



Review

“Stoned on the road”: A systematic review of cannabis-impaired driving educational initiatives targeting young drivers in Canada

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ABSTRACT

Background: With recreational cannabis legalized across Canada, concerns persist about youth driving under the influence of cannabis (DUIC). However, the extent of DUIC education and prevention efforts aimed at young Canadians remains unclear. This systematic review examines recent Canadian initiatives (2017 onwards) focused on reducing DUIC among youth. Specifically, we investigate (1) the types of initiatives and target audiences, (2) content and delivery methods, (3) sustainability, and (4) evidence of impact.

Methods: A comprehensive search was conducted across MEDLINE, PsycINFO, CINAHL, SCOPUS, and EMBASE (January 1, 2017–July 10, 2023), along with various grey literature sources. Initiatives were included if they targeted DUIC behaviour among youth aged 16 to 24, were developed and delivered in Canada by reputable organizations or individuals with institutional support, and aimed to address DUIC behaviour or its enabling conditions. Data extraction and quality appraisal were performed.

Results: Fifteen Canadian initiatives were identified: seven educational programs and eight awareness campaigns, encompassing national and regional levels. Delivery methods included in-person workshops, digital tools, online programs, and smartphone applications. While some initiatives increased awareness and influenced perceptions of DUIC, evidence of behaviour change remained limited. Challenges related to sustainability, particularly concerning long-term funding and digital platform maintenance, were noted.

Conclusions: This research highlights the progress made in addressing youth DUIC in Canada. Examining current DUIC educational initiatives is crucial for refining strategies, shaping policy, and allocating resources to prioritize the safety of young Canadians. Future efforts should focus on assessing behavioural impacts and ensuring financial sustainability and program longevity.

Background

With cannabis now legal for recreational use across Canada, concerns have risen regarding youth driving under the influence of cannabis (DUIC). Currently, individuals aged 16 to 24 exhibit the highest rates of cannabis use and DUIC. Results from the 2024 Canadian Cannabis Survey reveal that 41% of those aged 16–19 and 48% of those aged 20–24 report using cannabis in the past year, compared to 23% of those aged 25 and older (Health Canada, 2024). Drivers between 16 and 19 are also more likely to test positive for cannabis during roadside drug surveys (Canadian Council of Motor Transport Administrators, 2019) and after fatal collisions (Brown et al., 2023). Compared to pre-legalization data, significant increases have been observed in cannabis use among drivers, cannabis-related hospitalizations, and

impaired driving charges (Public Safety Canada, 2023). Moreover, DUIC has now become more common among youth than drinking and driving. According to the 2022 Ontario roadside drug survey, 14.1% of randomly selected drivers ages 16–21 tested positive for cannabis via an oral fluid sample, compared to just 0.8% who tested positive for alcohol using a breath sample (Ontario Ministry of Transportation, 2022). While a positive roadside test for cannabis does not directly confirm impairment, this finding remains concerning, as youth are already at an increased risk for crashes due to factors such as limited driving experience, underdeveloped hazard perception skills, and a greater propensity for risk-taking behaviours (Cassarino & Murphy, 2018; McCartt et al., 2009). Additionally, cannabis has been shown to impair youth's driving performance (Alvarez et al., 2021) and can increase crash risk (Rogeberg, 2019; Rogeberg & Elvik, 2016; Simmons et al., 2022). As

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such, there remains a critical need to prevent youth from DUIIC.

Decades of interventions and educational efforts have contributed to reductions in alcohol-impaired driving, yet DUIIC is on the rise. A growing body of literature suggests that youth are unaware of the risks associated with DUIIC, which may be contributing to this behaviour. Qualitative studies indicate that youth have a limited understanding of how cannabis affects driving ability, how police detect cannabis use at the roadside, and how the safety of DUIIC compares to alcohol-impaired driving (Colonna et al., 2021a; Donnan et al., 2022; McKiernan & Fleming, 2017). In addition, youth report that DUIIC has become normalized, with some perceiving it as convenient and socially acceptable (Colonna et al., 2021a; Donnan et al., 2022; McKiernan & Fleming, 2017). Even individuals in Ontario's DUIIC remedial program express there is a lack of cannabis related driving education (Watson et al., 2019). This is concerning given that youth's perceptions of risk has consistently been identified as a significant predictor of DUIIC behaviour (Arterberry et al., 2017; Colonna et al., 2021b; Goodman et al., 2020; Huynh et al., 2022; McDonald et al., 2021; Sterzer et al., 2022). For instance, in a survey of young drivers in Ontario, just 4.8% of those with a history of DUIIC considered it very dangerous, compared to 30.8% of cannabis users abstaining from DUIIC and 39% of non-users who shared this belief (Colonna et al., 2021a). Moreover, recent data from an Ontario roadside survey revealed that 25% of drivers who are subject to a 'zero tolerance' policy for alcohol and drugs were unaware of these restrictions (Ontario Ministry of Transportation, 2022), highlighting a clear need for targeted education efforts.

The extent to which young Canadians are exposed to DUIIC education remains unclear. Previous systematic reviews of drugged driving prevention initiatives have primarily focused on programs with formal evaluations (Holmes et al., 2014) or studies comparing interventions with control groups (Razaghizad et al., 2021). While these reviews provide valuable insights into factors contributing to the program's effect, they do not offer a comprehensive account of current educational efforts that might influence youth DUIIC behaviours. Many organizational (e.g., non-profit) and local prevention programs remain unpublished, yet they still reach Canadian youth. Furthermore, the most recent direct health education initiatives identified in these reviews date back to 2009 (Razaghizad et al., 2021) and 2012 (Holmes et al., 2014), prompting a critical reevaluation of existing strategies, especially in light of legalization. Examining current DUIIC educational initiatives is essential for refining existing approaches, shaping policy development, and effectively allocating resources to prioritize the safety and well-being of young Canadians.

Objectives

This systematic literature review identifies and critically appraises recent (2017-onwards) initiatives to reduce DUIIC among Canadian youth ages 16 to 24. Specifically, this review seeks to answer the following questions:

1. What initiatives are being delivered, and to whom?
2. What content is being delivered and how?
3. How sustainable are current initiatives (i.e., financial sustainability and program longevity)?
4. Is there any evidence of impact (i.e., initiative reach, behaviour change)?

Methods

Study design

This systematic literature review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Page et al., 2021; see Appendix A). In addition, the Template for Intervention Description and Replication (TIDieR)

guidelines were used to structure the descriptions of the included initiatives in the extraction table (Hoffmann et al., 2014). The study protocol was registered with PROSPERO in August 2023 (CRD42023455496).

Eligibility criteria

Initiatives are defined as targeted educational efforts designed to reduce or prevent DUIIC behaviour. Eligible initiatives targeted youth ages 16 to 24, were intentional educational or awareness efforts, were developed and delivered in Canada from 2017 onwards by reputable organizations or individuals with institutional support (e.g., academic researchers), aimed to influence DUIIC behaviour or the conditions that enable it (e.g., knowledge, perceptions, attitudes, peer beliefs,

Table 1
Eligibility Criteria.

