

What's in a Vape? Evaluating a Youth-Centered Digital Infographic on Vaping Risks

Kendra Nelson Ferguson, Kyla Christianson, Adrian Delgado, Gina Martin,
Stephanie E Coen, Laura Struik

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Kendra Nelson Ferguson^{1*} PhD; Kyla Christianson^{2*}; Adrian Delgado^{2*}; Gina Martin^{3*}; Stephanie E Coen^{4*}; Laura Struik^{5*}

¹1151 Richmond St. Western University London CA

²1147 Research Rd University of British Columbia Okanagan Kelowna CA

³Athabasca University Alberta CA

⁴University of Nottingham Nottingham GB

⁵University of British Columbia Okanagan Kelowna CA

*these authors contributed equally

Corresponding Author:

Laura Struik

University of British Columbia Okanagan

1147 Research Rd

Kelowna

CA

Abstract

Background: Youth vaping remains a pressing public health issue in Canada, with rates increasing since 2017 and rebounding after a temporary decline during the COVID-19 pandemic. As youth engagement with traditional public health warnings declines, innovative strategies are needed. Visually compelling, youth-driven digital content, such as interactive infographics, may help bridge knowledge gaps, enhance risk perception, and support more informed decision-making. Despite this potential, limited research has assessed their effectiveness in conveying vaping-related harms to youth.

Objective: To address this gap, the current study evaluates the impact of a co-developed, youth-informed digital infographic, "What's in a Vape?", on enhancing vaping education and improving youth understanding of vaping-related harms.

Methods: A convergent parallel mixed methods design was employed to assess the impact of a youth-informed digital infographic embedded within the Youth Vaping Information Project (Youth VIP) survey. The infographic was created in collaboration with youth co-researchers and youth advisory councils to ensure relevance. Participants were recruited through community partners, school boards, and youth networks, with a final sample of 63 high school students aged 14 to 19 (Mage = 16.5), primarily from Ontario and British Columbia. The survey evaluated baseline knowledge of vaping, engagement with the infographic, and post-exposure perceptions on whether the content contributed to increased awareness or understanding of vaping.

Results: Quantitative analysis showed that 87.3% of participants agreed that the infographic effectively communicated key information, and 85.7% gained new knowledge about vaping. Additionally, 61.9% found it was presented in an easy and meaningful way, while 52.3% indicated they would definitely share the infographic with others, reflecting strong engagement. Thematic analysis of qualitative feedback revealed four key themes: 1) Visual content enabled gaining new insights and knowledge into vaping, 2) Positive impact of visual design on engagement with information, 3) Sourced information enhanced credibility of the infographic information, and 4) Digital design of infographic made complex information more understandable. Qualitative feedback emphasized that youth appreciated the infographic's engaging design, clarity, and scientific support.

Conclusions: This study demonstrates the potential of youth-driven digital infographics to serve as effective health communication tools. Findings highlight the importance of peer-led design, evidence-based content, and interactive, visually compelling formats in enhancing youth comprehension and receptiveness to health messaging. By integrating youth feedback in development and prioritizing digital engagement, the infographic bridged knowledge gaps while reinforcing the credibility and clarity of its content. These results suggest that such approaches may complement broader public health strategies to curb youth vaping and inform future educational interventions. Continued research is warranted to assess long-term impacts on attitudes and behaviour.

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What's in a Vape? Evaluating a Youth-Centered Digital Infographic on Vaping Risks

Kendra Nelson Ferguson¹

Kyla Christianson^{2,3}

Adrian Delgado²

Gina Martin^{1,4}

Stephanie E. Coen^{1,5}

Laura Struik²

¹Department of Geography and Environment, Western University, London, ON, N6A 5C2, Canada

²School of Nursing, Faculty of Health and Social Development, University of British Columbia Okanagan, Kelowna, BC, V1Y 9X1, Canada

³Ingram School of Nursing, Faculty of Medicine and Health Sciences, McGill University, Montreal, QC, H3A 2M7, Canada

⁴Faculty of Health Disciplines, Athabasca University, Athabasca, AB, T9S 3A3, Canada

⁵School of Geography, University of Nottingham, Nottingham, UK, NG7 2RD

Corresponding Author: Dr. Laura Struik, laura.struik@ubc.ca, University of British Columbia Okanagan, 1628 Dickson Ave, Landmark 4 - 609, Kelowna, BC V1Y 9X1, Canada.

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Abstract

Introduction: Youth vaping remains a pressing public health issue in Canada, with rates increasing since 2017 and rebounding after a temporary decline during the COVID-19 pandemic. As youth engagement with traditional public health warnings declines, innovative strategies are needed. Visually compelling, youth-driven digital content, such as interactive infographics, may help bridge knowledge gaps, enhance risk perception, and support more informed decision-making. Despite this potential, limited research has assessed their effectiveness in conveying vaping-related harms to youth. To address this gap, the current study evaluates the impact of a co-developed, youth-informed digital infographic, “What’s in a Vape?”, on enhancing vaping education and improving youth understanding of vaping-related harms.

Methods: A convergent parallel mixed methods design was employed to assess the impact of a youth-informed digital infographic embedded within the Youth Vaping Information Project (Youth VIP) survey. The infographic was created in collaboration with youth co-researchers and youth advisory councils to ensure relevance. Participants were recruited through community partners, school boards, and youth networks, with a final sample of 63 high school students aged 14 to 19 (Mage = 16.5), primarily from Ontario and British Columbia. The survey evaluated baseline knowledge of vaping, engagement with the infographic, and post-exposure perceptions on whether the content contributed to increased awareness or understanding of vaping.

