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Perceptions of the Harms of E-Cigarettes, Combustible Cigarettes, and Other Substances among Adults who Smoke in the UK: A Mixed Methods Study

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Abstract

Whilst e-cigarettes have been characterised by public health bodies as substantially less harmful than combustible tobacco products, research shows that a proportion of adults, including those who are smoking combustible cigarettes, perceive these devices to be as harmful, or more harmful, than combustible cigarettes, whilst many others are uncertain as to the relative harmfulness of these products. Research has also shown that perceptions of the diverse harms of combustible cigarettes and e-cigarettes can influence the likelihood of individuals using e-cigarettes as a means of quitting smoking.

In this paper, we focus upon the harm perceptions of a sample of adults who smoke in the United Kingdom. Whilst a large proportion of the adults surveyed correctly viewed e-cigarettes as less harmful than combustible cigarettes, around four in ten (41%) viewed these devices as equally harmful, more harmful, or were unsure of the relative harm of these devices in comparison to combustible cigarettes. Qualitative interviews with survey participants indicated that the perceptions of relative harm between combustible cigarettes and e-cigarettes were a complex amalgam of beliefs, fears, predictions, reactions, and uncertainties about the long-term impact of e-cigarettes and judgements about the greater frequency and intensity with which e-cigarettes were likely to be used compared to combustible cigarettes.

There is an important need to identify the most effective means by which those involved in the use, regulation, manufacture, media reporting and evaluation of these devices can be combined in developing effective communication strategies to ensure that those who are smoking have access to accurate information with which to make informed choices as to whether to use e-cigarettes as a means of quitting smoking.

Keywords: E-cigarettes; Harm Perceptions; Adult Smokers

Introduction

With an estimated 7.69 million deaths globally linked to smoking in 2019, and one in two long-term smokers dying from a smoking related disease, combustible cigarettes have become one of the most harmful products available for retail sale anywhere across the globe [1,2,3]. Within the United Kingdom (UK) public health bodies have identified e-cigarettes as being substantially less harmful than combustible tobacco products [4, 5, 6]. In striking contrast to the 76,000 deaths that occur annually within the U.K.

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linked to smoking, the Medicines and Healthcare products Regulatory Agency (MHRA) has identified only three deaths directly linked to e-cigarettes since 2016 [7,8,9]. Within the United States (US), the Food and Drug Administration (FDA) has recently provided marketing authorisations to a small number of e-cigarette manufacturers on the basis that the specific products authorised are, in striking contrast to combustible cigarettes, judged to be "appropriate for the protection of the public health" [10].

In addition to being less harmful, e-cigarettes have been shown to be associated with an increased number of quit attempts on the part of adults who smoke, and an increased likelihood that those quit attempts will be successful [11,12]. Where e-cigarettes have been compared to other validated means of smoking cessation, these devices have been shown to be at least as effective, and in some cases more effective, than those other methods studied [13, 14]. Importantly, research has shown that use of e-cigarettes is associated with smoking cessation even amongst those adults who had no prior intention of quitting smoking at the point at which they initiated their e-cigarette use [15]. Based on the available evidence, the UK government announced a "Swop to Stop" campaign in 2023 designed to further catalyse efforts at quitting smoking by offering one million adults the opportunity to exchange their combustible cigarettes for e-cigarettes at no charge [16].

Despite the weight of evidence that e-cigarettes pose only a fraction of the harm of combustible cigarettes, nevertheless the global prevalence of smoking continues to far outstrip the estimated total number of people using e-cigarettes. According to the Global Burden of Disease (GBD) study there were an estimated 1.1 billion people smoking in 2019 [17], compared to an estimated 82 million people globally using e-cigarettes in 2022 [18]. The reasons why the prevalence of e-cigarette use lags far behind the prevalence of combustible cigarette use, despite their very different harm profiles, are many and varied and include: outright bans of the use of e-cigarettes in some countries (Thailand, Singapore, India, Hong Kong, Cambodia, amongst others), national legislation limiting access to e-cigarettes to medical prescribing whilst simultaneously allowing combustible cigarettes to be purchased through retail outlets (Australia), price [19], varying levels of appeal of e-cigarettes amongst adult smokers [20], and as a result of some adult smokers perceiving the sensorial experience of vaping to be less pleasurable than that of smoking combustible cigarettes [21].

In addition to each of these reasons for why e-cigarettes may not be being used more widely there is also the question of whether e-cigarettes are perceived by adult smokers, including those considering quitting, as being less harmful than combustible cigarettes and with those perceptions influencing the likelihood with which those smokers might use these devices as an alternative to smoking. Research has shown, for example, that a proportion of adults (wrongly) perceive e-cigarettes to be as harmful as combustible cigarettes, and with some adults perceiving e-cigarettes to be more harmful than combustible tobacco products [22,23]. In 2023, researchers working on the U.K. Smoking Toolkit Study estimated that only 15.4% of adult smokers perceived e-cigarettes to be less harmful than combustible cigarettes, whilst 36.6% viewed these devices as being as harmful as combustible cigarettes and 31.7% thought that e-cigarettes were more harmful than combustible cigarettes. Significantly, there is evidence that the proportion of adult smokers who perceive e-cigarettes to be more harmful than combustible cigarettes may have risen markedly in recent years [24, 25, 26]. The perception that e-cigarettes may be more harmful than combustible cigarettes evident in U.K. has also been shown in research from the U.S. [27] showing that that the proportion of the US population who perceive e-cigarettes to be more harmful than combustible cigarettes increased from 6.8% in 2018 to 28.3% in 2020. The importance of adult smokers' perceptions of the relative harm of combustible cigarettes and e-cigarettes has been demonstrated in research showing that the likelihood of adult smokers using these devices, as an alternative to combustible tobacco products, reduces in direct relation to these perceptions of relative harm [28, 29, 30].

