

# A Quality Assessment of Information Provided on Websites Selling Cannabis to Consumers in Canada

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## Research Article

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# Abstract

**Background:** Cannabis is used by millions of people for both medical and recreational purposes, and this use is even greater in jurisdictions where it is legalized, such as Canada. Online cannabis vendors have gained popularity for purchasing cannabis due to the easy access and convenience to consumers. The objective of this study was to evaluate the quality of health information provided by websites of cannabis vendors selling products to Canadian consumers, and to further identify trends in the information provided.

**Methods:** Six different searches were conducted on Google.ca, and the first 40 webpages of each search were screened for eligibility. A total of 33 unique websites of cannabis vendors selling products to Canadian consumers were identified and included. The DISCERN instrument, which consists of 16 questions divided into three sections, was used to evaluate the quality of cannabis-related health information on these websites.

**Results:** Across the 33 websites, the average of the summed DISCERN scores was 36.83 (SD = 9.73) out of 75, and the mean score for overall quality of the publication (DISCERN question 16) was 2.41 (SD=0.71) out of 5. Many of these websites failed to discuss uncertainties in research evidence on cannabis, the impact of cannabis use on quality of life, alternatives to cannabis use, risks associated with cannabis use, and lacked references to support claims on effects and benefits of use.

**Conclusion:** Our findings indicate that the quality of cannabis-related health information provided by online vendors is poor. HCPs should be aware that patients may use these websites as primary sources of information, and appropriately caution patients while directing them to high-quality sources. Future research should serve to replicate this study in other jurisdictions and assess the accuracy of information provided by online cannabis vendors, as this was outside the scope of the DISCERN instrument.

## Background

Cannabis was used for medical and recreational purposes by approximately 200.4 million people worldwide in 2019, making it the third most commonly used psychoactive substance after alcohol and tobacco [1]. Some of the proposed medical applications of cannabis include improvements in pain, dystonia, cachexia, multiple sclerosis spasticity, seizures resulting from Dravet syndrome and Lennox-Gastaut syndrome, glaucoma, and long-term use of opioids and opiate withdrawal [2]. Cannabis is also commonly used for cognitive issues such as anxiety/stress, post-traumatic stress disorder, depression, and insomnia [3]. Some risks associated with the use of cannabis include psychiatric manifestations such as psychosis, respiratory disease from long-term exposure, and low infant birth weight if cannabis is used during pregnancy [4, 5].

While recreational cannabis remains largely illegal on a global scale, medical cannabis has been legalized in countries such as Uruguay, the Netherlands, Thailand, the United Kingdom, and Colombia [6]. In Canada, cannabis was legalized for recreational use following the *Cannabis Act* in 2018, almost two

decades after the legalization of medical cannabis in 2001 [7, 8]. Since then, the prevalence of cannabis use among Canadians has increased. In 2021, 25% of participants in the *Canadian Cannabis Survey* reported cannabis use compared to 22% in 2017, although this was a slight decrease from 2020 in which 27% reported cannabis use [9–11]. Due to this surge in interest, the number of online vendors selling cannabis products to consumers have also been rapidly growing. With a greater number of cannabis consumers, it can be inferred that more individuals seek cannabis information online and may acquire their information from online vendors. A qualitative systematic review identified that patients using cannabis for pain reported conducting their own research online to find the best dispensaries and to understand which strains of cannabis and dosages would provide the best treatment for their specific condition [12]. In 2020, 69% of Canadians used the internet to search for health information [13]. Online health information influences how consumers think, behave, and make decisions pertaining to their health, which is why the quality of such information is important [14, 15]. Youth, in particular, are frequently exposed to and influenced by information found online about cannabis [16].

To our knowledge, no studies have broadly examined the quality of information provided by online cannabis vendors in the Canadian context specifically. Given that an increasing number of Canadians are now seeking information surrounding cannabis and purchasing it via online vendors, the objective of the present mixed-methods study was two-fold with respect to websites of online cannabis vendors that ship to Canada: 1) to assess the quality of consumer health information using the DISCERN instrument and 2) to identify trends in information provision that contribute to the overall quality of these websites for health information.

