

Article

Clearing the haze: novel methodology objectively assessing children's online exposure to tobacco and vape marketing

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Abstract

Marketing of tobacco and vape products is effective at recruiting new users; yet, little is known about children's online exposure to such material. This research aimed to develop a methodology for assessing children's exposure to, and engagement with, online tobacco and vape marketing. This pilot study used data from the innovative Kids Online Aotearoa Study in which 156 11–13-year-olds from schools in the Wellington region of Aotearoa New Zealand used Zoom teleconferencing software to record real-time, screen-shared internet use for four consecutive days. We developed a coding framework to analyse the nature and extent of exposure to tobacco or vape marketing and applied it to a strategic subset of children's ($n = 16$) data. Twenty-one instances of tobacco or vape marketing were identified from 12 participants; four participants had no identified exposures. The findings show that children are exposed to such marketing online, despite legislation that should protect them; these insights improve understanding of the online marketing environment and may help to support global health promotion efforts in tobacco and nicotine control given the borderless nature of the online world. The Kids Online Aotearoa tobacco and vape marketing methodology and coding framework enables the direct assessment of children's exposure to online tobacco and vape marketing and is a valuable research tool to monitor and provide evidence to inform social and political action to protect children from online harm.

Keywords: children, online, tobacco, advertising, determinants of health

Contribution to Health Promotion

- A novel methodology that captures real-time children's exposure to tobacco and vape marketing online.
- A method of analysing the nature and extent of children's exposure to tobacco and vape marketing online that can be used to generate evidence to inform policy and monitor change.
- Children as young as 11 years are exposed to online tobacco and vape marketing.
- Provides evidence that further regulation of the online space is urgently required to protect children from tobacco and vape marketing and associated harms.

BACKGROUND

Tobacco-related harms are a well-established threat to public health internationally (World Health Organization, 2022). Vape products, although likely less harmful than traditional tobacco products, are an increasing public health challenge. Over the past decade, tobacco use has been steadily declining among young people globally (Vallone *et al.*, 2020; Patanavanich *et al.*, 2021; Action on Smoking and Health, 2022; Leventhal *et al.*, 2022), and although this trend is seen in Aotearoa New Zealand (Aotearoa), youth vaping rates are now increasing disproportionately to falling smoking rates (Action for Smokefree 2025, 2022; Ministry of Health, 2022). The detrimental impacts of tobacco use are well described

and while there is less evidence about the long-term health impacts of vaping, it is not as harmless as has been portrayed (Dai *et al.*, 2022; World Health Organization, 2022). Nicotine impacts the developing brain and young people quickly become nicotine-dependent compared to adults leading to anxiety, agitation and discomfort related to cravings (Goriounova and Mansvelder, 2012; Mansvelder and Goriounova, 2012). Vaping was ostensibly introduced as a smoking cessation tool, yet some international evidence suggests it is more effective at attracting young non-smokers (Dai *et al.*, 2022). In Aotearoa, rangatahi [adolescent] Māori experience daily vaping rates twice that of their non-Māori peers. If current trends in Aotearoa continue, youth vaping has the potential

to perpetuate and exacerbate health inequities between Māori and non-Māori (Te Hīringa Hauora Health Promotion Agency, 2020).

National legislation and international commitments under the Framework Convention on Tobacco Control have long restricted tobacco marketing and more recently regulations have expanded to include the marketing of vape products (New Zealand Government, 1990; World Health Organization, 2005). Nevertheless, the difficulty of regulatory monitoring and enforcement in the online world has allowed for social media and online tobacco and vape marketing to flourish (New Zealand Government, 1990; World Health Organization, 2005; World Health Organization Regional Office for Europe, 2022; Hardie et al., 2023). Vape products in particular have benefited from regulatory lags, allowing for essentially unregulated marketing prior to the introduction of the Smokefree Environments and Regulated Products (Vaping) Amendment Act 2020 (New Zealand Government, 2020; Hardie et al., 2022, 2023).

