Cannabidiol (CBD) Marketing and Decision-Making: Examining 164 Crowdfunding Campaigns and 2,165 CBD Products for Sale Online in Canada

by

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Abstract

The popularity of cannabidiol (CBD) has increased dramatically due to medical perceptions of CBD as a "cure-all", with over 1,000 products available. Limited research examines how consumers find and decide to purchase CBD for medical purposes. First, to understand motivations for CBD medical use, 164 GoFundMe.com campaigns incorporating CBD for a medical condition are thematically examined. Second, to understand how CBD is presented to potential consumers, 2,165 CBD products on Canadian websites are analyzed. The resulting findings suggest that among crowdfunders, CBD is identified as a treatment through self-directed research, a recommendation by a trusted care provider, or experiential insights from someone associated with or influencing the personal network. Product descriptions frame CBD as a treatment or cure for specific ailments, a natural health product, or a product used in specific ways to achieve particular results. These findings suggest the need for systematic auditing of CBD products for regulatory adherence.

Keywords: Cannabidiol; Cannabis; Crowdfunding; Marketing

Dedication

The thesis is dedicated to my parents, Maurizio and Barbara Zenone. Their unwavering support is my greatest asset and motivation.

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Chapter 1

Introduction

Cannabidiol (CBD) is one of the eighty cannabinoids found in cannabis and hemp plants. Often used for medicinal purposes, CBD became more widely known following of the legalization of cannabis and hemp-derived CBD extracts in Canada and certain areas in the United States. Despite widespread public perception of CBD's medicinal benefits, there is limited evidence to support its efficacy for most of its uses as a medical treatment (1–4). These include but are not limited to: pain, inflammation, anxiety, mental health conditions, and cancer treatment and symptom relief (5–7). Rare seizure disorders are the only conditions CBD is clinically accepted for as a treatment, and then only when other seizure relief interventions are not effective (8). Other concerns, such as proper dosage, safety, unenforced regulations, and proper labelling of CBD product concentrations remain issues for both medical and non-medical users (9–14).

At the moment (May 7 2020), there are over 600 studies registered with the National Institute of Health (NIH) testing the efficacy of CBD as a treatment for numerous conditions (15). Current research into CBD is highly focused on its biomedical applications by medical researchers and there is limited research occurring examining its current uses and misuses and public understanding of CBD. Numerous articles in high profile news outlets such as the *New York Times* and *Washington Post* have been published that highlight unproven uses of CBD without sufficient scientific evidence, the intentional spread of misinformation by CBD sellers through marketing, lack of regulatory oversight, and misleading claims of CBD product content and concentrations (1,6,16,17). The reasons prospective customers choose CBD and where their information is retrieved is largely unknown. Existing research occurs primarily in the United States and the United Kingdom through cross-sectional surveys, focusing on the specific medical conditions which CBD is applied (9,18–20). In the Canadian context, this is problematic amid cannabis legalization.

Anecdotal evidence, such as news reporting in Canada-based news outlets, show CBD is oftentimes marketed and sold, without adherence to regulatory standards and that current regulations regarding the marketing and sale of CBD are insufficient to protect the

public's interests (21,22). This is a significant public health issue for several reasons. First, CBD is touted as a "cure-all" for many conditions, including emerging diseases or viruses, often without proven cures or treatments. In the midst of the COVID-19 pandemic, a CBD company called "Monalisa Healing" owned by singer Bif Naked made statements that their CBD can "help defend against coronavirus" (22). Similarly, the United States Food and Drug Administration have warned several CBD companies for making similar claims for COVID-19 (23). Such claims can cause serious harms in the form of delaying evidence-based treatment, perceived "protection" against the specified condition, and spread misinformation to others. The claims and warnings by regulatory agencies are not isolated to COVID-19, and also include rebuts against claims of curative cancer properties and treatment application to other serious health conditions (24). While companies are warned for such claims, the majority are not detected, and continue to spread health misinformation, and thus require scholarly attention.

Second, the infancy of CBD research due to legal restrictions on research does not confirm if there are adverse safety issues associated with CBD. Widespread promotion and sale of CBD without confirmed safety can lead to health issues for certain groups, such as infertility in men (3). Last, the premature adoption of CBD can deter evidence-based uses of CBD. There is significant research occurring investigating the medicinal qualities of CBD (15). Clouding application of CBD for scientifically unsupported uses may reduce the credibility for new evidence-based uses.

To further research, the advertising surrounding CBD, including which claims are delivered to prospective customers, and consumer decision-making when acting on such information needs attention. The unproven, anecdotal, or exaggerated efficacious perception of CBD may influence prospective CBD user or current user-decision making away from evidence-based treatments.

The present thesis aims to contribute to the development of this topical and essential research area through four goals:

1. Examine the pathways through which those interested in CBD for medical purposes come to consider and decide on CBD;

2. Identify the medical conditions, symptoms, and ailments that people treat with CBD;

3. Examine how CBD sellers frame medical benefits to prospective customers in Canada, including the specific medical applications marketed or claimed; and

4. Develop recommendations to the appropriate Canadian regulatory authorities to reduce the spread of CBD misinformation.

To accomplish these goals, two objectives are completed:

1. Utilize crowdfunding data from GoFundMe.com to determine how people fundraising for CBD decided to use CBD, where their information was retrieved, and for what medical conditions and ailments they are crowdfunding; and

2. Systematically collect and analyze the product descriptions from Canadian websites selling CBD to determine how CBD products are framed to prospective customers, which treatments or ailments CBD are marketed for, and identify which sellers do not adhere to Canadian regulations.

The novel sources of data sources can provide insight into several areas of needed research such as understanding why people choose to use CBD (covering both external and internal influences), the actions of sellers on prospective CBD user decision making, specific medical claims made by CBD sellers, and product adherence to regulatory standards. Considered throughout the thesis are recommendations for Health Canada and future researchers.

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Chapter 2

Literature Review

The History of CBD: Scientific Origins, Research & Regulations

The first scientific study investigating possible medical benefits of cannabis occurred in 1839, when Dr. William B. O'Shaughnessy, an Irish researcher and physician, published a study looking at the therapeutic effects of cannabis (1). The theorized medical benefits were not understood until 1940, when Dr. Robert S. Cahn, a British chemist, discovered cannabinol (CBN) – the first partial cannabinoid, which became a foundation for subsequent cannabinoid research (2). In 1942, Dr. Roger Adams, an American chemist, successfully isolated the first cannabinoid – cannabidiol (CBD) (3). Shortly later, Adams also isolated tetrahydrocannabinol (THC). Following these discoveries, research on cannabis and its medical applications was halted due to increased perceptions of cannabis as an illicit drug. In 1961, the introduction of the *Single Convention on Narcotic Drugs* passed by the United Nations labelled cannabis an illicit substance (4). The majority of UN member states then legislated cannabis illegal following the convention, thus stalling medical research.

In 1963, Dr. Raphael Mechoulam identified the stereochemistry of CBD (5). He similarly discovered the stereochemistry of THC in 1964 (2). These discoveries are significant because they isolated the euphoric and mind-altering effects of cannabis within specific cannabinoids. Through this research, CBD was determined not to produce the psychoactive effects of THC. In 1980, amid a legally constrained research environment, Dr. Mechoulam led a trial to determine if CBD is a viable epilepsy treatment (6). This study, conducted in Brazil due to its more permissive regulations on cannabis research, found that in 8 study participants, CBD stopped seizures in 4 participants and significantly reduced seizures in the other 4. Despite the findings of the study, the stigma associated with cannabis, legal restrictions, and lack of opportunities for research, led to these findings not being immediately followed up by larger studies.

In subsequent years, cannabis and CBD began to gain traction as a medical treatment. Anecdotal feedback and testimonials convinced high profile advocates to push for

medical cannabis legalization (with a prescription). In 1996, California became the first state in the United States (US) to legalize medical marijuana through Proposition 215 (7). Other states – such as Oregon, Alaska and Washington followed in 1998. In 2001, Canada introduced a government-run medical marijuana program (8). Medical cannabis is legal in 33 states across the United States (9).

The popularity of CBD grew substantially in 2010. Charlotte Figgi, a 7-year-old child with a rare form of epilepsy, made headlines when her parents gave her CBD to control her seizures (10). Before taking CBD, she experienced 300 seizures per week. After taking CBD, her seizures were reduced to 3 or 4 per month. Dr. Sanjay Gupta, the Chief Medical Correspondent of CNN, ran a story about Charlotte on CNN (11). This led to parents around the world rushing to obtain CBD and see if similar results were possible. Colorado – which legalized recreational cannabis in 2016 – became a tourist destination for parents seeking the purported benefits of CBD (12). Clinical adoption occurred in 2018 when Epidiolex, a primarily CBD derived medication, was approved by the United States Food and Drug Administration (FDA) for rare seizure disorders (13).

While CBD grew in popularity, it reached mainstream status between 2016 and 2018 when two key pieces of legislation passed in the United States and Canada. The United States *Farm Bill* legalized the production of CBD derived from hemp (14,15). Under the bill, CBD derived products with under 0.03% of THC content produced from hemp were legalized and not considered under the definition of cannabis. In Canada, the *Cannabis Act* legalized cannabis products, including CBD (16–18). Legislation in both jurisdictions, while warranted and needed, allowed CBD products to enter the market rapidly. Regulatory restrictions such as prohibiting health claims, marketing restrictions, labelling requirements, and proper licensure, have generally not been put into practice due to the size of the market and lack of proper enforcement mechanisms. The FDA has repeatedly warned companies regarding making false claims about CBD's safety and efficacy, but misinformation remains an ongoing issue in the US market (19). In Canada, companies selling CBD make similar anecdotal health efficacy claims that are not compliant with the *Cannabis Act* (20,21). Presently CBD is incorporated into numerous mainstream products such as foods and hygiene products, and controlling the hype

surrounding such products is recommended by scientists and health care providers (22–24).