Results: Quantitative analysis showed that 87.3% of participants agreed that the infographic effectively communicated key information, and 85.7% gained new knowledge about vaping. Additionally, 61.9% found it was presented in an easy and meaningful way, while 52.3% indicated they would definitely share the infographic with others, reflecting strong engagement. Thematic analysis of qualitative feedback revealed four key themes: 1) Visual content enabled gaining new insights and knowledge into vaping, 2) Positive impact of visual design on engagement with information, 3) Sourced information enhanced credibility of the infographic information, and 4) Digital design of infographic made complex information more understandable. Qualitative feedback emphasized that youth appreciated the infographic’s engaging design, clarity, and scientific support.

Discussion and Implications: This study demonstrates the potential of youth-driven digital infographics to serve as effective health communication tools. Findings highlight the importance of peer-led design, evidence-based content, and interactive, visually compelling formats in enhancing youth comprehension and receptiveness to health messaging. By integrating youth feedback in development and prioritizing digital engagement, the infographic bridged knowledge gaps while reinforcing the credibility and clarity of its content. These results suggest that such approaches may complement broader public health strategies to curb youth vaping and inform future educational interventions. Continued research is warranted to assess long-term impacts on attitudes and behaviour.

Keywords: youth vaping; youth-centered digital infographic; health communication; mixed methods

Introduction

Vaping has emerged as a critical public health concern, particularly among youth in Canada. Surveillance data shows a consistent rise in youth vaping since 2017, with a temporary decline in 2020 that may be attributed to the COVID-19 pandemic or multiple public health initiatives implemented in Canada [1]. In Canada, 30% of youth aged 15 to 19 have reported ever vaping, with 14% having vaped in the past 30 days [2]. While overall prevalence rates have remained relatively stable, the frequency of use has risen. Daily vaping among youth reached 6.5% in 2022, up from 4.7% in 2019—an increase observed across consecutive survey cycles—highlighting a troubling shift toward habitual use and potential nicotine dependence [2]. These statistics position Canada among the countries with the highest youth vaping rates globally, denoting the urgent need for targeted public health interventions for this demographic.

Adolescence is a critical period for brain development, and evidence suggests that the adolescent brain is particularly susceptible to long-term impacts [3,4]. Vaping has been linked to reduced working memory and concentration, as well as impaired problem-solving skills, which can negatively impact academic performance and overall educational attainment [5,6]. Engaging in vaping has also been linked to a higher likelihood of experimenting with other substances, including cannabis, cocaine, and heroin [7,8,9]. Moreover, longitudinal studies have found that adolescent vaping is associated with a higher incidence of mood disorders, such as anxiety and depression, compared to their non-vaping peers [10]. Given these risks, the Canadian Drugs and Substances Strategy [11] identifies limiting adolescent exposure to nicotine and other substances as a key public health priority.

In addition to its effects on brain development and mental health, vaping exposes youth to toxic substances that can pose serious physical health risks. While e-cigarettes vary in design, most include a liquid reservoir, rechargeable battery, heating element, and mouthpiece [12]. Variations in device voltage, wattage, and temperature settings can lead to the formation of harmful compounds,

such as formaldehyde and acetaldehyde, which are both carcinogenic and cytotoxic [13]. Toxic metals and other hazardous substances have also been detected in e-liquids and aerosols, likely originating from the materials used in device construction [14]. Emerging evidence on the myriad of adverse health effects linked to vaping underscores the importance of effectively communicating these dangers to youth [14].

Research gaps in youth awareness of vaping-related harms emphasize the need for clearer and more effective communication strategies. Rohde et al. (2020) found that while youth recognized the potential for device explosions and respiratory issues, they were less aware of issues such as skin contact with e-liquids, exposure to diacetyl, ingestion of e-liquids, cardiovascular damage, carcinogenic chemical exposure, and addiction [15]. Further, Greiner Safi et al. (2023) found that uncertain language in public health communication targeting youth can lead to confusion, misinterpretation, and dismissal of vaping harms, reinforcing the need for clear, accessible messaging [16].

To enhance message clarity and engagement, public health campaigns must prioritize effective communication strategies. Research has demonstrated that visual aids, such as infographics, can simplify complex health information, overcome literacy barriers, and improve knowledge retention [17]. Drawing on these findings, infographics are most impactful when paired with clear, direct messaging, increasing the likelihood of behaviour change [17]. Many public health campaigns fail to leverage interactive digital technologies despite their proven effectiveness with youth, who are more likely to respond to content that aligns with their digital media habits [18,19]. Studies by Rohde et al. (2023), England et al. (2021), and Stalgaitis et al. (2020) highlight the importance of integrating digital platforms to maximize the reach and impact of health messaging [15,20,19].

Beyond improving information delivery, research emphasizes the importance of actively engaging youth in campaign development to ensure that messaging resonates with its intended

audience. Greiner Safi et al. (2023) found that incorporating youth perspectives enhances the relevance and effectiveness of health campaigns, increasing their ability to shift attitudes and behaviours [16]. The Rethink Vape campaign [20] exemplifies the benefits of this approach, demonstrating that youth-centered campaigns lead to greater message retention and impact. Participants who engaged with the campaign demonstrated greater increases in comprehension of vaping-related information, heightened risk perception, and stronger intentions to avoid vaping compared to a control group. As youth engagement with traditional public health warnings declines, incorporating youth-driven, visually compelling content with interactive digital strategies may be critical in addressing high vaping rates [16].