It is well-documented that exposure to marketing alters behaviour and can influence purchasing decisions (Kotler, 2020). Online marketing is generally cheaper and less regulated than traditional marketing in print, on television or in stores and, therefore, has allowed harmful commodities a new avenue of marketing that can reach vast audiences rapidly (Lin et al., 2021; World Health Organization Regional Office for Europe, 2022). The tobacco and vape industry uses online marketing techniques to appeal directly to young people and to reach large, global audiences (Lin et al., 2021; World Health Organization Regional Office for Europe, 2022). Tactics include using popular social media influencers, bright colours, youth-appealing themes and products with enticing sweet flavours (Chu et al., 2019; Hoetger et al., 2020; Hardie et al., 2022; Moran et al., 2022). Exposure to online marketing of tobacco and vape products is associated with increased rates of commencing vaping and/or smoking among young people (Sawdey et al., 2017; Pokhrel et al., 2018; Vogel et al., 2021; Yang et al., 2021; Zheng et al., 2021; Donaldson et al., 2022). Young people who vape have an increased risk of becoming future cigarette smokers, including those who initially intended to remain smoke-free (Barrington-Trimis et al., 2020; Owotomo et al., 2020).

Time spent online is increasing globally, however, little is known about the online world for children, particularly for those aged under 13 years old (Pacheco and Melhuish, 2019). Existing studies have examined exposure to online marketing using surveys reliant on recall or have assessed reactions to experimental images within a study (Sawdey et al., 2017; Pokhrel et al., 2018; Lazard et al., 2021; Yang et al., 2021; Wulan et al., 2022). The World Health Organization has called for real-time screen capture of what children see to inform policy combating unhealthy commodity marketing, including that for tobacco and vape products (World Health Organization, 2018). Effective online regulation requires adequate monitoring and timely knowledge of what children are being exposed to online to inform effective health promotion intervention. To the best of our knowledge, there is no objective real-time evidence of children's exposure to tobacco and vape marketing online. This study aimed to develop and pilot a novel methodology to objectively assess the nature and extent of children's exposure to and engagement with tobacco and vape marketing online.

METHODS

This pilot study used data from Kids Online Aotearoa, a cross-sectional observational study of children aged 11–13 years recruited from schools in the Wellington region from 2021 to 2024 (Gurtner et al., 2022). The 156 Kids Online Aotearoa participants used Zoom video conferencing software to record their online activity. Participants were asked to record on all the devices they used, including school laptops, personal phones and tablets, over a 4-day study period. Participants' confidentiality was a priority, recorded data were only viewed by researchers after participants had an opportunity to review and delete any material they wished. Participants could withdraw their consent at any time. They were advised that the data were stored securely and that if an image from their data were used in publications, all identifiable features (for example, name, school name, handle) would be deleted or obscured. Researchers were required to sign a data access agreement before viewing the data. Ethical approval was given by the University of Otago Human Ethics Committee (Reference: 20/006) to study any aspect of the online world for children. Further details of the Kids Online Aotearoa methodology is published elsewhere (Gurtner et al., 2022).

A strategic sample of participants for this pilot study was selected by randomly identifying one female and one male from each of the participating schools. One all-boys school and one all-girls school were included; two students were selected from each of these schools. At the time this pilot study was conducted, 50 students from eight schools had participated resulting in the analysis of data from 16 children. The strategic sample of children included eight girls and eight boys aged 11–13 years, three children self-identified as Māori, three children as Pasifika and one-quarter of the children attended schools with a high proportion of students from low socioeconomic households. All recordings from each participant were watched to identify instances of tobacco or vape marketing. In this study, marketing was defined as 'advertising, and any activity that presents products or services to potential consumers with the aim of influencing behaviour and instilling regular purchase patterns' (Kotler, 2020). Any identified tobacco or vape marketing exposures were recorded in a master document with the participant number, video file name, time of exposure and a still image screen capture of the exposure. The use of artificial intelligence to identify exposures was considered, however, due to the variability of the exposures it was felt the technology was not sufficiently advanced to be beneficial at the time of the study.