The CBD Market

In the United States, CBD projects to become a $16 billion (US) industry by 2025 (25). There are limited global figures to report on CBD sales. Total CBD sales in the US from 2014 to 2022 have increased for all uses. In 2014, CBD sales for recreational purposes (without a prescription) were $2 million, and medical sales were $139 million (26). In 2019, these figures increased to $295 million (recreational) and $352 million (medical). The top products used in 2018 by sales were: ingestibles ($883.5m), topicals ($491.2m), inhalables ($395.4m), pet products ($63.8m) and pharmaceuticals ($16m) (27). By 2025, the following CBD product types are expected to have the following market valuations: nutraceutical products ($6.4b), topicals ($4b), beverages ($2.4b), beauty ($1.12b), food ($1.12b) and vapor products ($0.96b) (28). CBD pet products expect to become a $1.7b industry, while the CBD beverage market by 2025 is estimated to be worth $1.7 billion, and the food market $950 million (29,30). Skin products are increasing rapidly – estimated to be a $959m market in 2024 (31). In 2019, the year over year sales of CBD products in the United States increased by sale location type: multioutlet (+895.3%), food/grocery stores (+390.1%), and cannabis dispensaries (+15.2%) (32). The market for CBD derived from cannabis and hemp is fairly even. In 2017, 54.9% of CBD products were derived from cannabis and 45.1% derived from hemp (33). Recent regulations such as the *Hemp Bill* and *Cannabis Act* may impact these figures.

Driving the growth of CBD is the 1000+ products available for purchase in the US (34). CBD products are available as edibles (gummies, chocolate, marshmallows, cheeseburgers, ice cream, and others), beverages (coffee, teas, soda, beer, wine, and cocktails), beauty products (blemish creams, eye serums, mascara, lip balm, lotions, and serums), hygiene products (deodorants, tampons, shampoo, conditioner, toothpaste), pet products, sex products (lubricants, condoms) and traditional forms such as oil tinctures, capsules, and dried flower forms (19,22,23,25,35–42). These markets are major sources of sales. Major corporations – ranging from Coca-Cola, Ben & Jerry's, Walgreens,

Kroger, CVS, Carls Jr, Molson Coors Brewing, and Diageo are working to introduce CBD infused products or sell CBD products in their stores (19,23).

CBD Usage

In the United States, approximately 14% of adults used a CBD product in 2019 (43). The following groups have used CBD at least once: adults aged 18-29 (20%), adults aged 30-49 (16%), adults aged 50-64 (11%), and those over 65 (8%). The estimated annual usage of CBD projects to increase to 35% by 2024 (44). In the UK, CBD usage rates are lower. In 2019, the following groups used CBD at least once: those aged 18-24 (10%), those aged 25-49 (11%), those aged 50-64 (8%), and those 65+ (5%) (45). However, a large portion of groups in the UK considered using a CBD product: those aged 18-24 (36%), those aged 25-49 (31%), those aged 50-64 (27%), and those 65+ (20%) (46).

The most common reason for using CBD is to get perceived medical benefits. A cross-sectional study of CBD users found that 62% of users reported employing it for medical benefits (47). The most common reasons for use among adults in the United States are (by gender): relaxation (men, 56%; women, 53%), stress/anxiety (men, 53%; women, 47%), improved sleep (men, 44%; women, 46%), muscle pain (men, 46%; women, 42%), chronic pain (men, 42%; women, 36%), joint pain (men, 42%; women, 35%), social use (men, 15%; women, 28%), migraine relief (men, 24%; women, 17%), nausea (men, 21%; women, 13%), and spiritual use (men, 9%; women, 16%) (48). A survey by the Brightfield group found that more than 60% of CBD users take it for anxiety (25). Among young persons, a cross sectional study found that stress is the top reason for CBD use (65.4%), followed by relaxation (54.8%), and sleep improvement (42.22%) (49). In the UK and Germany, similar motivations for CBD use are observed. A recent survey in the UK found that adults used CBD for: pain (71%), anxiety/depression (38%), sleep disorders (24%), arthritis (10%), epilepsy (3%), and other medicinal purposes (1%) (50). In Germany, adults use CBD for the following reasons: To ease stress, overload and nervousness (adults 16-29,73%; adults 30-49, 67%; adults 50-69, 58%), insomnia (adults 16-29, 58%; adults 30-49, 51%; adults 50-69, 39%), inflammatory illnesses such as Crohn's disease or arthritis (adults 16-29, 54%; adults 30-49, 58%; adults 50-69, 58%), addiction treatment (adults 16-29 29%; adults 30-49, 28%; adults 50-69, 25%), acne and

neurodermatitis symptoms (adults 16-29, 23%; adults 30-49, 24%; adults 50-69, 16%), smoking cessation (adults 16-29, 22%; adults 30-49, 22%; adults 50-69, 15%), and obesity and excess of weight treatment (adults 16-29, 14%; adults 30-49, 15%; adults 50-69, 9%) (51).

The purported benefits of CBD range from minor ailments such as pain relief to life-threatening illnesses such as cancer. Reputable news outlets often critically report exaggerated or unproven claims made by CBD sellers for conditions, symptoms, and purposes including: epilepsy, anxiety, muscular dystrophy, viral infection treatment, sleep/insomnia, Parkinson's disease treatment, depression, brain injury, opioid addiction treatment, diabetes, arthritis, chronic pain, heart disease, stress, mood, concentration, memory, headaches, menstrual cramps, inflammation, attention deficit disorders (ADDs), post-traumatic stress disorder (PTSD), Alzheimer's disease, eczema, multiple sclerosis, mental health/addiction and cancer treatment or symptom relief (24,25,34,39–42,52–55).

Consumers are drawn to CBD for medical purposes for several reasons. First, CBD is a non-psychoactive substance (19,25,53). Customers wanting CBD benefits do not need to experience a high. The stigma associated with cannabis – its previous illicit status, the teaching of the supposed "gateway" effect, and negative social views do not apply to CBD products (38,56,57). Therefore, consumers who may not use cannabis are drawn to CBD for its purported benefits. Second, CBD is viewed as a safe substance with few to no side effects. The World Health Organization has stated it does not have a high chance of addiction or health risks associated with its use (58). Other researchers have stated its relative safety (59,60). However, side effects are emerging, such as those warned by the US Food and Drug Administration, including liver damage and male reproduction issues (61). Third, in the case of parents with children that often experience seizures, CBD is viewed as a last hope. Its clinical adoption in the form of Epidiolex has granted CBD public and scientific legitimacy (13). For rare forms of seizure disorders this is an appropriate and evidence-based application. However, this well justified use has given a halo of legitimacy for other uses despite insufficient scientific evidence at this time to support them (22,24,62).Fourth, CBD sellers make direct health efficacy claims (24). Advertising methods include product descriptions with direct claims of efficacy, blogs or

website with such claims or ideas and social media posts. Celebrity endorsements – such as Instagram posts from Kim Kardashian West– reach many consumers through unregulated channels (24,25,36,63,64). Finally, CBD is compatible with recent trends of 'functional' foods and wellness culture (65). Gwyneth Paltrow – founder of the controversial wellness brand 'Goop' – advocates for CBD as a natural health product with benefits rivalling pharmaceutical products (22).

CBD Concerns

There are several concerns regarding the regulation, usage, and sale of CBD. First, CBD is widely assumed to be a safe substance despite a significant lack of research on long-term usage (34,39,42,61). According to the American Association of Poison Control centres, over 1,090+ people have contacted their emergency lines regarding CBD. Among these calls, 46 people were later admitted to critical care units (25). The United States Food and Drug Administration (FDA) has made similar claims that, despite perceptions of CBD safety, there is not enough evidence to confirm these claims. An online statement from the FDA states: "Based on the lack of scientific information supporting the safety of CBD in food, the FDA is also indicating today that it cannot conclude that CBD is generally recognized as safe (GRAS) among qualified experts for its use in human or animal food" (66). The FDA reports side effects, which include damage to the liver, issues in male reproduction systems, addiction, and warn of other consequences that may appear after CBD is studied over a longer period (61). Similarly, research currently states there is not sufficient evidence to accept CBD as completely safe, citing the need for future well-designed studies (67,68). Other concerns regarding safety include that many CBD users are self-directing their treatment and that even among those that consult a qualified health care provider, there is limited knowledge on how to advise such patients (35,69). A physician speaking on the subject summarizes the context: "I'm inundated every day with patients wanting to know how much CBD they should take, which ones to buy. But we don't know what's in the stuff now being sold… We've had this explosion without guidance to the public or regulation" (34). These trends are concerning because CBD is widely used with general perceptions of safety when risks may be present.

Second, the dosing of CBD – how much a person should take for a specific condition or based on their age – is a significant safety and consumer concern. There is limited research determining proper dosing strategies, and current advice is not based on scientific evidence (40,41,49,70–73). CBD content administered to patients in clinical trials contains significantly higher doses than those sold on the recreational or medical markets (40). There is no evidence for those taking smaller doses of CBD and its effect on the body. These concerns are heightened for groups at higher risk, such as those who are pregnant and children, which could lead to safety concerns. Second, the selling of low-dose CBD at high prices, which may be entirely ineffective, harms the consumer by misrepresentation of CBD and its possible benefits. Until therapeutic dosing research is conducted, dosing remains a significant issue because a person may take too little and have no effect, or may take too much and receive unintended negative effects.

Third, CBD products are often incorrectly labelled. A 2019 study found that 26% of CBD products had less CBD than labelled (70). THC content in products are sometimes higher than labelled – which is concerning given that children use many CBD products (24). These groups may unexpectedly experience the psychoactive elements of THC. Secondly, due to an extensive number of CBD sellers not having appropriate licensure, oversight and adherence to labelling standards, such as proper warnings or enforcement CBD content, is limited (74–76). Such companies – which may offer edibles, candies, or other products that are not yet regulated commercially – are likely to have incorrect information on their labelling. Testing, a requirement of most CBD regulations, does not ensure risk mitigation. Independent laboratories hired by CBD companies are not government run and thus their results are potentially biased due to a market incentive to provide favourable results (42).

Fourth, CBD sellers are making claims, representing, and marketing CBD for purposes that are not scientifically supported or proven (34,36,37,40,65,74). In the most concerning cases, CBD is described as a "cure-all" and emerging as a possible treatment to new and concerning diseases such as COVID-19 (24,62). Currently, only Epidiolex – a medication for rare forms of seizure relief – is accepted for clinical use (77). All other uses have preclinical evidence to support their efficacy – meaning studies have only been

conducted on animals and are not validated for clinical use in humans. Despite specific regulations that do not allow sellers of CBD to market or make unproven claims about CBD in both the United States and Canada, sellers regularly make such claims. For instance, in November of 2019, the FDA sent warning letters to 15 companies making unproven claims about CBD. These claims ranged from curative cancer claims, treatment of Parkinson's disease, Alzheimer's disease, and menstrual relief (66). Physicians, public health officials, and researchers have warned against using CBD for treatment of diseases, conditions, or symptoms other than seizures as directed by a qualified medical professional. The chair of the American Psychiatric Association's Council on Addiction, recently stated in a New York Times article that she would not recommend her patients use CBD for several purposes, such as PTSD, anxiety, sleep, and depression (25). The marketing and representation of CBD as a medical product potentially can lead to an unnecessary financial burden for those seeking relief, foregoing conventional treatment in favour of CBD, and exploit hope when all other treatment options have been exhausted.

