



Zero alcohol products and adolescents: A tool for harm reduction or a trojan horse?

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ABSTRACT

Introduction: Zero alcohol products (ZAPs) could reduce alcohol-related harms by acting as a substitute for alcoholic beverages. However, concerns have been raised regarding the potential for these products to expose young people to additional alcohol-related stimuli, further normalising alcohol use and acting as a gateway to underage alcohol consumption. Scarce research has examined whether these concerns are warranted.

Method: This project comprised two parts involving Australian adolescents aged 15–17 years. Part 1 was a series of 5 online focus groups (n = 44) that provided initial insights into perceptions of and experiences with ZAPs. Part 2 was a national online survey (n = 679) that assessed the generalisability of the focus group findings and identified factors associated with ZAP-related attitudinal and behavioural outcomes.

Results: ZAPs were found to be salient and attractive to Australian adolescents. Over a third of surveyed adolescents (37%) had tried ZAPs. The focus group participants and survey respondents generally perceived ZAPs in a positive light, seeing them as a useful alternative to alcohol for both adolescents and adults who want to circumvent social expectations to use alcohol. Some of the study participants acknowledged the potential for ZAPs to serve as a gateway to alcohol use and recommended reducing their visibility and accessibility.

Conclusion: ZAPs are likely exposing minors to additional alcohol-related stimuli potentially increasing their risk of underage alcohol consumption. Regulatory responses to ZAPs need to protect young people from the potential adverse consequences of ZAPs exposure while enabling the products to be used by adults as an alcohol substitute.

1. Introduction

Zero alcohol products (ZAPs), also referred to as no-alcohol products, are designed to mimic the appearance, taste, and smell of alcoholic products, but contain no or very low amounts of alcohol (Hew & Arunogiri, 2023). In most jurisdictions, beverages have to contain less than 0.5% alcohol by volume to be categorised as a ZAP (Okaru & Lachenmeier, 2022). These products are increasingly popular across numerous countries and regions, including Australia, Canada, the EU, Japan, South Africa, the UK, and the US (IWSR Drinks, 2022; Kokole et al., 2022; Llopis et al., 2021). By replicating the organoleptic properties of alcoholic products, ZAPs could reduce alcohol use and the associated harms by acting as a substitute (Hew & Arunogiri, 2023; Miller et al., 2022).

However, the scarce research examining whether ZAPs act to reduce alcohol consumption among current drinkers has yielded mixed results, with some studies finding a substitution effect (Anderson et al., 2021; Clarke et al., 2022) and another finding an additive effect (i.e., ZAPs being consumed in addition to, rather than in place of, usual alcohol products) (Corfe et al., 2020). British survey data from 2013 to 2019 found that ZAPs were the least commonly used technique for trying to moderate alcohol consumption, with only 6% of drinkers using ZAPs for this purpose (Sasso et al., 2022).

Concerns have been raised about the potential for the growing ZAPs market to increase young people's exposure to alcohol-related stimuli (Hew & Arunogiri, 2023; Kaewpramkusol et al., 2019; Miller et al., 2022; World Health Organization, 2023). In most jurisdictions, ZAPs are

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not subjected to the same restrictions that are imposed on alcoholic beverages in terms of where they can be sold and how they can be advertised (Bury et al., 2023; Critchlow et al., 2022; Hew & Arunogiri, 2023), the exceptions being France and Norway where the marketing of ZAPs faces the same restrictions as alcoholic products (Corfe et al., 2020; Critchlow et al., 2022; World Health Organization, 2023). Due to this lack of restrictions, in many countries ZAPs can be used as a form of brand extension and a means to engage in ‘surrogate marketing’ (i.e., circumventing regulations by promoting core features of alcohol brands but not the products themselves) (Critchlow et al., 2024; Hew & Arunogiri, 2023; Kato et al., 2022). By advertising ZAPs using the same core branding as their alcoholic products, such as the brand name, logo, and colour schemes, producers can increase the visibility of their alcoholic brands in previously inaccessible domains, including contexts that will increase young people’s exposure to alcohol branding (Critchlow et al., 2022, 2024; Kaewpramusol et al., 2019). The vast majority of ZAP products sold have an alcoholic parent brand (Holmes et al., 2024). Therefore, ZAPs are likely to result in minors witnessing more alcohol-related stimuli (Hew & Arunogiri, 2023), which in turn has been consistently associated with earlier and more intense underage alcohol use (Hou et al., 2023; Jernigan et al., 2017; Rossow et al., 2016).

A further concern relating to ZAPs is their potential to act as a gateway to alcohol use by acclimating young people to the taste of alcoholic beverages and the practice of drinking alcohol-branded products (Miller et al., 2022; World Health Organization, 2023). While there is very little data available on this issue, a recent study in Taiwan found 15% of surveyed high school students had purchased and 19% had consumed non-alcoholic beers in the previous year (Hou et al., 2023). Those students who had consumed non-alcoholic beers were more likely to intend to consume alcohol over the next year (Hou et al., 2023). These findings suggest a possible association between the use of ZAPs and subsequent alcohol consumption among underage people.

Concerns that ZAPs might negatively affect young people have been raised by researchers, multilateral health organisations, and health agencies (Alcohol and Drug Foundation, 2023; Hew & Arunogiri, 2023; Pierce & Stafford, 2021; World Health Organization, 2023). To begin to address the recognised evidence gap around young people’s experiences with ZAPs that is impeding relevant policy development and implementation (Hew & Arunogiri, 2023; World Health Organization, 2023), this exploratory study aimed to examine adolescents’ perceptions and use of ZAPs and their support for a range of potential regulatory actions. The context of the study is Australia, where the current regulatory environment allows minors to purchase ZAPs and for these products to be sold and marketed in places where alcohol cannot (Australian Human Rights Commission, 2023; Hew & Arunogiri, 2023). The legal age for purchasing alcohol in Australia is 18 years and over (Commonwealth of Australia, 2022).

2. Methods

A mixed methods approach was used to generate novel insights and allow for a multi-perspective examination of this emerging research area. Part 1 involved a series of online focus groups and part 2 constituted an online survey. The focus groups were conducted to provide initial insights into Australian adolescents’ perceptions of and experiences with ZAPs. The findings from the focus groups informed the development of the survey items for the subsequent national survey that assessed the generalisability of the focus group findings and identified factors associated with ZAP-related attitudinal and behavioural outcomes. The study was approved by (blinded for review) human research ethics committee.

2.1. Part 1: online focus groups

2.1.1. Sample

Five online focus groups were conducted with Australian adolescents

aged 15–17 years (total $n = 44$). While adolescence is defined by the World Health Organization (2024) as being 10–19 years of age, this study limited recruitment to 15–17 years to focus on older adolescents who cannot legally purchase alcohol. A social research data collection agency (Thinkfield) was commissioned to recruit approximately 10 participants per focus group. To recruit participants, Thinkfield contacted adolescents in their research panel who had previously indicated an interest in research involvement to invite them to participate in this study. Participants were reimbursed \$80 AUD for attendance. To achieve variability in the sample, the recruitment agency assigned individuals to groups as shown in Table 1. This ensured approximately equal coverage of males and females, distribution across the limited 15–17 years age range, and representation of those living in metropolitan and regional areas. In addition to demographic attributes, information relating to participants’ past use of ZAPs and alcohol was collected during recruitment (Table 1 provides the focus groups sample profile and an overview of the groups’ characteristics).