Development of the coding framework

We developed a coding framework to enable a comprehensive assessment of children's online exposure to tobacco and vape marketing. We began by examining existing tobacco and vape marketing coding frameworks and seeking insights from the Kids Online Aotearoa research team's experience with developing coding frameworks for other exposures, including a generic marketing framework, gaming and alcohol marketing (Vaipuna et al., 2020; Kenny, 2022; Gurtner et al., 2024). While existing frameworks provided a useful starting point, they did not comprehensively capture the reality of online marketing of tobacco and vape products in a rapidly changing online environment.

At the time of this research, existing coding frameworks typically had not included consideration of the origin of the online material, yet this increasingly seemed important with the growing prominence of user-generated content and paid influencers, particularly among young people (De Veirman *et al.*, 2019; Han *et al.*, 2022; Willis and Delbaere, 2022). We also wanted to record the presence of health-benefit claims and messages that may motivate people to commence vaping by portraying it as safe, given this is a tactic that has been used by the industry (Groom *et al.*, 2021; Li *et al.*, 2021).

We also considered regulatory components of the marketing exposures given the obligations under the Framework Convention on Tobacco Control, United Nations Convention on the Rights of the Child 1989 and national legislation regulating marketing material (United Nations, 1989; New Zealand Government, 1990; World Health Organization, 2005). In Aotearoa, the Advertising Standards Authority Children's and Young People's Advertising Code (Advertising Standards Authority, n.d.) prohibits advertising that is appealing to children. Consequently, it was important to note any features of the exposures that may appeal to children. We noted that the presence of child-appealing features was included in the Kids Online Aotearoa alcohol coding framework, and to an extent in the framework by McCausland *et al.* (2020) though the latter coded multiple separate variables (sexualized, meme, cartoon, identity/community, selfie, hand check) making it complicated to use. The Kids Online Aotearoa alcohol coding framework includes the presence of any responsible drinking methods but does not assess age verification techniques (Kenny, 2022). Literature suggests online age verification techniques are poorly implemented and easy to circumvent; this study offered an opportunity to assess exposures for compliance with age restriction regulations (McCausland *et al.*, 2020). The Smokefree Environments and Regulated Products (Vaping) Amendment Act 2020 (amendment to Smokefree Environments and Regulated Products Act 1990) prohibits discounts or promotions such as 'buy one, get one free' on tobacco and vape products in Aotearoa, therefore, highlighting the importance of evaluating exposures that breach this legislation (New Zealand Government, 1990).

We reviewed the Kids Online Aotearoa alcohol coding framework and identified gaps to address when measuring tobacco and vape marketing. The alcohol coding framework included if the marketing was paid, owned or earned, if the marketing was a video or a static image and if the marketing was embedded in the content, or a banner or a pop-up (Kenny, 2022). However, it and other frameworks examined (Buckle and Moran, 2022; Rutherford *et al.*, 2022) did not include the platform being used when the exposure was encountered. Including the platform in the tobacco and vape framework was considered important given that evidence suggests children spend considerable periods of time on social media, particularly TikTok, viewing user-generated posts (Théodore *et al.*, 2021; Buckle and Moran, 2022; Rosenthal *et al.*, 2022; Rutherford *et al.*, 2022).

Preliminary data analysis prior to finalizing the coding framework identified that the context in which the marketing material was encountered needed to be included. Assessing if participants actively sought out or passively encountered tobacco or vape promotions provided richer information about how participants engage with such marketing. It was also thought important to assess if the exposures encouraged viewers to engage with likes, follows, shares or comments.

Such engagement is a powerful technique used by marketers to ensure viewers continue to be exposed to marketing material (McCausland *et al.*, 2020; Cochran *et al.*, 2021; Stanton *et al.*, 2022). The participants' engagement with the marketing exposure is included in the Kids Online Aotearoa generic marketing framework and the alcohol coding framework; however, the definition of engagement used in the tobacco and vape framework was expanded.

