesses/EVALI (box 1, F). One person also doubted that the

e-cigarette statement could be true because e-cigarettes were completely composed of chemicals, unlike tobacco cigarettes:

...because vaping products are all chemicals...It's difficult for me to believe that smoking only chemicals is less dangerous or is 95 percent less harmful than if I were to go out and roll my own cigarettes where it's just putting tobacco and using papers. (e-cigarette group, male smoker)

**Communicates that the products are still harmful**

Across groups, smokers and YAs also agreed that the statement more clearly communicated about *reduced harm* from vaping/snus than it did that there are still harms associated with vaping/using snus. Although in general 'less harmful' was understood to mean some level of harm was still possible, some commented

that the statements might be seen as almost providing a 'guarantee' or could be somewhat 'misleading' (because cigarettes are extremely harmful):

Well, cigarettes are very, very harmful, and something that's 95% less harmful would still be pretty harmful. (e-cigarette group, female smoker)

It's almost like a 100—you're gonna have no ill health at all if you vape instead of smoking... (e-cigarette group, female smoker)

Similarly, some YAs noted that the statement made e-cigarettes or snus seem relatively harmless:

If it's like only 5% as harmful, like you're probably fine. (e-cigarette group, male YA)

...They're just putting snus in this spot, like, 'Oh, this is such a great and close to harmless replacement to smoking. (snus group, male YA)

### Motivation to use product

Although several smokers suggested the statement would make them interested in the product, product reluctance was related to statement believability ('Well, we have to have proven fact for me to believe it.', e-cigarette group, female smoker), and concerns that the product would still pose harm ('I think for me to be convinced you would have to say it's 100%', snus group, female smoker). However, disinterest in switching to the product was also related to perceived difficulty in changing to a new product at their age, habit, or hesitance to switch to another addiction:

Ninety-five percent is great. It's a fabulous number. But I still wouldn't change my mind...I prefer my cigarettes...I honestly don't think anything is gonna make me stop unless it's me... (e-cigarette group, female smoker)

Some smokers and YAs also noted that the claims could be appealing to young people or other non-smokers ('...kids would love that statement,' e-cigarette group, female smoker):

I mean I just think that that 90 percent figure there is really the hallmark of this claim and that's...going to possibly attract people who aren't even smoking in the first place. So it would be a pretty smart tactic of them to use something like this in marketing their product. (snus group, male YA)

However, interest in using the products continued to be low among YA participants, but some thought the 95%/90% claims might be more likely to peak their interest to try them than the other claims viewed earlier:

...still low chances of me wanting to try it, but this something specifically did raise my chances from the previous statements. (snus group, female YA)

### Alternative wording/versions

#### Lower number

Participants across groups had mixed reactions to having a lower percentage number/estimate in the claim. Some thought a number lower than 95%/90% (such as 50%) would seem more believable:

Well, 95 percent just seems so absurd. Fifty percent, I could go with that...I'd probably have to go do a little investigating, but 95 percent...I just kinda dismiss it...(female smoker, e-cigarette group)

However, some seemed to misinterpret use of 50% in the claim as suggesting '50/50' chance of harm. In addition, while some suggested that 'any amount less is better', others noted a

lower number (like 30%) would be a non-starter, and that the stated percentage still needed to be high enough (above 50%) to be considered:

It [50%] wouldn't have nearly as big an impact...like if you said like 75 to 80 percent, that's not only believable, but it's also kind of attainable, until you get even more data to prove that it's above 80 percent. (male smoker, e-cigarette group)

#### Less likely to result in death/tobacco related disease

Some smokers had positive/favourable reactions to the 'less likely to result in death from tobacco use' or 'from a tobacco-related disease' alternative statements (table 1), with some noting this wording might be more 'eye-catching' and effective:

Well, that might make me use snus. Yeah, because if it's less likely for me to result in death... (snus group, male smoker)