2.1.2. Procedure

The focus groups were moderated by a member of the research team (XX). A semi-structured interview guide (see supplementary materials) was used to prompt discussions on the following topics based on issues and concerns identified in the literature (Hew & Arunogiri, 2023; Miller et al., 2022; World Health Organization, 2023): unprompted recall of alcohol branding in supermarkets; prompted recall of ZAPs; reactions to ZAPs; experiences with purchasing/using these products; intentions to use ZAPs; perceptions of ZAPs, including benefits and drawbacks; perceptions of the alcohol industry and its brand-extension efforts; and suggestions for potential regulatory actions. Assessment of prompted recall involved showing participants example images of ZAPs in a retail setting and as standalone products (see Fig. 1). Average duration of the focus groups was 58 min (range 56–61 min). The focus group discussions were recorded and the recordings were subsequently transcribed verbatim.

2.1.3. Analyses

The transcripts were imported into NVivo 12 for line-by-line coding and thematic analysis according to Braun and Clarke’s (2006) procedure. Due to the exploratory nature of the analysis, coding was undertaken by a single coder (author XX) to allow for emergent and reflexive

Table 1
Focus group participant characteristics and group overview ($n = 44$).

Participant characteristics		n	%		
Gender					
	Female	21	48		
	Male	23	52		
Age					
	15	10	23		
	16	14	32		
	17	20	45		
	Ever consumed ZAPs	23	52		
	Ever purchased ZAPs	5	11		
	Ever consumed alcohol	29	66		
Composition of each focus group					
Focus group	Gender	Age range	Age M (SD)	Residential location	Number of participants
1	Males	15–16 years	15.5 (0.53)	Metropolitan	10
2	Females	15–16 years	15.5 (0.53)	Metropolitan	8
3	Males	16–17 years	16.7 (0.48)	Metropolitan	10
4	Females	16–17 years	16.9 (0.35)	Metropolitan	8
5	Combined	15–17 years	16.6 (0.74)	Regional	8

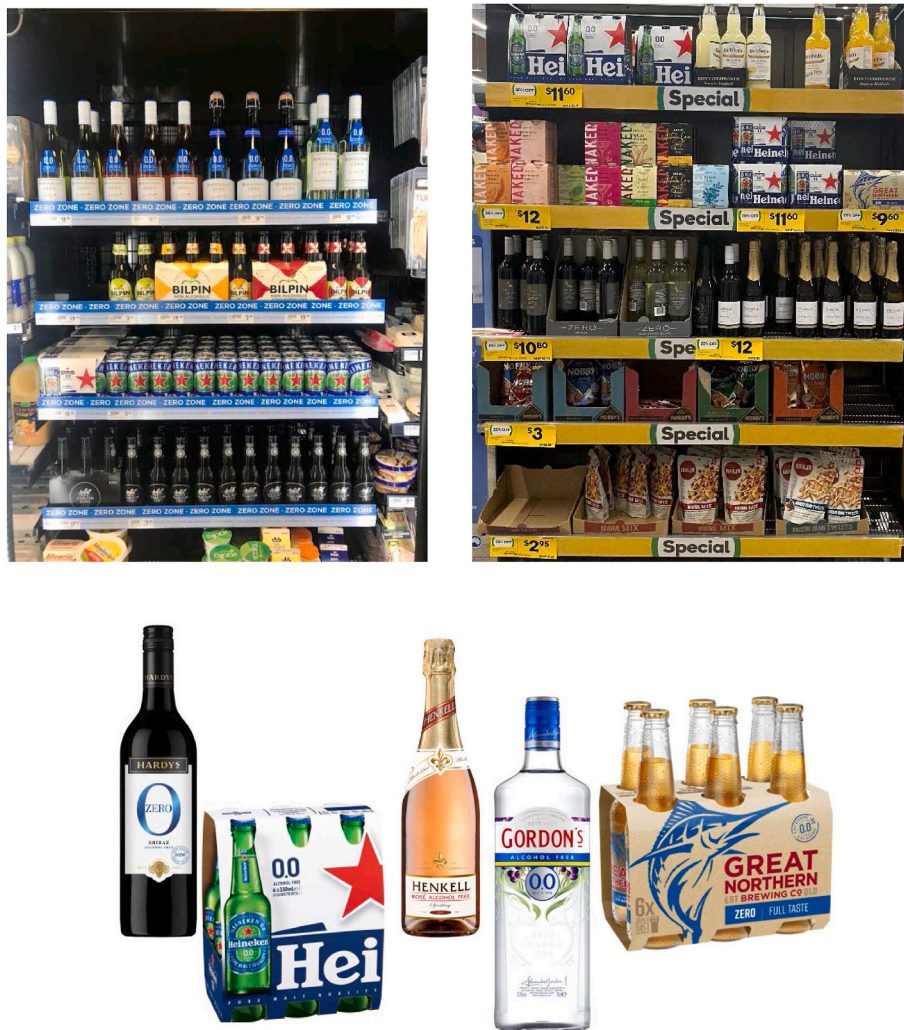


Fig. 1. Zero alcohol product displays and products shown to focus group participants.

code generation (Braun & Clarke, 2021; Elliott, 2018; Pailthorpe, 2017). This involved initially creating conceptual “nodes” in NVivo based on the topics covered in the interview guide and then progressively fleshing out the node hierarchy to include new topics as they emerged. Examples of initial (deductive) nodes included disadvantages of ZAPs, whereas emergent (inductive) nodes included adolescent use of ZAPs to circumvent alcohol-related peer pressure. This reflexive approach combined with the use of a single coder provided the flexibility required to generate unanticipated findings via thematic analysis, rather than attempting to match data to an existing theoretical framework (Smith & McGannon, 2018). Following the coding process, the author team identified patterns in the data to generate themes. A bivariate correlation was also conducted to examine the relationship between alcohol and ZAP use in the focus group sample.

2.2. Part 2: national survey

2.2.1. Sample

Pureprofile, an ISO-accredited web panel provider, administered the survey to 679 Australian adolescents aged 15–17 years. Quotas were used to recruit a demographically representative sample in terms of age, gender, and location (metropolitan vs. non-metropolitan). Pureprofile sent survey invitations to potential respondents who were pre-registered on their panel to undertake surveys and fit the recruitment criteria. Once they clicked a generic survey link that specified survey duration, the

respondents were advised that the survey was on the topic of use and perceptions of zero alcohol products. Respondents were reimbursed with points worth around \$5 AUD that could be used to purchase numerous items on the Pureprofile platform such as gift cards and cinema tickets. The demographic characteristics of the survey sample are displayed in Table 2.

