

Differences in use of electronic nicotine delivery systems by smoking status and demographic characteristics among Australian young adults

Abstract

Issue addressed: Electronic nicotine delivery systems (ENDS) continue to grow in popularity, particularly among young adults. Understanding by whom various ENDS are being used and why within this population segment can assist the development of appropriate interventions targeting those most vulnerable to use and inform policy decisions in this area. Accordingly, this study assessed the demographic characteristics associated with ENDS use among Australian young adults, and reasons for current e-cigarette use.

Methods: An online survey was administered to 1116 Australians aged 18-25 years (59% female).

Results: Smokers were more likely than non-smokers to report (i) ever use of ENDS (67% vs. 28%), (ii) ever use of an e-cigarette (64% vs. 24%), e-cigar (17% vs. 8%), or e-hookah (15% vs. 8%), and (iii) current use of e-cigarettes (19% vs. 6%). Male smokers were more likely than female smokers to be current e-cigarette users. The most common reason for current e-cigarette use was enjoyment.

Conclusions: Young male adults appear to be particularly vulnerable to both trialling ENDS and becoming regular e-cigarette users. This demographic group may need to be a primary focus of prevention and intervention efforts. Contrary to popular belief, smoking cessation was not a primary reason for e-cigarette use.

So What? Greater efforts are needed to educate young adults on the harms associated with ENDS use, especially if use is being driven by the perception that they are a harmless means of amusement. Maintaining existing regulations limiting the accessibility of these products is crucial to ensuring widespread use is minimised.

Summary:

Results from an online survey of 1116 Australian young adults aged 18-25 years suggested that young male adults are particularly vulnerable to both trialling ENDS and becoming regular e-cigarette users. The most common reason for current e-cigarette use among both smokers and non-smokers was enjoyment.

Keywords: electronic nicotine delivery systems; e-cigarettes; smoking; young adults.

Introduction

Despite insufficient data on the long-term health consequences of their use¹, electronic nicotine delivery systems (ENDS) have grown rapidly in popularity around the world². Multiple types of ENDS are now available, including e-cigarettes, e-cigars, e-hookahs, and e-pipes. Of these, e-cigarettes are the most commonly used³. In Australia, National Drug Strategy Household Survey (NDSHS) data showed a significant increase in ever use of e-cigarettes from 2013 to 2016 among adult smokers (18 to 31%) and non-smokers (2 to 5%)⁴. Rates were especially high among 18-24 year-olds, with 49% of smokers and 14% of non-smokers in this age group reporting ever use of e-cigarettes in 2016. By contrast, use of traditional cigarettes continues to decline in this age group (14% in 2013 vs. 13% in 2016).

While it has been suggested that e-cigarettes may represent an effective approach to smoking cessation by addressing the biochemical and behavioural aspects of smoking traditional tobacco cigarettes⁵, evidence of actual cessation efficacy is mixed⁶⁻⁸. In addition, the use of ENDS has been linked with a number of individual and population-level harms. In terms of individual harms, although less harmful than traditional tobacco cigarettes, ENDS use is associated with substantial health risks⁹. For example, these devices can contain ingredients such as aldehyde, tobacco-specific nitrosamines, nicotine, and additives that are cytotoxic and carcinogenic in nature and especially unsafe when heated¹⁰⁻¹³.

At the population level, concerns have been raised that the widespread introduction of ENDS may renormalise smoking-related behaviours and undermine decades of successful tobacco control that have seen smoking rates decrease substantially around the world^{14, 15}. It has also been suggested that ENDS experimentation and ongoing use may contribute to a new population of smokers by serving as a gateway to traditional cigarette use¹⁶. This is of particular concern for young adults who are especially vulnerable to tobacco smoking initiation¹⁷, with evidence suggesting that use of ENDS by young adults increases the likelihood of subsequent initiation of traditional cigarette smoking¹⁸. Use of ENDS among members of this population segment is therefore particularly important to assess, especially as ENDS continue to proliferate.

The NDSHS results provide no data for ENDS other than e-cigarettes and only limited information relating to the demographic characteristics of e-cigarette users. In addition, although the NDSHS assesses reasons for e-cigarette use by e-cigarette user status and smoking status, this information is not stratified by age. Understanding by whom various

ENDS are being used can assist the development of appropriate interventions designed to target those who may be most vulnerable to trial and use, and assessing reasons for e-cigarette use in young adults is needed to ensure efforts to minimise use are relevant to this population segment. In recent years, calls have been made to relax Australian regulations relating to e-cigarettes to improve access to these devices and facilitate smoking cessation attempts^{19, 20}. However, it has been noted that such changes have the potential to result in unintended harms among youth and that further research is needed to better understand the nature of use in this group to inform policy decisions in this area²¹.