Given these findings, digital infographics may bridge knowledge gaps, enhance risk perception, and support more informed decision-making among youth. Despite the potential of digital infographics as a public health communication strategy, limited research has assessed their effectiveness in improving vaping-related knowledge and awareness of the associated harms among youth. This study addresses this gap by employing a mixed methods approach to determine whether a co-developed, youth-informed digital infographic can enhance vaping education and strengthen understanding of vaping-related harms among youth. By integrating quantitative and qualitative data, this study provides a comprehensive evaluation of the infographic's impact, capturing diverse perspectives while offering both breadth and depth in understanding youth perceptions and experiences.

Methods

Infographic Development

This project began with a poll conducted among three youth advisory councils, each composed of high school-aged youth (two in British Columbia and one in Ontario) to gather their questions about e-cigarettes and how they wanted them answered. "What's in a vape?" emerged as the most pressing unanswered question, and all councils advocated for an interactive, digital

infographic to address it. The development of the infographic was led by a youth co-researcher (AD), an undergraduate student in the School of Nursing, who began by conducting a literature review on current evidence related to vape components and their health effects. Following this, AD engaged in collaborative sessions with the senior author (LS) to organize findings into a mind map, visually structuring key information before transitioning into an infographic. Mind mapping served as an initial step to systematically categorize vaping-related risks, ensuring a logical and comprehensive infographic design. To transition this information into a digital infographic, AD collaborated with a design thinking researcher (AC), who utilized Figma, a collaborative interface design tool, to incorporate graphic design and interactive digital strategies (e.g., clickable links, illustrations), ultimately creating the final product. Once the initial draft was completed, feedback was gathered from two high-school youth co-researchers (ACa and CY). Their input led to multiple refinements. A follow-up poll of the youth advisory councils was conducted to collect additional thoughts, opinions, and suggestions for improvement. After final revisions, the infographic was ready for fielding (see Appendix).

Study Design

This study employed a mixed methods approach. Specifically, a convergent parallel design was utilized, whereby both quantitative and qualitative data is collected simultaneously, analyzed as separate but complimentary data sets, and converged for interpretation in the discussion section [21]. A cross-sectional online survey, Youth Vaping Information Project (VIP), was developed and distributed to assess perceptions of the interactive digital infographic “What’s in a Vape,” which was embedded within the survey. The study was reported according to the Checklist for Reporting Results of Internet E-Surveys (CHEERIES) [22]. Study approval was obtained from [University name redacted for review] human ethics research board [ID redacted for review].

Recruitment and Participants

The research team disseminated the Youth VIP recruitment poster to community partners (e.g., health units, school boards), youth advisory councils, and youth co-researchers via email, requesting their support in circulating the poster to their networks. The poster included a QR code and web link directing potential participants to the Youth VIP survey on Qualtrics. The survey began with a letter of information outlining study details, followed by an eligibility questionnaire and assent/consent questions. Eligibility criteria included: being a resident of Canada, currently enrolled in high school (Grades 9-12), and fluent in English. Youth under 16 years old were required to obtain parental consent in addition to their own assent. After completing the demographic and behavioral questions, participants were shown the "What's in a Vape" infographic, which was embedded in the survey. They were encouraged to take their time in reviewing the infographic to ensure they could accurately respond to the subsequent questions.

The final sample consisted of 63 participants (26 identified as boys, 35 as girls, and 2 preferred not to disclose) aged 14 to 19 ($M_{age} = 16.5$). The sample was geographically concentrated in Ontario ($n=34$) and British Columbia ($n=29$), and 44% of participants identified as White/Caucasian.

Data Collection

The survey was developed by a multidisciplinary team (KNF, AD, LS) specializing in health promotion, health behaviour, health geography, and nursing. Questions were informed by knowledge translation (KT) principles [23] to ensure an accurate evaluation of the infographic. After drafting the survey, two high school youth co-researchers (ACa and CY) reviewed and refined the questions for youth relevance and project alignment. Following minor adjustments, members of three youth advisory councils [names redacted for review] piloted the survey for readability, functionality, and usability. The survey was finalized after further discussions and feedback from the councils. Participants who provided assent and parental consent (if <16 years

old) completed the survey, which took 20 to 30 minutes to complete. Upon completion, participants were emailed a \$10 gift card as a thank-you for their time.

Survey

Measures

Survey questions captured participant demographics (i.e., age, sex, gender, ethnicity, and socioeconomic status), and participants responded to a series of closed-ended questions assessing vaping behaviours and exposure to vape education. Questions related to vape use included: “Have you ever used a vape?”, “Do you currently vape?” and “Have you attempted to quit vaping?” with Yes/No response options. Exposure to vape education was assessed with the questions: “Have you attended any vape education presentations at school?” and “Have you noticed any educational material related to vaping at school (e.g., posters in the hall)?”, also using Yes/No response options. Participants were also asked about how informed they felt and how informed they believed their peers to be about vaping (“On a scale of 1 (not informed) to 10 (very informed), to what extent do you feel informed about vaping?”, “On a scale of 1 (not informed) to 10 (very informed), to what extent do you think young people such as your peers are informed about vaping?”). After viewing the infographic, participants provided feedback in four areas: 1) intentions to share the infographic (“Will you share knowledge from this infographic with your family/friends?”; response range: ‘definitely not’ to ‘definitely yes’); 2) effectiveness in addressing knowledge gaps (“The infographic tells me what I need to know about vapes...”; response range: ‘strongly disagree’ to ‘strongly agree’); 3) clarity and presentation (“The infographic is presented in an easily digestible and meaningful way...”; same response range); and 4) information sufficiency (response options: too much, the right amount, or not enough).