2.2.2. Survey items

The development of the survey items was informed by the focus group findings in terms of the areas of interest examined and identification of appropriate response options. Respondents were asked to provide their postcode to enable derivation of socioeconomic status via the Australian Bureau of Statistics, (2023) index of relative socio-economic advantage and disadvantage. Information on current alcohol use was also gathered using frequency and quantity items from (Australian Institute of Health and Welfare, 2020). To estimate likely exposure to ZAPs in supermarket settings, respondents reported their frequency of visiting supermarkets “In the last 12 months, how often did you visit a supermarket (e.g., Coles, Woolworths, IGA, Aldi)?” with response options never; less than once a month, about 1 day a month, 2–3 days a month, 1–2 days a week, 3–4 days a week, 5–6 days a week, and every day. To assess recollection of ZAPs, respondents were provided with the following description “Zero alcohol drinks look and taste like an alcoholic drink (e.g., beer, wine, cider, gin, and whisky), but do not contain alcohol.”, and then asked “Have you seen any of the following types of zero alcohol

Table 2
National survey sample profile (n = 679).

	n	%
Age M(SD)	16.2 (0.74)	
15	138	20
16	289	43
17	252	37
Gender		
Female	342	50
Male	317	47
Non-binary	7	1
Other/prefer not to answer	13	2
Socioeconomic Status		
Low (decile 1–4)	157	23
Mid (decile 5–7)	264	39
High (decile 8–10)	258	38
Residence		
Metropolitan	562	83
Non-metropolitan	117	17
State		
NSW	211	31
VIC	159	23
WA	120	18
QLD	120	18
SA	55	8
TAS	9	1
ACT	3	1
NT	2	1
Ever consumed ZAPs ^a	251	37
Consumed zero alcohol products in the previous 12 months	182	27
Ever consumed alcohol ^b	372	55
Consumed alcohol in the previous 12 months	281	41

Note: ZAPs = zero alcohol products.

^a Including sips of alcohol/ZAPs.

products? (Select all that apply)”. The response options were beer, wine, cider, spirits (e.g., whisky, gin), ready to drink beverages (e.g., vodka mixers, bourbon and coke), pre-made cocktails (e.g., margaritas, mojitos, spritz), other (please specify), and I have never seen any zero alcohol products.

Respondents were asked where they had seen ZAPs for sale as follows: “Have you seen zero alcohol products for sale in any of the following places? (Select all that apply)”, response options: major supermarket chain (e.g., Coles, Woolworths, Aldi, Costco, IGA), local convenience or grocery store/milk bar/deli (e.g., 7-Eleven), petrol station, newsagent/news stand, entertainment establishment (e.g., pub, restaurant), bottle shop or liquor store, internet, other (please specify), and I have never seen zero alcohol products for sale (adapted from Australian Institute of Health and Welfare (2020)). Respondents who had seen ZAPs for sale were asked to list any ZAP brand names they could recall (open response). The following item examined recollection of ZAP advertisements: “Have you seen advertising for zero alcohol products in any of the following media? (Select all that apply)”, response options: television, social media (e.g., TikTok, Facebook, Instagram), internet, in a bottle shop, at or around supermarkets, at sporting events, radio, newspapers, magazines, restaurants/pubs, billboards/posters, other (please specify), and none of these places (adapted from Jones and Magee (2011)).

To explore reactions to ZAPs, participants were shown four images (randomised order), with each image displaying four ZAPs from one product category (i.e., beers, wines, spirits, and ready to drink). Each row of Fig. 2 corresponds with the products displayed in each image. Respondents were then asked to answer the following questions with respect to all of the depicted products, “Please rate how much you agree or disagree with the following statements”. The response options were on a scale of 1 ‘Strongly disagree’ to 5 ‘Strongly agree’ for the following statements: I cannot imagine ever wanting to drink these beverages, the appearance of these products is appealing, the packaging on these products is attractive, I would drink these beverages if they were offered to me, and I would buy these beverages (adapted from Jaeger and Giacalone (2021)). Respondents’ perceived benefits of ZAPs were



Fig. 2. Zero alcohol products shown to survey respondents.

examined by asking “How much do you agree or disagree with the following statements”, with respondents providing their level of agreement on a scale of 1 ‘Strongly disagree’ to 5 ‘Strongly agree’ for: ZAPs can help people to drink less alcohol, are useful for when people want to pretend they are drinking alcohol, make it easier for underage people to say no to alcohol (e.g., at parties), are a good way for underage people to celebrate special occasions, and are a way for underage people to fit in with others who are drinking alcohol. Respondents were asked about their perceived target audiences for ZAPs, “Who do you think zero alcohol beverages are likely to appeal to? (Select all that apply)”, response options: males, females, pregnant women, those who have to drive, sportspeople, people with alcohol addiction, people aged 8–13 years, people aged 14–17 years, people aged 18–30 years, people aged 31–59 years, people aged 60+ years, other (please specify), and none of these (adapted from

Vasiljevic et al. (2019)).

The following question was used to determine whether respondents had ever used ZAPs: “Have you ever had even part of a zero alcohol drink?”, response options: no, yes just a few sips, yes I have had fewer than 10 zero alcohol drinks in my life, and yes I have had 10 or more zero alcohol drinks in my life (adapted from Department of Health and Aged Care (2022)). To assess current ZAP consumption, respondents were asked: “In the last 12 months, how often did you have zero alcohol drinks of any kind? Please do not count other non-alcoholic drinks like soft drinks, water, and juice”, response options: I did not have a zero alcohol drink, less than once a month, about 1 day a month, 2–3 days a month, 1–2 days a week, 3–4 days a week, 5–6 days a week, and every day (adapted from Australian Institute of Health and Welfare (2020)). For respondents who had used ZAPs, the types of products used were identified by asking “What types of zero alcohol products have you tried? (Select all that apply)”, response options: beer, wine, cider, spirits (e.g., whisky, gin), ready to drink (e.g., vodka mixers, bourbon and coke), pre-made cocktails (e.g., margaritas, mojitos, spritz), and other (please specify).

Respondents were asked to indicate where they usually use ZAPs: “Where do you usually drink zero alcohol products? (Select all that apply)”, with response options: in my own home; at a friend’s house; at a party at someone’s house; at raves/dance parties; at restaurants/café; entertainment establishments (e.g., pub, restaurant); at school, TAFE, etc.; at my workplace; in public places (e.g., parks, beaches); in a car or other vehicle; and somewhere else (open response) (adapted from Australian Institute of Health and Welfare (2020)). To identify who the respondents consumed ZAPs with, they were asked “Who do you usually drink zero alcohol products with? (Select all that apply). The response options were: mother, father, guardian(s), brother/sister under 18, brother/sister 18+, friend(s) under 18, friend(s) 18+, other family members, no-one, and other (please specify).