To address these research gaps, the present study assessed the demographic characteristics (gender, SES) associated with ENDS use among smoking and non-smoking young adults to provide greater insight into those who are experimenting with and regularly using these devices. To provide evidence that can be used by policy makers to determine whether a relaxation of existing Australian regulations on e-cigarettes has the potential to increase smoking cessation rates in this population segment or result in unintended harm, reasons for e-cigarette use were also assessed and compared between smokers and non-smokers.

Method

Sample

An ISO-accredited web panel provider (PureProfile) was commissioned to recruit Australian young adults. PureProfile has an established panel of approximately 350 000 Australians recruited via internet and radio advertising, word of mouth referrals, and general publicity. In total, 1116 Australians aged 18-25 years (mean age = 21.56 years, $SD = 2.32$, 59% females) completed the survey, which was accessible via an invitation email distributed to panel members or a link on PureProfile's website. Of those who provided their postcode ($n = 1095$), 33% were from a low SES background, 41% mid SES, and 26% high SES (calculated using the Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA) classification 2011²²).

Measures

Respondents reported whether they had smoked at least 100 traditional cigarettes in their lifetime and whether they had smoked in the last 30 days. Consistent with Hammond²³, respondents were classified as current smokers if they reported smoking >100 cigarettes in their lifetime and had smoked in the past 30 days (25% of the sample). All other respondents

(never and former smokers and those who reported smoking in the last 30 days but not >100 tobacco cigarettes in their lifetime) were classified as non-smokers.

Respondents were asked if they had ever used e-cigarettes, e-cigars, e-hookahs, and/or e-pipes. Given e-cigarettes are the most common electronic nicotine delivery system and central to the smoking cessation debate, those reporting ever use of these devices were further asked if they had used an e-cigarette in the last 30 days and, if so, how frequently (daily, weekly, fortnightly, monthly, less than monthly). Current e-cigarette users were those who had used an e-cigarette in the past 30 days, at a frequency of at least monthly. An open-ended item was used to assess reasons behind current e-cigarette use.

Statistical Analysis

For analysis purposes, two composite variables were created. These were an 'ever use of ENDS' variable that accounted for use of any ENDS and an 'ever use of alternative ENDS' variable that included only those who had used ENDS other than e-cigarettes. Descriptive analyses were conducted to assess the proportions of those in each demographic group reporting ever use of ENDS, ever use of alternative ENDS, and current use of e-cigarettes. Pearson chi-square analyses were used to assess for differences in use by smoking status, gender, and SES.

Results

Differences in ENDS Use by Smoking Status

Ever use of ENDS was reported by a majority of smokers (67%) and a substantial minority of non-smokers (28%) (see Table 1). Significantly more smokers than non-smokers reported current use of e-cigarettes ($p < .001$), ever use of ENDS and ever use of alternative ENDS (both $p < .001$), and ever use of an e-cigarette, e-cigar, or e-hookah (all $p < .001$). The difference in ever use of e-pipes was not significant ($p = .149$).

Differences in ENDS Use by Demographic Characteristics and Smoking Status

Several gender differences were observed in the data (Table 1). Compared to their female counterparts, (i) male smokers were more likely to have ever used e-pipes ($p = .039$) and be current e-cigarette users ($p = .009$) and (ii) male non-smokers were more likely to have used at least one alternative ENDS ($p = .014$) and e-pipes ($p = .039$). There were no significant SES differences in ENDS use among either smokers or non-smokers.

Insert Table 1 about here

Frequency of E-Cigarette Use and Reasons for Use

Among those currently using e-cigarettes (9% of the total sample), a quarter of both smokers (27%) and non-smokers (23%) reported using them daily (significance testing was not conducted due to insufficient sample size). Only 13% of current users (14% smokers and 11% non-smokers) reported using e-cigarettes to quit smoking. The most common reason for use among both smokers (23%) and non-smokers (26%) was that it was fun, enjoyable, and/or cool.

Discussion

Significantly more smokers than non-smokers reported current use of e-cigarettes and ever use of e-cigarettes, e-cigars, and e-hookahs. This is consistent with previous research linking smoking status to e-cigarette use⁵, and additionally suggests that smokers are more amenable than non-smokers to experimentation across a variety of ENDS products. Of concern, more than one quarter of non-smokers reported ever use of at least one device and a non-trivial proportion reported current use of e-cigarettes, suggesting that these devices have widespread appeal. Greater surveillance of use of all varieties of ENDS in both smokers and non-smokers appears warranted to ensure use across the whole spectrum of available products is accurately captured and to examine the extent to which multiple product use is occurring. Results from the present study also suggest that young male adults may be particularly vulnerable to both trialling ENDS other than e-cigarettes and becoming regular e-cigarette users. This demographic group may therefore need to be a primary focus of prevention and intervention efforts.