## Methods

### Search Strategy

Consumer health information is sought primarily via internet search engines, with Google holding the greatest market share and largely being the most popular among North American users [17]. JYN devised a search strategy that would replicate the search queries of individuals seeking to buy cannabis online. This involved conducting six different searches on the first four pages of Google.ca (10 results per page, totalling 40 results per search term) based on the following search strategies: “buy marijuana online”, “buy cannabis online”, “buy weed online”, “purchase marijuana online”, “purchase cannabis online”, and “purchase weed online”. We based our search on the fact that most users search online using common words and short phrases, while staying away from any advanced search features; generally, they also do not browse past the first few result pages [18]. Searches were conducted by NL and UT on January 12, 2022. Both NL and UT used the incognito setting on the Google Chrome browser to ensure that previous browser search history would not influence the search results.

### Eligibility Criteria and Screening

After conducting the searches, we applied the following screening criteria, whereby websites were only eligible if they were online cannabis vendors that shipped their cannabis product(s) to Canada. Exclusion

criteria included: duplicate websites, non-English language websites (or if bilingual, we only assessed the English component), websites that were not online vendors of cannabis, websites that were online vendors of cannabis but did not ship to at least one region in Canada, and websites with inaccessible URLs. We also excluded vendor websites if they declared that they would be ceasing their operations. Once all eligible websites were identified, we applied a mixed methods approach to assess the quality of information and understand trends in information provision.

## **Data Extraction and Quality Assessment of Website Consumer Health Information**

JYN, NL and UT pilot tested data extraction and the following information was collected: website URL, vendor name, year vendor was established, type(s) of cannabis products sold (e.g., edibles, vapes, extracts), type(s) of cannabis accessories sold (e.g., rolling papers, bong, vape batteries), and type(s) of non-cannabis products sold (e.g., mushrooms, LSD, clothing apparel). A quality assessment of the health information provided on each website was also conducted using the DISCERN instrument. JYN, NL and UT met to compare their pilot data extractions, and discrepancies were resolved through discussion; JYN served as arbitrator. Following this, NL and UT completed the data extraction and quality assessment for all remaining eligible websites.

We chose to assess each website using the DISCERN instrument, as it is a well-accepted, reliable, and valid tool used to assess the quality of consumer health information present on any given treatment choice [19]. The DISCERN instrument consists of 15 distinct questions which examine a particular publication on the reliability and quality of information provided. Examples of such information include descriptions of benefits and risks to treatment, references to information sources, and discussion of alternative treatment choices. Each website was individually examined and rated for 15 questions where they were scored on a scale of 1 to 5 based on the criteria provided by the DISCERN instrument guidelines. Once a web page had been evaluated for the 15 preliminary questions, it was assessed for its overall quality, question 16, based on its performance on the previous questions.

Following the completion of data extraction and quality assessment, NL and UT met with JYN to compare and discuss scores. Discrepancies arising from misinterpretation of the data were resolved without unduly modifying legitimate discrepancies between assessors. In addition to presenting the general characteristics of eligible websites, we present the means and standard deviations associated with each DISCERN item across websites, as well as the total DISCERN score for each individual website.

## **Results**

### **Search Results**

Our search using Google.ca yielded a total of 240 webpages from the first 40 search results of each search strategy used, which was narrowed to 35 unique websites after removing duplicates. A further two websites were excluded, with one of them having an inaccessible URL (n = 1) and another declaring that

their operations would cease in the coming months ( $n = 1$ ). In total, 33 online vendor websites were included based on the aforementioned eligibility criteria, underwent data extraction, and were assessed using the DISCERN instrument (Fig. 1).

## General Characteristics of Eligible Websites

Nine out of 33 (27%) websites exclusively sold cannabis products, such as flower, edibles, vapes, concentrates, and topical. Twenty-four websites (73%) sold cannabis accessories (e.g., rolling papers, bongs, pipes), and nine websites also sold non-cannabis products such as mushrooms, LSD, and clothing apparel. Eighteen websites (55%) appeared in more than one search strategy. Information about the year in which the vendor was established was only available for nine websites (27%), with the majority being established between 2017 and 2020 ( $n = 8$ ), and the remainder being established before 2010 ( $N = 1$ ). Common features among many websites were that they contained “About Us” and blog pages. The “About Us” pages were commonly used to provide information surrounding the aims and goals of the online vendor, whereas the blog pages often contained news and educational information about cannabis use, strains, effects, and safety. The general characteristics of all eligible websites assessed using the DISCERN instrument, listed in alphabetic order by vendor name, can be found in Table 1.