Inclusion Criteria	Rationale
<i>Population:</i> Initiatives targeting youth aged 16 to 24	To address the unique cannabis use patterns, beliefs, and driving risks among youth, only initiatives targeting this age group were included. Eligible initiatives could target youth directly or indirectly (e.g., via parents or educators).
<i>Intervention:</i> Intentional educational efforts or awareness campaigns	Focusing on intentional educational efforts or formal media/ awareness campaigns ensures that the initiatives identified have a structured and purposeful approach to addressing DUIIC among youth. These types of initiatives are more likely to incorporate tailored messages and strategies that resonate with the target audience, compared to general online resources, social media posts, or other unstructured materials.
Delivered in Canada	Since cannabis and impaired driving legislation varies by country, only initiatives delivered in Canada were included to inform Canadian prevention and policy recommendations.
Described in English	Only initiatives described in English were included due limited resources for translation.
Developed and delivered by a reputable organization or person with institutional support	Initiatives developed and delivered by credible organizations (e.g., public health, non-profits, academic researchers) were prioritized for their evidence-based approach and accountability. Example of non-credible sources may include influencer-driven social media messaging, unverified programs, and commercial ventures.
<i>Outcome:</i> Aimed to influence DUIIC behaviours or its contributing factors	Initiatives specifically designed to target DUIIC outcomes or its contributing factors (e.g., determinants, risk factors, motives) may be more likely to impact behaviours compared to general substance use and traffic safety education. Programs that merely state to avoid DUIIC with no further explanation or information were excluded, as they may not effectively change behaviours (Colonna et al., 2021a; Donnan et al., 2022; McKiernan & Fleming, 2017; Stelter et al., 2019).
<i>Time:</i> Delivered from January 1, 2017, onwards	With the introduction of Bill C-46 and the legalization of recreational cannabis across Canada in 2018, initiatives delivered from 2017 onwards were included to capture both ongoing and recent efforts aimed at addressing DUIIC. This timeline allows for the inclusion of initiatives that were developed in response to the legislative changes, as well as those delivered in anticipation of legalization.

environmental factors), and were described in English. Table 1 outlines the full eligibility criteria and rationale. Initiatives were excluded if they did not focus on youth, were influencer-driven social media messaging, unverified programs, or commercial ventures, were conducted outside of Canada, occurred prior to 2017, or were described in a language other than English. Additionally, initiatives with limited DUIC messaging (e.g., those that merely stated to avoid DUIC without further information or explanation) were excluded.

Information sources and search strategy

The search strategy was developed in consultation with two academic research librarians at Western University, London, Ontario. Initiatives were identified through both primary literature searches and an extensive grey literature search. Primary literature searches were conducted across five databases: MEDLINE (Ovid), PsycINFO, CINAHL, SCOPUS, and EMBASE, covering the period from January 1, 2017, to July 10, 2023 (Appendix B). Search terms focused on cannabis, driving, and educational initiatives (see Table 2). No age or country limiters were applied to the database searches.

Grey literature was identified across three sources. First, a comprehensive and iterative Google advanced search was conducted in July 2023 using incognito mode to reduce the web browser’s influence on results. A combination of search terms listed in Table 2 and the word “Canada” was entered into the “find pages with all these words” search field. Each query result was reviewed until two consecutive pages of irrelevant sites were encountered, prompting a new search. This process continued until only repeated or irrelevant resources appeared. Next, the Canadian Agency for Drugs and Technologies in Health (CADTH) Grey Matters resource was examined (CADTH, 2022). CADTH is an open-access platform for discovering grey literature that may not be available through bibliographic databases. Websites listed under the categories ‘Health Technology Assessment Agencies’ and ‘Miscellaneous’ as of August 2023 were reviewed and searched with terms from Table 2 to identify relevant programs. Lastly, to capture ongoing initiatives, projects actively funded under Health Canada’s Substance Use and Addictions Program were reviewed (Health Canada, 2023). Specifically, projects listed on the Active Project page (as of January 2024) with a primary focus tag of “cannabis” or “multiple substances” were examined. Projects previously funded under this mechanism (inactive) do not appear on the webpage. A detailed list and results of the grey literature search are provided in Appendix C.

Table 2
Key Concepts and Subject Headings.

Concept 1: Cannabis	Concept 2: Driving	Concept 3: Educational Initiative
Keywords	Driving	Intervention*
Cannabi*	Driver*	Prevent*
Marijuana	Auto* driv*	Aware*
Marihuana	Vehicle*	Program*
THC	Traffic Accident*	Educat*
CBD	Collision	Learn*
	Crash	Workshop
		Deterre*
		Campaign*
Subject Headings		
Cannabis [MeSH]	Motor Vehicles [MeSH]	Educational Early Intervention [MeSH]
	Traffic Accidents [MeSH]	Psychosocial Intervention [MeSH]
	Automobile Driving [MeSH]	Internet-Based Intervention [MeSH]
	Aggressive Driving [MeSH]	Accident Prevention [MeSH]
	Driving Under the Influence [MeSH]	Awareness [MeSH]
		Education [MeSH]
		Learning [MeSH]

Initiative selection

Results from the primary search were exported to EndNote for duplicate removal and then transferred to Covidence for further screening. After removing duplicates, two reviewers (AS, ZP) independently screened the titles and abstracts. Articles considered potentially eligible by either reviewer were included in the full-text review. Full-text screening was conducted by the same two independent reviewers (AS, ZP) based on the prespecified eligibility criteria for initiatives. Any disagreements at each stage were resolved through consensus, and if necessary, a third reviewer (RC) was consulted. Following full-text screening, three published reviews (Colonna & Alvarez, 2022; Raza-ghizad et al., 2021; Rubin-Kahana et al., 2022) were reference-checked. Primary articles that described eligible initiatives were included in this review.

Results from the grey literature search were exported by a single reviewer (ZP) into multiple Microsoft Word tables (see Appendix C). Each table included search queries, search dates, website URLs, and the following details: relevance rating for each URL (High, Medium, Low, None, Repeat; tagged by ZP), classification as a primary or secondary site (primary sites were those visited directly via Google, while secondary sites were those identified via another site), and reviewer comments (ZP). If additional information was needed to determine eligibility, supplementary Google searches were conducted. This process of seeking information was common, as many initiatives appeared across multiple sources with varying levels of detail (e.g., a news article mentioning an initiative provided less information than the initiative’s main website). After the tables were populated, URLs tagged as Medium or High relevance were reviewed independently by another reviewer (AS or RC). Identifying eligible initiatives was an iterative process, as some initially deemed relevant were later found to be ineligible upon further review. Once two reviewers confirmed an initiative as eligible, it was included in this review.

Data charting

One reviewer charted the data, while another reviewed the results for quality assurance (ZP, AS). The following information was collected for each initiative: name, aim, content, delivery method, location, start date, program duration, target audience, host organization/developer, funder, and stated impact (if applicable). For health education initiatives, a quality appraisal rating was also included. If an initiative was not fully described in a single primary or grey literature source, additional data from other sources were used and appropriately cited.