Some YAs also thought this version could be less appealing to young people/non-smokers. However, some thought the message was too extreme and some were unclear what was meant by 'tobacco related diseases' (suggesting 'smoking diseases' might be clearer). Some noted that it is the chemicals in e-cigarettes and tobacco (including nicotine) that is the problem, not tobacco itself:

...tobacco isn't the problem. It's what they put in the tobacco that's the problem. So that makes the second statement kinda untrue altogether... (e-cigarette group, female smoker)

In the e-cigarette groups, some participants also seemed confused by the reference to reduction in 'tobacco-related diseases', since e-cigarettes do not contain tobacco.

#### Unlikely to exceed 5% of smoking harms

Lastly, smokers in the e-cigarette groups consistently found the wording of the 'unlikely to exceed 5% of the harm' message variation (table 1) to be more difficult to understand ('I don't even know what the hell that means', female smoker) and thought it required more cognitive effort ('You have to really put thought into the sentence', female smoker). Some participants also misinterpreted the statement, thinking it suggested vaping was only 5% better or safer and thus almost as harmful as cigarettes:

I wouldn't even accept a 5% commission let alone—you're just helping me 5%.' (e-cigarette group, female smoker)

Several participants agreed after some consideration that the statement essentially provided the same information, but worded or framed in a different way. However, several participants across groups agreed that the '95% less harmful message' would be more attention grabbing, clearer and have more impact than the 5% message:

Well, if you read it [5% message] quickly, which is how we read most advertisements, commercials, it just it takes you longer to kind of—you have to actually read this one thoroughly and think about it, because it's not as powerful as the other one...When you see 95 percent less harmful, I mean, right away, your eyes can just kind of digest that in a couple seconds. (e-cigarette group, female smoker)

But the 95 percent hits it home a little better because now you're saying what am I saving? I'm saving 95 percent of my harm. Here you're saying, I'm gonna have 5 percent of what I had before—it just doesn't have the same effect. (e-cigarette group, female smoker)

## DISCUSSION

To our knowledge, this is the first qualitative study to examine reactions to quantitative claims suggesting substantially lower health risk (90%, 95%) from snus and e-cigarettes. Although data were collected in the USA, results may also have relevance for other countries using or considering these types of messages. Results suggest that these types of numeric claims may be attention grabbing, quickly communicate that these products are substantially less harmful than cigarettes, and potentially appeal to some smokers compared with other types of MR claims. However, results also suggest challenges with message believability, and some potential issues with misunderstanding and appeal to young people.

With respect to believability, participants were generally sceptical that the claims were 'too good to be true.' This scepticism appeared to be based on the high magnitude of the presented numbers, perceptions that the products were 'too new', and perceptions that the claims conflicted with other product information they had heard and their existing beliefs. This type of cognitive anchoring bias, which can lead individuals to judge new information based on existing 'anchored' beliefs/knowledge,<sup>46</sup> may limit smokers' receptivity to MR messages. In addition, although some smokers suggested a lower, more modest number may be more believable, it is unclear whether there is a numeric 'sweet spot' that, in addition to being accurate or agreed on, is also believable and motivating. On the other hand, we observed that although YA non-smokers were also generally sceptical of the claims, including the magnitude, some did express a perception that the claims made the product seem relatively harmless and potentially appealing to young people, which could suggest some risk for unintended effects.

It is also worth noting that participants' scepticism at the high estimates presented are not unreasonable, given that these figures are in fact estimates based on a limited set of studies and data, and are not universally accepted in the tobacco control community. Indeed, the 95% e-cigarette message has been a source of some debate/controversy among scientists themselves.<sup>47 48</sup> Furthermore, the broadly stated 90%/95% claims we examined do not capture the fact that risk estimates may differ significantly for particular health conditions. For example, the Levy *et al* study found that while estimates for total mortality relative risks associated with low-nitrosamine SLT fell between 5%–10% of the risk of smoking, estimates were lower for lung cancer (2%–3%) and higher for oral cancer (15%–30% of risk of smoking).<sup>33</sup> In addition, these numbers may not represent actual levels of reduced harm for smokers who *switch* to these products, given that these estimates are based on consideration of exclusive product use, not switching. These numbers may also not reflect accurate reduction in certain risks that are common to all non-medicinal nicotine products, such as addiction or harms to fetal development among pregnant smokers. These important nuances can be difficult to communicate in short standalone written messages.