To gain deeper insight into participants’ perceptions and experiences with the infographic, the survey included four open-ended questions designed to elicit qualitative feedback. These questions were included after participants viewed the infographic and explored whether the content

contributed to increased awareness or understanding of vaping, as well as the overall appeal of the infographic, while also prompting participants to reflect on its design and content. Specifically, participants were asked: 1) “Does the infographic provide new knowledge? If yes, what did you learn?”, 2) “What I liked about the infographic was...”, 3) “What I did not like about the infographic was...”, and 4) “What would you change about the infographic?”.

Quantitative Analysis

Descriptive statistics were used to present characteristics of the sample and explore the proportion of the sample that responded favourably to questions about the infographic. Analyses were conducted using Apple Numbers (version 3.6.2).

Qualitative Analysis

Thematic analysis was conducted to explore open-ended survey responses. Using an inductive approach, two researchers (AD and LS) independently reviewed and grouped responses into themes based on recurring ideas [24]. Any irrelevant responses (e.g., “N/A”, “I don’t know”, “none”) were removed. Following this, AD and LS acted as “critical friends” [25] to challenge and refine theme interpretations. Key discussions led to revisions of theme names to ensure alignment with participant perspectives. For example, the theme “visual content enabled gaining new insights and knowledge into vaping” was initially titled “gaining new knowledge on vaping”, but after discussions, it was revised to further reflect the nuances of youth experiences. Once consensus was reached, the first author (KNF) reviewed the themes for plausibility and consistency, strengthening the study’s rigour and trustworthiness.

Results

A narrative contiguous approach was implemented for reporting and integrating the mixed methods results. In this approach, quantitative findings are presented first, followed by qualitative findings, with each set of results outlined in different subsections [26]. Both datasets are then synthesized to inform the overall discussion.

Quantitative Results

Table 1 provides the demographic and behavioural characteristics of the sample (n=63). Of the participants, 44.4% identified as male and 52.3% as female, and by gender, 41.2% identified as boys and 55.5% as girls. Ethnic representation was predominantly White (44.4%), followed by East Asian (23.8%). Socioeconomic status varied, with 20.6% never worrying about money, 44.4% worrying only about extras, and 34.9% having just enough or not enough to get by. The majority of participants rated their physical and mental health as very good (36.5%; 38%) or good (33.3%; 30.1%). Vaping behavior was reported by 41.2% of participants, among whom 65.4% had tried to quit. Social exposure to vaping was high, with 34.9% indicating many or most/all of their friends vaped, 44.4% reporting some, and 20.6% reporting none of their friends. The most common exposure settings included school (69.8%), peers/friends (46%), and online/social media (41.2%), with less frequent exposure at home and the workplace (6.3% each). Just over half of the participants had attended vape education presentations at school (53.9%) or had noticed vape education materials at school (52.3%).

Table 1. Characteristics of the Sample (n=63)

Variable	Number of Participants (n = 63) (Valid %/mean)
Age	
Range	14-19 (16.5)
Sex	
Male	28 (44.4)
Female	33 (52.3)
Missing	1
Gender	
Boy	26 (41.2)
Girl	35 (55.5)
Missing	2
Ethnicity	
White	28 (44.4)
Indigenous	7 (11.1)
Black	3 (8.3)
East Asian	15 (23.8)
South East Asian	4 (6.3)
South Asian	2 (3.1)
West Asian or Middle Eastern	2 (3.1)

Missing	1
Socio-economic status	
Never worry about money	13 (20.6)
Only worry about money for extras	28 (44.4)
Just enough or not enough to get by	22 (34.9)
Physical health	
Excellent	12 (19)
Very Good	23 (36.5)
Good	21 (33.3)
Fair or poor	7 (11.1)
Mental health	
Excellent	8 (12.6)
Very Good	24 (38)
Good	19 (30.1)
Fair or Poor	12 (19)
Vaping experience	
Currently vape (past 30 days)	26 (41.2)
Tried to quit vaping	17 (65.4)
Friends who vape	
Many and most/ all	22 (34.9)
Some	28 (44.4)
None	13 (20.6)
Exposed most to vaping (select all)	
At school	44 (69.8)
Online (social media)	26 (41.2)
With peers/friends	29 (46)
At home	4 (6.3)
At the workplace	4 (6.3)
Activities	11 (17.4)
Attended vape education presentations at school	34 (53.9)
Noticed vape education materials at school	33 (52.3)

Table 2 presents closed-ended responses to the infographic. The majority (87.3%) agreed or strongly agreed that the infographic effectively conveyed the necessary information. Regarding presentation, 61.9% of participants agreed or strongly agreed that the infographic was presented in an easy and meaningful way, whereas 17.4% expressed disagreement or strong disagreement. When asked about the amount of information provided, 52.3% felt there was too much information, while 46% believed the amount was appropriate. A substantial proportion of respondents (85.7%) reported gaining new knowledge from the infographic. In terms of sharing the infographic with family and friends, 52.3% indicated that they would definitely share it.

Table 2. Closed-Ended Infographic-Related Responses

Infographic-Related Questions	Number of Participants (n = 63) (Valid %/mean)
It tells me what I need to know	
Strongly agree or agree	55 (87.3)
Neutral	4 (6.3)
Disagree or strongly disagree	4 (6.3)
It is presented in an easy and meaningful way	
Strongly agree or agree	39 (61.9)
Neutral	6 (9.5)
Disagree or strongly disagree	11 (17.4)
Amount of information	
Too much	33 (52.3)
The right amount	29 (46)
Not enough	1 (1.5)
Gained new knowledge	
Yes	54 (85.7)
No	9 (16.9)
Likely to share it with family and friends	
Definitely	33 (52.3)
Maybe	23 (36.5)
Probably or definitely not	7 (11.1)

Qualitative Results

Thematic analysis of open-ended survey responses revealed four main themes: 1) Visual content enabled gaining new insights and knowledge into vaping, 2) Positive impact of visual design on engagement with information, 3) Sourced information enhanced credibility of the infographic information, and 4) Digital design of infographic made complex information more understandable. While open-ended survey responses were initially disaggregated by vaping status (ever-vapers or never-vapers), the open-ended responses were ultimately merged due to the consistency of findings. Each theme is explored through participant quotes from both ever- and never-vapers.