Initiatives were categorized into two groups: educational initiatives and awareness campaigns. Educational initiatives were defined as structured programs or activities intentionally designed to facilitate learning. These initiatives provided participants with opportunities to actively engage in knowledge expansion, skill development, or achieving predefined learning objectives. In contrast, awareness campaigns consist of related content or resources to raise awareness and promote messaging, often using mass media channels (e.g., social media, radio, television). Unlike educational initiatives, these campaigns focused on disseminating information to audiences who passively consume it. Initiatives or web pages that did not meet these criteria but may still be of interest to the reader are reported in Appendix D.

Quality appraisal

Quality appraisal of each information source was conducted using the Joanna Briggs Institute (JBI) Checklist for Analytical Cross-Sectional Studies for peer-reviewed primary literature (Moola et al., 2017) or the Authority, Accuracy, Coverage, Objectivity, Date, and Significance (AACODS) checklist for grey literature (Tyndall, 2008a; 2008b) respectively. The JBI Checklist is designed to assess the methodological quality of studies using eight appraisal questions specific to

cross-sectional analytical studies. Likewise, the AACODS checklist offers a structured and systematic framework for grey literature critical appraisal, with a clearly outlined methodical approach to assess information sources across the six categories. Initially, we intended to use the Cochrane risk-of-bias tool for randomized and non-randomized studies, although no studies met this study design criterion to appraise using these tools. Two reviewers (ZP, AS) independently appraised each information source and compared results. Disagreements were resolved through consensus and, if necessary, a third reviewer (RC). If multiple sources identified the same initiative, then the main initiative website was used for quality appraisal. If no initiative website was available, then the source that provided the most information was appraised.

Results

Initiative selection

Our primary literature search identified 2543 records, which were reduced to 1083 after duplicate removal. After title and abstract screening, 20 published records were identified for full-text review (see Fig. 1). Only one study from the primary search provided information on an eligible educational initiative and underwent extraction and appraisal. In addition, three published reviews (Colonna & Alvarez, 2022; Razaghizad et al., 2021; Rubin-Kahana et al., 2022) were reference-checked, and no additional initiatives were identified. Regarding grey literature, the Google Advanced Search displayed 423 unique websites across 10 searches, with 69 sites providing relevant information about eligible programs. Upon evaluation against the eligibility criteria, 14 programs were eligible. Health Canada’s Substance Use and Addictions Program website contained 142 actively funded projects tagged as cannabis or multiple substances (as of January 2024). Although the descriptions of 15 projects initially appeared

relevant, no further information could be retrieved for 9 of these projects (via Google), and the remaining six projects did not meet our study eligibility criteria. Similarly, of the 22 websites identified from CADTH, no relevant initiatives were sought for retrieval. Table 3 provides a detailed overview of the 15 included initiatives.

Initiative overview

Of the 15 initiatives, seven were classified as educational programs (Canadian Centre on Substance Use and Addiction, 2024; MADD Canada, 2024; Parent Action on Drugs, 2024; Project Whitecard, 2024; Rural Development Network, 2023; Springboard Services, 2024; YMCA Greater Toronto Area, 2023) and eight as awareness campaigns (Arrive Alive Drive Sober, 2023; Bear Paw Media and Education, 2019a, 2019b; Canadian Automobile Association, 2020; John Howard Society New Brunswick, 2024; Ontario Students Against Impaired Driving, 2024b; Public Safety Canada, 2017; Royal Canadian Mounted Police, 2020). More than half (8/15; 53.3%) of the identified initiatives were implemented nationally (Arrive Alive Drive Sober, 2023; Canadian Automobile Association, 2020; Canadian Centre on Substance Use and Addiction, 2024; John Howard Society New Brunswick, 2024; MADD Canada, 2021, 2023; Parachute Canada, 2023; Public Safety Canada, 2017; Royal Canadian Mounted Police, 2020), with three being educational programs (Canadian Centre on Substance Use and Addiction, 2024; MADD Canada, 2021, 2023) and five awareness campaigns (Arrive Alive Drive Sober, 2023; Canadian Automobile Association, 2020, 2023; John Howard Society New Brunswick, 2024; Parachute Canada, 2023; Public Safety Canada, 2017). The remaining initiatives were delivered in specific provinces/regions. For example, three were offered in Ontario (Moreno & Van Mierlo, 2021; Ontario Students Against Impaired Driving, 2024b; YMCA Greater Toronto Area, 2023), two in Alberta (Bear Paw Media and Education, 2019b; Rural