In this paper, we outline the results of a mixed method study which examined U.K. adult smokers absolute and relative harm perceptions of combustible cigarettes, e-cigarettes, and a range of other substances; alcohol, caffeine, fatty foods, marijuana, nicotine, nicotine replace therapy, and sugar. Quantitative estimates of absolute and relative perceived harm were obtained through a web-based survey of a sample of U.K. adult smokers. Following completion of a standardized instrument, research subjects participated in a qualitative interview in which individuals were invited to comment at greater length about their perceptions of the harms associated with combustible cigarettes e-cigarettes and the various other substances listed.

Materials and Methods

Sample Recruitment

Survey participants were recruited from the Sago Panel (www.sago.com). Panel members were sent an email informing them of a new survey opportunity on tobacco and nicotine. Panel members who clicked the survey link in the email were directed to a screener questionnaire to check their eligibility to take part. Panel members, living in the UK, aged 21 to 60 years who were currently smoking combustible cigarettes and not currently using e-cigarettes, Heated Tobacco Products (HTP), or Nicotine Replacement Therapy (NRT) were eligible to take part in the survey. Potential participants were excluded from the research if they had a history of, or were currently experiencing, a psychiatric

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disorder diagnosed by a doctor, had no access to a reliable internet facility, could not take part in an online audio-recorded interview, were not fluent in English (necessary for the qualitative interview), had current or recent past contact with the sponsoring agency, or if they had a close relative with a financial interest in a company selling tobacco- or nicotine-based products. The stages of sample recruitment are outlined in Figure 1.

Panellists who met the inclusion criteria were directed to an online Informed Consent Form (ICF). Once consent had been provided, research participants were directed to a website containing a structured questionnaire that asked respondents to rank nine substances and products (combustible cigarettes, e-cigarettes, nicotine, alcohol, marijuana, NRT, sugar, fatty foods, and caffeine) in terms of their perceived absolute and relative levels of harm. Below we outline the definitions used in characterising our study population and the measures used in our online survey.