Finally, at times, CBD sellers appear to curtail regulations intentionally. In November 2019, when 15 companies were warned for making false or unproven claims about CBD, advocacy efforts by proponents of CBD, such as the Council for Responsible Nutrition, felt the warning to be unjustified and harmful for the future of the industry (19). Blame is placed on regulatory agencies, such as the FDA, for unclear regulations versus sellers making questionable claims. Second, the marketing tactics of CBD sellers are compared to tactics by tobacco sellers for making questionable health claims and for targeting young consumers (24). To skirt advertising regulations, CBD sellers are intentionally vague about their product offerings and use non-traditional forms of marketing to support efficacy claims of their products (40). These tactics include indirect mechanisms such as celebrities sharing testimonials on their social media pages and blogs (64). Finally, companies selling CBD sponsor CBD research. A recent study found that sponsored research reports higher benefits compared to non-sponsored research. Therefore, there is speculation of biased research to advance the interests of the industry (78).

CBD Efficacy Research: State of Evidence

Several studies have found that CBD may support short term withdrawal symptoms associated with addiction and substance use issues. A 2019 systematic review published in the *Journal of Clinical Medicine* found that among patients with another mental health condition, such as schizophrenia, CBD improved symptoms of withdrawal (79). However, the study acknowledges limitations in that the reason for symptom relief needs further investigation. A previous systematic review conducted in 2015 found similar evidence that preliminary data indicates CBD may support those with opioid, cocaine, or psychostimulant addiction, but further studies are needed to evaluate CBD as an intervention for addiction disorders (80). Other studies investigating the role of CBD in alcohol use disorder exist and have found CBD as a possible treatment to deter alcohol consumption. Similar to those for addiction, these studies conclude that CBD requires further research (81–83).

For ADHD, current evidence is insufficient for clinical application. A systematic review published in 2019 in the journal *Expert Review of Neurotherapuetics* found that CBD is likely not to show better efficacy than conventional treatment but may have better tolerability (84). For anxiety, several studies show potential for CBD as a possible treatment (83,85). A 2020 review found that CBD improved anxiety outcomes (86). However, such findings are early and require further evidence.

Research is ongoing to determine if CBD has therapeutic or treatment potential for cancer. A 2020 review article found that cannabinoids have been found in some studies to deter cancer cell growth in animal model studies (87). A 2019 review found that several preclinical studies claim CBD may inhibit tumour formation (88). However, these studies are very early and suggest the need for future study of CBD for cancer-related purposes. Many CBD studies examining potential medical applications contain conflicts of interests, sponsored by cannabis or CBD companies. Other studies, including lab studies, have identified CBD for potential clinical trials (89–92). Future research is also needed to determine if drug interactions with other cancer therapies occur.

Suggested uses for CBD include Alzheimer's disease. A 2017 review in *Behavioural Pharmacology* suggested that further animal model studies are warranted, finding that

early evidence suggests the potential for CBD to delay or provide relief for Alzheimer's disease (93). A 2019 review found that CBD may prevent Alzheimer's through suppression of causal factors which are yet to be determined (94). More research is needed in humans to confirm such studies and proceed to clinical trials. A 2017 systematic review of preclinical studies published in *Neuroscience Behavioural Review* found CBD improved cognition of study participants, including neurodegenerative disorders such as Alzheimer's disease, neuroinflammatory disorders such as cerebral malaria, neurologic disorders, and neuropsychiatric disorders (95). Future studies are needed to inform possible clinical adoption. A 2016 systematic review found similar findings but cautioned that observing such effects does not mean CBD is protective (96).

For autism, CBD has shown no preclinical or clinical data suggesting a prospective treatment (97). CBD is under investigation for brain health and supporting the healing of concussions and related syndromes. CBD may support such healing through reducing inflammation in the brain (98). However, further research is needed to support proper dosing and clinical adoption. Rigorous study designs are recommended due to the lack of appropriate methodologies in previous research studies. For sleep, a 2019 critical review found that while studies have reported positive effects, such as fewer sleep disturbances and better quality, such studies often have small sample sizes and use non-objective measurements (99). A 2017 review found that CBD may support REM sleep and treat insomnia (100).

A 2019 systematic review found that CBD is possibly a protective treatment of cardiac conditions and injuries through reducing inflammation, oxidative stress, and apoptosis (101). The authors recommend future clinical trials. The majority of studies included in the review were animal-based, and further preclinical research is needed (102). A review published in *Frontiers Endocrinology* found that CBD is a potential agent to alleviate symptoms associated with obesity such as insulin resistance, type 2 diabetes, and various metabolic syndromes. For colitis, a systematic review found that CBD reduced inflammation and pain (103).

A 2020 brief review found the potential application of CBD for joint diseases and for arthroplasty (104). The studies collected contain significant limitations such as primarily

relying on case reports. Future research is needed for the adoption of CBD into clinical environments. For multiple sclerosis, reviews identify early evidence supporting notions that CBD can be used to reduce spasticity and delay disease progression (105,106). Dosing, drug interactions, and side effects remain issues requiring further study. Similarly, for Parkinson's disease, a 2020 systematic review found that CBD appeared to reduce pain when compared to conventional treatments (107). A 2019 review of preclinical trials found that CBD may have a blocking effect to reduce disease progression (108). The specific mechanisms and how to incorporate these into treatments require future study.

Research into the anti-seizure properties of CBD for conditions such as epilepsy is extensive and clinically adopted for rare seizure disorders, such as Gravet's syndrome. Numerous reviews, including six systematic reviews, have found that CBD reduces seizure incidence compared to placebo and is generally well-tolerated (109–114). CBD is recommended as a last resort medication when seizures are uncontrolled by other means.

CBD is highly marketed for pain relief. The evidence does not confirm such use, however. CBD is most effective when used with THC for pain relief purposes (115). Therefore, CBD cannot be attributable to pain relief efficacy claims. A systematic review in 2020 found that the current evidence does not support CBD for pain management (116). Other studies report similar results (117,118). However, studies have reported different results, finding that CBD is possibly effective for neuropathic pain, and further investigation is required for the role in CBD in treating chronic pain (119,120). Limited evidence is available for the treatment of inflammation. The current evidence base consists of preclinical studies, and there are many unknowns such as dosage, safety, and frequency of use (121–124). Further evidence is required.

CBD is proposed for the treatment of mental health disorders, primarily for psychosis relief and the treatment of depression. Recent systematic reviews found there is insufficient evidence to conclude the efficacy of CBD for psychosis relief, but maintain further study is needed due to several positive findings such as symptom relief (72,79,125–127). Existing studies are low-quality, and thus rigorous research is needed.

In summary, research suggests early, pre-clinical evidence for potential CBD medical application. However, the current evidence is confined to animal-model studies and does not support use in humans, except for the treatment of seizure-related disorders. However, CBD usage and belief statistics suggest people are unclear about the evidence-base and confuse early evidence, such as animal-based studies, for proven efficacy research.

Decision Making: Comparisons to Scientifically Unsupported Treatments

The decision-making process for complementary or alternative (CAM) treatments can provide insights into the reasons that people may choose to consider and ultimately use CBD. Notably, treatments such as stem cell therapies for a variety of uses such as neurodegenerative disorders, hyperbaric oxygen therapy for autism, and numerous alternative cancer therapies (128-130). CBD is similar to these treatments in that it is costly, scientifically unsupported, publicly promoted, and widely used. Described in the following paragraphs are reasons other researchers have identified for CAM decision-making.

First, decision-making for CAM treatments are often not confined to specific personal actions but rather high-level contextual factors, such as a person's background or health beliefs (131). For example, an integrative literature review investigating decision-making among cancer patients using alternative therapies identified four influencing factors: one's beliefs, social factors, demographic and disease-related factors, and cultural norms (132). Ultimately, the review found that these influencing factors and treatment decision making cannot be separated from context, and that using such alternative treatments led to a higher sense of control, empowerment, less anxiety and fear, and conflict.

Second, when selecting CAM treatments, the person receiving the treatment or their caregiver may conduct research on all their possible options. However, such research may be confused by inaccurate forms of evidence such as anecdotes, testimonials, and profiteering websites, versus scientific evidence (133). For example, a qualitative study among parents with children who have autism found that testimonials may influence decision-making by confirming the claims made by the CAM seller or information provider (134). Similarly, a narrative literature synthesis examining justifications for

CAM used among persons with musculoskeletal conditions found that such testimonials may contribute to decision-making (135). In situations where there is mixed messages surrounding efficacy, patients may not value scientific evidence the same way as medical providers. For example, a qualitative study among people with cancer using CAM found that patients do not evaluate the scientific validity through the same methods as their healthcare providers (136).

Last, people may choose CAM because of a bad experience with the healthcare system, mistrust, or to fill a gap that the healthcare system cannot satisfy (137). For example, a qualitative study among men with prostate cancer found that men were often "pushed" towards CAM treatments from negative interactions with their healthcare providers (138). A second qualitative study among persons with cancer found that conventional treatments were often considered "risky", while natural and other CAM treatments as safe (139). The decision-making context described by these studies inform potential reasons for CBD use despite the limited surrounding its efficacy.

Rationale for Research

The present thesis focuses on advancing CBD research through two studies. The first examines how people decide to use CBD, including where the idea of using CBD originates. This is an essential area of research because while there is substantial biomedical research occurring on the efficacy of CBD for specific conditions and ailments, such as clinical trials, there is limited evidence for why people try CBD. The existing literature is confined to news reports of anecdotal reasoning, and evidence consists of cross-sectional surveys where people list the conditions in which they use CBD. Therefore, this study will identify where information is retrieved that leads to the decision to use CBD. We utilize GoFundMe.com crowdfunding campaigns raising money for CBD to inform this study.