Perceived difficulty of acquiring ZAPs was assessed using the following question: “How easy or hard do you think it would be for you to get zero alcohol products if you wanted?”, response options on a scale of 1 ‘Very hard’ to 5 ‘Very easy’ (adapted from Kuntsche et al. (2008)). ZAP purchasing behaviours were examined by asking “Have you ever attempted to purchase a zero alcohol drink but were refused service?”, response options: yes or no. This was followed by “Have you ever successfully bought a zero alcohol drink?”, response options: yes or no. Respondents who had successfully bought ZAPs were asked “Where did you successfully buy zero alcohol drinks from?”, with response options: major supermarket chain (e.g., Coles, Woolworths, Aldi, Costco, IGA), local convenience or grocery store/milk bar/deli (e.g., 7-Eleven), petrol station, newsagent/news stand, entertainment establishment (e.g., pub, restaurant), bottle shop or liquor store, internet, and other (please specify) (adapted from Australian Institute of Health and Welfare (2020)). All respondents reported their intentions to purchase ZAPs: “Do you intend on buying zero alcohol products over the next: (Please select the option that applies best)”, with response options few days, week, fortnight, month, 3 months, 6 months, year, after I turn 18, and never.

ZAP provision sources were determined by asking respondents “Has anyone ever given a zero alcohol drink to you?”, response options: yes or no. If they answered affirmatively, respondents then answered the following question “Who has given you zero alcohol drinks? (Select all that apply)”, response options: my parent(s)/legal guardian(s), my brother/sister, I took them from home without my parent(s)/legal guardian(s) permission, friend who is 18+, friend who is under 18, I got someone to buy them for me, and another person (please specify). Respondents reported their support for three potential ZAP harm-reduction policies “How much do you agree or disagree with the following?”, using a scale of 1 ‘Strongly disagree’ to 5 ‘Strongly agree’ for: banning the sale of zero alcohol products to underage people (under 18 years); banning zero alcohol products from being sold in places that don’t sell alcohol (e.g., ban them from supermarkets, local convenience stores, delis, and petrol stations); and alcohol branding not being allowed on products that are not alcoholic drinks.

2.2.3. Analyses

Descriptive analyses were conducted to determine proportions of respondents selecting each response option. Agreement for statements examining reactions to ZAPs, perceived benefits, and support for harm-reduction policies, were calculated by summing the proportion of respondents who selected ‘Agree’ or ‘Strongly agree’. Multiple generalised linear models were conducted to identify factors associated with (i) recollection of ZAPs (yes vs. no), (ii) recollection of ZAP advertisements (yes vs. no), (iii) positive reactions to ZAP images (composite score), (iv) perceptions that ZAPs are beneficial for underage people (composite score), (v) current use of ZAPs (yes vs. no), (vi) intent to purchase ZAPs over the next year (yes vs. no), and (vii) support for potential ZAP harm-reduction policies (composite score). For the outcomes with binary response options, binomial distributions were specified with odds ratios calculated from the resulting model outputs. For the outcomes with continuous normal distributions, normal linear distributions were specified. For all the models, the following independent variables were specified as the main effects: age; gender (male vs. female); location (metropolitan vs. non-metropolitan); socioeconomic status (decile); alcohol use in the previous 12 months (yes vs. no); and the frequency of visiting supermarkets. The models did not include respondents who identified as non-binary or selected ‘prefer not to answer’ for gender (n = 20).

The composite score for positive reactions to ZAP images was calculated by aggregating the scores on the five items examining reactions to the ZAP product images shown in Fig. 2, with ‘I cannot imagine ever wanting to drink these beverages’ being reverse coded so that higher scores represented more positive reactions. A composite score for perceptions that ZAPs are beneficial for underage people was calculated by aggregating the results from the three perceived benefits items relating to underage people (i.e., ‘make it easier for underage people to say no to alcohol’; ‘are a good way for underage people to celebrate special occasions’; and ‘are a way for underage people to fit in with others who are drinking alcohol’). Similarly, a composite score for support for potential ZAP harm-reduction policies was calculated by aggregating the respondents’ level of agreement for the three examined policies.

3. Results

3.1. Part 1: online focus groups

The bivariate correlation conducted on the participants’ descriptive data showed a strong association between alcohol and ZAP use among the focus group participants ($r(42) = 0.47, p < 0.001$). Three main themes emerged from the focus group discussions: (i) ZAPs are salient and appealing, (ii) ZAPs could have some disadvantages, and (iii) there are potential ways to reduce harms that may result from ZAPs. These themes were consistent across the focus groups, apart from some apparent gender differences that are noted in the theme descriptions below.

3.1.1. ZAPs are salient and appealing to teens

Many of the focus group participants recalled seeing ZAPs for sale in supermarkets, with beer, cider, wine, cocktail imitations, and ready-to-drink beverages reported as observed ZAP categories. Most participants were able to nominate at least one specific ZAP brand.

I usually see zero alcohol and stuff at the shops ... It’s in the drinks aisles usually. Any particular brands? Great Northern and Gordon’s. Male, 15–16, Metropolitan.

At the [supermarket] I live near, there’s like alcohol products with no alcohol in it, like substitutes. I see those. Can you remember any particular brand? Carlton, I think that’s one. There’s one that’s like natural or something, that’s like the cocktail mixers. Female, 15–16, Metropolitan.

Carlton Zero was a big one like at the start of last year, but at the moment the Great Northern zeros are the ones I see the most. Usually near the cordials. It's usually like the zero beer and wine. *Female 15–17, Regional.*

Participants reported seeing ZAPs advertised across several media platforms, especially television and social media. Humour was noted to be an effective approach used in some ZAP ads, including by depicting confusion resulting from the products being consumed in situations where it is not appropriate to use alcohol.

I remember seeing an ad, I think it was the Heineken's zero alcohol beer, where the guy was in the car drinking the beer and the policeman came up to him and passed him a ticket and he showed that it was zero alcohol beer, but the ticket wasn't for that – he was in a no parking zone. *Female, 15–16, Metropolitan.*

I saw the Guinness Zeros and the Gordon Zeros on my TikTok, both in the last week ... In the Guinness one they were like pouring it out in a pub, and it was a zero, so I was like, "That's a bit funky". *Female, 15–17, Regional.*

The participants found the ZAP products shown to them (Fig. 1) to be generally attractive. Typically, males were drawn to the zero alcohol beers and spirits and described the packaging of these products and the colours they used as being appealing. Females also noted the colour of some products as being attractive, but in contrast to the males, stated that the colour profiles of several products (primarily zero alcohol cocktails) would be particularly appealing to young people.

The Heineken at the top left of the right picture looks appealing, I reckon. *What is it about that do you reckon that looks good?* Just the white and then like the red and blue that stands out. *Male, 15–16, Metropolitan.*

The gin bottle looks coolest. I like the way the blue sort of goes with the green and the green is all like natural and stuff, and the blue is all straight edges. I think it's pretty cool. *Male, 15–17, Regional.*

I agree with like the colour thing, like to a younger audience who would maybe want to drink fun drinks like cocktails. My eyes are very much drawn to the brightly coloured boxes. *Female, 16–17, Metropolitan.*

I agree about the Naked brand. I feel like that's really appealing to teenagers as they like that pop of colour. I feel like that wouldn't be very appealing to adults because they're kind of not really that into that kind of stuff. *Females, 15–16, Metropolitan.*

Some female participants spontaneously mentioned that ZAPs can be a useful alternative to alcohol for adolescents in social situations. These participants noted that they were increasingly feeling pressure to consume alcohol in social contexts such as parties, and that they saw ZAPs as a useful way to circumvent this expectation.