## DISCERN Instrument Ratings

Across the 33 websites, the average of the summed DISCERN scores was 36.83 (SD = 9.73) out of 75. The highest scoring website was *SQDC* (summed DISCERN score of 59.5/75), while the lowest scoring website was *Dutch Love* (summed DISCERN score of 20.5/75). The mean score for overall quality of the publication (DISCERN question 16) was 2.41 (SD = 0.71) out of 5. Considering that both the mean of the summed DISCERN scores and the mean score for overall quality of the publication were low, the quality of consumer health information provided by online cannabis vendors was found to be generally poor. The DISCERN question with the highest mean score (mean = 4.02; SD = 1.18) was question 10 (i.e., “Does it describe the benefits of each treatment?”). Conversely, the DISCERN question with the lowest mean score (mean = 1.08; SD = 0.18) was question 12 (i.e., “Does it describe what would happen if no treatment is used?”). Of the 15 questions assessed, only four questions (questions 1–3, and 10) had a mean score greater than 3.00. DISCERN scores for all questions assessed on each website are presented in Table 2, listed in descending order of summed DISCERN score.

## Trends Identified Across Resources Assessed

### SECTION 1 Is the publication reliable? (Questions 1–8)

Question 1 and 2 assessed the aims of the website, specifically inquiring into whether the aims were stated clearly and whether they were achieved, respectively. The mean score for question 1 was 3.79 (SD = 0.97) and the mean score question 2 was 3.82 (SD = 0.79). Websites scoring higher in these domains usually had an “About Us” section, which stated clear and specific aims and values of the company, in addition to other general information such as the location of the distributor and target populations.

Question 3 assessed whether the information provided on the website was relevant to cannabis consumers. Twenty-one out of 33 websites (64%) received a score of 3 or greater on this domain, and the question received a mean score of 3.06 (SD = 1.04). Websites receiving a high score in this section provided realistic information that was relevant to the needs of cannabis consumers, such as information about strains, dosing, methods of use, effects, as well as information on which patients with pre-existing conditions may benefit from cannabis use.

Question 4 assessed whether the information provided on the website was supported with external sources. Generally, most websites rated low in this domain, with a mean score of 2.08 (SD = 1.25). Websites scoring in the 3 to 5 range provided citations embedded in the text and/or a complete reference list at the end of the information sections. Question 5 assessed if it was clear when the information used or reported on the website was produced. Fourteen out of 33 websites (42%) scored 3 or greater in this domain, and the mean score was 2.21 (SD = 1.45). Generally, most websites with blog posts containing information on cannabis provided dates of publication. Question 6 assessed whether the information provided on the website was balanced and unbiased. The mean score for this question was 2.56 (SD = 0.90), and websites scoring 3 or higher (39%) presented information in an objective manner, referenced multiple sources of information (peer-reviewed, governmental, or health information sites), and provided a balanced discussion of both the benefits and harms of cannabis use. Poorly scoring websites tended to provide information in a sensational or promotional manner, or lacked an adequate amount of information on the cannabis products in general. Question 7 assessed whether the website provided details of additional sources of support and information. Although the mean score for this domain was low (mean = 2.05 SD = 1.43), websites would score high in this domain if they suggested further readings and sources where consumers could learn more in-depth about the cannabis topics presented on the website.

Lastly, question 8 evaluated whether the website referred to areas of uncertainty with respect to cannabis products. Only nine websites (27%) scored 3 or higher in this domain (mean = 1.79; SD = 1.16), as they referred to specific areas where further cannabis research is required, explicitly identified which claims are supported through limited evidence, and/or mentioned the variable effects of cannabis use.

## **SECTION 2 How good is the quality of information on treatment choices? (Questions 9–15)**

Question 9 assessed whether the website described how each of the listed cannabis products work, and 19 out of 33 (58%) websites received a score of 3 or greater. Most websites scoring high in this domain had a “cannabis education”, “learn about cannabis”, or other blog pages which provided information on how cannabis works on the body to produce its effects. The endocannabinoid system and neurotransmitter action were frequently discussed across many websites.

Questions 10 and 11 assessed whether the website correctly identified the benefits and the risks associated with cannabis use, respectively. Twenty-nine websites (88%) adequately (score of 3 or greater) described the benefits of cannabis use (mean = 4.02; SD = 1.18); in contrast, only 10 (30%) websites

adequately described risks (mean = 2.44; SD = 1.64). Websites scoring poorly in both these questions identified limited to no benefits or risks, provided vague and general disclaimers, or often lacked information on the effects of cannabis use in general.