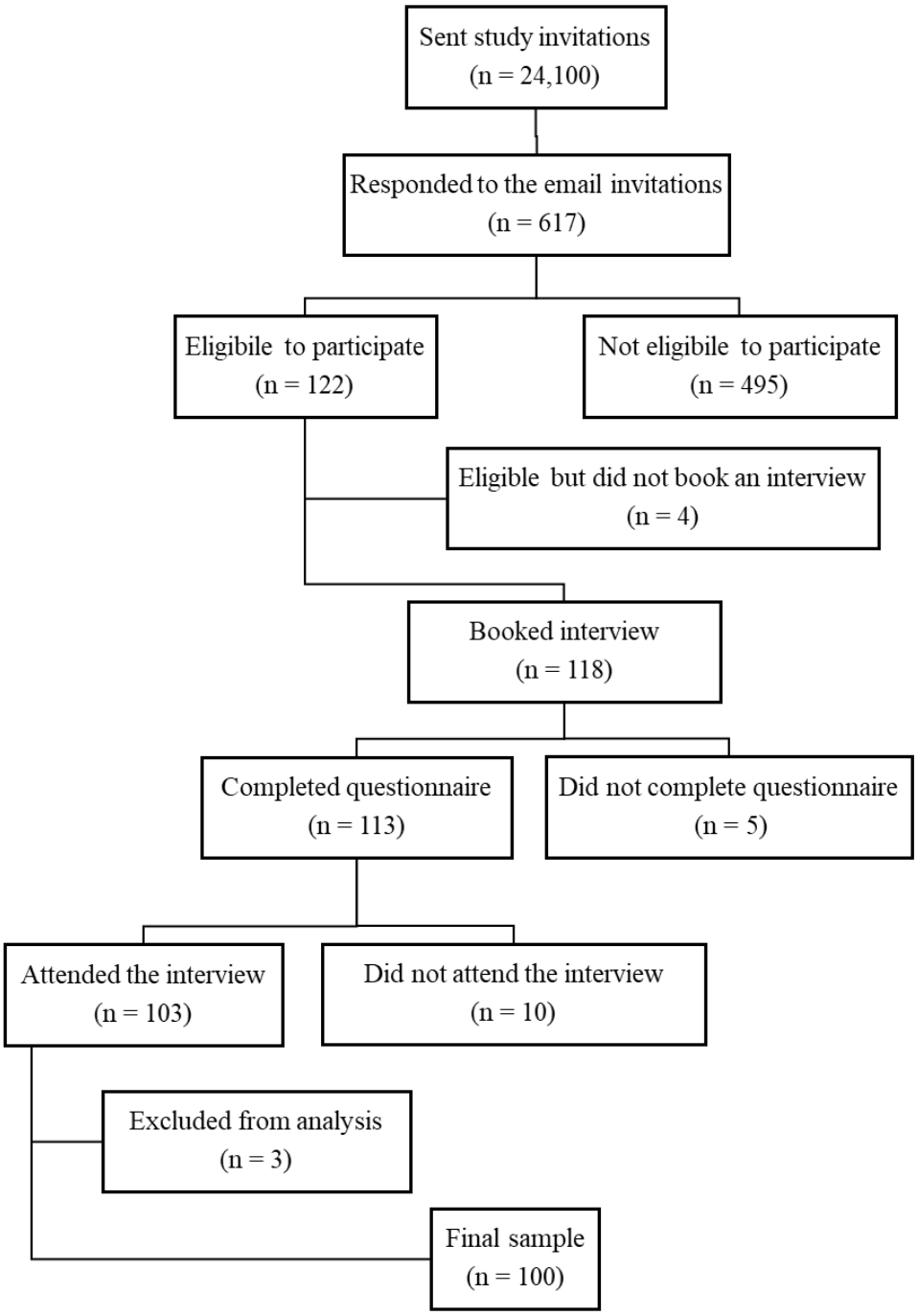

Figure 1: Sample Recruitment

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Definitions

Adults who were currently smoking were defined as those who had smoked 100 or more cigarettes in their lifetime and had smoked in the past 30 days. Adult non-current use of electronic nicotine vaping products, heated tobacco products and NRT was defined as those who had used the product at least once in their lifetime but do not use it now or use it less than monthly.

Survey Measures

The harm perception survey questions were adapted from the Population Assessment of Tobacco and Health (PATH) Study Wave 5 questionnaire. In relation to individuals' perceptions of absolute harm, respondents were asked: "How harmful do you think [product] are to health?". The response options were 'Not at all harmful'; 'Slightly harmful'; 'Somewhat harmful'; 'Very harmful'; and 'Extremely harmful'. Respondents were given the option of reporting 'Don't know' or 'Refused'. Respondents were also asked to rank these nine substances and products in terms of their perceived relative harmfulness: "Could you rank these substances in terms of your view of their relative harm ranging from most harmful at the top to least harmful at the bottom? Rank each item in order of importance, with no. 1 as the 'least harmful' item, to no. 9 as the 'most harmful' item". Finally, respondents were asked to indicate how harmful the substances and products assessed were, in their opinion, compared to e-cigarettes: "Is using e-cigarettes or other electronic nicotine products less harmful, about the same, or more harmful than [each individual substance and product assessed]?". Participants could answer 'Less harmful'; 'About the same'; or 'More harmful'. Respondents were given the option of reporting 'Don't know' or 'Refused'.

Qualitative Interviews

Following completion of the survey, study participants were asked to take part in a semi-structured interview, which was audio recorded. They were asked to expand on their views of the harms of the various products and substances. Interviews were scheduled to take no longer than 60 minutes, were conducted using the Zoom platform, and with study participants paid £40 for their participation in the qualitative interview. Respondents were asked for their views on the following topic areas:

- The types of harms linked to different substances and products.
- Which harms were the most likely to occur linked to different substances and products.
- Whether some people were at greater risk than others of the harms identified.
- The extent to which the perceived level of harm of different substances and products differed between those who were using the substance and those who were in the company of individuals using the substance.
- Whether, and in what ways, the harms attributed to each substance and product might vary depending on the frequency of use, history of use and characteristics of the user.
- How likely it was that the individual would experience any of the harms identified.
- What the individual believed had most influenced their perceptions of how harmful different substances and products were, and whether they felt their views of those harms had changed over time.
- How the harms of diverse substances and products could be reduced.

Data Analysis

Data on demographic characteristics, lifetime use of e-cigarettes, heated tobacco products and nicotine replacement therapy were summarised using frequencies and proportions. Response options for absolute harm were recoded into three groups: 'Not at all harmful'; 'Slightly or Somewhat harmful'; and 'Very or Extremely harmful'. The categorical responses of absolute and relative harm perception variables were summarised using proportions. A Total Harm Score was calculated by summing the harm score reported by each participant for each of the nine substances and products. A Mean Harm Score was calculated by diving the Total Harm Score by the number of participants who provided a response to the question for each for the substances and products. All analyses were conducted using SPSS Version 28.0 [31].

Interviews were recorded and transcribed by two members of the research team (JC/SN) and a secure transcription service (TP Transcription). All personal identifying details were removed from interview transcripts. An inductive thematic analysis approach was used to interpret the data. Two members of the research team (JC/SN) working independently read a selection of the transcripts to familiarise themselves with the data prior to coding. JC/SN then coded the manuscripts independently and met regularly to compare the coding schemas, discussing any discrepancies until agreement was reached. Analysis of the coded interview transcripts focussed upon identifying common themes across interviewees in terms of the assessments of relative harm and how those assessments were arrived at. Analysis proceeded on an iterative basis to explain the range of data around specific codes, identifying broader categories and themes. All analyses were conducted using NVivo 12 software [32,33].