Visual Content Enabled Gaining New Insights and Knowledge into Vaping. As reflected in the quantitative closed-ended questions, most of the ever- and never-vapers reported gaining new knowledge from the infographic. Many participants noted that they had previously focused on the substances inside vapes rather than the materials used to construct them. One

participant explained, “I did not know about the materials of a vape; we mostly learn about the substances inside rather than the carrier” (Never-Vaper). Others found the infographic useful in clarifying how e-cigarettes function, with one participant stating that it “provides an explanation for how e-cigarettes work” (Ever-Vaper). Beyond understanding the mechanics of vaping devices, participants also reported learning about the overall health risks associated with vaping. Several noted that they were unaware of how vaping affects the respiratory system and academic performance and how metals from vapes accumulate in vital organs such as the brain, liver, and kidneys. This is highlighted in the following quote: “[I learned that] inhaling chemicals and nicotine can damage lung function, leading to breathing difficulties” (Ever-Vaper), whereas another participant mentioned learning about how, “aluminum particles are collected in the brain, liver, and kidneys” (Never-Vaper). Along these lines, participants also reported increased awareness of the chemicals and metals in vape liquids and aerosols. As one ever-vaper put it, “I learned that e-cigarette liquids contain nicotine, flavouring agents, and chemicals harmful to our health”. Another participant echoed this sentiment: “I learned about the different harmful metals and substances found in vapes, which I didn't know of before” (Never-Vaper). It is apparent that the infographic provided valuable insights into both the components of vapes and the associated health risks for both ever- and never-vapers alike.

Positive Impact of Visual Design on Engagement with Information. Participants expressed an appreciation for the visual elements of the infographic, highlighting how the design effectively communicated essential information. The vibrant visuals helped capture attention, with one participant mentioning, “the infographic’s vibrant colours and engaging design immediately caught [my] attention, making the information more accessible and enjoyable to explore” (Never-Vaper). Similarly, another participant added, “the visual aspect made it appealing and more inviting to read” (Ever-Vaper). In addition to its appeal, participants found that the infographic’s structure made the content easier to personalize and more accessible. One participant explained that it

“allows users to customize the display of infographics to their personal preferences” (Never-Vaper), whereas another participant said, “it was scientific, and had a diagram which helped me understand; it was also well organized” (Ever-Vaper). The responses demonstrate that the visual aspects of the infographic were perceived to enhance both the accessibility and engagement of the information.

Sourced Information Enhanced Credibility of the Infographic Information. It was evident that youth participants valued the credibility and transparency of the information presented, particularly regarding the associated risks of vaping and the components of vapes. Pointing to the effective communication of health risks, one participant shared, “all the info about the harms is impactful and helps you to realize the effects of vaping on your body” (Ever-Vaper). Similarly, a never-vaper commented on learning about “all the ingredients in e-cigarettes, all the damage they cause to the human body, the names of the ingredients and what they do”. Another participant added, “I liked how the infographic contained information about the parts of a vape and also the harmful effects of vaping” (Ever-Vaper). Participants also discussed the importance of the infographic’s transparency when it comes to the sources used and provided reference materials. This is explained in the following quote: “I like the source and reference materials of this information diagram the most so that I can learn more about electronic cigarettes” (Ever-Vaper). This was complemented by another participant who highlighted the inclusion of data and statistics: “The inclusion of statistics and data adds credibility to the information presented in the infographic” (Never-Vaper).

Digital Design of Infographic Made Complex Information More Understandable. Most participants recognized that the infographic effectively broke down complex information into digestible and understandable content. One ever-vaper shared, “[it was] easy to understand even though there was lots of new scientific information on how a vape works”. Another participant echoed this sentiment by saying, “[it made] complex information easier to understand through data

visualization” (Never-Vaper). The clear labelling and detailed presentation were helpful, as highlighted in the following quote: “I liked how it pointed to specific parts of the vape and broke it down. I liked how it was clearly labelled as well” (Never-Vaper). Additionally, the infographic’s visuals, such as diagrams and illustrations, were particularly appreciated for their ability to simplify the information presented. One participant shared, “the amount of diagrams provided to illustrate the main point of the texts [was helpful]” (Ever-Vaper), while another added, “I like that it uses charts and diagrams to display data, making it easier to understand and remember” (Never-Vaper). These visual elements, combined with detailed information, made the content both accessible and engaging, helping participants understand the different aspects of vaping in a clear and concise manner.

Discussion

This study explored whether a co-developed, youth-informed digital infographic can enhance vaping education and strengthen understanding of vaping-related harms among youth. By integrating quantitative and qualitative data, the study provided comprehensive insight into how youth interact with and interpret vaping-related educational materials. To our knowledge, this is one of the first studies to examine the impact of a youth-created digital infographic on youth vaping, offering insights into how peer-designed digital materials can influence young people's knowledge and engagement with vaping-related education.