Quality assurance

Developing the coding framework was an iterative process with multiple drafts developed, tested on the data and discussed with M.S., J.H. and A.D. before being finalized (Table 1). The wider Kids Online Aotearoa research team also provided feedback on the initial draft coding framework's feasibility and comprehensiveness. The revised framework was then peer-reviewed by other members of the Kids Online Aotearoa team to ensure clarity and suitability for the broader study's needs. Then experienced coders from the Kids Online Aotearoa team conducted a reliability test of the tobacco and vape coding framework on a sample of exposures, which found intercoder reliability greater than 85%.

Tobacco and vape coding framework

Five overarching categories of interest were identified and included in the final tobacco and vape coding framework. Detail of the categories and sub-categories follows and a summary of the final coding framework is shown in Table 1.

Marketing type

Four sub-categories cover the type and location of marketing: the generation of marketing (paid, user-generated, etc.); site of exposure (TikTok, Instagram, website, etc.); type of content (video, text, static image, etc.) and type of marketing (banner, pop-up, etc.).

Tobacco or vape exposure type

Tobacco or vape marketing exposures were defined as 'any visual or text representation of vape devices, e-cigarettes, cigarettes or vape liquids, people engaging in vaping or smoking or purchasing these products'. This wide definition ensured all instances of tobacco or vape marketing were captured, including the use of brand names, hashtags or vape tricks that are included in existing frameworks (McCausland *et al.*, 2020).

Child-appealing and engaging features

Features that breached the Children's and Young People's Advertising Code were included in the framework as 'youth-centric references', echoing the language used in the Advertising Code. Youth-centric references encompassed a broad range of features, including the use of emojis, hashtags, trends and popular music. Interactive features such as the use of polls, live content and advergames are appealing to children and were also included in the coding framework. Participants' engagement with the exposure is also noted in this section.

Regulatory components

We coded for compliance with, and efficacy of, current tobacco and vape marketing regulations, the presence or absence of health warnings, health-benefit claims, promotional offers and age restriction methods.

Table 1: Summary of Kids Online Aotearoa tobacco and vape coding framework

Coding variable	Options
Marketing type	
Generation of marketing	Paid; owned; sponsored; user-generated; other
Site of exposure	Website; YouTube; Snapchat; TikTok; Instagram; Facebook; Discord; Twitter; WhatsApp; other
Type of content	Video; text only; interactive; static image
Type of marketing	Banner or side bar; embedded within content; pop-up
Exposure type	
Vape exposure type	Actively vaping; vape device or liquids; brand name of vape; retail outlet; text regarding vaping or products; none
Tobacco exposure type	Actively smoking; cigarettes or tobacco product; brand name of tobacco product; text regarding smoking or tobacco products; none
Child-appealing features	
Interactive features	None; links; polls/quizzes; social media interaction; auto-play; hashtags; comment; other
Features that breach the ASA CYPC*	None; characters or celebrities; youth-centric references; design features; context of exposure
Engagement with content	Watched; closed advertisement; social media interaction; re-watched; link followed; hashtag
Regulatory components	
Age restriction	Yes; no; uncertain
Promotional offers	Yes; no
Health warnings present	Yes; no; uncertain
Health-benefit claims	Yes; no; uncertain
Reach of content	
Total reach	Free text option to note likes, shares, comments
Other comments	If required, free text element

*ASA CYPC: Advertising Standards Authority Children's and Young People's Advertising Code ([Advertising Standards Authority, n.d.](#)).

Reach of material

A free text option was developed to capture the number of likes, shares and comments that each exposure receives; this is not included in existing frameworks. Although these features are a measure of engagement with the exposure, they can serve as a proxy for how extensively the harmful content is disseminated.

Coding the data

B.M. used the framework to code each identified exposure to tobacco or vape marketing in the sample; this often required re-watching the clip multiple times in slow motion. Descriptive information about the minute before and after each marketing exposure was documented to provide context and a richer representation of the nature of participants' online experiences. For each exposure, the 'marketing type' was typically easy to establish and code. The exposure was coded as either a still image, video, banner or pop-up and it was noted if the content was paid advertising, from a retailer or social media user-generated content. However, defining the 'exposure type' as tobacco or vape was more complicated. For an image to be coded as 'vaping' either a brand or vaping retail outlet name, a device including vape liquids or vaping-related text needed to be visible. To be coded as 'tobacco' either a brand name, cigarette or lighter, packaging or text regarding tobacco needed to be present. When the exposure only contained someone exhaling smoke or vapour and if the source of the exhaled material was unable to be determined the exposure was coded as both tobacco and vape.