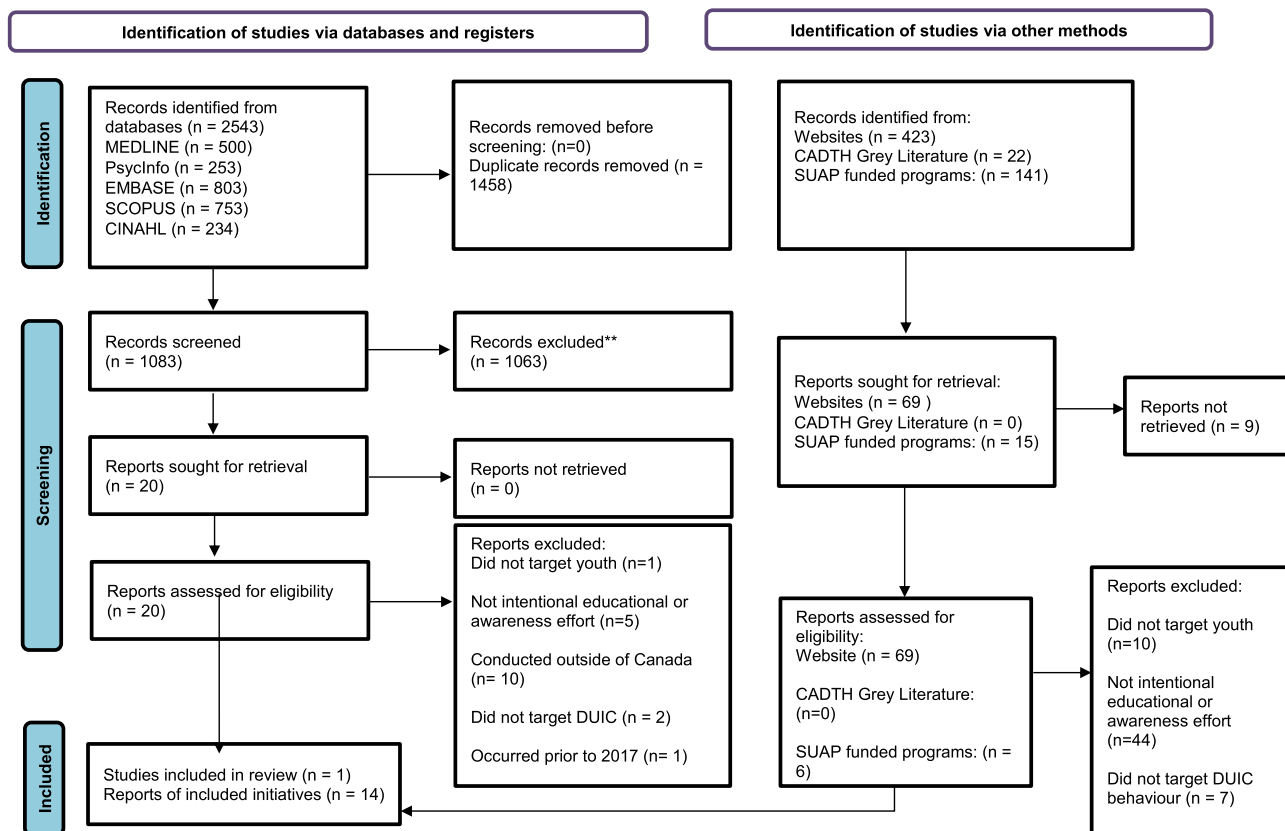


Fig. 1. PRISMA Flow Chart. DUIC: Driving under the influence of cannabis; SUAP: Substance Use and Awareness Program; CADTH: Canadian Agency for Drugs and Technologies in Health.

Table 3
Initiative & Study Characteristics.

Prevention Initiative [Information Source Citation]	Target Audience ^a	Organization & Funder	Initiative Impacts
<p>Educational Interventions – Primary Search</p> <p>What's With Weed: Check Your Cannabis Questionnaire (Moreno & Van Mierlo, 2021)</p> <p><i>Aim:</i> To allow participants to evaluate their own cannabis use and risky behaviours (e.g., DUI) in a non-judgmental setting and with a harm reduction perspective.</p> <p><i>Content:</i> Online questionnaire that allows participant to answer questions about their cannabis use and then receive personalized feedback about how their behaviours compares to their peers (same age and sex). If users report DUI, their report includes a section with information about the risks of DUI (i.e., effect of cannabis on driving, crash risk).</p> <p><i>Delivery:</i> Online through program website. Promoted at speaking engagements and high schools in Ontario, Canada.</p> <p><i>Location:</i> Web-based program intended for high school students in the Greater Toronto Area, Ontario, Canada.</p> <p><i>Timespan:</i> Launched in March 2019 (refers to the Ontario-specific version licensed by Parent Action on Drugs). Currently inactive (questionnaire links are broken (Parent Action on Drugs, 2024))</p>	High school students in the Greater Toronto Area, Ontario, Canada.	Check your Cannabis was originally developed by Evolution Health Systems. An Ontario based youth advocacy group, known as Parent Action on Drugs, licensed a white-label version for use with Ontario youth ('What's With Weed' ; Moreno & Van Mierlo, 2021; Parent Action on Drugs, 2024). Funded by Canopy Growth (Canopy Growth Corporation, 2019)	Questionnaire delivered to 1110 Ontario youth under 25 years old. 342/1110 reported DUI and received a report about the risks of cannabis on driving. No data on program impact on behaviour. <i>JBI Score:</i> 5/7
<p>Educational Interventions – Grey Literature</p> <p>Weed Out The Risk (MADD Canada 2021, 2024)</p> <p><i>Aim:</i> Informs youth about the risk associated with DUI or being a passenger with someone DUI</p> <p><i>Content:</i> Educator guide discusses how cannabis and alcohol impairment affects one's ability to safely operate a motor vehicle, and potential financial, legal, and social risks when DUI or riding with a cannabis-impaired driver.</p> <p><i>Delivery:</i> Interactive in-person classroom workshops by a trained facilitator. Workshop use games, discussion questions, videos, and scenarios to enhance delivery. Adapted to virtual web-based delivery in 2020 via Springboard's Community Learning HUB.</p> <p><i>Location:</i> Canada (unspecified provinces/territories)</p> <p><i>Timespan:</i> Launched in 2015 (MADD Canada, 2019). Currently ongoing</p>	Grade 9–12 students (As stated in the 2019 program flyer)	Developed by Springboard. Delivered in partnership with MADD Canada. Funded by Health Canada's Substance Use Awareness Program (Health Canada, 2019)	Delivered to over 137,000 youth . Independent evaluation (as stated in their annual report (Springboard Services, 2021) found: 87.7% reported learning strategies for avoiding DUI or being a passenger in a car driven by someone DUI. 89.5% reported they were more aware of consequences of DUI. 90.2% reported a better understanding of the effects of cannabis. <i>AACODS Score:</i> 22/22
<p>Clarity On Cannabis (Rural Development Network, 2023)</p> <p><i>Aim:</i> Raises awareness on cannabis' potential risks and harms, as well as providing alternative coping tools and strategies for youth who choose to use cannabis.</p> <p><i>Content:</i> An exhibit that showcases narratives, facts, stats, and harm-reduction based information where students can interact with research-based materials in a 'fun' manner.</p> <p><i>Delivery:</i> Online guidebook, along with an in-person or virtual exhibition. Youth will spend 30–45 min navigating the exhibit.</p> <p><i>Location:</i> Alberta, Canada</p> <p><i>Timespan:</i> Launched in 2021 (based on social media posts). Currently inactive (website link is broken)</p>	Grade 10–12 students in rural Alberta communities As stated on program website (Rural Development Network, 2023)	Delivered by Alberta's Rural Development Network Funded by Health Canada's Substance Use Awareness Program (Rural Development Network, 2023)	Not specified. Stated aim was to reach 1000 youth. <i>Not enough information to conduct AACODS assessment (i.e., site went down during extraction and quality appraisal)</i>
<p>The High Way Home (Canadian Centre on Substance Use and Addiction, 2024)</p> <p><i>Aim:</i> Increase the awareness of youth and young drivers with the risks and harms associated with DUI</p> <p><i>Content:</i> Guides users through real-life scenarios where they must make decisions about using cannabis, alcohol, and driving after use. Youth learn facts about road safety and receive road tips, access evidence-based information and resources about cannabis, explore the consequences of impaired driving, and test their knowledge about driving and drugs. Content is tailored towards the specific provinces/territory of the user.</p> <p><i>Delivery:</i> Virtual delivery through interactive website</p> <p><i>Location:</i> Web-based program tailored for each</p>	Youth As stated on program website.	Developed by the Canadian Centre on Substance Use and Addiction in partnership with Desjardins Insurance	Not specified <i>AACODS Score:</i> 22/22

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Table 3 (continued)