I think it's pretty appealing because it's not that obvious. So if you didn't want to drink but you felt a little bit left out at a party, especially the Gordons one, I think that you probably get away with having that and pretending like you had a drink. At my age, because there's some people that don't want to drink but feel left out and often get peer pressured, this [zero alcohol] would be a good alternative for that. *Female, 15–16, Metropolitan.*

I think there is a place for non-alcoholic drinks like for under 18s at like parties and stuff if you don't want to drink but you want to fit in. *Female, 16–17, Metropolitan.*

When asked about possible benefits of ZAPs, there was a general recognition among both male and female participants that adults are typically expected to consume alcohol in social situations, and that ZAPs could enable adults to meet expectations to consume alcohol without actually engaging in alcohol use. In addition, some thought ZAPs could

be helpful for people with alcohol dependency to satisfy alcohol cravings without consuming alcohol.

I think it's a social thing, and useful as you get older and you want to have a night out with friends, but you don't want to be hungover or something in the morning ... It's probably for the social expectation without having to suffer the consequences. People expect you to be drinking when you go out with friends. If you don't have a beer, are you really enjoying yourself? *Male, 15–16, Metropolitan.*

If someone is a past alcoholic but still wants to reach for something, it would be good for them to reach for the alcohol alternative because it does taste like it [alcohol] most of the time, depending on what you get. But it's not actually alcohol, so it doesn't actually affect them. *Female, 15–16, Metropolitan.*

Among those who reported having tried ZAPs, parents were frequently reported as being the primary provision source. However, several participants reported purchasing ZAPs for their own consumption, typically from supermarkets and licenced premises. The most commonly reported reason for purchasing ZAPs was to feel included in social contexts where peers were consuming alcohol.

I was wondering if it tasted any different and he [father] was like, "Oh zero alcohol, have a try". *Male, 15–16, Metropolitan.*

A non-alcoholic gin – my mum bought it for me. But she also bought it for herself when she wanted to drink but had to drive. *Female, 15–16, Metropolitan.*

We were just having like a mocktail party at my house, so all of my friends bought non-alcoholic stuff and then you know we made mocktails from it. That's how I tried the non-alcoholic wine for the first time. *Female, 15–16, Metropolitan.*

I've gone to restaurants, if I'm going out with friends, sometimes they'll drink. Since I can't drink since I'm underage, I'll just order like a zero alcohol one sometimes. So it could be like a mocktail with some zero alcohol spirits, like gin and stuff put in it, or it could be like a zero alcohol standalone, like a cider or something. *Female, 16–17, Metropolitan.*

It was my friend's 18th, so since I wasn't going to be drinking whatever they brought, I decided that, "Oh, I'll go buy a zero alcohol drink". *Male, 15–17, Regional.*

3.1.2. ZAPs have their disadvantages

When participants were asked to discuss any possible disadvantages of ZAPs, a commonly anticipated issue with ZAPs was the potential for them to act as a gateway to alcohol use by allowing younger people to become accustomed to the taste of alcoholic products. Participants expected that at least some underage people would initiate the use of actual alcohol products earlier because they had used ZAPs.

I feel the zero alcohol beverages like non-alcoholic beers kind of get younger people hooked on it, and then when they turn 18, they might start drinking beer. *Male, 15–16, Metropolitan.*

You don't really want kids to start enjoying and drinking the taste of alcohol, because if it kind of encourages them when they're a little bit older to drink alcohol more because they really like it. *Female, 16–17, Metropolitan.*

I feel like kids when they're around 14 and 15, they are really impressionable. And if they start drinking that [ZAPs] at a younger age, they're going to want to start drinking actual alcohol. Doing non-alcoholic drinks just seems like a gateway to them drinking actual alcohol. *Female, 16–17, Metropolitan.*

Some ZAP non-users considered the main appeal of alcoholic drinks to be their intoxicating property rather than taste of the beverage. For

these participants, ZAPs were perceived as being pointless and unappealing due to their lack of alcohol, leading to a preference for more affordable and palatable soft drinks/sodas.

I think that at our age, if you're drinking, you're drinking to get drunk. You're drinking to have fun and experience getting drunk. *Female, 15–17, Regional*

I don't really care if I see like a kid drinking a non-alcoholic drink. They should have just bought a Coke because they will just be drinking a drink that tastes bad. It's not even going to get them drunk, so it will just be a waste of money. *Male, 16–17, Metropolitan*

If you want something non-alcoholic, I'm sure most people would prefer a soft drink. *Male, 15–17, Regional*

3.1.3. Suggestions to reduce harm

When prompted at the end of the focus group sessions to discuss potential approaches to minimising the risk ZAPs could pose to young people, participants made several recommendations that focused on reducing the visibility and accessibility of these products. In terms of visibility, suggested strategies included moving ZAPs to higher shelves, product aisles that are less appealing to young people, and dedicated sections at the back of the store. A few participants recommended only selling ZAPs in dedicated stores (e.g., alcohol outlets) to reduce young people's exposure.

Put it on a higher shelf, I wouldn't put them down like the soft drink aisle, that's where kids are more prone to go to. Put it somewhere adults would probably go, at the back of the store or something. *Female, 15–16, Metropolitan*

I'd definitely put it in a place where they're not going to go, like in the dog food aisle or the utilities aisle. *Male, 16–17, Metropolitan*

Make it more specialised. I reckon you should have to get it from somewhere where they actually dedicatedly sell it. So you walk in there and you know I'm in here to get it, I'm not just going to happen upon it. *Male, 15–16, Metropolitan*

To reduce accessibility, some respondents thought that a minimum age limit on purchasing ZAPs was appropriate, but they did not generally suggest the 18 years restriction that applies to alcohol products. Instead, around 15–16 years of age was often perceived as being a suitable threshold.

For the non-alcoholic drinks, I think it should be definitely like 16, or maybe 15. *Male, 16–17, Metropolitan*

I definitely agree with it being sold at bottle shops and maybe supermarkets, but yeah maybe an ID thing, like 16 or something. I honestly thought that you had to be 18 to buy zero alcohol drinks. *Female, 16–17, Metropolitan*

While most participants seemed receptive to some form of regulation for ZAPs marketing, several thought that attempts to reduce the visibility of ZAPs were futile. They noted that the extra exposure to alcohol brands resulting from observing ZAPs was marginal compared to the large amount of alcohol advertising that young people already see.

They're already exposed to alcohol through their parents drinking and through advertisements. It's already something children are aware of. I doubt putting them [ZAPs] on shelves is going to make too much of a difference. *Males, 15–16, Metropolitan*

They're going to be exposed to it [alcohol] probably anyway, like if their parents drink it, or at like a family gathering, or something on TV in the media. I feel like it could be one route of exposure, but it's not the only way. *Female, 16–17, Metropolitan*

3.2. Part 2: national survey

The survey results are summarised below. These results generally aligned with the focus group findings with one notable exception. Support for potential ZAP harm-reduction strategies was low among the survey respondents compared to focus group participants.