The second study contributes to research literature by determining how sellers frame CBD products for sale. There currently exists limited literature examining how CBD information is conveyed to prospective customers. Current evidence consists of company market size reporting and product forms (such as oils or edibles) sold. We systematically identify the different product framings in which CBD is sold to customers through online

product descriptions. Second, we identify the specific efficacy assertions made by sellers. Reporting on CBD commonly includes statements of concern for CBD misinformation. We quantify the number of products making specific claims by conditions and ailments.

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Chapter 3

What are the Informational Pathways that Shape People's Use of Cannabidiol for Medical Purposes?[1]

Background

Cannabidiol (CBD) is a non-psychoactive cannabinoid found in the cannabis family of plants (1). The use of CBD for medical purposes has increased dramatically over the past five years. In 2014, CBD sales in the United States were $108 million, booming to a projected $1.8 billion in sales by 2022 (2). Increases in CBD medical usage are in part due to the declassification of CBD products derived from hemp containing less 0.3% tetrahydrocannabinol (THC) as a controlled substance in the United States and legalization of cannabis in Canada (3,4). Limited scientific evidence for CBD exists for uses such as pain management, depression, cancer treatment, osteoarthritic disorders and mental health conditions (5-14). There have been numerous studies with promising results for CBD usage for treatments such as epilepsy and related conditions (15-24). Recently, the United States Food and Drug Administration (FDA) approved Epidiolex – a CBD oral solution for advanced epilepsy treatment (25).

Despite advancing research, academics and news outlets have expressed concerns over hype – understood as extreme promotion of a medical treatment or service above what is justified by evidence of efficacy – surrounding CBD (26-31). Represented often as a cure-all and marketed with non-evidence based or exaggerated efficacy claims, current uses of CBD do not align with extant evidence of safety and efficacy (26). While regarded as a relatively harmless substance, the hype surrounding CBD is concerning because persons may spend substantial amounts of money and choose to forego effective treatment for unproven CBD treatments, relying on unproven and potentially inaccurate claims (5,32).

Limited literature exists exploring why people are increasingly trying CBD for a range of ailments. Media discourse suggests several possible reasons. First, anecdotal testimonials, often from celebrities or other persons of influence, are highly visible and frequently come from what are perceived to be trustworthy sources. These testimonials document the efficacy of CBD for numerous health purposes. Claims range from pain relief to Alzheimer's treatment to chronic disease treatment (33). For example, the former National Football League (NFL) player Rob Gronkowski has advocated that CBD is the most effective treatment for his chronic pain resulting from his football career (34). Other testimonials include celebrities such as Kim Kardashian using CBD for anxiety relief and Duchess Camila of the United Kingdom utilizing CBD for pain relief (35,36).

Second, CBD is safe and not psychoactive; therefore, the potential negative consequences of trying CBD are perceived to be slight and its use is seen to be socially acceptable (5). The non-psychoactive properties of CBD allow for justification from a wide range of users who might not openly use products containing THC or other psychoactive molecules.

Third, CBD is available in formats friendly to consumers and thus attractive and for experimentation. For example, CBD is available in popular foods (gummies, cheeseburgers), hygienic products (toothpicks, shampoos) and a wide variety of other products (5,28,37,38). While these routes to trying CBD may partially explain experimentation, the underlying personal reasons people are trying CBD are likely more complicated and contextualized. Thus, to inform public policy and understand the hype surrounding CBD for medical purposes, additional research is needed that considers the personal experiences and narratives of individuals using or considering trying CBD.

An effective strategy to better understand the informational pathways that shape decisions regarding CBD usage is to examine medical crowdfunding campaigns. Crowdfunding platforms allow users to host fundraising campaigns for medical purposes and share these campaigns on social media. These campaigns often describe the personal and medical context of the fund recipient and offer explanations for their proposed use of funds. The content is unsolicited, therefore allowing for unprompted narratives detailing the point of view of the fundraiser. Researchers have used crowdfunding data to explore fundraising

needs and motivations for other groups such as transgender communities (39). CBD is costly, typically not covered by public or private insurance, and unaffordable to many, therefore providing conditions for online fundraising for CBD using crowdfunding platforms (40,41). Thus by using crowdfunding campaigner narratives, this analysis seeks to augment existing research on factors promoting the use of CBD and identify specific informational pathways these individuals go through prior to arriving at a decision to utilize CBD for medical purposes.

Methods

Crowdfunding campaigns on GoFundMe.com containing the terms "cannabidiol" or "CBD" were retrieved using an automated web scraper tool. The tool, the Crowdfunding for Health Research Portal (CHRP), is a database of GoFundMe campaigns that includes campaign characteristics such as title, category, location, funding pledged, funded received, Facebook shares, number of donors, as well as the description and updates. CHRP has collected campaigns posted to the GoFundMe online sitemap from April 2019. Our search retrieved 1547 GoFundMe campaigns referencing cannabidiol or CBD. GoFundMe categories not related to medical uses were removed from these results (n=1101 remaining) and a two-year cut off (Jun 2017 to May 2019) implemented (n=727 campaigns remaining). We chose these date parameters to coincide with approximately one year before and after the initial cannabis legalization date of Jul 1st, 2018, in Canada and ongoing cannabis legalization discourse in the United States (42,43). Geographic parameters limited campaigns to only Canada and the United States for these reasons, leaving 596 campaigns. The first author then reviewed each campaign to determine inclusion. Campaigns were included if the campaign organizer was directly crowdfunding for CBD for a medical purpose in humans. The second author decided inclusion for campaigns flagged by the first author. After reviewing each campaign, 164 remained. Campaigns were excluded for not crowdfunding for CBD (n=372), using CBD for an animal (n=37), legal issues related to CBD (n=10), campaign text not available in English (n=6), or outside of the geographic inclusion area (n=7).

Each author independently reviewed 30 campaign descriptions and met to discuss how the campaigners decided to utilize CBD as a potential treatment option. It was through

this process that a focus on informational pathways emerged. Three dominant pathways were identified using thematic analysis that led campaigners to try CBD: (1) self-directed research (2) recommendation by a trusted care provider, and/or (3) experiential insights offered from someone associated with or influencing the personal network. The first author independently assigned each campaign to a dominant, and in some cases also secondary, pathway in a spreadsheet and recorded the medical condition inspiring crowdfunding for CBD. The second and third authors each audited 25% of campaigns to ensure consistency and confirm interpretation of the informational pathways. Any disagreements identified by the second and third authors were resolved through discussion.

Results

The 164 included campaigns requested $2,219,284.24 (median, $7000) and raised $610,613.87 (median, $1805) from 6825 donors (median, 26). The campaigns were shared 42,299 times on Facebook (median, 156 shares). Most campaigns originated in the United States (n=155), with few from Canada (n=9). The proposed uses of CBD were for managing the symptoms of, or seeking a cure for, cancers (n=96), seizure inducing diseases/conditions (n=48), other/unspecified conditions (n=6), joint/inflammatory diseases (n=6), mental health disorders (n=3), nervous system diseases (n=3), and autoimmune diseases (n=2) (see table 1). In the most prevalent proposed use, cancer, CBD was proposed for curative or primary treatment (n=57), pain/symptom relief from cancer and cancer treatment (n=24), enhancing conventional treatment (n=11), and unspecified uses in 4 campaigns. For the second most prevalent use, seizure inducing diseases/conditions, all campaigns (n=48) were to prevent seizures.

Self-directed research (n=149) was the most commonly observed pathway to trying CBD. This informational pathway is characterized by the campaigner or a close loved one undertaking significant self-directed research to identify symptom management strategies or cures in the context of having limited, ineffective, or no other options to support their disease or condition. This self-directed process of reviewing websites and other informational sources then led individuals to pursue usage of CBD. This pathway is seen predominantly in cancer and seizure-inducing diseases and conditions where no cure

exists or symptoms are debilitating. For example, the family of a young child with frequent seizures found CBD through self-research after repeated unsuccessful management attempts: "We have done research on CBD oil and it is something we are interested in and believe will help stop the seizures" (44). A second campaign describes a husband completing significant research on alternative treatments after being told his wife's cancer is incurable and thus arriving at CBD: "My wife has small cell cancer of the pancreas. We were told by doctors that there is nothing more they can do. I have been investigating alternative therapies and they look very promising" (45). Campaigns describing this informational pathway are additionally characterized by those who came to CBD from a hope or desire to treat their disease or condition using natural or alternative options. Often, citing the perceived harms of western medicine or holding beliefs that the body is adequately prepared to heal itself. For example, a person with non-small neuroendocrine cancer rejected chemotherapy, radiation, and surgery in favour of a self-researched protocol incorporating CBD: "I decided to follow a natural treatment protocol which included raw juicing, buying an oxygen system, daily supplements, CBD oil, lots of prayer, and traveled near and far seeking natural treatments" (46).

Some campaigners tried CBD as a result of a recommendation from a trusted care provider as a key information source (n=36). Initial recommendations for CBD came from both medical practitioners such as physicians, as well as alternative practitioners such as naturopaths. Such individuals formed the basis of this informational pathway. Physicians often recommended CBD to help control seizures. For example: "A new neurologist along with another one of her doctors has recommended that we start [recipient] on CBD oil. The CBD oil has the potential to be life-changing for [recipient]. We are hopeful that it could help with her seizures" (47). Alternative practitioners were observed in some cases advising patients for natural cancer regimens, usually in the context of having no other options. For example, a person with stage 4 breast cancer was crowdfunding treatment prescribed by a naturopathic oncologist, which included "high doses of RSO, CBD, Vitamin IV therapy" (48). There were numerous instances of a trusted care provider being approached by a person or their caregiver seeking to try CBD oil but wanting to first ensure its safety or efficacy, therefore acting as gatekeepers. For example: "[Rachel]'s family research alternative methods to try to control her seizures

and asked the doctor about CBD. He was immediately on board with the ideas and gave her a recommendation for it" (49).

Experiential insights from someone associated with or influencing the crowdfunders personal network drew some people to CBD (n=30), and this forms the basis of the third informational pathway identified. CBD recommendations came from a person in the immediate social network of the person or their caregiver, including family, friends, colleagues, and acquaintances. Other recommendations came from someone associated with but not in the personal network such as strangers (online or in-person), via social media messages, or from shared online testimonials. An example of someone within the social network is a daughter who did online research and recommended to her mom to try CBD: "After doing much research since the beginning of our Mother's diagnosis she [daughter] read on about Cannabis oil and Rick Simpson's oil and about people healing themselves of tumours and cancer by ingesting high levels of THC and CBD" (50). Recommendations from outside the personal network, such as strangers, often reached came through social media or traditional media such as viewing testimonials on television programs. For example, a family struggling to control the seizures of their youngest daughter saw an interview on CNN (an American news network) about a girl who was experiencing over 300 grand mal seizures per week and who found relief from CBD. The parent responded by making it a mission to try CBD (51). In a second case, a family is reached out to on Facebook with information that CBD is a viable option for cancer treatment: "I had some wonderful ladies private message me that are going through the same thing, have started CBD and some are in remission. There is hope!" (52). The exchange led to the family trying and prioritizing CBD treatment.