Results

A total of 113 participants completed the web-based survey of which 103 participants attended the qualitative interview. Three interviewees were subsequently excluded

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from analyses because of inconsistencies in reports of their current smoking status.

Quantitative Analysis

The demographic characteristics and nicotine product lifetime use for study participants are summarised in Table 1.

Figure 2 shows respondents' absolute harm perceptions of nine substances and products. Combustible cigarettes were viewed as 'Very or extremely harmful' by the largest proportion (76%) of those surveyed, followed by alcohol (57%), nicotine (55%), marijuana (49%), fatty foods (36%), sugar (36%), e-cigarettes (33%), NRT (11%) and caffeine (5%). Very few respondents perceived any of the nine products and substances as being 'Not at all harmful"; with only 1% of respondents viewing combustible cigarettes as "Not at all harmful", followed by alcohol (2%), fatty foods (2%), nicotine (3%), marijuana (3%), e-cigarettes (4%), sugar (5%), caffeine (7%), and NRT (8%). Approximately one in ten respondents (11%) didn't know how harmful e-cigarettes were.

Figure 3 shows the relative ranking of the nine substances and products in terms of their perceived level of harm. Combustible cigarettes were perceived as being the most harmful of all the nine substances and products assessed, with e-cigarettes perceived as being less harmful than combustible cigarettes, alcohol, marijuana, nicotine, and fatty foods but more harmful than sugar, caffeine, and NRT.

Table 1: Demographic characteristics and nicotine product (e-cigarettes, heated tobacco products, and NRT) lifetime use (n = 100)

Characteristics	n (%)
Sex	
Male	40 (40%)
Female	60 (60%)
Age	
21-30	25 (25%)
31-40	38 (38%)
41-50	22 (22%)
51-60	15 (15%)
Mean (SD)	38.4 (9.9)
E-cigarettes or vaping products	
Ever used	62 (62%)
Heated tobacco products	
Ever used	24 (24%)
Nicotine Replacement Therapy (NRT)	
Ever used	31 (31%)

Figure 4 shows the level of perceived harm of e-cigarettes relative to seven other substance and products assessed. Whilst the majority (59%) of respondents perceived e-cigarettes to be 'Less harmful' than combustible cigarettes, nevertheless around one in every four adults surveyed believed that e-cigarettes were as harmful, more harmful or didn't know harmful e-cigarettes were in comparison to combustible cigarettes. Specifically, one in five respondents (21%) viewed these devices as posing the same level of harm as combustible cigarettes, one in ten (9%) viewed e-cigarettes as being 'More harmful', and one in ten (11%) were unsure of where e-cigarettes and combustible cigarettes stood in relation to each other in terms of relative harm. Approximately one third (36%) viewed e-cigarettes as more harmful than NRT. Over two-thirds (64%) viewed e-cigarettes as being as harmful, more harmful, or not knowing the harm in relation to alcohol. These figures show very clearly that, relative to a wide range of other substances and products, a significant minority of respondents perceived e-cigarettes to be more harmful than these other substances.

Qualitative Data Analysis

In this section we focus upon the views of those respondents who perceived e-cigarettes to be more harmful than combustible cigarettes. We look at the reasoning offered by respondents in explaining how they had arrived at the view that e-cigarettes were likely to be more harmful than combustible cigarettes.

Scare Stories in the Media

Some interviewees drew attention to recent coverage in the news media citing various health harms that they recalled as being linked to e-cigarettes. Whilst some respondents identified specific media stories highlighting particular harms that e-cigarettes could cause, others seemed to cite media stories more in the way of confirming their pre-existing view that e-cigarettes were more harmful than people often assumed:

"There was this big scare about all these teenagers having this, their lungs filling with fluid from vaping and all, I can't remember. You know I think it was very much, no one really knew if it was the cause or correlation or whatever was going on with it but I just thought like you've got, people don't know and that was the problem is that they were, some people were saying yes it is the vape, some people were saying no it's nothing to do with the vapes and I think the fact that there was no definitive answer is what makes me kind of uneasy with it. I think there's just you know you just don't know what you're putting in your body." [Interview 88]

Concerns About the Technological Nature of E-cigarettes

Amongst those interviewees who perceived e-cigarettes to be more harmful than combustible cigarettes, attention was