<p>Canadian province/territory <i>Timespan:</i> Launched in 2019 (Canadian Centre on Substance Use and Addiction, 2019). Website remains active. Current promotion/use is unknown.</p>	<p>Youth As stated on program website.</p>	<p>Developed by Project Whitecard Studios and Manitoba Public Insurance. Delivered by Manitoba Public Insurance & Saskatchewan Government Insurance</p>	<p>Not specified AACODS Score: 20/21</p>
<p>DRIVR-X: Choose Your Reality (Hart, 2018; Manitoba Public Insurance, 2017; Project Whitecard, 2024) <i>Aim:</i> Educate individuals about negative impacts of both alcohol and drug-impaired driving <i>Content:</i> Choose-your-own-game takes youth through various simulations of driving while impaired. Uses a driving simulator with haptic feedback and virtual reality goggles. <i>Delivery:</i> Virtual reality simulation delivered in-person at schools, community events and trade shows. Virtual delivery for individual smartphone uses through the Google Play and Apple App Stores. <i>Location:</i> Manitoba & Saskatchewan, Canada <i>Timespan:</i> Launched in 2017. Smartphone application remains active. Current in-person simulator promotion/use is unknown.</p>	<p>Grade 7–12 students As stated on program website.</p>	<p>Developed and delivered by MADD Canada Funded via several national, provincial and corporate sponsors (MADD Canada, 2023)</p>	<p>Results from a 2017–18 survey show that 79% said cannabis will make them drive worse, and 97% support a similar presentation the following year (MADD Canada, 2023) AACODS Score: 22/22</p>
<p>MADD School Program (MADD Canada 2023, 2024) <i>Aim:</i> Spread awareness about the dangers of impaired driving. <i>Content:</i> Educator guide includes information sheets, discussion questions, worksheets, and assessment tools to help educate youth about alcohol and cannabis impaired driving. Videos include dramatizations and testimonials from real-life victims. Youth manual has resources for students to raise awareness about impaired driving, fundraise, and participate in other MADD events. Program contents are updated annually. <i>Delivery:</i> Delivered in-person to students in classrooms (via teachers) and in 1-hour large group assemblies (via trained MADD representatives). <i>Location:</i> All Provinces and Territories in Canada except Nunavut (MADD Canada, 2024). <i>Timespan:</i> Launched in 1994. Currently ongoing.</p>	<p>Youth ages 12–24 As stated on program website.</p>	<p>Delivered by YMCA of Greater Toronto Funded through Health Canada's Substance Use and Addictions Program</p>	<p>Not specified AACODS Score: 20/21</p>
<p>YMCA Cannabis Awareness Program (YMCA Greater Toronto Area, 2023) <i>Aim:</i> To educate youth and adults involved in young people's lives on cannabis awareness, including potential risks, healthy choices, and informed and responsible decision making <i>Content:</i> The workshops cover the following topic areas: Cannabis perceptions and knowledge; Cannabis-impaired driving; Cannabis and the law; Physical and mental health risks; Product types and quality; How to seek support; Social competencies. The program's Knowledge Hub also offers various online resources (i.e. fact sheets) about DUIIC <i>Delivery:</i> In-person and virtual. Facilitated by a YMCA youth outreach workers. Workshops can be booked for classroom settings, community centres, youth groups, and summer camps. <i>Location:</i> The workshop is delivered in Ontario, Canada. <i>Timespan:</i> Launched in 2020. Terminated in 2023.</p>	<p>Awareness Campaigns Public Safety Canada's Don't Drive High Campaign (Public Safety Canada, 2017; John Howard Society of Newfoundland & Labrador, 2023) <i>Aim:</i> Raise awareness about the dangers of DUIIC <i>Content:</i> Information about the risks of impaired driving, alternative options to impaired driving, and addressing myths surrounding cannabis and car use <i>Delivery:</i> Online through website and educational videos. Ads are also presented in offline in public spaces, social media, television, and movie theatres. <i>Location:</i> Digital campaign intended for Canada <i>Timespan:</i> Launched in December 2017. Currently ongoing (i.e., program website last updated March 2024)</p>	<p>Youth (As stated by press release from Public Safety Canada. In addition, the main campaign videos portray youth DUIIC</p>	<p>Developed and delivered by Public Safety Canada Campaign results from April 2020 to March 2021 include 64 million digital advertising impressions, 20.7 million views of the new video, over 2000 engagements with the dedicated campaign Facebook and Instagram accounts, and 634,000 visits to the Don't Drive High campaign landing page (Public Safety Canada, 2021)</p>

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Table 3 (continued)

<p>CAA's Do Anything But Drive Campaign (Canadian Automobile Association 2020, 2023)</p> <p><i>Aim:</i> To raise awareness about the long-lasting effects of cannabis edibles on driving. Messaging encourages planning ahead after ingesting cannabis and ensuring a safe ride home.</p> <p><i>Content:</i> The campaign includes eight videos (French and English) showing young adults who consumed edibles engaging in activities other than driving. Each video ends with "If you do edibles...." followed by activities like partying, binge-watching, texting, eating, gaming, and chilling, then concluding with "do anything but drive."</p> <p><i>Delivery:</i> Online via paid social media and CAA website. Offline via TV advertisements.</p> <p><i>Location:</i> Digital campaign intended for Canada</p> <p><i>Timespan:</i> Launched in September 2020. Status unknown (likely inactive).</p>	<p>Youth As stated on website. Campaign videos portray youth</p>	<p>Developed by Vancouver-based media agency One Twenty-Three West (Canadian Automobile Association, 2020) Delivered by Canadian Automobile Association Funded by Health Canada</p>	<p>Website reports campaign has reached over 3 million young Canadians (Canadian Automobile Association, 2023)</p>
<p>Parachute Canada's #KnowWhatImpairedMeans Campaign (Parachute Canada, 2023)</p> <p><i>Aim:</i> Phase 1 focused on educating young Canadians on the risks of DUI. Phase 2 expanded the campaign to target parents of youth.</p> <p><i>Content:</i> Various advertisements, videos, and short GIF's depicting the dangers of DUI. Phase 2 included videos suggesting a need for parents to "have this talk" about DUI</p> <p><i>Delivery:</i> Online through the campaign website and social media. In-person through an "Impaired" light sculpture installation at the three-week-long Canadian National Exhibition and for the 2019 National Teen Driver Safety Week.</p> <p><i>Location:</i> Digital campaign across Canada. In person sculpture in Toronto, Ontario</p> <p><i>Timespan:</i> Launched in 2018. Terminated in 2021</p>	<p>Youth aged 15 to 24 years old As stated on website. Campaign videos also portray youth</p>	<p>Developed and delivered by Parachute Phase 1 funded by Parachute and the Ministry of Transportation Ontario. Phase 2 funded from Health Canada's Substance Use and Addictions Program (Teahen, 2023; Health Canada, 2019)</p>	<p>An unpublished Parachute 2020 survey showed 76 per cent of respondents felt the "Know What Impaired Means" campaign is moderately to extremely effective in communicating the message (Teahen, 2023)</p>
<p>Bear Paw Media's DUI FYI Campaign (Bear Paw Media and Education 2019a, 2019b)</p> <p><i>Aim:</i> To educate Indigenous youth about cannabis use and driving</p> <p><i>Content:</i> 12-minute video and a booklet that provides information explaining myths and truths around impaired driving, roadside stops, DUI penalties, driver rights, and legal limits for alcohol and cannabis.</p> <p><i>Delivery:</i> Booklet is available online or offline by mail. Video is available online (Bear Paw Media and Education, 2019b) or offline by mail through a USB.</p> <p><i>Location:</i> Digital campaign intended for Alberta, Canada</p> <p><i>Timespan:</i> Launched in 2019. Status unknown (likely inactive based on last social media post in December 2022).</p>	<p>Indigenous youth (14–24 years), service providers, and educators working with Indigenous communities As stated on website</p>	<p>Delivered by Bear Paw Media Funded by Alberta Law Foundation</p>	<p>Not specified</p>
<p>RCMP's Impaired Driving Materials (Royal Canadian Mounted Police, 2020)</p> <p><i>Aim:</i> To educate youth about the consequences of impaired driving</p> <p><i>Content:</i> Lesson plans about drug impaired driving (including cannabis), videos illustrating the thoughts/experience of youth engaging in DUI, as well as various infographics/awareness images that emphasize the risks, misconceptions, and consequences of cannabis-impaired driving.</p> <p><i>Delivery:</i> Online through social media (e.g., Facebook, Twitter, YouTube) and campaign website. In-person promotion through schools.</p> <p><i>Location:</i> Campaign intended for Canada</p> <p><i>Timespan:</i> Launched in 2018. Status unknown.</p>	<p>9 to 12 students and educators</p>	<p>Developed and delivered by the RCMP</p>	<p>Not specified</p>
<p>Arrive Alive Drive Sober Campaign (Arrive Alive Drive Sober, 2023)</p> <p><i>Aim:</i> Raise awareness around the risks and prevention opportunities relating to impaired driving</p> <p><i>Content:</i> Information about the risks, consequences, and alternatives to impaired driving.</p> <p><i>Delivery:</i> Print materials for in person delivery at conferences, fundraising events, public events, high schools, etc. Video and audio PSA's are shared on the radio, TV, and on social media.</p>	<p>Youth in Ontario Campaign materials and videos mainly portray youth</p>	<p>Developed by Arrive Alive. Materials are provided to various organizations for delivery. Funded by various sponsors and partners (e.g., Beer Store, Desjardins, CAA, Ontario Ministry of Transportation, CA, Molson Coors, Smart Serve)</p>	<p>Website reports their radio and television public service announcements receive over 15 million dollars of in-kind airplay each year</p>