To be coded as containing 'child appealing features', the exposure needed to contain colours, music, popular charac-

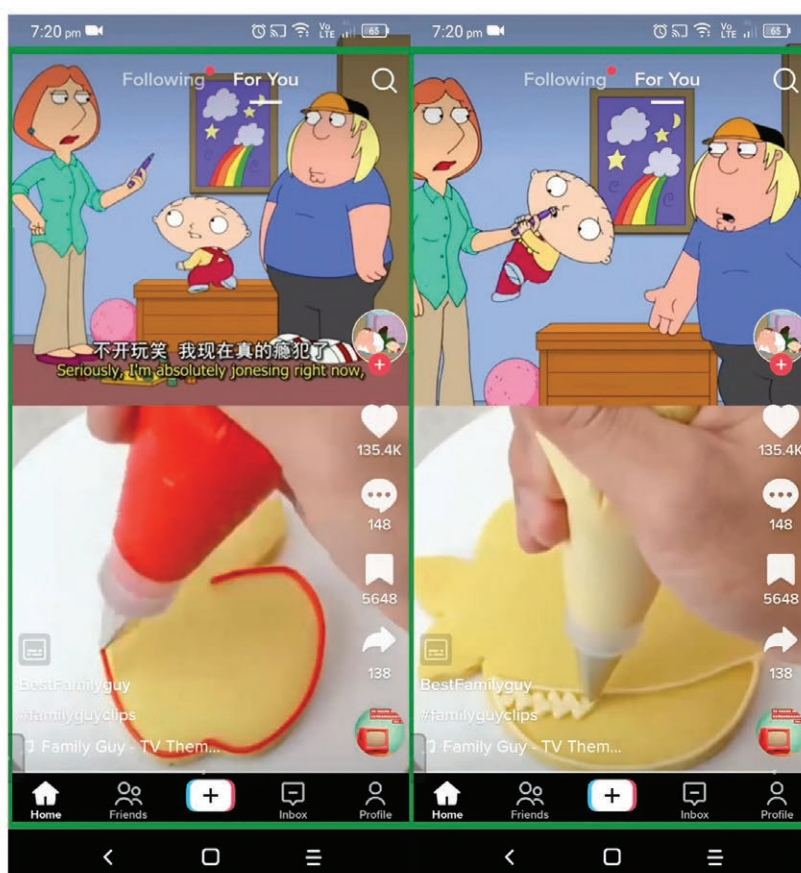
ters or youth-centric references, such as the use of emojis and hashtags. Coding for 'regulatory components' was straightforward as it was clear if exposures contained the required components, such as age restriction techniques or health warnings.

Estimating the reach was generally simple as the number of likes, comments and shares were visible during the exposure. In some instances, this information was not readily available from the recording and the profile or page that generated the exposure was searched on social media to determine follower numbers, where publicly available. Although the true reach of material includes those who have seen but not engaged with the exposure, the level of engagement provides some insight into how widely the exposure was seen.

RESULTS

Twenty-one tobacco and/or vape exposures were identified from 12 participants' recordings; four participants had no identified exposures. The total recording time varied widely between participants in this study, from 10 min to over 150 h. Identification of the exposures took 80 h, with coding (including the context provision) taking approximately 2 h per exposure. In total, exposure identification and coding took 120 h. [Figure 1](#) provides an example of a coded exposure.

Data were real-time screen recordings and able to be slowed down or fast-forwarded, therefore, no data were unusable or excluded. The data allowed for brief exposures to be identified such as a child scrolling past an image containing tobacco or vape products. It was also possible to identify popular content and trends that were appealing to children, such as the split-screen video content in [Figure 1](#).