The remaining four questions in this section (questions 12 to 15) scored poorly, all receiving mean scores less than 2. These questions assessed, respectively, whether the website i) described what would happen if no cannabis was used (question 12; mean = 1.08 ; SD = 0.18); ii) described how the treatment choices affect overall quality of life (question 13; mean = 1.62 ; SD = 0.74); iii) made it clear that there may be more than one possible treatment choice (question 14; mean = 1.94; SD = 0.53); and iv) provided support for shared decision-making (question 15; mean = 1.44; SD = 1.00). As evident by these mean scores, most websites were lacking in these areas and received scores within the 1 to 2 range.

## **SECTION 3 Overall rating of the websites (Question 16)**

Based on questions 1 to 15, question 16 evaluated the overall quality of the website as a source of information about cannabis. Most websites were determined to be poor in overall quality, as 70% received an overall score lower than 3, and the mean overall score of all websites was 2.41 (SD = 0.71). Among other factors assessed, these low scores can be attributed mainly to the lack of discussion on uncertainties in research evidence on cannabis, quality of life, alternatives to cannabis use, and shared decision making, along with a lack of references to literature and provision of additional sources of support.

## **Discussion**

The present study used the DISCERN instrument to assess the quality of consumer health information provided by 33 websites of vendors selling cannabis to consumers in Canada. Although online vendors facilitate easier access and convenience to individuals wishing to purchase cannabis, the quality of health information on these websites was generally found to be low. Across the 33 websites, the average of the summed DISCERN scores was 36.83 (SD = 9.73) out of 75, and the mean score for overall quality of the publication (DISCERN question 16) was 2.41 (SD = 0.71) out of 5. Many of these websites failed to discuss uncertainties in research evidence on cannabis, the impact of cannabis use on quality of life, alternatives to cannabis use, risks associated with cannabis use, and lacked references to support claims on effects and benefits of use. These findings warrant concern, considering that patients may use these vendors as primary sources of information prior to purchasing cannabis. Physicians and other healthcare practitioners (HCPs) should be aware of these findings and appropriately caution patients who express interest in cannabis use.

There may be a few reasons why the quality of consumer health information found on most websites are low. First and foremost, the commercial nature of many websites causes them to present information in a sensational rather than objective manner, aiming to persuade consumers to buy their products. This consequently causes much of the information to be biased and unbalanced, with greater focus on the benefits of cannabis use and less focus on the risks, as evident by our results and past studies [20, 21].

Presenting information that could potentially detract consumers from buying products, such as the side-effects of cannabis use, is not in the interest of many online vendors [22]. Additionally, as evident by the aims and goals provided by many of these websites, they are primarily concerned with selling their products as opposed to educating consumers [23]. In our study particularly, websites scored low in many domains as they lacked essential information on cannabis topics including risks of treatment, impact on patient quality of life, and uncertainties in research, among others. Moreover, research on cannabis is an emerging field, therefore clear information on the risks and benefits of use may not be easily found by many website owners. In general, there is concern that website owners may lack the expertise in interpreting and providing health-related information [24–26]. There is also a significant amount of misinformation present online about cannabis [27], and website owners may be influenced by this misinformation without thoroughly reviewing peer-reviewed literature or well-established health information websites.

## Comparative Literature

This is the first study to broadly evaluate the quality of health information provided by online cannabis vendors selling to Canadian consumers, with no restrictions on health conditions or purpose of use. Ng et al. recently used the DISCERN instrument to evaluate the quality of web-based consumer health information at the intersection of cannabis and pain [28]. Although the averaged DISCERN scores were found to be higher than those in our study, the quality of health information in this area was still concluded to be poor. However, considering that cannabis is commonly used by consumers for a wide range of conditions other than pain, it is important to broadly evaluate the quality of consumer health information without excluding conditions other than pain. Additionally, this study included health portal, professional, cannabis news, non-profit, and commercial websites from the Netherlands, United States, and Canada, whereas our focus was specifically on commercial websites selling cannabis products to Canadian consumers. As a result, we included and thoroughly evaluated a greater number of websites of this type.