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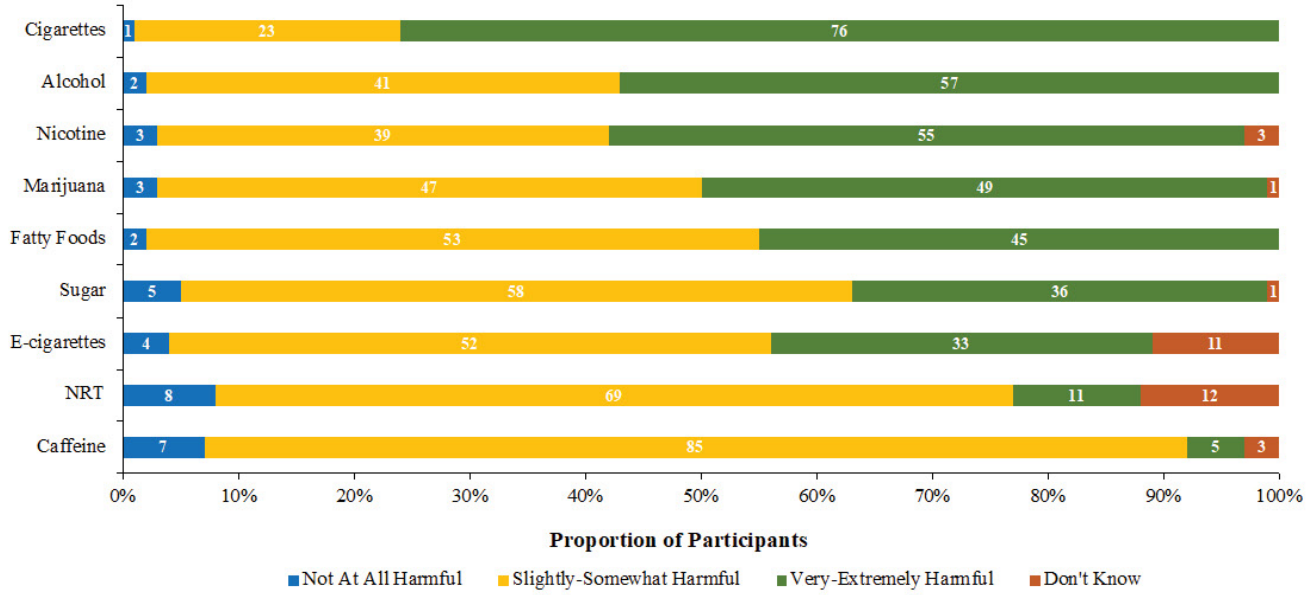

Figure 2: Absolute harm perceptions of cigarettes, nicotine, e-cigarettes, marijuana, caffeine, alcohol, sugar, fatty foods and NRT (n = 100)

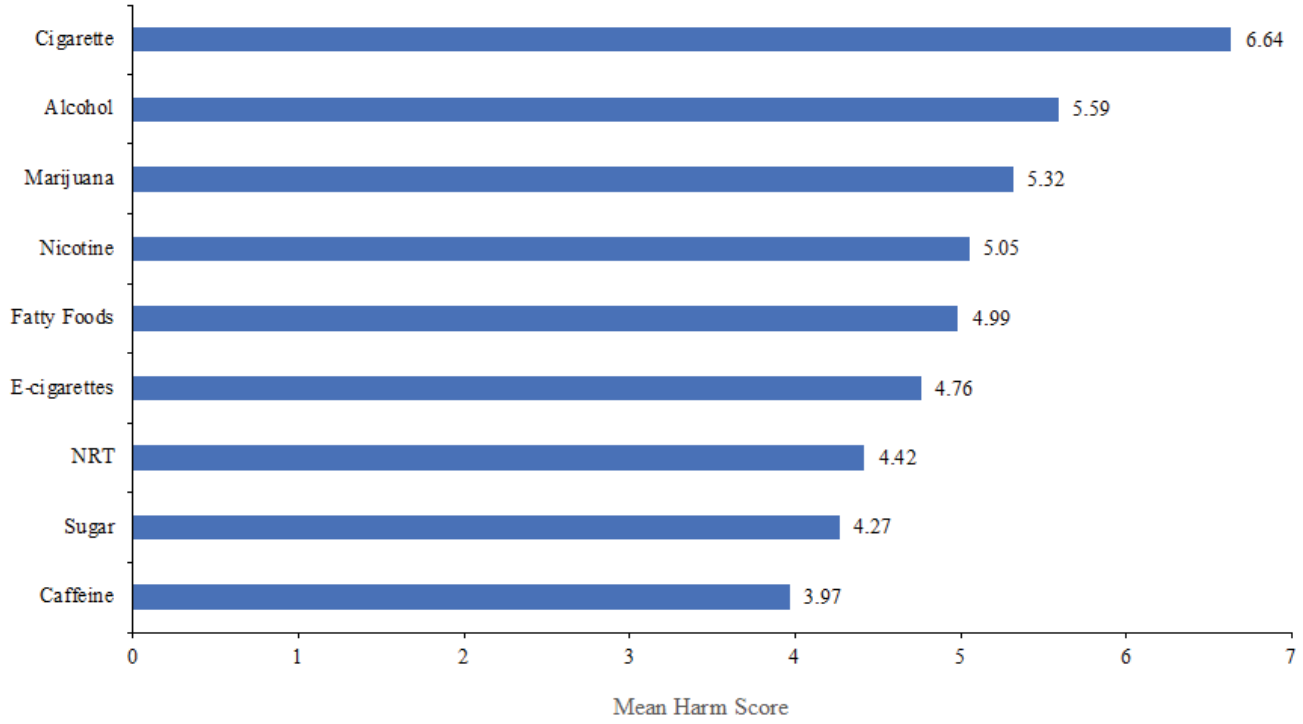

Figure 3: Ranking of harmfulness of cigarettes, nicotine, e-cigarettes, marijuana, caffeine, alcohol, sugar, fatty foods and NRT (n=88)

Note: Analysis excluded participants who did not rank all nine substances and products

often drawn to concerns around the technological nature of vaping with some respondents contrasting the "non-natural" nature of vaping with what they saw as a the more "natural" nature of smoking:

"I think maybe because… I'm throwing off a bit about the electrical part… the electronic devices because anything that come- I think our body naturally has like some sort of electronic field within where how everything operates. And I just, I don't know, I think maybe it's a mental thing for me thinking that maybe if it's something I'm electronically pulling something, like is it being charged as I'm inhaling it with the vape or something. Am I also pulling in other things into my body? Whereas at least with a cigarette you know,

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it's, okay it's bad enough because you've got the nicotine and the paper, the rolling paper that it's in. But with the electrical device it's like, okay, is there anything else that I'm inhaling? So, I think that's more- So I think, yes, I think that's probably why I don't know. I think that's what throws me off a little bit, yes." [Interview 52].

Frequency of Use

Interviewees drew attention to the greater frequency with which e-cigarettes would be used in comparison with combustible cigarettes, as a way of explaining why they felt e-cigarettes were more harmful than combustible cigarettes:

"I don't think, well my friends vape, and they used to smoke, and I think that since they've been vaping if I'm in the car with them it's in their hand. It's constant whereas when they smoked it wasn't constant because you couldn't light up that cigarette every five minutes that you wanted to whereas you've got this vape, you just pick it up and that's it, you keep putting it down. I think that's had a big influence on my opinion on it but other than that I haven't really read up on it to be honest because I don't, I don't know what's right and what's wrong on the Internet, but I have my own views on it. I just feel that it's harmful. I think it's the same as cigarettes. They tried to make it a substitute for smoking. It's all the same, you're putting the same stuff into your body." [Interview 77]

In such cases, it was the perceived greater frequency with which e-cigarettes were likely to be used, rather than an implicit comparison of the two individual products, which caused e-cigarettes to be regarded as more harmful than combustible cigarettes.

Uncertainty Regarding the Impact of Long-Term Use

In explaining their thinking as to why e-cigarettes were believed to be more harmful than combustible cigarettes, several interviewees drew attention to the lack of clarity and the absence of certainty with the regard to the potential harms associated with long-term e-cigarette use with the fear being that in time hitherto unknown harms associated with such use may become evident in time even if they were not known about at present:

"I think it, the harm (of vaping) would be that dependency and you know the harm of not, I think the harm is not knowing what the harm is long-term. You know if you, if you're vaping for 10/15 years what is that doing to your lungs, to your brain? You know you are, there are chemicals in a vape. People presume it's just, oh it's just water vapor and like bubble gum flavouring. It's not, they have all sorts in there, we just don't know what they are. Same with cigarettes you know for years everyone smoked you know because no one understood the harm of it and then decades later it's causing cancer, it's causing you know all sorts, people's teeth and nails are falling out and I think that, that kind of goes the same with vapes. I think there's just no one knows really what happens. It could be ruining your lungs; you just don't know." [Interview 9]

Uncertainty About E-liquid Content

In explaining their thinking as to why e-cigarettes were believed to be more harmful than combustible cigarettes, interviewees drew attention to their concerns around the chemicals contained within e-liquids:

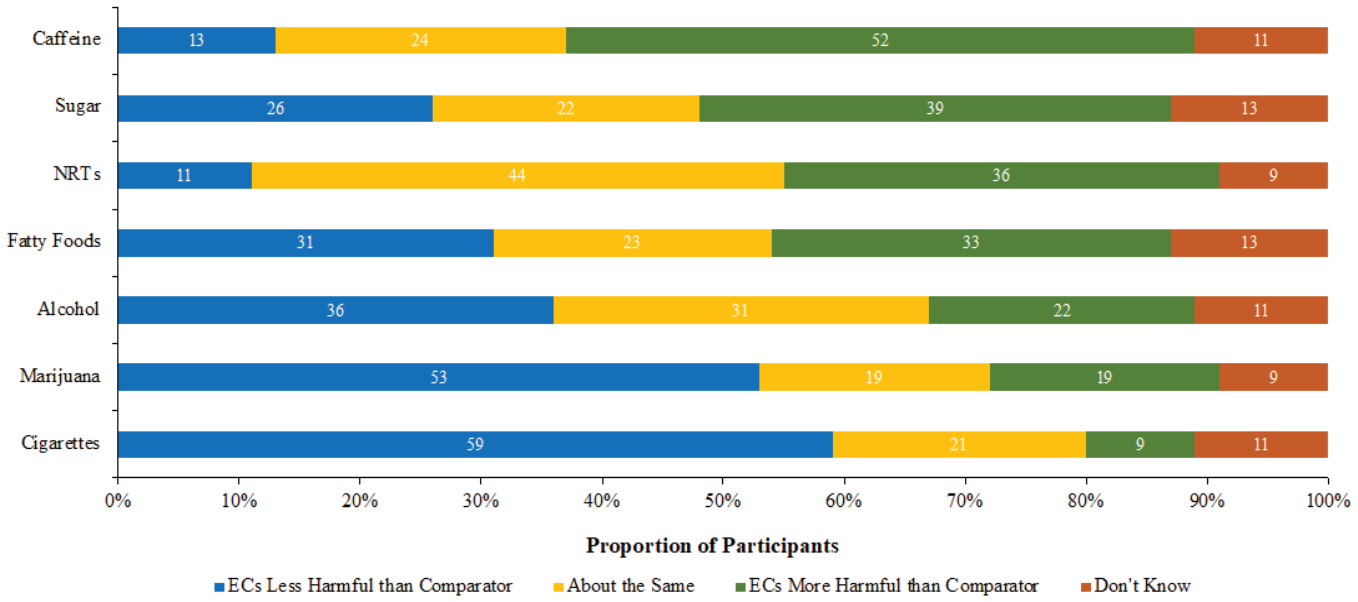

Figure 4: Perceived relative harmfulness of e-cigarettes compared to cigarettes, marijuana, alcohol, fatty foods, NRT,