Discussion

Our findings suggest that crowdfunders basing their decisions on CBD use primarily from information they have compiled from their own research to address a serious health issue, usually not accompanied by medical advice. That the most commonly observed informational pathway to CBD use is self-directed research suggests that most campaigners are satisfied in-part by the evidence or testimonials they find from their online search strategies. Similarly, those referencing an experiential insight from another

person who has had success with CBD found the testimonials compelling and were at least in-part satisfied with the anecdotal information provided. Only a small number of crowdfunders in our sample detailed having consulted a qualified medical provider in their decision.

Campaigners often had few to no perceived effective options for managing their health, often describing terminal diagnoses, significant pain, uncontrolled symptoms from numerous diseases, and/or other issues requiring intervention. Some crowdfunders mentioned emerging research that CBD may support their condition, as well as many others. For some of the conditions listed, such as cancer, there is early, premature research for its possible treatment and therapeutic use (18,54,54). The perception of untapped medical potential made CBD an attractive option as there was little to nothing for campaigners to lose from experimentation. Other studies have found that many people believe there is not yet discovered medical potential (55,56). Amplifying its attractiveness to crowdfunders, many viewed CBD as a safe, natural substance, absent of psychoactive properties. News reporting commonly comments on such perceptions (6,27,57,58). Thus, to crowdfunders, CBD appears to offer a harmless chance of treatment or symptom relief in the absence of other options.

A significant finding from our study is that those fundraising for CBD on GoFundMe.com usually are motivated and pursue CBD through their own initiative versus exposure to advertisements, the advice of qualified medical professionals, or the opinion of alternative medical practitioners. Policy responses to regulate or ensure the appropriate usage of CBD need to consider that those using CBD for medical purposes – whether for pain relief or for treatment of serious illnesses – are usually people seeking information and arriving at informational pathways from outside of the medical hierarchy. To promote retrieval of information from qualified sources, several evidence-based strategies are available. These include health literacy interventions, incorporation of patient perspectives into treatment decisions, careful media dissemination of new study findings to avoid sensational reporting, online fact-checking, and social media campaigns (59-62).

There were important differences between the informational pathways of those trying CBD for epilepsy versus other health conditions referenced in the reviewed crowdfunding campaigns. There is clinical acceptance for the use of CBD for epilepsy, primarily for the management of seizures (25). Those trying CBD for this reason often incorporated the advice of a medical practitioner into their treatment decision, as opposed to other uses. Those utilizing CBD for other symptoms and diagnoses seemingly made the decision with limited or no clinical acceptance. For example, those incorporating CBD for cancer into their treatments commonly presented narratives where their healthcare system did not have any curative options left for them or the prescribed treatment was ineffective. The usage of CBD was seen as an alternative option to those offered by a medical system that had abandoned them. In the most extreme cases, foregoing accepted medical treatments in favour of CBD or relying on CBD for consequential diseases such as cancer. This finding underscores the importance of policymakers and medical bodies to provide and disseminate health literacy materials for the scientifically-supported uses of CBD.

Several research areas were identified that need further exploration. First, the information sources that campaigners in our study referenced – blogs, product descriptions, and information websites – need further study so we can understand their content. This can inform what messages are being transmitted that lead to CBD experimentation. Second, our study could not capture the interactions between campaigners and the in-person conversations they had with those who work at cannabis dispensaries (both legal and non-legal) or other providers. Numerous campaigners in our study reference that they are guided from knowledge persons such as cannabis retail workers in decision-making around CBD, including dosing, product selection, and method of administration. Future research should incorporate qualitative interviews into those who help prospective CBD consumers initiate and guide treatment.

Our study has several limitations. The data collected is self-reported and the accuracy of campaigns are subject to the truthfulness of campaigners. There may be information selectively omitted to make a compelling case for donations. Second, our study does not

capture all fundraising of CBD products for medical purposes. Our search strategy, while robust, does not capture CBD products which might go by a different name.

Conclusion

This study explored the informational pathways used by those fundraising for CBD on GoFundMe with the intention of incorporating CBD into their medical treatment. After identifying 164 campaigns using CBD for medical purposes on GoFundMe.com, we discerned that most potential or current CBD users arrived at the decision the result of three pathways: self-directed research, a recommendation from a trusted care provider, or from the anecdotal experience of another. The medical uses of CBD were for a variety of purposes, with most being for cancer or epilepsy. CBD filled an urgent void or need for most campaigners – in that they had ineffective or no options, did not trust the other treatment options available, or wanted a natural treatment option. This information should help policy makers and patient advocates to craft targeted interventions for users of CBD, including combatting specific sources and types of misinformation. Future research is needed to understand which self-directed sources of information potential CBD users find and use to inform their treatment decisions.

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Table 1: Disease or condition proposed for CBD by intended outcome, Facebook shares, donors, total requested, and total received

Disease or Condition	Intended Outcome	Facebook Shares Total	Number of Donors Total	Total Requested in $US	Total Received in $US	Total Campaigns
Cancer	Enhance conventional treatment	5146	888	236237.7	95862.21	11
	Pain/symptom relief	4049	843	233476.22	74227.7	24
	Treatment/cure	18023	3065	1018765.54	281692.77	57
	Unspecified	514	76	45000	12750	4
	Total	**27732**	**4872**	**1533479.46**	**464532.68**	**96**
Seizure inducing diseases/conditions	Seizure relief	10937	1306	466397.35	96814.44	48
	Total	**10937**	**1306**	**466397.35**	**96814.44**	**48**
Other	Pain/symptom relief	587	109	47555	6753	4
	Symptom/pain relief and seizure relief	101	13	1500	950	1
	Unspecified	21	9	50000	570	1
	Total	**709**	**131**	**99055**	**8273**	**6**
Joint/inflammatory diseases/symptoms	Pain/symptom relief	638	208	52401.62	12591.18	4
	Treatment/cure	772	72	12000	7547	2
	Total	**1410**	**280**	**64401.62**	**20138.18**	**6**
Nervous system diseases	Pain/symptom relief	69	21	4000	1665	1
	Treatment/cure	419	50	19450.81	4884.57	2
	Total	**488**	**71**	**23450.81**	**6549.57**	**3**
Mental health conditions and disorders	Pain/symptom relief	159	15	11500	1760	2
	Treatment/cure	430	82	16000	9365	1
	Total	**589**	**97**	**27500**	**11125**	**3**
Autoimmune disorders	Treatment/cure	434	68	5000	3180	2
	Total	**434**	**68**	**5000**	**3180**	**2**
Grand Total		**42299**	**6825**	**2219284.24**	**610612.87**	**164**

Chapter 4

Selling Cannabidiol Products in Canada: A Framing Analysis of Advertising Claims by Online Retailers[2]

Background

The popularity of cannabidiol (CBD) – one of many cannabinoids found in cannabis and hemp plants – has increased in Canada and globally in recent years (1). By 2024, the CBD industry expects to reach a market valuation of 20 billion USD (2). Unlike traditional cannabis products, which often come in dried flower form, CBD products are diverse. They include cosmetic products such as makeup, hygiene products such as shampoos, edibles, beverages, oils, and vaporizer products such as infused vape pens or liquids.

Media sources often attribute CBD's popularity is to its representation as a medicinal cannabis product, capable of treating numerous conditions and ailments without the psychoactive effects of tetrahydrocannabinol (THC) (3,4). The majority of medical cannabis users in Canada reported using products with higher CBD content (41%) over products with high THC (5). Retailers commonly advertise CBD as helpful for uses such as inflammation, nausea, pain, epilepsy, depression, insomnia, anxiety, cancer, multiple sclerosis, skin health, and Alzheimer's disease (3,6–9). Academics and journalists alike have pointed out that CBD is described as a 'cure-all' despite limited research confirming such general or specific claims (9,10).

Only one CBD-derived medication for rare seizure disorders – Epidiolex – is clinically accepted for treatment by the Food and Drug Administration (FDA) in the United States (11). There are no primary CBD-derived medications approved by Health Canada (12). The supporting evidence for medical uses besides seizure relief is in the early stages of development and primarily based on animal-model studies or case reports. As described by Dr. Margaret Haney, a neurobiologist at Columbia University: "So far, messages of

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CBD's purported health benefits come from people trying to sell CBD products – not from scientists" (13).

Cannabis sellers, including CBD, are not allowed to make health or therapeutic claims in Canada or the United States. Under the *Cannabis Act*, the legislation governing cannabis products in Canada: "It is prohibited to promote cannabis, a cannabis accessory or a service related to cannabis… if there are reasonable grounds to believe that the promotion could create the impression that health or cosmetic benefits may be derived" (14). The *Cannabis Act* also stipulates that cannabis cannot be promoted in a "manner that is false, misleading or deceptive or that is likely to create an erroneous impression about its characteristics, value, quantity, composition, strength, concentration, potency, purity, quality, merit, safety, health effects or health risks" (15). Similarly, the United States prohibits the marketing of CBD products with unproven medical claims (16). An FDA spokesperson summarizes the situation and reasoning for their stance: "Misleading, unproven, or false claims associated with CBD products may lead consumers to put off getting important medical care, such as proper diagnosis, treatment, and supportive care" (16).

Despite the existence of regulations, there is evidence to suggest that sellers of CBD are representing their products as medical options. In November of 2019, the FDA issued warnings to 15 companies making unproven claims of CBD efficacy for conditions such as cancer and Parkinson's disease (17). Similar observations are reported in Canada. For example, an unlicensed CBD brand known as 'MonaLisa Healing' made claims during the COVID-19 pandemic that their CBD can "help your body defend against COVID-19 coronavirus" (18). Marijuana Business Daily, a cannabis industry news source, acknowledges the medical representation of CBD products to prospective consumers: "Cannabis products with unauthorized health claims are commonly sold in unregulated channels, especially products containing CBD" (19). It is unclear if such claims are widespread across the CBD industry or an outlier, and thus represent an area of needed research.