3.2.1. Recollection of ZAPs and ZAP advertising

Table 3 provides a summary of where respondents reported being exposed to ZAPs and ZAP advertising. A large majority (80%) of respondents recalled seeing ZAPs for sale, with the most common locations being supermarkets (58% of the total sample) and alcohol stores (33%), followed by the internet (22%) and smaller grocery stores (19%). When respondents were asked about the brands of zero alcohol products they had seen, a third recalled products with alcohol parent brands (e.g., Heineken) (32%). Just over three quarters (76%) recalled seeing advertising for ZAPs, with the most frequently recalled sources of exposure being television (44% of the total sample), social media (38%), alcohol retailers (31%), the internet (30%), and supermarkets (29%).

3.2.2. Reactions to ZAPs and perceived benefits

Just over half of respondents agreed that the products displayed in the survey (Fig. 2) looked appealing (56%) and that the packaging was attractive (54%). Two in five (41%) said they would drink the products if they were offered to them and 31% said they would buy them (see Table 4).

A majority of respondents agreed that ZAPs could help drinkers to consume less alcohol (63%) and enable people to pretend they are drinking alcohol (54%). In terms of benefits for minors, just over half agreed that ZAPs are a good way for underage people to celebrate special occasions (52%) and they make it easier for underage people to say no to alcohol (51%). Almost half agreed that ZAPs are a way for underage people to fit in with others who are drinking alcohol (45%) (see Table 5).

When asked to nominate population subgroups to whom ZAPs would appeal, half selected people who have to drive (50%), followed by people with alcohol addiction (47%) and pregnant women (43%). In terms of the age groups that ZAPs could appeal to, respondents most commonly selected their own age group 14–17 years (42%), followed by

Table 3
Recollection of zero alcohol products (n = 679).

	n	Proportion of sample (%)
Recall ever seeing zero alcohol products for sale	543	80
<i>Point of sale location</i>		
Major supermarket chain (e.g., Coles, Woolworths, Aldi, Costco, IGA)	396	58
Bottle shop or liquor store	226	33
Internet	148	22
Local convenience or grocery store/milk bar/deli (e.g., 7-Eleven)	132	19
Entertainment establishment (e.g., pub, restaurant)	100	15
Petrol station	96	14
Newsagent/news stand	28	4
Recall any zero alcohol advertising	513	76
<i>Advertising medium</i>		
Television	300	44
Social media (e.g., TikTok, Facebook, Instagram)	254	38
In a bottle shop	207	31
Internet	204	30
At or around supermarkets	194	29
Restaurants/pubs	94	14
At sporting events	91	13
Billboards/posters	89	13
Magazines	54	8
Newspapers	47	7
Radio	44	7

Table 4
Responses to zero alcohol product images (n = 679).

	Disagree (%)	Neutral (%)	Agree (%)
The appearance of these products is appealing	17	27	56
The packaging on these products is attractive	15	31	54
I would drink these beverages if they were offered to me	31	28	41
I would buy these beverages	36	33	31
I cannot imagine ever wanting to drink these beverages	43	35	23

Note: Five-item response scale from 1 (strongly disagree) to 5 (strongly agree). Respondents selecting 1 'Strongly disagree' or 2 'Disagree' were categorised as disagree, those selecting 3 'Neither agree nor disagree' were categorised as neutral, and those selecting 4 'Agree' or 5 'Strongly agree' were categorised as agree.

Table 5
Perceived benefits of zero alcohol products (n = 679).

	Disagree (%)	Neutral (%)	Agree (%)
Zero alcohol products can help people to drink less alcohol	13	25	63
Zero alcohol products are useful for when people want to pretend they are drinking alcohol	16	30	54
Zero alcohol products are a good way for underage people to celebrate special occasions	18	30	52
Zero alcohol products make it easier for underage people to say no to alcohol (e.g., at parties)	17	33	51
Zero alcohol drinks are a way for underage people to fit in with others who are drinking alcohol	19	36	45

Note: Five-item response scale from 1 (strongly disagree) to 5 (strongly agree).

18–30 years (33%), 31–59 years (21%), and 60+ years (21%). Few thought ZAPs would appeal to those aged 8–13 years (9%) (see [Supplementary Table 1](#)).

3.2.3. Using and buying ZAPs

Just over one-third of respondents reported ever using ZAPs (37%), most of whom had been given the beverages by someone else (33% of respondents). The most common provision sources among these respondents were parents (56%), friends aged 18+ years (28%), friends aged under 18 (19%), and siblings (11%) (see [Table 6](#)). Zero alcohol beer was the most frequently consumed product (14%), followed by cider (11%), wine (9%), pre-made cocktails (7%), and ready-to-drink beverages (5%). A majority of respondents who had consumed ZAPs nominated their own home as their usual place of consumption (55%), followed by 'A friend's house' (33%) and 'A party at someone's house' (25%). Fathers (36%) and mothers (35%) were the most frequently selected people with whom ZAPs were consumed, followed by friends under 18 (30%) and friends 18+ years (25%).

Around half of respondents (51%) thought it would be easy to obtain ZAPs, and only 18% thought it would be difficult (see [Table 7](#)). Among those who had attempted to purchase ZAPs, 88% had been successful at least once and 24% had ever been refused service. Of the respondents who reported successfully purchasing ZAPs, 58% had made a purchase at a major supermarket, 23% at a smaller local store, 20% at a pub/bar/restaurant, and 14% at a petrol station. Ten percent of respondents intended buying a ZAP in the next month and an additional 14% indicated they would make a ZAP purchase in the next year.

Table 6
Zero alcohol consumption outcomes (n = 679).

	n	Proportion of total sample (%)
Had tried zero alcohol products	251	37
<i>Products tried</i>		
Beer	121	18
Cider	73	11
Wine	64	9
Pre-made Cocktails (margaritas, mojitos, spritz)	47	7
Ready to Drink (e.g., vodka mixers, bourbon and coke)	35	5
Spirits	22	3
Provided with zero alcohol products	226	33
<i>Provided by</i>		
Parent	127	19
Friend (18+)	64	9
Friend (under 18)	42	6
Sibling	24	4
Taken from home without permission	9	1
I asked someone to purchase for me	8	1
<i>Consumption location</i>		
In my own home	137	20
At a friend's house	82	12
At a party at someone's house	64	9
At restaurants/café	43	6
Entertainment establishment (e.g., pub, restaurant)	21	3
At raves/dance parties	14	2
In public places (e.g., parks, beaches)	10	1
At school, TAFE, etc.	7	1
In a car or other vehicle	4	1
Workplace	2	1
<i>With whom use occurred</i>		
Father	91	13
Mother	89	13
Friend(s) under 18	75	11
Friend(s) 18+	62	9
Other family members	44	6
Guardian(s)	39	6
Sibling(s) 18+	35	5
Alone	29	4
Sibling(s) under 18	18	3

Table 7
Purchasing zero alcohol products (n = 679).

	n	%
Perceived ease of acquiring zero alcohol ^a		
Easy	349	51
Neutral	206	30
Hard	124	18
Purchase attempts		
Any	113	17
Refused service (at least once)	27	4
Successful (at least once)	100	15

^a Scale of 1 'Very hard' to 5 'Very easy'.