(continued on next page)

Table 3 (continued)

<p><i>Location:</i> Digital campaign across Canada (mainly Ontario)</p> <p><i>Timespan:</i> Launched in 1989. Remains ongoing.</p> <p>Ontario Students Against Impaired Driving Campaign (Ontario Students Against Impaired Driving 2024a, 2024b)</p> <p><i>Aim:</i> Raise awareness around the issues of impaired driving</p> <p><i>Content:</i> Posters, information resources, event planning guide, impaired goggles. OSAID webinar has DUIC specific content, while other resources are more general alcohol and drug.</p> <p><i>Delivery:</i> Student-led events, OSAID chapter meetings, provincial/national conferences, webinars, social media, and promotion of the national Students Against Impaired Driving (SAID) Day (i.e., national awareness day for impaired driving. Cash awards for participation are provided to schools and not-for-profit organizations).</p> <p><i>Location:</i> Intended for Ontario, Canada</p> <p><i>Timespan:</i> Launched in 1987. Remains ongoing.</p>	<p>High school students and teachers in Ontario</p> <p>As stated on website</p>	<p>Developed by Ontario Students Against Impaired Driving</p> <p>Funded by various sponsors and partners (e.g., Ontario Ministry of Transportation, Smart Serve, CAA, Spirits Canada, etc.)</p>	<p>Not specified</p>
<p>St John Society's Atlantic Youth Challenge to Prevent Drugged Driving Program (John Howard Society New Brunswick, 2024)</p> <p><i>Aim:</i> Reduce youth DUIC by changing their attitudes and perceptions of cannabis and impaired driving</p> <p><i>Content:</i> Youth-created social media messaging to educate their friend and family on the dangers of DUIC. Posts are voted on for prizes.</p> <p><i>Delivery:</i> In-person in school and on online via social media</p> <p><i>Location:</i> Atlantic Canada</p> <p><i>Timespan:</i> Launched in February 2020 (John Howard Society of Newfoundland & Labrador, 2023). Currently inactive.</p>	<p>Grade 10 students across Atlantic Canada</p>	<p>Led by the John Howard Society of New Brunswick.</p> <p>Funded by Health Canada's Substance Use Awareness Program (Health Canada, 2019)</p>	<p>Not specified</p>

^a The target audience was written as stated on the initiative website

^bThe strengths and limitations are based on the reviewers' impressions of the program. These impressions are based on the descriptions provided in the identified literature.

Development Network, 2023), one across Manitoba and Saskatchewan ([Manitoba Public Insurance, 2017](#); [Project Whitecard, 2024](#)), and one across Atlantic Canada ([John Howard Society New Brunswick, 2024](#)). The Canadian territories, British Columbia, and Quebec had fewer impaired driving initiatives and awareness campaigns overall. For the target audience, approximately half (7/15; 46.7%) of the initiatives targeted high school students specifically ([Parent Action on Drugs, 2024](#); [Springboard Services, 2024](#); [YMCA Greater Toronto Area, 2023](#)), whereas others focused on youth more broadly ([Canadian Automobile Association, 2020, 2023](#); [Canadian Centre on Substance Use and Addiction, 2024](#); [Parachute Canada, 2023](#); [Project Whitecard, 2024](#); [Public Safety Canada, 2017](#)). Some programs engaged parents ([Parachute Canada, 2023](#)) and educators ([MADD Canada, 2023](#); [Ontario Students Against Impaired Driving, 2024b](#)) to facilitate learning across settings. In addition, one program specifically targeted indigenous youth ([Bear Paw Media and Education, 2019b](#)).

Contents and delivery

The identified initiatives offered a range of content focused on DUIC prevention. Most focused exclusively on DUIC, with six addressing DUIC in conjunction with other substances like alcohol and/or other drugs ([Bear Paw Media and Education, 2019a](#); [Canadian Centre on Substance Use and Addiction, 2024](#); [MADD Canada, 2023, 2024](#); [Ontario Students Against Impaired Driving, 2024b](#); [Project Whitecard, 2024](#)). Initiatives communicated a range of personal, social, financial, and legal risks associated with DUIC. Personal risks included reduced driving ability, greater crash likelihood, physical injury, and death. Social risks included harming passengers or others, damaging relationships, and long-term stigma. Financial and legal consequences ranged from fines and license suspensions to criminal charges and increased insurance costs.

There was also content on the effects of cannabis on driving, legal repercussions, prevention strategies, and resources for seeking support. Some programs incorporated real-life scenarios to support decision making and emphasize the risks ([Canadian Centre on Substance Use and Addiction, 2024](#); [Project Whitecard, 2024](#); [Rural Development Network, 2023](#)), with one including testimonials from real-life victims ([MADD Canada, 2023](#); [Ontario Students Against Impaired Driving, 2024b](#)). Three educational initiatives made their full content available online through an educator guide, interactive website, or recorded webinars ([MADD Canada, 2021, 2023](#); [Springboard Services, 2024](#); [YMCA Greater Toronto Area, 2023](#)), and two allowed access to the program online ([Canadian Centre on Substance Use and Addiction, 2024](#)) or via a smartphone app ([Project Whitecard, 2024](#)).