Coding variable	Code
Marketing Type	
Generation of marketing	User-generated
Site of exposure	TikTok
Type of content	Video
Type of marketing within the online space	Embedded within content
Exposure type	
Vape exposure type	Actively vaping
Tobacco exposure type	None
Child appealing features	
Interactive features	Social media interaction; auto-play; hashtags; comment
Features that breach the ASA CYPC	Characters or celebrities; youth centric references; design features; context of exposure
Engagement with content	Watched
Regulatory components	Regulatory components
Age restriction	No
Promotional offers	No
Health warnings present	No
Health benefit claims	No
Reach of content	
Reach	Likes 135,400 Comments: 5,648 Shares/forwards: 138 Saves: 5,648
Other comments	Non-branded vape being used by cartoon baby. Exposure duration: 23 seconds

Fig. 1: Example of a coded vape exposure.

The majority of exposures were user-generated posts; all occurred on social media platforms and were predominantly in video format. No traditional advertisements for tobacco or vape

products were identified, and no exposures claimed tobacco or vape products had health benefits. Further examples highlighting the variability of the exposures are shown in Figure 2.

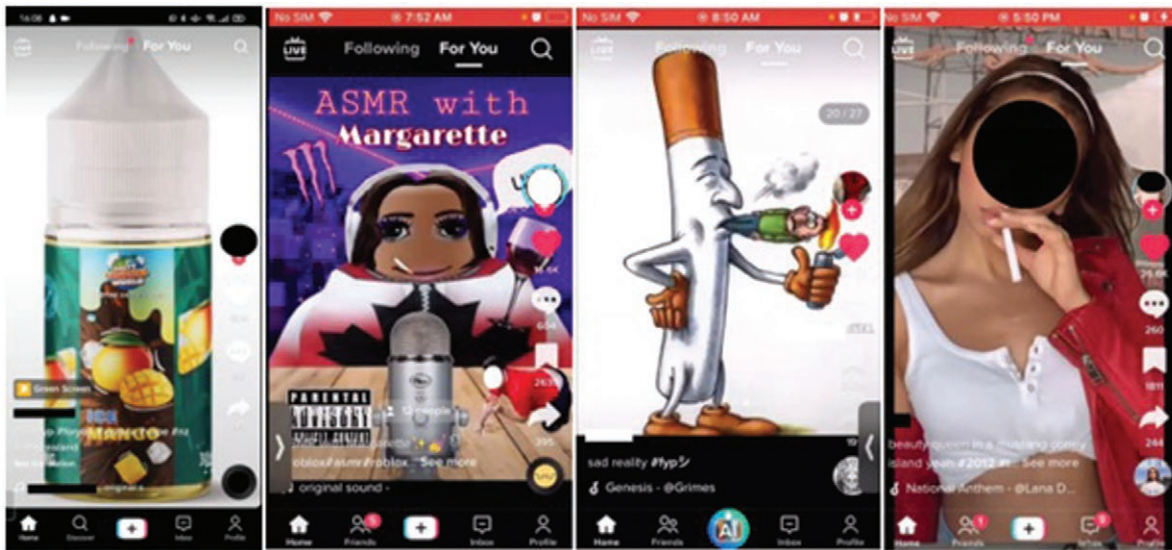


Fig. 2: Four examples illustrating different types of exposure; vape liquid, smoking cartoon character, large cartoon cigarette and imitating cigarette smoking.

DISCUSSION

This article reports on a novel methodology to study children's exposure to tobacco and vape marketing online using screen recording software. Our pilot study demonstrated that it is possible to collect such data and code it to provide insight into how children are exposed to and engage with such marketing. To the best of our knowledge, this is the first study to collect such data in real-time and from children aged 11–13, an age group frequently neglected in this research area (World Health Organization, 2018). The methodology has advantages over previous methods. The use of screen-capturing technology allows for data collection directly from the perspective of children and overcomes limitations with recall and social desirability bias seen in other studies that examine the online world (World Health Organization, 2018). It also enables researchers to identify popular and contemporary online trends. In addition, the Kids Online Aotearoa methodology is acceptable and feasible to schools, parents and participants. This article shows that children are willing to participate in research recording their screen time and that this data can be collected ethically. However, children had the opportunity to review and delete data, very few utilized this option. Given the similarities in marketing of harmful commodities, this methodology could be used to examine exposure to other harmful commodities online, such as gambling and junk food, and examine the online behaviour of different age groups.