3.2.4. Support for potential harm-reduction policies

Support for the three assessed harm-reduction policies was limited, ranging from a high of 27% for 'Banning the sale of zero alcohol products to underage people (under 18 years)' to a low of 22% for 'Banning zero alcohol products from being sold in places that don't sell alcohol'. For the three examined policies, the proportion of respondents disagreeing with implementation was greater than the proportion agreeing (see [Supplementary Table 2](#)).

3.2.5. Factors associated with ZAP perceptions and experiences

The regression analyses results are shown in [Table 8](#). Respondents who had used alcohol were more likely to report positive perceptions of the ZAP products displayed in [Fig. 2](#) ($\beta = 0.26$ [0.14, 0.37], $p < 0.001$),

Table 8
Factors associated with ZAP perceptions and behaviours (n = 659).

Factor	Recall ZAPs for sale OR[95% CI]	Recall ZAP adverts OR[95% CI]	Positive reactions to ZAPs β [95% CI]	Intend to purchase ZAPs in the next year OR[95% CI]	Currently use ZAPs# OR[95% CI]	Agree ZAPs beneficial for young people β [95% CI]	Support for potential policies β [95% CI]
Age	1.17 [1.00,1.37] ^b	0.93[0.80, 0.08]	0.02[-0.06,0.10]	1.1[0.94,1.28]	1.12[0.97,1.29]	-0.01[-0.09,0.08]	0.02 [-0.07,0.10]
Gender (Female)	0.80[0.64,1.01]	0.71 [0.57,0.88] ^c	0.23 [0.11,0.34] ^d	1.06[0.85,1.32]	0.88[0.72,1.08]	0.23 [0.11,0.36] ^d	-0.08 [-0.20,0.04]
Location (Non-metropolitan)	1.03[0.75,1.43]	0.92[0.68,1.24]	-0.07 [-0.23,0.09]	0.85[0.63,1.16]	0.97[0.73,1.30]	-0.06[-0.24,0.12]	-0.09 [-0.26,0.08]
SES (decile)	1.02[0.97,1.06]	0.99[0.95,1.03]	<0.01 [-0.02,0.03]	0.96[0.92,0.10]	1.03[0.99,1.07]	0.01[-0.02,0.03]	<0.01 [-0.03,0.02]
Currently use alcohol ^a	1.75 [1.37,2.24] ^d	1.1 [0.94,1.47]	0.26 [0.14,0.37] ^d	1.62 [1.3,2.02] ^d	1.83 [1.49,2.25] ^d	0.12[-0.01,0.25]	-0.34 [-0.47,-0.22] ^d
Frequency of visiting supermarkets	1.08 [0.98,1.19]	0.9 [0.90,1.09]	0.03[-0.02,0.08]	1.03[0.94,1.13]	0.98[0.90,1.07]	0.03[-0.03,0.08]	0.01 [-0.04,0.06]

Note: OR = odds ratios for binary outcomes, β = coefficient for continuous outcomes.

^a Have used at least once in the last 12 months.

^b $p < .05$,

^c $p < .01$,

^d $p < .001$.

to intend making a ZAP purchase in the next year (OR = 1.62.

[1.3, 2.02], $p < 0.001$), and to have used ZAPs (OR = 1.83 [1.49, 2.25], $p < 0.001$). Correspondingly, they were also less likely to support the proposed harm-reduction policies (OR = -0.34 [-0.47, -0.22], $p < 0.001$). Females typically found the example ZAPs more appealing ($\beta = 0.23$ [0.11, 0.34], $p < 0.001$) and were more likely to think that ZAPs can be helpful for young people ($\beta = 0.23$, [0.11,0.36], $p < 0.001$). Males were more likely than females to recall being exposed to ZAP advertisements (OR = 1.41 [1.14, 1.75], $p = 0.002$), while older respondents were more likely to recall seeing ZAPs for sale (OR = 1.17 [1.00, 1.37], $p = 0.045$).

4. Discussion

The present results provide valuable insights into a new area of research, revealing the ways in which Australian adolescents engage with ZAPs. Most of the surveyed adolescents recalled seeing ZAPs and ZAP advertisements, indicating that these products are highly salient to this age group. ZAPs were generally viewed favourably, particularly in terms of being a useful alcohol alternative that can help drinkers to consume less alcohol and a means for underage people to celebrate without using alcohol. The positive perceptions of ZAPs corresponded with over a third of respondents having tried these products and one in ten intending to buy them within the next month, and fits with research linking attitudes to ZAP consumption in the adult population (Shaw et al., 2023). Overall, the findings strengthen previously articulated concerns relating to underage people acquiring and using ZAPs, with some participants agreeing that they could act as a gateway to alcohol use (Hew & Arunogiri, 2023; Miller et al., 2022; World Health Organization, 2023). In addition, researchers have identified negative outcomes resulting from youth exposure to alcohol-related stimuli (Booth et al., 2024; Jernigan et al., 2017; Rossow et al., 2016), and the results of the present study suggest that ZAPs might increase exposure to alcohol branding.

A sizable proportion of the focus group participants (52%) and survey respondents (37%) reported trying ZAPs. These usage rates are substantially lower than the prevalence of alcohol use in the survey sample (66% ever tried) and in a recent large-scale survey of Australian secondary school students (65% ever tried) (Scully et al., 2023). Focus group participants reported trying these products out of curiosity and wanting to fit in with others who were consuming alcohol, which is aligned with adolescent tendencies to seek new and adult experiences during this phase of development (Scheffels et al., 2023; Wade et al.,

2021). The use rates observed among survey respondents were substantially higher than the 19% of Taiwanese adolescents who reported consuming ZAPs in a recent study (Hou et al., 2023), potentially reflecting pro-alcohol cultural norms in Australia (Abercromby et al., 2021; Booth et al., 2022) and more restrained drinking practices in Taiwan compared to Western cultures (Chen & Chien, 2018; Lee et al., 2015). Consistent with the results of the Taiwanese study, a significant association was found in the present study between drinking ZAPs and using alcohol, with survey respondents who consumed alcohol being 1.8 times more likely to use ZAPs compared to alcohol abstainers. ZAPs might act as a gateway to alcohol use, or alternatively alcohol use precedes ZAP use and ZAPs are used in lieu of alcoholic drinks. The association between ZAP use and alcohol use could also be explained by increased sensation seeking tendencies that some adolescents experience, which makes them liable to engaging in novel and risk-taking behaviours (Sargent et al., 2010; Steinberg et al., 2018). Heightened sensation seeking has been linked to underage alcohol use (Sargent et al., 2010; Steinberg et al., 2018) and could also make adolescents more likely to try novel products like ZAPs, potentially accounting for the observed overlap.