Around one quarter of smokers and non-smokers who were current users of e-cigarettes reported using these devices daily. Given use of these devices presents unnecessary health risks and has the potential to renormalise smoking-related behaviours by exposing users to behavioural and sensory smoking cues¹⁶, efforts are needed to educate young adults on the harms associated with use, especially if use is being driven by the perception that these devices are a harmless means of amusement²⁴. This is supported by the results of the present study highlighting that the most commonly reported reason for use of e-cigarettes was enjoyment and fun, with only one in ten smokers and non-smokers using e-cigarettes for

smoking cessation purposes. Relaxing current Australian regulations on e-cigarettes is therefore unlikely to result in substantial increases in smoking cessation in young adults. On the contrary, increasing the accessibility of these products and, more specifically, nicotine-containing e-liquids, may result in Australia observing more widespread use of e-cigarettes, similar to that observed in the US where there are fewer restrictions on the marketing and sale of these devices^{1, 25}.

The results of this study should be interpreted in light of several limitations, especially the cross-sectional design, use of an online panel provider to recruit respondents, and the non-representative sample. The sample comprised lower proportions of young adults in the low SES category (33% vs. 40%) and higher proportions in the high SES category (26% vs. 20%) compared to the general population based on ABS SEIFA deciles²². The sample also included a larger proportion of ever e-cigarette users compared to the proportions obtained in the nationally-representative NDSHS of smokers (64% cf. 49%) and non-smokers (24% cf. 14%). This may be due to the non-representative nature of online panels or the differing survey methodologies employed (the NDSHS uses a combination of face-to-face, paper, and online survey). Given previous research suggesting that NDSHS data underestimate illicit drug use²⁶, the explanation is likely to be a combination of these two factors. Replication in representative samples is therefore needed to provide additional evidence relating to the characteristics of those who are experimenting with and regularly using ENDS.

To conclude, the growing range of electronic devices capable of delivering nicotine represents new challenges for public health²⁷. The present study suggests substantial levels of ENDS trial and use are occurring among young adults, especially among males and those also currently smoking cigarettes. Results also suggest that few young adult e-cigarette users are using these devices to quit smoking and that a substantial minority are using for enjoyment purposes, supporting concerns that e-cigarettes are not discouraging use of traditional cigarettes and may be contributing to a new population of smokers¹⁶. Routinely assessing use and reasons for use of all varieties of ENDS in representative population surveys will be critical for informing the development of appropriate interventions designed to target those most vulnerable to trial and use of these products.

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Table 1.

Use of ENDS stratified by smoking status, gender, and socio-economic status

	Overall	Gender		Socio-economic status ^a		
	%	%		%		
		Male	Female	Low	Mid	High
Smokers	(n=272)	(n=118)	(n=154)	(n=89)	(n=109)	(n=68)
Ever ENDS users	67	65	68	64	70	65
Ever alternative ^b ENDS users	29	34	26	25	32	32
Ever e-cigarette users	64	63	65	61	67	65
Ever e-cigar users	17	20	14	14	19	18
Ever e-pipe users	7	10*	4	6	9	4
Ever e-hookah users	15	18	14	16	12	21
Current e-cigarette users	19	26**	14	18	19	22
Daily	27	23	33	31	19	33
Weekly	40	45	33	38	48	33
Fortnightly	17	16	19	13	19	20
Monthly	15	16	14	19	14	13
Non-smokers	(n=835)	(n=335)	(n=500)	(n=266)	(n=335)	(n=219)
Ever ENDS users	28	31	26	27	28	30
Ever alternative ^b ENDS users	16	20*	14	17	16	15
Ever e-cigarette users	24	25	24	22	25	26
Ever e-cigar users	8	10	6	8	8	7
Ever e-pipe users	4	7*	3	3	5	4
Ever e-hookah users	8	9	7	8	8	8
Current e-cigarette users	6	8	4	5	6	6
Daily	23	24	23	14	15	42
Weekly	19	20	18	14	25	17
Fortnightly	28	20	36	21	35	25
Monthly	30	36	23	50	25	17

^aRespondents who had missing data on the postcode variable ($n = 21$; 2% of the sample) were not included in these analyses.

^bAlternative ENDS = ENDS other than e-cigarettes (i.e., e-cigars, e-hookahs, e-pipes).

Gender differences: * $p < .05$; ** $p < .01$.