Delivery methods were diverse, ranging from in-person to fully virtual or hybrid approaches. The in-person components comprised classroom programs led by teachers ([MADD Canada, 2023](#); [Ontario Students Against Impaired Driving, 2024b](#)), workshops led by trained facilitators ([Springboard Services, 2024](#); [YMCA Greater Toronto Area, 2023](#)) and immersive experiences using interactive tools (e.g., virtual reality, driving simulators, impaired driving goggles) to simulate the effects of DUIC and better engage youth ([Ontario Students Against Impaired Driving, 2024b](#); [Project Whitecard, 2024](#)). Virtual components included structured online programs, questionnaires, guidebooks, interactive websites, virtual 'exhibits', and a mobile smartphone application available on commercial app stores. All educational initiatives had some type of virtual component, although some stated virtual delivery was only developed in response to the COVID-19 pandemic ([Rural Development Network, 2023](#); [Springboard Services, 2024](#)). The awareness campaigns delivered online utilized websites, educational videos, social media, and news-related information. Campaigns delivered offline employed posters, booklets, radio messages, TV ads, exhibitions,

fundraising events, and public events to disseminate their content.

Sustainability

The sustainability of these initiatives varies, with many being funded through government sources or corporate sponsors. Nearly half (7/15, 46.7%) were funded through Health Canada's Substance Use and Addictions Program, which provided time-limited grants for substance use prevention, harm reduction and treatment across Canada (Health Canada, 2019; Canadian Automobile Association, 2020; Teahen, 2023; Rural Development Network, 2023; YMCA Greater Toronto Area, 2023). A smaller proportion (5/15, 33%) were funded through corporate partners and sponsors (Arrive Alive Drive Sober, 2023; Bear Paw Media and Education, 2019a, 2019b; Canadian Centre on Substance Use and Addiction, 2024; Canopy Growth Corporation, 2019; MADD Canada, 2023; Ontario Students Against Impaired Driving, 2024b), and the remaining initiatives (3/15, 20%) were funded internally (John Howard Society New Brunswick, 2024; John Howard Society of Newfoundland & Labrador, 2023; Public Safety Canada, 2017; Royal Canadian Mounted Police, 2020). As of September 2024, five initiatives remain ongoing (Arrive Alive Drive Sober, 2023; MADD Canada, 2019, 2023; Ontario Students Against Impaired Driving, 2024b; Public Safety Canada, 2017), five are inactive/terminated (Parachute Canada, 2023; Parent Action on Drugs, 2024; Public Safety Canada, 2017; Rural Development Network, 2023; YMCA Greater Toronto Area, 2023), three are likely inactive (Bear Paw Media and Education, 2019a; Canadian Automobile Association, 2023; Project Whitecard, 2024), and two are unknown (Canadian Centre on Substance Use and Addiction, 2024; Royal Canadian Mounted Police, 2020). Among the five ongoing initiatives, two are educational initiatives, and three are awareness campaigns. These established programs have run for several years and have a wide network of funders demonstrating strong longevity (Arrive Alive Drive Sober, 2023; MADD Canada, 2021, 2023; Ontario Students Against Impaired Driving, 2024b; Public Safety Canada, 2017). Some programs had broken web links (e.g., Parent Action on Drugs, 2024; Rural Development Network, 2023), suggesting challenges with long-term sustainability and maintaining their digital interface.

Evaluation

Among the seven educational initiatives, two stated changing perceptions (MADD Canada, 2021, 2023), and one program stated reach (Moreno & Van Mierlo, 2021). For instance, according to an independent evaluation of Weed Out The Risk (delivered to over 137,000 youth), 87.7% of participants reported learning strategies to avoid DUIC or riding with an impaired driver, whereas 89.5% reported increased awareness of the consequences of DUIC, and 90.2% gained a better understanding of the effects of cannabis on driving (Springboard Services, 2024, 2021). Likewise, the MADD School Program reported results from a 2017–18 survey that showed 79% of participants believed cannabis would impair their driving, and 97% supported having a similar presentation the following year (MADD Canada, 2023). None of the initiatives provided evidence of changing DUIC behaviour.

For the awareness campaigns, several reported their reach using different metrics. Health Canada's 'Don't Drive High' campaign documented its reach with 64 million digital advertising impressions, 20.7 million views, over 2000 social media engagements, and 634,000 visits to the campaign landing page (Public Safety Canada, 2017). Similarly, CAA's 'Do Anything But Drive' campaign reached over 3 million young Canadians (Canadian Automobile Association, 2023). The Arrive Alive Drive Sober's campaign noted that their radio and television announcements receive over \$15 million worth of in-kind airplay annually (Arrive Alive Drive Sober, 2023). In contrast, Parachute's #Know-WhatImpairedMeans campaign evaluated its effectiveness through an unpublished survey, with 76% of respondents rating the campaign as moderately to extremely effective in communicating the risk of cannabis

on driving (Parachute Canada, 2023).

Quality appraisal

Five of the six grey literature educational initiatives were assessed using the AACODS Checklist, and all received very high scores (i.e., three got a score of 22/22, and two got a score of 20/21 due to no detailed references; see Appendix E). The differences in the total are based on the number of relevant elements from the AACODS checklist that apply to an initiative. One initiative could not be appraised (Rural Development Network, 2023) since the web page went down after extraction and prior to quality appraisal. The final educational initiative was appraised using the JBI Checklist for Analytical Cross-Sectional Studies and received a score of 5/7 due to unclear confounders and limited outcome measurement reliability/validity.

Discussion

This systematic review highlights the current landscape of DUIC education delivered to Canadian youth since cannabis legalization. In total, seven educational programs and eight awareness campaigns were identified, offering valuable insight into the content, delivery methods, sustainability, and impact of these DUIC initiatives. These findings shed light on trends, gaps, and opportunities for further initiative development and research.

The content across the identified initiatives aligns with existing literature, highlighting the importance of educating on the dangers and legal risks of DUIC, the effects of cannabis on driving, personalized feedback, peers' beliefs, and prevention strategies (Colonna & Alvarez, 2022; Colonna et al., 2022; Holmes et al., 2014; Razaghizad et al., 2021; Stelter et al., 2019). Content was offered in various formats, including static content, multimedia, and interactive elements. Notably, some programs incorporated real-life scenarios, which were identified by youth who use cannabis as one of the most important content areas for a DUIC intervention (Colonna et al., 2022). Other key areas highlighted by youth included the legal consequences, consideration of the pros and cons, and the specific effects of cannabis on driving (Colonna et al., 2022). Few programs focused on driving after polysubstance use, which can be riskier than DUIC alone (Fares, Wickens, et al., 2022; Fares, Wright, et al., 2022).