Among the study participants, consumption of ZAPs often took place at home in the company of parents, who were also the most common provision source of ZAPs. Drinking ZAPs socially at home with parents could normalise the consumption of alcohol-branded products, create positive experiences around the use of alcohol-branded products, and suggest relaxed parental attitudes to using ZAPs. While it is unclear whether this would increase children's desire to use alcohol, the alcohol literature has shown that allowing children to have 'sips' of alcoholic beverages increases the risk of negative alcohol-related outcomes for children (Aiken et al., 2020; Wadolowski et al., 2016). Developing evidence-informed communication strategies to educate parents about the potential risks associated with allowing their children to use ZAPs could be an effective method of discouraging parental provision.

In Australia, it is legal for people aged under 18 to purchase ZAPs, although some retailers are opting to refuse service to minors voluntarily (Australian Human Rights Commission, 2023). The present findings show that Australian adolescents can easily purchase ZAPs from a range of outlets. This is of concern given the World Health Organization's cautions about allowing minors to purchase ZAPs (World Health Organization, 2023). The focus group discussions and survey responses also indicate that some of these purchases are taking place in licenced venues for consumption on-premises with others who are drinking alcohol. This may serve to strengthen associations between drinking

alcohol-flavoured beverages and socialising in these types of venues, potentially inducting minors into drinking alcohol-like products at licenced premises before they can legally purchase alcohol.

The present results indicate that ZAPs are increasing adolescents' exposure to alcohol-related stimuli. Over three-quarters of survey participants recalled seeing advertising for ZAPs and 80% recalled seeing ZAPs for sale. This is concerning given alcohol advertising is poignant for minors (Vranken et al., 2023) and research has consistently demonstrated a strong association between exposure to alcohol advertising and subsequent alcohol-related harms experienced by adolescents (de Bruijn et al., 2016; Jernigan et al., 2017). ZAPs are likely to exacerbate this issue; research shows that when alcohol brands are displayed on non-alcoholic products, young people associate the ZAPs with the corresponding alcoholic beverages (Kaewpramusol et al., 2019). Therefore, any extra exposure to alcohol branding via ZAPs is likely to be problematic, especially if advertising occurs in spaces where alcohol advertising is prohibited to protect younger people, for example during children's television viewing hours (Critchlow et al., 2022; Kato et al., 2022).

Focus group participants noted the social pressure to drink alcohol as an adult within Australian culture and growing peer pressure to drink alcohol in their own social settings, which is consistent with research findings (Booth et al., 2022; Laursen & Veenstra, 2021). In line with previous research in other countries that has found ZAPs to be considered an option for adults (Jané Llopis et al., 2022) and young people (de Wit et al., 2021) to avoid the social stigma associated with not drinking, some participants in the present study, and females in particular, thought that ZAPs would help adults and adolescents avoid peer pressure to use alcohol. These findings are aligned with theoretical frameworks that highlight the key role that social motivations play in underage alcohol use (Cooper, 1994; Grant et al., 2007). For example, adolescent alcohol use has been consistently linked to desires to fully participate in social occasions by conforming to alcohol-related social norms (Comasco et al., 2010; Georgie et al., 2020; Grant et al., 2007; Kuntsche et al., 2014; Sjödin et al., 2021). This is an acknowledged aspect of the 'identity work' involved in the transition to adulthood (Fenton et al.).

Several potential regulatory responses to ZAPs were proposed by the focus group participants that centred on reducing the visibility of ZAPs in retail outlets likely to be frequented by minors and reducing the accessibility of ZAPs for young people. Strategies that target the visibility and accessibility of alcohol can reduce alcohol-related harms (Burton et al., 2017; World Health Organization, 2017), suggesting similar approaches could be useful for regulating ZAPs. However, unlike alcohol products, the potential for ZAPs to serve as a harm reduction tool represents a regulatory conundrum between restricting young people's access to avoid potential gateway and alcohol-normalisation effects, while not preventing access in the context of avoiding alcohol use. Other regulatory responses proposed in the literature, such as banning the use of ZAPs for surrogate marketing to extend alcohol branding or circumvent current alcohol marketing controls (Critchlow et al., 2022, 2024; Pierce & Stafford, 2021) or prohibiting the sale of these products in contexts where alcohol sales are not permitted (World Health Organization, 2023), were not proposed by the focus group participants, but could constitute effective strategies.

Levels of support for the examined ZAP harm-reduction policies were low among the survey respondents, which was in contrast to the apparent receptiveness to these policies when they were conceived by focus group participants. An advantage of focus groups compared to surveys is that they allow for more in-depth deliberation of topics via group exploration of the discussed issues (Coenen et al., 2012). Potentially the focus group discussions relating to the possible drawbacks of ZAPs fostered a greater appreciation of these issues among the focus group participants compared to survey respondents, who primarily saw ZAPs as being a beneficial alcohol alternative. These findings suggest that without public awareness of the potential downsides of ZAPs,

support for harm-reduction strategies might be limited.

4.1. Limitations and future research

The results of the present study should be considered with respect to several limitations. First, the use of a web panel provider could limit the representativeness of the survey results, although the use of quotas to maximise the representativeness of the sample should have at least partly ameliorated this issue. Second, the present findings relate to Australian adolescents and may not generalise to other geographic and cultural contexts. Third, associations identified in the generalised linear models are cross-sectional, meaning that causal relationships cannot be inferred. Fourth, due to the scarcity of research in this area, several of the survey items were developed for the purposes of this study and have not been used previously. Attempts were made to use previously published items to inform the survey wherever possible to minimise this limitation. Future research should examine adolescents' perceptions of and experiences with ZAPs in other contexts, and longitudinal research is needed to better understand whether ZAPs act as a gateway to subsequent alcohol use among minors.

4.2. Conclusion

ZAPs are growing in popularity and could assist drinkers to reduce their alcohol use. While these types of products could assist adults and adolescents to navigate social expectations to use alcohol, they are not without their drawbacks. ZAPs could increase young people's exposure to alcohol-related stimuli, normalise alcohol use, and accustom minors to the taste of alcoholic beverages, potentially increasing the likelihood that they will engage in underage alcohol use. This study demonstrated that ZAPs are highly salient for Australian adolescents, with most of the study respondents recalling the products and their advertisements and expressing favourable views, and a sizeable minority reporting prior consumption. Given this interest, the present findings highlight the need to treat ZAPs with a degree of caution and devise strategies to foster their potential as a harm-reduction tool while simultaneously ensuring that they do not adversely affect underage people by acting as a trojan horse for industry. Striking this balance will help to minimise the potential risks of these increasingly popular products.

Ethical statement

Ethical approval for the involvement of human subjects in this study was granted by The University of New South Wales Human Research Ethics Committee, Reference number HC220835, 15/15/2022.

CRedit authorship contribution statement

Leon Booth: Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation. **Danica Keric:** Writing – review & editing, Methodology, Conceptualization. **Jacqueline Bowden:** Writing – review & editing, Methodology, Funding acquisition, Data curation. **Ashlea Bartram:** Writing – review & editing, Methodology, Data curation. **Agnivo Sengupta:** Writing – review & editing, Formal analysis, Data curation. **Simone Pettigrew:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Formal analysis, Data curation.

Declaration of competing interest

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Data availability

The data that has been used is confidential.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2024.107582>.

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