Similar studies have been conducted in jurisdictions other than Canada, primarily in the United States. In 2014, Boatwright et al. evaluated the quality of medical marijuana claims on popular websites determined by online marketing tools, in which they found that 76% of claims made by websites were inaccurate and were based on low-quality evidence [29]. However, this study had significant methodological differences compared to ours, as they only evaluated the top ten most popular websites, and specifically focused on medical marijuana, excluding websites that sold cannabis for recreational purposes. Additionally, this study evaluated the accuracy and quality of only three medical cannabis claims on each website, as opposed to assessing the entire website. Three other studies from the United States (Luc et al.; Cavazos-Rehg et al.; and Kurger et al.) analyzed the content provided by online cannabis retailers, concluding that many dispensaries made unsubstantiated claims about the benefits of cannabis for various conditions, such as nausea, depression, and anxiety [30–32]. Aligning with the findings from our study, Luc et al. and Kruger et al. also reported that there was limited mentioning of potential side effects or risks associated with cannabis use [30, 32]. Moreover, a study from the United

Kingdom found that much of the online information on medical cannabis would raise unrealistic expectations of benefits and downplay potential side effects [20]. In other forms of media such as newspapers and online discussion forums, the quality and accuracy of cannabis-related health information was also found to be poor [33, 34]. Furthermore, it is notable to mention that the aforementioned studies did not use the DISCERN instrument, which in addition to quality, assesses the reliability of consumer health information, as opposed to accuracy.

## Implications and Future Directions

Patients may bring up their interest or use of cannabis to HCPs, who should be aware of the low quality of cannabis-related health information provided by online vendors as highlighted by our findings. HCPs should appropriately caution patients about these findings and refer them to sources of high-quality information, such as the National Center for Complementary and Integrative Health [35]. This will ensure that patients are adequately informed prior to purchasing cannabis online and may ultimately guide purchasing practices. Unfortunately, another concern relates to HCPs training and education on the topic of cannabis, both in Canada and across other jurisdictions. As many HCPs lack the necessary knowledge to effectively counsel patients on the safe use of cannabis, they are often reluctant to discuss this as a therapeutic option with patients [36–38]. With the known and rapid increase in cannabis vendors and the low-quality information provided by them online, it is of urgent importance to adequately train HCPs and HCP students so that patients have a reliable source of information to turn to for guidance. Public health agencies and those involved in cannabis-specific health policy may consider using the present study as a resource to inform healthcare providers and patients alike of the high frequency of low-quality information provided by online cannabis vendors.

Although our study evaluated the quality of cannabis-related health information provided by Canadian vendors, and similar research has been conducted in the United States, it would be beneficial for further research to replicate this study in other jurisdictions where cannabis has been legalized such as the Netherlands or Uruguay [39, 40]. Moreover, one study identified that source credibility had no significant effect on consumers' interpretation of the quality of online health information [41]. Future research should also serve to evaluate the accuracy of information provided by online cannabis vendors, similar to the approach used by Boatwright et al. for medical cannabis, as this was not possible using the DISCERN instrument [29]. When doing this, a special focus should be placed on distinguishing between the type of sources used to support information (e.g., peer-reviewed literature versus blog posts), allowing for low-quality information and inaccuracies to be identified. Lastly, one study examined the implementation and effectiveness of online responsible vendor training for recreational marijuana in the United States, revealing that most employees were satisfied with the training and found it user-friendly [42]. Although this training was mainly focused on regulatory practices such as using the state's inventory tracking system or checking for valid identifications, the authors suggest that cannabis-specific training on topics such as safety and dosing is a crucial future step. Such training may be beneficial for owners of online cannabis vendors in Canada as well as other jurisdictions, allowing them to incorporate important topics related to cannabis safety in online descriptions.

# Strengths and Limitations

Our study had several strengths and limitations. One strength was the use of a validated and reliable instrument, DISCERN, to assess the quality of consumer health information on cannabis products. Another strength was the use of six different search terms on Google.ca, of which the first 40 search results were viewed for each (totalling 240 webpages), ensuring that the most frequently visited online cannabis vendors were captured and assessed. Moreover, an inherent strength of our study is that it is the first to assess the quality of health information provided by online cannabis vendors in Canada, with no restrictions to information on certain medical conditions.