The present study contributes to filling this research gap by systematically exploring how CBD products are advertised for sale on Canadian cannabis retail websites.

Approximately 20% of medical cannabis users in Canada order their products online (5). Sellers of CBD typically seek to describe the benefit(s) of purchasing their product, and thus online product messaging is an ideal source to determine how retailers are representing CBD products to consumers. The exploration of online CBD product advertisements in Canada will contextualize industry adherence to existing Government of Canada regulations and inform public health policies.

Methods

To identify CBD products available for sale online by Canadian retailers, two Google searches of 'buy CBD Canada' and 'buy cannabidiol Canada' were completed on January 14[th,] 2020. The website URL on the first 20 pages of each search (400 URLs retrieved) was recorded. This broad search term phrasing mimics Google searches a prospective CBD consumer may use to identify and find information on CBD products. After identifying 400 websites that potentially sell CBD products, a duplicate filter left 296 websites for review to determine if they sold CBD to Canadian consumers.

For inclusion into the study, the websites retrieved must have sold at least one CBD product for human consumption/use and it must have been possible to purchase such products from the website directly, without a medical provider's approval or license. The website operators must also have been based in Canada or individually operated a Canadian division and thus were subject to Canadian regulations. After implementing a review of each website, 68 websites met the inclusion criteria. During the review, seven websites selling CBD were identified as being run by a provincial or territorial government, inclusive of British Columbia, Alberta, Ontario, New Brunswick, Newfoundland and Labrador, Yukon, and Nova Scotia. We searched for other government-run online retailers in the other provinces or territories not identified in the original website search. After doing so, an additional two websites were added, from Prince Edward Island and the Northwest Territories, totaling 70 identified websites selling CBD in Canada. The remaining provinces and territories (Saskatchewan, Manitoba, and Nunavut) did not have a government-run CBD retail website.

The first author then retrieved each CBD product URL from the 70 included websites. We considered CBD products to be those that through naming or product description

contained an equivalent or higher amount of CBD than THC. The URLs from each website were searched and collected through one of three ways: (1) reviewing all products included in CBD-specific sections of websites; (2) reviewing products identified from a 'CBD' and 'cannabidiol' keyword search in the search function of the website; or (3) in the absence of a search function or CBD section, hand searching all pages of a website to identify and review products. After the website reviews were completed, a total of 2165 CBD product URLs were recorded by website (Table 1).

To collect product details, including product name, company, CBD form, product description, and price, two methods were used. The website and its associated URLs were either data scraped using custom made DataMiner codes (n=34 websites) or the information manually retrieved through visiting the website and recording the above data fields (n=36 websites). Decisions to use either method depended on (1) the number of URLs/product descriptions to extract by website, where generally, more than 15 products led to the development of a scraper code, or (2) if website contained protections where a scrape job could not be completed due to reasons such as a manual requirement to confirm the user was not a computer bot, age verification checks, or other formatting issues.

After collection, each author independently reviewed 10% of products and met to determine an appropriate analytic framework. After discussion, we agreed to use framing analysis - a qualitative analysis technique to examine how information (e.g., an advertisement, a new story) is framed to convey a particular belief – to explore how online CBD product retailers in Canada framed CBD product uses and benefits in their web advertisements. (20, 21) After further independent data review and another collaborative meeting we confirmed three dominant frames for CBD products, which was that they were: (1) a treatment or cure for specific ailments; (2) a natural health product; and (3) a product used in specific ways to achieve particular results. To support our exploration of the first and third frames, we also counted the specific medical conditions or medical applications suggested in the CBD product descriptions on the reviewed websites.

Results

The websites identified (n=70) had on average 31 (median, 21) CBD products for sale. The most popular form of CBD product available was oil/tincture/concentrate (n=755), followed by edibles (n=428), vaporizer pen/cartridge/liquid (n=290), topical/cosmetic products (n=200), capsules/pills/soft gels (n=178), dried cannabis flower products (n=163), bath products (n=80), beverages (n=36), patches (n=21), assorted product (n=7), suppositories (n=5), and other forms (n=2). (Table 2).

Frame #1: It is a Product That Can Treat or Cure for Specific Ailments

The first framing theme identified, *treatment or cure for specific ailments* (n=1153 products), contained product claims of suggestive efficacy and effectiveness for 171 medical conditions, ailments or symptoms (Table 3 summarizes claims with a minimum frequency of 20 claims). Treatment and curative claims ranged from minor ailments such as pain, inflammation, or bruising, to severe ailments such as replacement of conventional cancer treatment, Parkinson's disease treatment, and neurological conditions. For example, a dried flower product from the bestpotdelivery.ca website stated their product was "very effective for chronic medical conditions like bipolar disorder, chronic stress, depression, panic attacks, anxiety disorders, and post-traumatic stress disorder" and that "one lungful and you'll feel all your depression and stress melt away" (22). Other CBD product descriptions contained long lists of purported treatments and conditions. For example, a product description for a CBD infused lollipop from herbapproach.com listed the following purported uses: "Medical Conditions [treated by CBD]: ADD, ADHD, Anxiety, Appetite, Arthritis, Asthma, Back Pain, Bipolar Disorder, Body Pain, Cachexia, Cancer, Cramps, Crohn's Disease, Depression, Epilepsy, Fibromyalgia, Gastrointestinal Disorder, Glaucoma, Headaches, Hepatitis C, HIV/Aids, IBS, Inflammation, Insomnia" (23).

To support CBD as a treatment for the numerous conditions or ailments collected in the product descriptions, retailers or the CBD companies provided references to published research studies or used anecdotal feedback from their customers or, in some cases, themselves. When describing the research, retailers often used animal-based studies or study designs that were not suitable for clinical adoption to support their claims. For

example, a CBD capsule product from thehealingco.ca stated: "A rarely discussed health benefit of CBD oil is how it can reduce the risk of developing diabetes. In a study… 32% of the mice that received the CBD were diagnosed with diabetes, compared to 100% of the untreated group" (24). The details of the studies, including information on study limitations, were often not disclosed. For example, a CBD infused vaporizer liquid from thefoggyforest.ca stated: "A lot of studies have been done that point to CBD being beneficial for fighting cancer. Less potent cancer cells were found in breast tumours when a person uses CBD" (25). The product description further states: "[T]here's also one study that shows dependent cell death thanks to the CBD oil. This non-toxic compound, when used at 700 mg per day for six weeks, showed no signs of toxicity" (25).

Anecdotal testimonials for product efficacy wee referenced in some product descriptions. Statements of anecdotal effectiveness did not make general claims, but rather detailed how they had been helpful for certain people and relieved their symptoms or condition. For example, a product description from a CBD Move gummy product on the healingco.ca website contained anecdotal feedback from the company founder and his social network. He described how his experience with CBD had motivated him to bring the benefits to others: "After an injury, the creator of CBD Move discovered the power of CBD. As he says himself [he] started recommending CBD to friends and relatives suffering from different physical ailments, arthritis, headaches etc. Every single time CBD provided them ease and welcome relief" (26). The framing of *CBD as a treatment or cure for specific ailments* was represented through direct claims, seller interpretation of CBD research, and through anecdotal product testimonials.

Frame #2: It is a Natural Health Product

The second framing identified, *a natural health product* (n=872 products), sold the natural benefits of CBD and its advantage over conventional health products. Most often, products described CBD as a natural option to treat pain. For example, a CBDfx lotion product sold on the chilliwackcbd.ca website stated: "This skin-nourishing cream lets you target your pain 'hot spots' with the healing power of 150 mg of full-spectrum CBD hemp oil and other natural pain relievers" (27). Products in numerous cases advocated

using CBD in place of other conventional medications or treatments. These ranged from minor substitutions, such as using CBD for inflammation, to suggestions of potential treatment replacement of severe illnesses. For example: "Over the past few decades, informed consumers have begun a major shift away from synthetic pharmaceutical drugs with their long lists of debilitating side effects, in favour of health-enhancing natural remedies" and that "CBD, from hemp is providing that all-natural solution for many, and word of its success at providing an amazing variety of therapeutic benefits for a host of physical and mental disorders" (28).

Natural framing of CBD commonly described the cultivation methods and additional ingredients or precautions used to formulate the product. Natural health product terms such as "organic", "pure", "non-GMO", "pesticide-free", and "naturally grown" were viewed in product descriptions as selling qualities. For instance, an edible CBD infused gummy product from balancecbd.com made the following statement to support the role of organically produced products on health: "Our tasty gummies are made with the finest organic ingredients, without any animal by-products, cementing our commitment to providing a natural way to enjoy the benefits of CBD" (29). Another tincture product from earthchoicessupply.com used a similar method of selling the organic production of their product and its effect on health: "try our 3000mg Premium Hemp Tincture Oil if you want a quick and effective way of getting all the benefits offered by this unique plant. Natural and Organic are the best words to describe our 30ml Tincture Oil that contains 3000 MG CBD Oil and 0% of THC!" (30). CBD was framed as *a natural health product* through descriptions of natural benefits, cultivation methods, or ingredients. The natural characteristics of CBD were used by sellers to illustrate its claimed advantages over conventional products and terminology associated with natural products emphasized for safety.

Frame #3: It is a Product Used in Specific Ways to Achieve Particular Results

The third frame, *a product used in specific ways to achieve particular results* (n=1388), utilized characteristics of treatments to describe CBD products and advertise them to potential buyers. These included describing CBD products in terms of treatment unit quantities, labelling the use of CBD products as treatment, offering comparison to

medical or pharmaceutical standards, and identifying treatment methods of administration. CBD quantities were characterized as "doses" and contained language using precise amounts to describe CBD concentration. These statements were similar to pharmaceutical advice and direction. For example, a CBD gummy product from happybears.ca stated that "[e]ach chewy gummy combines a concentrated dose of pure CBD with the natural calming properties of Melatonin to promote restful sleep and morning wakefulness" (31). Product descriptions contained language that referenced the person taking CBD as receiving "treatment" or being a "patient" for using a CBD product. For example, a zenabis.com CBD spray stated the intended user of their product was a patient: "Each 0.1 ml spray (at full compression) of Zenabis' High CBD 30:0 Spray offers patients 3 mg of CBD and 0 mg of THC in Medium-chain Triglyceride (MCT) oil" (32).