Note: EC = E-cigarette

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"I think the trouble is, even now, we're still- nobody knows what's really in it to cause massive effects. Smoking, we know what it's going to do. We still smoke and we know exactly what it's doing to us. E-cigarettes, we don't know, but we still use them." [Interview 66]

"E-cigarette is basically chemical, hydrocarbons you know, you've got hydrocarbons, you've got all different chemicals that are in the e-cigarette. So, if you're smoking something organic, which is like tobacco is organic, it's natural and smoking you know, chemicals like benzene and ethylene and so many chemicals. Obviously, chemicals are more harmful to your body than natural, organic stuff kind of thing. So, each of those chemicals, it's not natural, you know, it's like if you eat natural fruits and salad, it's good for you because it's natural. But if you're smoking e-cigarettes, it's completely toxic, it's chemically. It's like a chemical poisoning, basically." [Interview 67]

E-cigarette Use Much Less Bounded

Concerns were also expressed that the use of these devices was much less bounded than was the case with combustible cigarettes resulting in these devices being used much more widely than was the case with combustible tobacco products - thereby potentially exposing many more people to some level of harm:

"My sister has a vape and it drives me mad, and she was, we were at a family dinner and she's sitting there at the table inside vaping. I just thought no, this is gross. Like I didn't ask, I don't want to smell like peppermint oil whatever it is. It was, oh they just, it really drives me mad, and I think there's just at least with like smoking you can you know there's a smoking area, you don't have to go in it. You know people can't smoke inside anymore; people tend to like you can avoid it. With vaping people just seem to do it like they have no, I mean this is you're really see this is really getting on my nerves just talking about it, people just seem to be quite, they don't care what you think of it. Like they don't, because they think it's harmless, I think that's what annoys me. People think it's harmless and they don't actually know what they've, like my sister started vaping occasionally with her friends I would say maybe four months ago and now she's constantly doing it. She's got a full-on nicotine addiction; she never had any issue with smoking or anything like that and now she's dependent on them I would say. She uses them when she's in the car. I just think like this ugh. Her room smells of it as well and I just think it infuriates me that people presume they're harmless and think that everyone else then wants to like sit in a cloud of water vaper or whatever. It's, that's what bothers me. I think it's the social aspect more." [Interview 88]

Harm Perceptions

Finally, it was evident that for a small number of interviewees the perception that e-cigarettes were less harmful than combustible cigarettes was itself seen as a possible cause of harm providing e-cigarette users with a misplaced sense of confidence in relation to the actual likely harms of vaping:

"I think they are more harmful now than I would have a few years ago and I think that's because people presume they're harmless. That's what makes me feel they're more harmful because people just think there's no problem with it. It was the same with smoking like 50 years ago. People didn't think anything of it. They would smoke with their kids in the same place and you just you presume it's harmless and that creates a bigger problem so that's kind of similarly how I feel…. I think that when you, you go into any situation and you think like oh like this is perfectly fine this, there are no risks here that is when you know you are more likely to have an issue. Like if you think like if you're going to a sports day and you're like oh I'm going to just go running you know I don't need to do a stretch I can just run 200 metres and then that's when you're more like to harm yourself because you're not anticipating that you might pull a muscle, you haven't done any stetches. You have no idea as to like the dangers and I think everyone like vaping is so common now and just so accepted and I think the fact that no one's thinking well actually I'm putting nicotine into my body, no one's thinking oh you know this could be a problem. They just think oh it's water vapour, it's not smoke so it's fine. It's like that's not true, it's still chemicals and you know I've no idea how it works. I've no idea what's in them. I think that's the problem. That's what makes you know something being harmless more harmful because you're not prepared for any of it." [Interview 88]

It is clear from the interviews that the perception of e-cigarettes as being more harmful than combustible cigarettes is based upon an amalgam of media stories about e-cigarettes, fears, concerns about the non-natural nature of electronic devices and e-liquids, concerns about the possible impact of long-term use of these devices, the greater frequency with which individuals are using e-cigarettes. What was striking in these accounts of the reasons why e-cigarettes were perceived as being more harmful than combustible cigarettes was the lack of any mention of how these devices have been characterised by respected public health bodies or the various empirical studies that have been undertaken having been designed to assess the actual relative harm of combustible cigarettes and e-cigarettes.