The Kids Online Aotearoa tobacco and vape marketing methodology identified that children aged 11–13 are exposed to online tobacco and vape marketing despite regulations that should prevent this. This finding supports the need for stronger health promotion initiatives, including policy and online regulation to protect children from harmful marketing. The methodology provides an extremely rich data source and it was practical for assessing children's exposure to and engagement with tobacco and vape marketing, which is a strength.

There are some limitations to this study. This was a pilot study; further analysis of this dataset would enable a fuller

picture of children's exposure to tobacco and vape marketing online. Although children reported recording most, or all, of their screen time, it is likely that some data were missed, and some were deleted by the children, as per the ethics procedure. Consequently, the children's exposure to tobacco and vape marketing is likely underestimated.

This methodology could be used to examine other commercial determinants of health in the digital space and with children of other ages. However, we found that analysing video recordings was time-consuming and suggested a strategic approach may be required to manage the data in larger datasets. This research team is currently analysing Kids Online data for alcohol, gambling and junk food and exploring the utility of artificial intelligence. Researchers in Australia are doing similar (Deakin University, 2024). Ongoing advances in artificial intelligence may allow exposure detection to become more automated in future, thus helping to overcome a key challenge of this method. Online technology is constantly evolving, therefore, it is important that the framework is reviewed and amended to incorporate contemporary features of the online environment in future research.

Action is urgently needed to protect children from tobacco and vape marketing online. Central to all policy decisions should be the rights and best interests of children including their right to be protected from harm, to attain the highest standard of health, and for their views to be heard (United Nations, 1989). As well as the principles and articles in the United Nations Convention on the Rights of the Child, in 2013 the United Nations Committee on the Rights of the Children clearly set out the duties of governments regarding the impact of commercial activities on children's rights, and in 2021, regarding children's digital environments (United Nations, 2021). The online world poses a threat to children's rights and wellbeing, and existing international obligations call for governments to address this issue. Given the transnational nature of tobacco and vape marketing and the online world, coordinated international action and effective monitoring to prevent harm and protect children are required (Holly et al., 2024).

CONCLUSION

This methodology including the coding framework developed for the Kids Online Aotearoa tobacco and vape marketing study enabled the objective assessment of children's exposure to online tobacco and vape marketing. Results from this pilot show that children are exposed to such marketing online, despite legislation that should protect them. With a larger data set, inequities in exposure by gender, ethnicity and socioeconomic status could be identified. Our findings reinforce the need for stronger protections and regulations for, and effective monitoring of, the online environment to honour Aotearoa's international obligations in tobacco and nicotine control and in children's rights. The screen-share method of capturing children's online world is feasible and acceptable to participants and could be applied in further research exploring children's exposure to a range of potential online harms and provide evidence for wider health promotion action to safeguard children. Our findings provide insights into the online tobacco and vape marketing landscape and provide a coding framework to quantify this environment, a critical space for global efforts in tobacco and nicotine control.

AUTHOR CONTRIBUTIONS

B.M., M.S., L.S., A.D., J.H. conceived the idea and developed the study protocol. M.S., J.H., A.D., L.S. provided supervision. B.M. developed the coding framework. B.M., M.S., L.S., M.G. collected the data. B.M. watched, coded and analysed the data. B.M. prepared the manuscript draft. All authors contributed to the manuscript and approved the final version.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

DATA AVAILABILITY

The data underlying this article will not be made publicly available, in accordance with our ethical agreement.

ETHICS APPROVAL

Ethics approval was granted by the University of Otago Human Ethics Committee (Reference: 20/006) to study the nature and extent of children's online world, their engagement with it and how it may impact their health and well-being.

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