The infographic’s youth-centered and youth-created design may have enhanced its relevance and appeal, supporting previous research that peer-led interventions can be effective tools for disseminating vaping-related information [16,27]. Further, the iterative process with youth allowed for the refinement of infographic concepts to better align with the needs and preferences of a youth audience which was reflected in our qualitative findings related to visual content and digital design. As noted by England and colleagues (2021), concepts favoured by adults are often dismissed by teens, emphasizing the need to prioritize youth input in health communication [20]. Given that youth are experts in their own lives, they are well-positioned to

identify the information most relevant to them [20]. Our findings support the importance of incorporating youth voices and perspectives when developing public health education materials, thereby increasing their potential effectiveness at translating health information.

Findings indicate that participants appreciated the infographic's ability to simplify complex information. Participants noted that the infographic effectively communicated technical facts, breaking down intricate details about vaping risks into digestible and understandable content without overwhelming the audience. Unlike traditional approaches that often oversimplify health information, resulting in vague and unhelpful messaging that may fail to engage or inform youth effectively [16,27], the infographic provided nuanced, evidence-based details in a structured and visually engaging format. This approach acknowledges that young audiences are capable of processing detailed health information when presented in a manner that does not sacrifice depth and accuracy. Rather than reducing content to simplistic messages, the digital format enabled a layered presentation of information, allowing youth to connect with key points. Research has shown that digital platforms, particularly those utilizing interactive and visual elements, enhance youth engagement and comprehension by allowing them to explore content at their own pace [17,19]. Our findings reinforce existing research depicting that youth are more responsive to health messaging delivered through digital media, as such platforms align with their media consumption habits [18,19].

The effectiveness of the infographic to translate complicated health information also aligns with research demonstrating that visual and interactive educational tools improve knowledge, particularly for complex topics [17]. Participants stated that they valued the clarity and organization of the information, which is consistent with existing evidence that visually compelling materials enhance comprehension and accessibility [17,28,29]. Specific design elements, such as clear diagrams, attractive colours, and structured layouts, were praised for making the content easier to digest—echoing studies that highlight the role of visual aids in improving the retention

and clarity of health messages [17,29]. Additionally, the immersive features, such as clickable links and illustrations, further enhanced interest, demonstrating the potential of digital platforms to appeal to youth.

Beyond accessibility, participants also valued the infographic's credibility and transparency, particularly the inclusion of data and references related to the health effects of vaping. This emphasizes the need for evidence-based, transparent messaging in educational resources, as young audiences are often skeptical of health information that lacks clear scientific backing [16,27]. Due to the absence of clear public health messaging on the harms of e-cigarette use, youth are often exposed to mixed messages about vaping risks [20,30,31,32]. A reduced perception of risk, combined with a general underestimation of nicotine's addictive properties, can increase youths' susceptibility to vape marketing strategies [30], contributing to vaping initiation [15]. Thus, the inclusion of scientific sources strengthened the infographic's credibility among youth, which may urge them to check for sources when presented with other forms of vaping information.

Strengths and Limitations

This study has several strengths. First, it contributes to the limited research on youth-centered vaping education by evaluating a co-developed digital infographic with youth. By incorporating youth perspectives into its design, the study ensures that the educational material is relevant and engaging for the target audience (i.e., youth). Second, using a mixed methods approach allows for a more comprehensive understanding of how youth interact with and interpret vaping-related information. Including both ever-vapers and never-vapers provides valuable insight into differences in knowledge, perceptions, and responses to educational materials. Lastly, the combination of both quantitative and qualitative responses provides a nuanced understanding of how youth interpret and perceive vaping-related messaging.

Despite these strengths, the study has some limitations to note. The sample was geographically limited to Ontario and British Columbia and, due to the small sample size, is not

representative of youth in those regions or reflective of the broader diversity of perspectives across Canada. While efforts were made to include a range of participants, the demographic distribution does not fully reflect the broader youth population. Since vaping prevalence, attitudes, and access to vaping products can vary across provinces, particularly in rural versus urban settings [33,34], future studies could aim for a more geographically diverse sample to ensure findings apply to a wider audience. Additionally, while the study assessed participants' perceived knowledge gain, it did not measure actual behaviour change. Although participants reported feeling more informed after viewing the infographic, it remains unclear whether this knowledge will be sustained or translate into changes in attitudes or vaping behaviours. Future studies should evaluate the sustained impacts of vaping education initiatives through longitudinal research. Lastly, the data were not analyzed by vaping status (i.e., ever-vapers vs. never-vapers), as the intent was not to draw statistical comparisons between these groups. As a result, while demographic differences may exist between those who vape and those who do not, no adjustments were made, and group-level interpretations should be made with caution. Future research should consider more robust analytic approaches that control for demographic variables and explore in greater depth how vaping status may influence youth interest in and knowledge of vaping-related information.

Conclusion

This study demonstrates the potential of youth-driven infographics as effective educational tools for conveying vaping-related information and enhancing youth engagement with prevention messages. The findings highlight the critical role of youth-driven design, visual appeal, accessibility, and credibility in ensuring that public health messages resonate with young audiences. By presenting trustworthy information in a visually appealing way, the infographic not only improved participants' understanding of vaping-related harms but also encouraged greater interaction with essential health knowledge. As vaping continues to pose a public health risk, strategies like these, which leverage the power of digital media and youth-centered design, could

play a crucial role in shaping informed decisions and promoting healthier behaviours among youth.

In light of these findings, the need for future research to examine the long-term impact of these types of educational tools on vaping behaviour across a broader and more diverse youth population is evident.

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Conflicts of Interest: None

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Appendix: “What’s in a Vape?” Infographic

WHAT'S IN A VAPE?

Contrary to popular belief, the clouds produced by vapes are not just harmless water vapour...