One limitation to our methodology was that only websites with English-language content were eligible, potentially excluding websites in French (Canada's second national language) and other languages. However, it should be noted that there were no non-English websites identified through our search. Additionally, considering that the internet is a constantly changing tool, we were only able to identify and assess websites at a certain snapshot of time. Therefore, if our methods are reapplied now, the content on many of these websites may have changed, and different websites may appear in the search results. Further, an inherent limitation of the DISCERN tool is that while it can be used to assess whether references and additional sources of information are provided by websites, it does not distinguish between the types of sources, such as peer-reviewed scientific literature versus blog posts, where the former would be deemed more credible in most cases and increase the quality of information provided by the website.

## Conclusion

Given the large number of cannabis users in Canada, purchasing cannabis from online vendors has gained increasing interest due to the easy accessibility and convenience. This study sought to evaluate the quality of health information provided by websites of cannabis vendors selling products to Canadian consumers. The DISCERN instrument, which has been proven for its high reliability and validity, was used to evaluate 33 websites meeting the eligibility criteria. Our findings indicate that the quality of cannabis-related health information provided by online vendors is poor. Given that consumers may use these websites as primary sources of information prior to purchasing cannabis, HCPs should be aware of this, and a need exists to create adequate training so they can appropriately advise patients while directing them to high-quality sources. Future research should serve to replicate this study in other jurisdictions and assess the accuracy of information provided by online cannabis vendors, as this was outside the scope of the DISCERN instrument.

## Abbreviations

HCPs: Healthcare Practitioners

## **Declarations**

# **Ethics Approval and Consent to Participate**

This study involved a search and review of publicly available online information only; it did not require ethics approval or consent to participate.

## **Consent for Publication**

All authors consent to this manuscript's publication.

## **Availability of Data and Materials**

All relevant data are included in this manuscript.

## **Competing Interests**

The authors declare that they have no competing interests.

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## **Authors' Contributions**

JYN: conceptualized and designed the study, collected the data, interpreted and analysed the data, provided contributions and critically revised the manuscript, and gave final approval of the version to be published.

UT: collected the data, interpreted and analysed the data, co-drafted the manuscript, and gave final approval of the version to be published.

NL: collected the data, interpreted and analysed the data, co-drafted the manuscript, and gave final approval of the version to be published.

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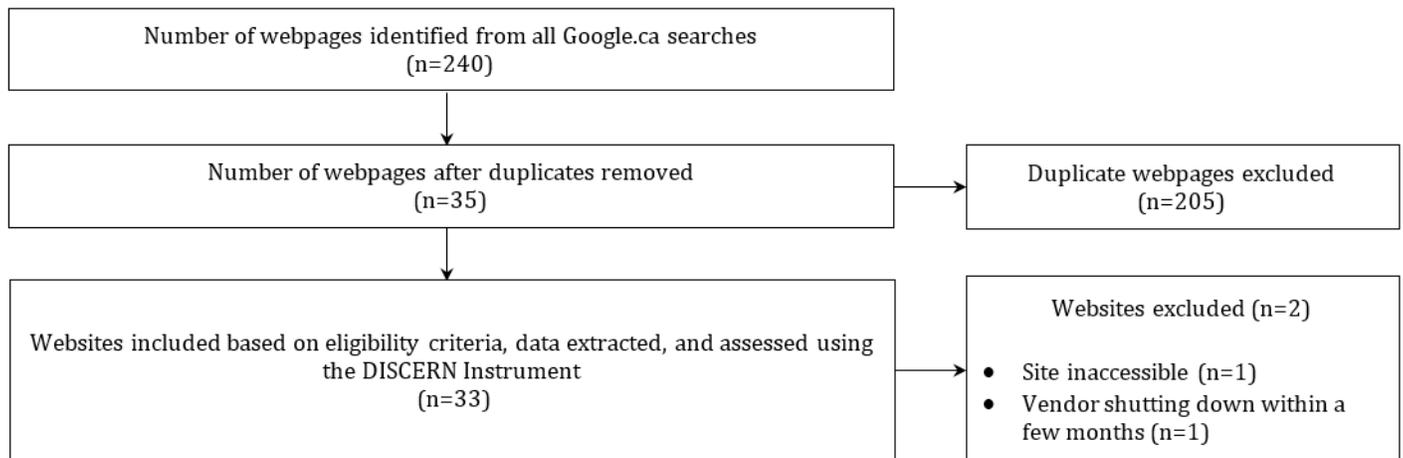
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## Tables

Tables can be viewed in the supplementary section.

## Figures



**Figure 1**

Web Information Search Strategy and Assessment Flowchart

## Supplementary Files

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