Comparisons to existing standards of conventional treatment were observed in these campaigns. Products utilized such terminology such as "pharmaceutical grade" or "medical grade" to support the potential health impact of product use. For example, a CBD product from CBD-EEZ on the birachandfog.com website that is sold in powder form stated: "each effervescent packet comes with 50mg of 99.9% pharmaceutical grade CBD to give you easy relief from anxiety, pain, insomnia and/or stress" (33). Similarly, the recommended intake method of CBD emulated conventional treatments. CBD product administration methods included ingestion, sublingual intake, topically, through capsules, pills, soft gels, syringes, suppositories and droppers. For example, an Emerald Health product on the Ontario Cannabis Store website (ocs.ca) stated: "This flavourless concentrated cannabis oil comes in a 20-mL bottle which includes a precision 1mL dosage syringe" (34). Sellers framed CBD as *a product used in specific ways to achieve particular results* by equating CBD to conventional forms of medications and treatment.

Discussion

The majority of CBD products collected in our sample (53.3%) made at least one health claim, confirming the speculation of widespread CBD efficacy claims (35,36). The top claims – that CBD treats or manages pain (n=824), anxiety (n=609), and inflammation (n=545) – have been reported on significantly in the media (10,37,38). The range of

health uses recorded included relief for minor symptoms such as stress (n=386), disordered sleep (n=316), muscle relief (n=236), and nausea (n=170). These health uses also covered treatment or symptom relief for chronic or life-threatening illnesses such as multiple sclerosis (n=210), arthritis (n=179), cancer (n=169), Parkinson's disease (n=59), and Alzheimer's diseases (n=50). Taken together, these claims demonstrated the multiple uses for which CBD products were advertised and sold to Canadian buyers.

In Canada, the use of CBD for medical conditions is not currently supported by the medical regulatory system. Only two cannabis-derived medications have drug identification numbers (DIN) from Health Canada: Nabilone, for the treatment of nausea, and Sativex, for treatment of muscle spasticity related to multiple sclerosis (10,12). There are no CBD-specific medications with a DIN. (10) Epidiolex, approved by the FDA for treatment of rare seizures disorders in the United States, is undergoing a clinical trial in Canada but is not yet approved (12). Thus, the presence of claims for these conditions does not comply with the *Cannabis Act*, which restricts CBD sellers from making any suggestion or claim of efficacy for medical conditions (14).

Product descriptions commonly framed CBD as a legitimate medicinal product with unique benefits. Sellers represented CBD as a cure or treatment for specific ailments and equated efficacy in the same terms as pharmaceutical products, in some cases advocating for the replacement of conventional products (for example, for pain relief). Misinterpretation of CBD research and overvaluation of efficacy testimonials lent credence to the seller's assertions that such classification is correct and appropriate. Specific cure or treatment claims were supplemented by language for administering CBD products in specific ways to achieve particular results. This included information and instructions on methods of administration (oils/tincture droppers, capsules, syringes, and suppositories), product measurements and quantities (doses), and treatment protocols. Such instructions may have been used to reassure users of the product's safety and effectiveness. Legitimacy was further established through stressing CBD's natural benefits. These natural characteristics served to represent CBD as safer and more effective compared to pharmaceutical products.

Sellers referenced clinical studies and other sources of evidence to support the claims made in product descriptions, but the inaccuracies suggested overvaluation of and confusion regarding extant evidence of CBD's efficacy as a medical treatment. The majority of sellers acknowledged the limited evidence available regarding CBD but framed it as a symptom of a new product with potential medical uses. Through this representation, sellers then represented the current evidence base as sufficient to demonstrate the plausibility of CBD for specific uses. Unsupported claims pose a concern for those using CBD for medical purposes, who may accept the accuracy of such claims and spend significant amounts of money on these products for potentially little benefit (39,40). This is especially concerning in situations when CBD is purchased to improve or treat life-threatening illnesses among patients who may forego evidence-based treatments (41). The spread of unproven and, in many cases, false claims, contributes to the spread of misinformation.

In response to the findings of the study, it is recommended that Health Canada conduct a systematic inspection of cannabis retailers selling CBD products for adherence to the *Cannabis Act*. The widespread CBD claims made by online retailers based in Canada or selling specifically to Canadian consumers make clear that non-compliance with existing regulations is prevalent, thus demonstrating a need to inspect CBD products to minimize consumer harm. Current risks to consumers buying CBD products under this context include unnecessary financial expenditure, purchasing based on false or unproven claims, and the spread of misinformation (41,42,43). The authority available to Health Canada to ensure compliance under the *Cannabis Act* includes inspections (44). Therefore, this is an appropriate intervention. Health Canada has the ability to issue cautions against those found not to be in compliance, including CBD retailers. These cautions can come in the form of warnings, fines, and additional inspections.

Further research on CBD in the Canadian context is needed. First, there is a need to investigate adherence to other *Cannabis Act* regulations, specifically, plain-packaging and non-marketing of cannabis products to children. Many products included in the sample did not adhere to plain packaging restrictions. Products that appear to appeal to children, such as those mimicking popular candy bars or child-like characters, were

identified and require further attention. Second, the role of in-person retail sellers requires analysis. The present study was limited to online products and thus cannot capture how retail employees or salespersons frame CBD to prospective consumers and how this may impact their decision-making.

Conclusion

Online Canadian retailers of CBD typically present products to potential customers through three distinct frames: a treatment or cure for specific ailments, a natural health product, and a product used in specific ways to achieve specific results. The framing of CBD lends support to the seller's perception of CBD as a legitimate option for health purposes, despite a limited, and often misrepresented, evidence base. Online sellers of CBD in Canada demonstrate that many CBD products are not compliant with the *Cannabis Act* – with the majority of products in our sample making at least one health claim. Unproven claims have concerning implications for persons experiencing a medical illness or displaying symptoms, through unnecessary financial expenditure and the ineffectiveness of the product bought. The frames identified also contribute to the spread of CBD misinformation. Regulatory action is needed to monitor and inspect CBD sellers and ensure they comply with the *Cannabis Act*.

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Table 1: Number of CBD Products by Website and Framing Code

Website	Framing #1: Treatment or Cure	Framing #2: Natural Health Product	Framing #3: Specific Usage & Results	Total Products
herbapproach.com	72	46	85	118
cbd-oil-canada.ca	66	55	84	111
leaf2go.ca	31	21	85	109
thehealingco.ca	59	34	63	96
birchandfog.com	66	37	65	85
budlab.ca	76	51	60	81
justcannabis.shop	56	25	64	80
chilliwackcbd.ca	57	44	60	78
cbd2go.ca	52	55	55	75
shopcbdonline.ca	39	28	52	74
magnoliawellness.ca	53	34	23	73
buybudnow.ca	25	41	46	71
speedgreens.ca	14	10	24	53
mjnexpress.ca	27	22	28	46
cannabis-nb.com	0	7	12	44
bccannabisstores.com	0	6	22	43
albertacannabis.org	0	6	10	42
weedsmart.ca	2	1	11	40
topshelfexpress.ca	12	11	25	40
buymyweedonline.ca	37	12	37	38
motacannabisproducts.ca	35	5	27	37
mailorder-marijuana.ca	27	8	30	36
canadablissherbals.com	24	18	25	34
happybears.ca	26	28	29	32
ocs.ca	0	7	15	29
sqdc.ca	8	19	9	29
shopcannabisnl.com	0	0	0	28
buycbdcanada.ca	19	15	17	27
delta9.ca	0	1	8	27
buymellow.com	12	22	14	24
feelcbd.ca	18	21	23	24
getkush.ca	12	15	13	24
greensociety.ca	17	10	19	23
cannabiscare.ca	11	11	17	22
cannabis.shoppersdrugmart.ca	22	0	22	22
headz.ca	8	7	14	20
lowcloud.ca	10	7	8	20

ganjaexpress.ca	12	1	10	19
westcoastsupply.ca	12	6	11	18
canadaonlinethc.ca	3	1	3	18
balancecbd.com	1	15	17	17
thefoggyforest.ca	13	2	3	16
platinumherbalcare.com	14	6	9	16
high420.ca	2	7	8	15
tokyosmoke.com	0	2	6	15
canadacannabisdispensary.ca	5	7	8	13
peicannabiscorp.com	0	5	2	12
cannabisdispensary.ca	11	3	7	12
greencanadacbd.ca	9	8	9	11
budsandbeyond.ca	6	1	5	9
firstwonder.ca	9	2	9	9
cannabisyukon.org	1	2	0	9
cannacanine.ca	8	1	1	8
bestpotdelivery.ca	7	6	8	8
vitalityhealthcbd.com	3	6	8	8
greenleafexpress.ca	2	8	8	8
earthchoicesupply.com	8	8	8	8
calyxwellness.co	6	5	6	6
honestbotanicals.ca	4	5	6	6
zenabis.com	0	0	5	6
houseofcannabis.ca	2	0	6	6
cannawholesalers.ca	4	2	4	6
canadianbotanicaldrops.ecwid.com	6	6	6	6
icaria.co	1	5	5	6
bcweedpen.com	4	0	0	4
cbddirectonline.ca	1	4	3	4
cbdme.store	1	4	1	4
hemp-canada.ca	3	2	3	3
okanagancbd.com	2	2	2	2
doseofcanna.ca	0	0	0	2
Total	**1153**	**872**	**1388**	**2165**

Table 2: Number of CBD Products by Form

Form	Frequency
Oil / Tincture / Concentrate Products	755
Edibles	428
Vape pen / cartridge / liquid / kit	290
Topical / cosmetic	200
Capsules / pills / softgels	178
Dried cannabis flower products	163
Bath products	80
Beverages	36
Patch	21
Assorted	7
Suppositories	5
Other	2
Total	**2165**

Table #3: Number of Medical Claims by Condition/Symptom (minimum frequency, n=20)

Conditions	Frequency
Pain	824
Anxiety	609
Inflammation	545
Stress	386
Sleep	316
Muscle relief	236
Depression	229
Multiple sclerosis (MS)	210
Insomnia	200
Appetite stimulant	190
Arthritis	179
Nausea	170
Cancer	169
Spastic-symptoms	154
Epilepsy	136
Mood	136
Unspecified ailments/conditions/diseases	135
Neurologic health	106
Skin health	98
Post-traumatic stress disorder (PTSD)	96
Seizure relief	95
Neuropathy	79
Crohn's disease	78
Migraines	74
Irritable Bowel-Syndrome	64
Joint relief	63
Attention hyperactivity disorder (ADHD)	61
Fibromyalgia	61
Parkinson's disease	59
Eczema	55
Attention deficit disorder (ADD)	54
Headache	54
Human immunodeficiency virus (HIV)	54
Acne	52
Acquired immunodeficiency syndrome (AIDS)	52
Hepatitis C	52
psychotic	51