Discussion

In the research reported in this paper an estimated 41% of adults surveyed perceived e-cigarettes to be more harmful, as harmful than combustible cigarettes or were uncertain as to the relative harmfulness of e-cigarettes and combustible cigarettes. The proportion of adult smokers who perceived e-cigarettes to be more harmful, or as harmful, than combustible

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cigarettes or who are uncertain as to the relative harmfulness of these products is important in part because of the evidence from other studies that has shown that the likelihood of individuals using e-cigarettes as a means of quitting smoking may be influenced by individuals' perceptions of the relative harm of e-cigarettes and combustible cigarettes. (Yong et al. 2022).

Based on the interviews undertaken, judgements as to the relative harmfulness of combustible cigarettes and e-cigarettes involve a complex amalgam of beliefs, fears, predictions, reactions, uncertainty about the long-term impact of e-cigarettes, and the relative recency with which these devices had become available for widespread use. To characterise adults who perceive e-cigarettes to be more harmful than combustible cigarettes as "misinformed" or "under-informed" fails to grasp the complex, multi-faceted nature, of their harm perceptions as they are applied to these products and to

misconstrue the magnitude of the task of better informing adult smokers about the actual relative harmfulness of these products.

Strengths and Limitations

This study provides a quantitative and qualitative insight into adult smokers' perceptions of the absolute and relative harms of combustible cigarettes, e-cigarettes and various other substances. Before considering the implications of the research reported it is important to recognise the limitations in the study undertaken. Firstly, in terms of the sample surveyed there were more females than males included in the research and a larger proportion of adults aged 40 years old or less (63%). Almost two-thirds of our sample had ever used an e-cigarette, around one quarter had used a heated tobacco product and approximately one third had ever used NRT. Further, it is important to acknowledge the small sample of individuals interviewed and surveyed in this research and to caution against the perception that the views of the respondents surveyed here can be unproblematically applied to the population of adult smokers in general or to the wider adult population within the U.K.

Conclusions

If e-cigarettes are going to realise their potential to further reduce the multiple serious health harms associated with the use of combustible cigarettes, it will be necessary to ensure that those who are using combustible cigarettes (and those who are using e-cigarettes) have access to accurate, contemporaneous, and evolving information on what is known about the relative harms of these products and devices. In the case of those who are committed to using other means of quitting smoking there is perhaps less of a need to ensure access to such information than is the case for those who are not thinking of quitting smoking, those who may have tried and failed to quit using other means of smoking cessation, and those who are considering initiating either combustible cigarettes or e-cigarettes as their chosen means of consuming nicotine.

However, communicating accurate information about the relative harmfulness of combustible cigarettes and e-cigarettes is unlikely to be straightforward. Firstly, e-cigarettes are of much more recent origin than combustible cigarettes and resultingly less is known about the long-term impact of the use of e-cigarettes than combustible cigarettes. Secondly, the world of e-cigarettes is a world of rapid change and innovation with the result that there is greater uncertainty about the impact of recent innovations in e-cigarette technology than the established knowledge and evidence around the use of combustible cigarettes that have changed relatively little in their essential form for many decades. Thirdly, the harmfulness associated with the use of e-cigarettes is not a fixed characteristic of the devices themselves but rather a dimension that is influenced to an unknown degree by how the products are being used i.e. the intensity, frequency, and duration of use. Comparing the relative harm exposure of an individual who smokes one or two cigarettes a month, with the harm exposure of an individual who is using e-cigarettes daily is by no means straightforward and as we have shown can result in some individuals perceiving e-cigarettes are being more harmful than combustible cigarettes precisely because of the greater frequency with which these devices may be used in comparison to combustible cigarettes. Fourthly, in comparing the perceived harms of combustible cigarettes and e-cigarettes there is a degree to which individuals are seeking to differentiate between the certainty of the (known) harms of smoking combustible cigarettes with the continuing uncertainties around aspects of the use of e-cigarettes. In a situation where one is seeking to rank the two dimensions of the certainty around the harms of one product, against the continuing uncertainties around the use of other products, it is perhaps by no means surprising that some individuals should place greater emphasis on the uncertainties around the impact of using e-cigarettes in judging the level of harmfulness of these products in comparison to what may be seen as the greater certainty around the harms of combustible tobacco products. .

The evidence around the relative harms of combustible cigarettes and e-cigarettes set out within the published scientific literature is by no means available for adult smokers more generally. Within the UK, in common with most other areas, there are no well-established means of communicating and translating the findings of empirical studies in a form that is accessible to non-specialists and there are often financial barriers in place impeding individuals' access to published data and published articles. As a result, knowledge of the harmfulness of e-cigarettes is highly dependent upon media reporting of that evidence base. It is perhaps understandable

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given the priority which the media often give to reporting "new" information that media reporting of the harms of e-cigarettes will be given greater prominence than what may be seen to be the reporting of more familiar and more historically rooted understanding of the harms of combustible cigarettes. Within the context of these multiple challenges greater attention needs to be focussed upon how each of the constituent groups involved in the use, manufacture, regulation, and study of the use of e-cigarettes may be better combined to optimise the communication of accurate information about the relative harm of combustible cigarettes and e-cigarettes thereby opening up greater opportunities for smokers to use these devices as a means of quitting smoking and reducing smoking related health harm.

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Ethics

The research reported here received a favourable ethics assessment from the Reading Independent Ethics Committee.

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