Delivery methods varied, with a clear trend toward increasing technology integration. While some programs transitioned to virtual delivery due to the COVID-19 pandemic (Rural Development Network 2023, 2024), various interactive tools have emerged, including virtual reality, mobile applications, interactive websites, and online virtual exhibit platforms. Over the past decade, several interventions targeting youth substance use (primarily alcohol) have been developed using mobile devices as the primary mode of delivery (Colonna & Alvarez, 2022; Crane et al., 2015; Seth et al., 2023; Tofighi et al., 2019; Wilson et al., 2016), reflecting a broader recognition of technology's potential to reach younger audiences (Marsch & Borodovsky, 2016; Michie et al., 2017; Teeters et al., 2022; Webb et al., 2010). Despite the rise in technology-driven approaches, the two ongoing educational programs still utilize trained facilitators for content delivery (MADD Canada, 2024; Springboard Services, 2024). The success of these programs may depend on the quality and consistency of facilitator delivery. Evidence suggests that providing adequate training and resources to facilitators is crucial for program success (Dusenbury et al., 2003; Rohrbach et al., 1993) and increases their confidence in delivering impaired driving education (Stelter et al., 2019). Further research is needed to compare the effect of technology-based methods with traditional in-person approaches and to evaluate how they influence long-term behaviour change in DUIC prevention (Webb et al., 2010).

None of the identified initiatives provided evidence related to changes in DUIC behaviours, with a few reporting initiative reach or shifts in perceptions. This finding aligns with a recent review suggesting

a lack of evaluation among DUIC mass media campaigns and media advocacy (Colonna, 2022) and underscores the need for additional evidence to evaluate the impact of these initiatives on DUIC behaviours. This is particularly important given the mixed evidence regarding the effectiveness of youth-focused cannabis-related interventions. While some studies have demonstrated positive effects, such as reductions in cannabis use or cannabis-related behaviours (Bou Nassif et al., 2023; Côté et al., 2024; O'Hara et al., 2024), others have shown no significant impact (Beneria et al., 2022; Halladay et al., 2019). Robust evaluations that include behavioural outcomes are essential to understanding DUIC prevention efforts' effects and inform future funding and policy decisions.

The lack of reporting on behaviour change may also be attributed to the limited published literature identified in this review. Only one primary source met our eligibility criteria, which could be due to the narrow scope of our search criteria or existing gaps in the literature. Other relevant studies may have been published but were excluded as our search focused on structured initiatives from reputable sources, targeting Canadian youth (16–24) to address DUIC behaviour and its influencing factors. Further exploration with expanded search terms or the inclusion of different databases could yield a more comprehensive understanding of DUIC prevention and its effects on youth behaviours. Alternatively, the limited findings may reflect a broader scarcity of published interventions targeting DUIC among Canadian youth, consistent with previous findings (Holmes et al., 2014; Razaghizad et al., 2021). For example, a 2014 systematic review identified four interventions aimed at reducing drugged driving among youth, with three based in the United States and one in Canada (Holmes et al., 2014). A similar 2022 rapid review identified just two mass media campaigns delivered in Canada related to DUIC (Colonna, 2022), while a 2021 systematic review identified four drugged-driving prevention interventions in Canada, although participants had a mean age over 30, indicating they were not specifically targeted at youth (Razaghizad et al., 2021).

Few of the identified programs demonstrated sustainability, with a noticeable trend of reliance on government funding. Half of the initiatives were funded through Health Canada's time-limited Substance Use and Addictions Program, a funding mechanism like those used for other Canadian drugged-driving initiatives (Holmes et al., 2014; Razaghizad et al., 2021). This reliance on external funding threatens long-term sustainability, as many initiatives conclude once the funding is exhausted. Most of the ongoing programs have a wide network of funders, which may help to ensure their continued operation. To enhance future DUIC prevention efforts, initiatives should prioritize rigorous evaluation of behaviour change, increased youth engagement in design and delivery, sustainable funding models, and more focused messaging regarding polysubstance use.

Limitations

This study should be viewed in light of several limitations related to data and design. First, the eligibility criteria were restricted to initiatives delivered by reputable sources in Canada post-2017. While this approach was intended to filter out non-credible sources, it may have overlooked the influence of DUIC content or promotions that young Canadians encounter from other sources, including international campaigns or influencer-driven strategies. For example, one of the identified awareness campaigns partnered with social media influencers to promote content (Teahen, 2023), highlighting the potential impact of such approaches. Our team is currently undertaking research exploring the influence of social media content on DUIC and its potential impact on youth behaviours. Second, the search was limited to English-language sources, which may have excluded initiatives delivered in French (Canada's second official language) or other languages, potentially narrowing the study's scope. Although none of the identified sources were specifically excluded based on language, it is possible that the web

browser's settings may not have presented French-language results. Third, the lack of a consistent definition of 'youth' may have led to the inadvertent inclusion or exclusion of initiatives that did not align precisely with the study's age criteria (16–24 years). Several initiatives used the broad term 'youth' to describe their target audience without specifying the exact age range, which could impact the relevance of our findings to the intended demographic. Additionally, initiatives that did not exclusively target youth were excluded, even though they may have still influenced youth behaviour. Fourth, the identification of grey literature via Google searches may introduce bias. While we documented all searches and used a private, non-trackable browser, research suggests that Google search results are not fully reproducible and can be influenced by factors such as geographical location, user relevance, and webpage popularity (Haddaway et al., 2015; Piasecki et al., 2018). Furthermore, grey literature often lacks robust archiving, which means sources may be removed or URLs may change over time. An example of this was the 'Clarity on Cannabis' source (Rural Development Network, 2023), which became inaccessible during this study, resulting in an incomplete quality appraisal assessment. Finally, this review did not assess the type of content delivery strategy. Evidence suggests that some approaches, such as fear-based messaging, may be less effective in youth DUIC prevention compared to offering clear, actionable steps for abstaining (Davis & Cismaru, 2020). Future research could explore these initiatives' specific delivery methods and messaging strategies, examining whether they align with best practices for influencing youth behaviour.

Conclusion

This research underscores the progress made in addressing DUIC in Canada, highlighting a range of educational initiatives and awareness campaigns since recreational cannabis legalization. While these efforts have raised awareness and shifted some perceptions about the risks of DUIC, there is still a need for more evidence on their impact on behavioural change. Sustainability remains a key challenge, as many initiatives rely on time-limited government or external funding, which can limit their long-term viability. However, emerging technology-based interventions, such as virtual reality and interactive tools, offer exciting potential and warrant further exploration to assess their effectiveness compared to traditional methods. To maximize long-term impact, developing more interventions focused on behaviour change and securing sustainable funding sources is crucial. Continued research is needed to evaluate the lasting effects of these initiatives and explore innovative strategies to engage youth better to reduce DUIC among this high-risk population.

Ethics approval

The authors declare that the work reported herein did not require ethics approval because it did not involve animal or human participation.

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CRedit authorship contribution statement

Robert Colonna: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Zuha Pathan:** Writing – original draft, Formal analysis, Data curation. **Anuprati Sultania:** Writing – original draft, Formal analysis, Data curation. **Liliana Alvarez:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.drugpo.2025.104835](https://doi.org/10.1016/j.drugpo.2025.104835).

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