Alzheimer's	50
Psoriasis	49
Immune function	48
Gastrointestinal health	47
Energy (fatigue relief)	44
Neuroprotective	43
Colitis	42
Diabetes	42
Sexual health	41
Spinal cord	40
Dizziness	39
Eating disorders	39
Brain injuries	38
Muscular dystrophy	38
Analgesia	37
Nervous system health	37
Cramp	35
Menstrual health	34
Glaucoma	28
Vomiting	26
Addiction	25
Aging	25
Cell damage and/or regeneration	25
Circulation	25
Discomfort	25
Mobility	24
Cardiovascular health	23
Mental clarity	23
Rash relief	22
Scarring	21

Chapter 5

Conclusion

Synthesis of Research Findings: Novel Findings & Policy Implications

The present thesis contributes to the research literature with several novel findings that were specified in the thesis objectives. **First, in response to the first thesis goal of examining the pathways which those interested in CBD for medical purposes come to consider and decide on CBD, we find that prospective CBD consumers conducting crowdfunding campaigns receive most of their information through self-research (online sources, testimonials of others)**. A small portion of consumers retrieved information from alternative health practitioners, such as naturopaths. Qualified healthcare provider input is rare. The only exception is CBD use among children for seizure relief – in these cases parents routinely received advice (safety, CBD source) from a qualified healthcare provider. This finding is significant because it appears that the decision to use CBD is internally motivated – leading prospective consumers to search for CBD information versus exposure to external sources. This contrasts with current ideas of CBD regulation that emphasize restrictions on CBD marketing. While we do not suggest removing CBD marketing restrictions, the findings suggest that policy responses to CBD need to consider that a majority of prospective consumers are retrieving information on their own from sources that are not evidence-based (blogs, social media, websites) versus passively being exposed to advertising.

Those retrieving information from non-evidence based sources appear to receive the information as credible. This demonstrates a significant need for health literacy initiatives, focused on critical evaluation of online health information sources. Second, it appears that many of those who use CBD do not trust certain healthcare providers or have unmet needs. A small but significant portion of CBD users included in the study incorporated CBD in replacement of conventional care, citing a terminal or unmanaged diagnosis, preference for natural means of treatment, or mistrust of conventional medical care. While not specific to CBD but rather alternative medical practices more generally,

such findings represent a need for healthcare providers and administrators to strengthen trust with specific patient populations and practice modification.

Next, CBD is both used and sold for a range of medical conditions that range from minor symptom relief (inflammation, skincare) to life-threatening illnesses (cancer, Alzheimer's disease). This finding satisfies the second and third thesis objectives of identifying the medical conditions, symptoms, and ailments that people treat with CBD, as well as the specific medical applications marketed or claimed. The findings are consistent with media reporting of CBD portrayal as a "cure-all" and over 150+ medical uses were recorded. In the first study, I found that the majority (61.9%) of crowdfunders sought CBD financial contributions for cancer-related purposes: curative or life-prolonging reasons (n=57), pain relief (n=35) and unspecified (n=4). The only evidence-based use – seizure relief – was observed in 28.7% of GoFundMe.com campaigns. The other uses recorded were not frequent: joint/inflammatory diseases and symptoms (n=6), nervous system diseases (n=3), mental health conditions and disorders (n=3), autoimmune diseases (n=2), and other (n=7). In the second study, evaluating online CBD product descriptions, over 50% of the 2,165 products made at least one health claim. The top uses recommended in product descriptions were: pain (n=824), anxiety (n=609), inflammation (n=545), stress (n=386), muscle relief (n=236), relaxation (n=231), depression (n=229), multiple sclerosis (n=210), insomnia (n=200), and appetite stimulation (n=190). The following life-threatening or life-altering conditions were recorded: neurologic disorders (n=106), crohn's disease (n=78), Parkinson's disease (n=59), human immunodeficiency virus (HIV) (n=54), and Alzheimer's disease (n=50). The use of CBD for all of these conditions – except rare seizure disorders – is not evidence-based.

The Canadian *Cannabis Act* – enforced by Health Canada – prohibits CBD sellers from making medical or therapeutic claims. The findings of my second paper, examining online product description framing, demonstrate the over 50% of those selling CBD online in Canada are uncompliant with the Cannabis Act. The uses described in the former paragraph illustrate the numerous medical assertions online. I viewed but did not systematically collect other violations, such as labelling. I recommend Health Canada to

conduct an audit of CBD sellers for compliance to Cannabis Act regulations. The current enforcement mechanisms appear inadequate. Systematic inspections need to occur at ongoing intervals. Reliance on complaints, news coverage, or unsystematic inspection will not deter CBD sellers from making unproven CBD medical claims.

Third, sellers attempt to legitimize CBD for medical application through its representation as a natural health product with clinical application and effects similar to conventional pharmaceutical products. This finding satisfies the third thesis objective of examining how CBD sellers frame medical to prospective customers. The second study, online CBD product descriptions in Canada, identified 872 instances of CBD represented as a natural health product. Sellers claimed CBD is used in specific ways to achieve particular results in 1,387 product descriptions. CBD is compared against pharmaceutical products and represented often as superior for its natural (non-artificial) characteristics. Specific terminology – organic, natural, NON-GMO and others – are used to support such qualities. The methods of administration – syringes, droppers, capsules/pills – present CBD in traditional treatment modalities. Accompanied by specific medical claims, these efforts intend to legitimize the medical usage of CBD prematurely without research or clinical studies. This finding again supports that health literacy interventions are warranted. As described in previous paragraphs, Cannabis Act regulations need enforcement to deter unwarranted claims of medical efficacy. Existing efforts to have CBD listed as a natural health product should not be approved. The limited medical efficacy research available, unknown side effects, and widespread misinformation associated with CBD can lead to spikes in CBD purchasing and exacerbate the current context.

Finally, the studies demonstrate significant CBD misinformation. Both sources – crowdfunding data and online CBD product descriptions – contain harmful information which can influence how others adhere to treatment regimens or contribute to unnecessary financial expenditure. Crowdfunders and sellers justify these claims through anecdotal sources of information and misrepresented peer-reviewed research. Conclusions of existing scientific evidence are exaggerated. Animal-based studies are often referenced for prove of CBD efficacy. The studies referenced, often far away from

clinical study, are described as sufficient proof for CBD claims. The misrepresentation of evidence is then shared through social networks (in the case of crowdfunding) and onto consumers (in the case of online CBD sales). Prospective CBD consumers and sellers attempting to reference research suggests there is little knowledge of the scientific process and process of drug regulation. Such findings appears to represent a second need for health literacy intervention.

Several recommendations are offered in response the final thesis objective of developing recommendation to reduce CBD misinformation spread. First, researchers, healthcare providers, and administrators, are recommended to develop health literacy resources targeted to both patients and healthcare professionals. These resources should inform both the patient, and healthcare provider, on the most up to date evidence for CBD and its applications. Medical institutions better serve patients by providing evidence-based information and not passively allowing misinformation to spread. Patients inquiring about CBD should be met with understanding and given a non-biased summary of the known CBD benefits and risks.

Second, the scientific rationale and process behind the process of pharmaceutical product introductions are unknown to most sellers, thus requiring intervention given that CBD sellers consider their product a medicine. Resources to inform CBD sellers on the proper channels that pharmaceutical drug undergo can support regulatory efforts to explain why health efficacy claims are not allowed.

Next, Health Canada, while already hosting CBD information sources (such as the cannabis for health professionals' webpage) can create plain-language sources of information for CBD sellers and users. This can centralize the current evidence supporting CBD usage and allow both sellers and consumers to know the benefits and risks of CBD use.

Fourth, as mentioned in earlier paragraphs, Health Canada should conduct regular audits of CBD sellers for adherence to *Cannabis Act* regulations. The current enforcement mechanisms appear to not confront or handle the issue of unproven efficacy claims. More frequent audits, met with ongoing monitoring and other health literacy resources, can support reducing the spread of unproven claims. Audits should prioritize enforcement

activities on unlicensed CBD sellers that typically operate independent of regulatory standards. Potential actions can include pathways to licensure or removal of these products.

Future Research

Several future areas of research are warranted. First, as mentioned in previous paragraphs, adherence to *Cannabis Act* stipulations is lacking and future research is needed to determine the extent of non-adherence. In my second study, investigating online CBD product framing, we confirmed widespread CBD health efficacy claims by online sellers for Canadian consumers which is non-compliant with the *Cannabis Act*. During data collection, it became evident that many products were not abiding to regulatory requirements. Numerous products did not feature required plain packaging designs, appropriate labelling of THC or CBD content, and product label warnings. Future research is needed to assess regulatory compliance to such requirements. Second, research investigation is needed to determine how CBD is sold in the in-person retail environment. Both sources of data collected in the thesis studies – crowdfunding campaigns and product descriptions – do not capture the influence of the in-person retail environment on CBD decision-making and how products are framed. Future studies should focus on the medical intake instructions given by in-person retail workers, efficacy claims, and CBD product labelling requirements in the retail environment. Next, numerous products identified were not licensed under the *Cannabis Act*. We did not systematically map the brands and websites which sold unlicensed products, nor the differences in product framing or efficacy claims. Future research should focus on quantifying the number of unlicensed sellers, assess their actions, and examine the policy space that allows such CBD sellers to operate. Finally, the role of social networks propagating misinformation surrounding CBD is an area of needed analysis. The thesis comments that testimonials and online self-research are informational pathways which CBD is identified for medical treatment. However, specific sources are not identified.

Conclusion

The presented thesis provides two original studies that make contributions to the CBD literature. In the first study, crowdfunding data examines how CBD consumers decide to

use CBD. To our knowledge, there are no other studies that looked at the informational pathways for CBD usage among consumers, aside from listing specific medical conditions CBD is sought. The second study, online framing of CBD products in Canada, provides the first research analysis in Canada describing how CBD products are framed to potential consumers. The study provides a comprehensive representation of the specific medical claims made by CBD sellers in Canada. My study confirms widespread efficacy claims often reported by news outlets. The findings of the two studies have policy implications – specifically, highlighting the need for health literacy initiatives, and for Health Canada to both complete an audit of CBD products and re-examine *Cannabis Act* compliance strategies.