Trace Metals in Vapes



All About E-Liquid

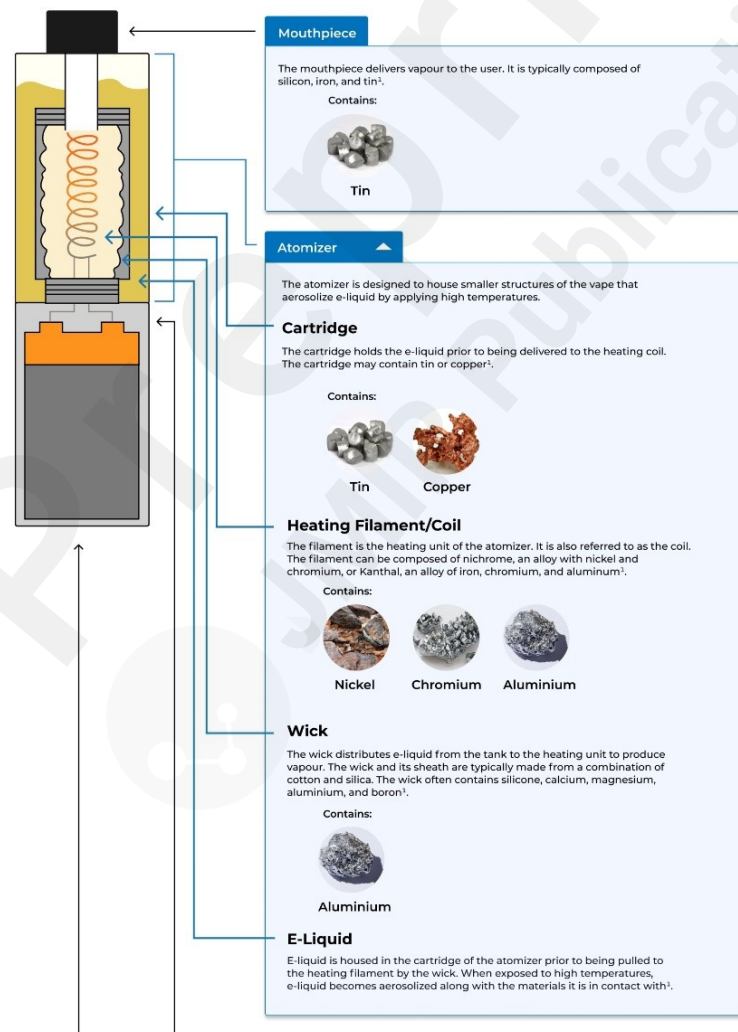


Structure of a Vape

The basic structure of the vape includes the battery, the atomizer, and the mouthpiece.

The battery is connected to the atomizer via copper wiring. The atomizer contains the cartridge for the liquid, a wick to deliver liquid to the heating element, and the heating element itself. The atomizer is held together with brass clamps and soldered joints.

Trace metals are abundant in vape aerosol. When the heating coil is activated, high temperatures cause leaching of metals from the vape into the inhaled aerosol¹.



Copper Wires | Brass Clamp | Soldering Joints

Copper Wires

The copper wires attach the battery to the atomizer and supply power. They are typically composed of an alloy with copper and silver¹.

Contains:


Copper

Brass Clamp

The brass clamp holds the copper wire in place with the filament and heating coil. It is composed of copper and zinc¹.

Contains:


Copper


Zinc

Soldering Joints

Soldered joints hold in the various parts of the atomizer. Soldered joints are typically composed of tin and lead¹.

Contains:


Tin


Lead

Battery

The battery provides power to the atomizer when activated. Batteries may be nickel-cadmium, nickel metal-hydride, lithium ion, lithium polymer, or lithium manganese. Batteries will contain any of these combinations of metals in addition to copper¹.

Contains:


Copper


Nickel


Cadmium


Manganese

Metals in Vapes



Nickel

The inhalation of nickel causes long term swelling in the lungs and irreversible scarring in the alveoli. Nickel is damaging to the liver and kidneys. Nickel is also a causative factor of lung and sinus cancer¹.



Battery

Heating Filament/Coil



Chromium

Chromium is a potent cancer causing metal. Chromium breaks down the inner lining of the lung leading to permanent respiratory diseases. Chromium causes damage to the alveoli resulting in a difficulty in breathing¹.



Heating Filament/Coil



Lead

Lead is toxic to the brain and kidneys. Exposure to lead can decrease cognitive ability, decreasing performance in school or work¹.



Soldered Joints



Aluminium

Aluminium particles collect in the kidney, brain, and liver. Excessive aluminium in the body causes bone degradation, decreasing growth in children and increasing likelihood of bone fractures. Aluminium causes mental diseases such as Alzheimers and Parkinsons¹.

Wick

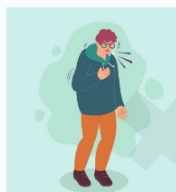




Cadmium

Cadmium induces irritation to the lungs, which can lead to coughing and shortness of breath. Furthermore, cadmium contributes to cancer formation in the lungs. Cadmium damages the liver, weakens bones, and weakens the immune system¹.

Battery

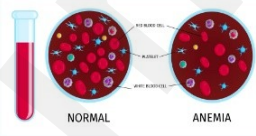




Tin

Tin particles become embedded in the lungs, impeding the ability of the lungs to function properly. Prolonged tin exposure has been associated with the development of anemia¹.

Mouth Piece Soldered Joints Cartridge





Copper

Copper exposure causes swelling in the lungs leading to shortness of breath. Additionally, copper triggers immune responses that result in permanent scarring of the lungs. Long term copper exposure leads to liver and kidney disease, as well as anemia^{1,2}.