This study also suggested some comprehension issues related to numeracy. Indeed, previous research has documented that people struggle with mathematical statements about risk, particularly with odds and percentages.<sup>46 49</sup> Our results also suggest potential framing effects of quantitative MR message understanding and appeal, with smokers reacting more favourably to the more positive message that e-cigarettes are '95% less harmful' (which emphasises a 'less harmful' benefit) than to the more negatively framed message that emphasises the potential harm from e-cigarettes (about 5% of that from smoking cigarettes). Previous literature has shown that when comparing positive and negative frames of risk information, positive frames lead to lower risk perceptions.<sup>46 50</sup> Although this may help encourage harm reduction for smokers, our results also

suggested that this framing and message could have some unintentional appeal with YA non-smokers. Future research could also explore additional framing comparisons of quantitative MR messages, such as those emphasising the magnitude of risk reduction relative to smoking ('90% less harmful than smoking') vs those emphasising the relative risk of smoking (eg, 'smoking is about 10 times more harmful than using snus').

Finally, while the 95%/90% figures remain estimates and may not be completely agreed on or precisely understood, these messages may leave audiences with the 'gist' that these products are believed to be, at least by some experts, substantially less harmful than cigarettes. According to the fuzzy-trace-theory of medical decision making, people often interpret the 'bottom-line meaning' of numeric information in a qualitative way, and use this 'gist' information, rather than exact precise numbers, in decision-making.<sup>51</sup> Indeed, as described by one participant, the figures may not be exactly right but give a 'ballpark' idea and were interpreted by participants as meaning that the products are 'way better' or 'a lot safer'. While some participants commented that the statements were misleading, many appropriately perceived these figures to be estimates rather than as hard facts or guaranteed reductions.

Study limitations include the use of a small convenience sample, and potential order and priming effects, given that the 90%/95% messages were discussed last in group sessions. It is also worth noting that participants were not naïve to these products, particularly e-cigarettes (including many ever triers and some current users), and we previously documented that negative and unsatisfying product experiences also appeared to influence their future product interest.<sup>32</sup> Future research may benefit from additional studies comparing reactions to different types of MR messages, and how they may vary by audience type and product experience.

Overall, quantitative claims suggesting high levels of reduced risk when comparing e-cigarettes or SLT/snus relative to cigarettes may be successful in gaining attention, communicating reduced-risk quickly, and being persuasive for some audiences, particularly if attributed to more credible sources. However, health professionals and health organisations should be mindful of the limitations of such claims, particularly if presented as stand-alone messages, and aim to mitigate unintended consequences.

## What this paper adds

- ⇒ Qualitative studies examining perceptions of reduced or 'modified risk' (MR) messages about e-cigarettes and smokeless tobacco have indicated consumers want statistics and to know 'how much' less harmful such products are, that is, a quantification of harm reduction. Some organisations have used such messages (eg, that e-cigarettes are 95% less harmful than cigarettes).
- ⇒ However, limited research exists on consumers' understanding and perceptions of these types of quantitative MR messages.
- ⇒ Our results from focus groups in the USA suggest that quantitative claims suggesting high levels of reduced harm (90%, 95%) from snus and e-cigarettes may be attention grabbing, quickly communicate that these products are substantially less harmful than cigarettes, and potentially appeal to some smokers compared with other types of MR tobacco product claims. However, results also suggest challenges with message believability, and some potential issues with misunderstanding and appeal to young people.

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