Battery Brass Clamp Copper Wires Cartridge





Manganese

Manganese causes inflammation that can worsen conditions like asthma and other respiratory diseases. Manganese increases the likelihood of developing pneumonia and chronic cough. Furthermore, Manganese causes neurological problems like confusion or brain fog. Manganese intensifies the toxicity of other metals by enhancing absorption into the body¹.

Battery





Zinc

Overexposure to zinc is toxic to human cells, causing widespread damage throughout the body. Zinc can cause cancer, scarring of the lungs, and plaque buildup on blood vessels¹⁻³.

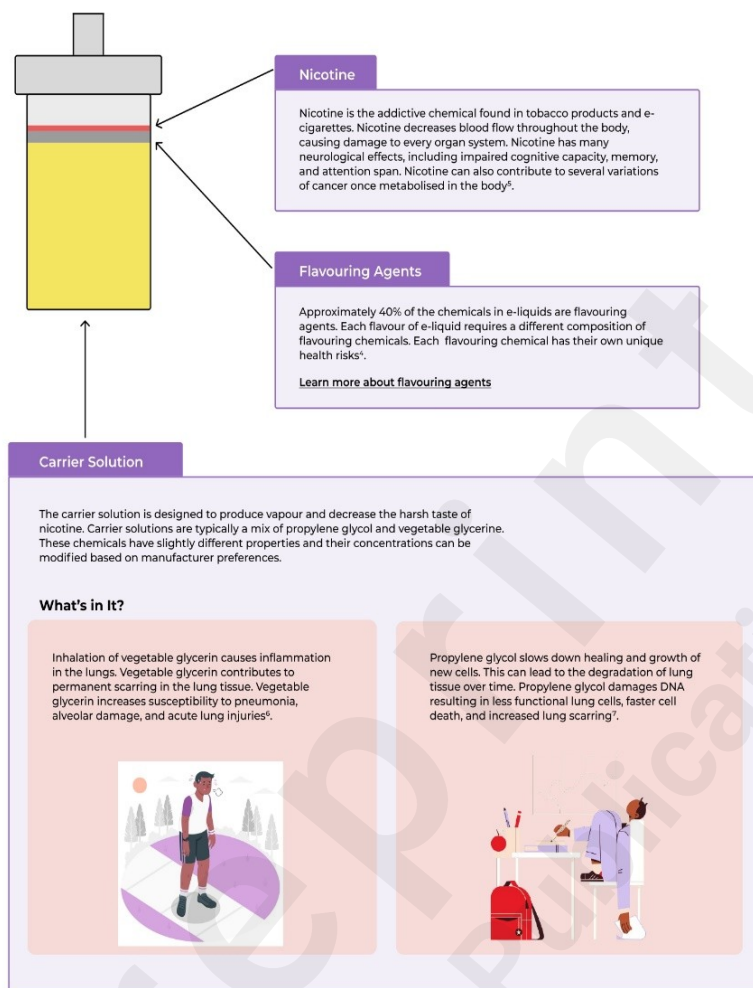
Brass Clamp



What's in E-Liquid?

Of the 825 vaping liquids examined in Canada, over 1500 unique chemicals were identified. Remarkably, 50% of these chemicals appeared in only one product. This wide variety of vaping products makes it difficult for scientists to fully understand all of the risks associated with vaping⁴.

The main components of e-cigarette liquid fall into three categories. The carrier solution, which comprises 90% of the liquid, nicotine, which can be between 0-6% depending on potency, and the flavouring agents, which comprises the remainder of the blend⁴.



Have You Heard of Organic Aldehydes?

Organic aldehydes are formed when carrier solutions and flavouring agents are exposed to high temperatures⁶.

Organic aldehydes have been identified as the primary contributor to **heart disease and lung disease** in cigarette smokers⁷.

When **vegetable glycerin** or flavouring agents are heated, they produce **glycidol** and **acrolein**, which are both cancer causing chemicals^{4,8}.

Newer generation vapes produce more aldehydes than prior generations due to the higher temperature of the heating coil. This means that **new generation vapes are also more dangerous**⁹.

A Closer Look at Flavouring Agents



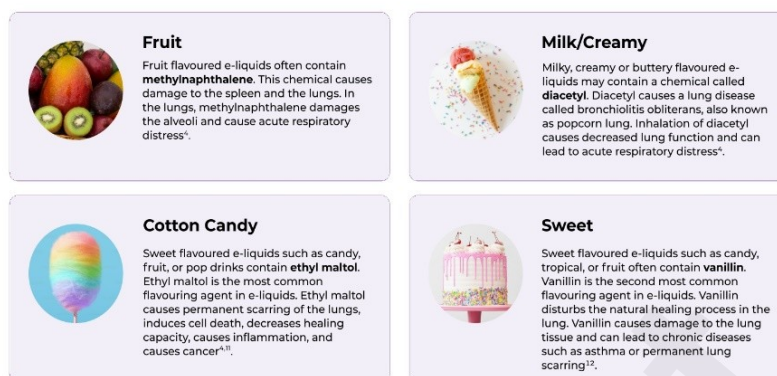
Mint

Mint flavoured e-fluid typically uses a chemical called **Monoterpene Pulegone**. This chemical is known to cause cancer in people who are exposed to it long term⁴.



Spice

Savoury dessert and tea flavoured e-liquids typically contain chemicals called **cinnamaldehyde** and **benzaldehyde**. These chemicals can increase the toxicity of nicotine, as well as cause immune system suppression contributing to increased risk of illness¹⁰.



If you're thinking of quitting or reducing your vape use, please visit quitnow.ca/ as a resource. They are a free program that helps you quit or reduce your nicotine use and understand what happens when you make this change.

Infographic created by Adrianna Chong (BDes) and Adrian Delgado (BScN)

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