ABSTRACT
Globally cannabis regulations are rapidly changing. In recent years social and political pressure, not science, has driven this change. Experience from jurisdictions that have implemented regulatory change, although relatively new, should be used to inform future policy development for other jurisdictions, assisting in addressing the wicked problem that cannabis regulations present. This review aimed to elicit underlying themes from a broad range of literature exploring the effects of regulatory change relating to cannabis. To achieve this a meta-narrative theoretical approach using inductive constant comparative analysis was used to synthesize data until thematic saturation was reached. Following a systematic literature search, 92 papers were analyzed before thematic saturation was complete. Five super-ordinate themes emerged that observed the societal and health effects following legislative and regulatory change: Normalization; Economics; Gatekeeping; Community and Health. These themes, empirically derived through a formal qualitative approach, were considered regarding cultural contexts, providing an understanding of how cannabis regulation is changing the social landscape. Consideration of the themes during future research may provide a focus point for the discussion of legislation and policy, not only relating to cannabis, but also other broad-ranging areas such as social policy, welfare, education and health.

Introduction
International approaches to cannabis legislation have been rapidly changing, ranging from laws developed to increase medicinal access to those that provide a framework for recreational use. Although international convention still identifies cannabinoids as illegal, in two countries (Uruguay and Canada) cannabis is legal and in a further two, legal with a provision to purchase (Georgia and South Africa). In other jurisdictions, including more than half of US states, territories and the District of Columbia, various regulatory changes have made accessing cannabis for medical use far more straightforward (Kim et al., 2020). Changes in policing policy have also reduced the threat of sanction for many, further extending global cannabis use.

Historical context
Throughout history cannabis has been a significant drug in humankind’s use of psychoactive substances. It has been used to manage illness (Clarke & Merlin, 2013; Petrovska, 2012), in religious observance (Bennett, 2014) and as a recreational product. In the modern medical era Cannabis sativa was part of the Pharmacopoeia (Bridgeman & Abazia, 2017) until a 1930s law change in the United States saw it become illegal. Later, a series of United Nation (UN) treaties, the 1961 Single Convention on Narcotic Drugs (United Nations, 2019), 1971 Convention of Psychotropic Substances (United Nations, 1971) and 1988 United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (United Nations, 1988) saw a globalization of this prohibitionist stance. Throughout this period cannabis has remained the most widely used illegal drug globally (United Nations Office on Drugs and Crime, 2019). This use has been deemed recreational although many individuals consider their use ‘medical’ (Dai & Richter, 2019; Pedersen & Sandberg, 2013).

Regulatory change and evidence-based input
In many countries cannabis and cannabis-based products are increasingly socially and politically acceptable, with regulatory changes bringing them back into the socio-political limelight. Efforts to legalize medical and/or recreational use have raised questions about the effects of these changes. The prolonged period of cannabis prohibition prevented the development of pharmaceutical and clinical trials that was seen in...
other medicines and medical disciplines over that time. Consequently, legislative policy change relating to the use of cannabis as a medicine lacks strong clinical evidence-based input. This subsequently affects the understanding of the effects of cannabis regulatory change more broadly.

**Rationale for review in context of the current literature**

Despite this, there is a substantial body of literature that explores cannabis and cannabis-based products more generally. This is unsurprising considering the impact of cannabis on society appears to be a ‘wicked problem’ (Churchman, 1967; Rittel & Webber, 1973). Wicked problems affect multiple spheres of interest, have no ‘right’ answer and are hard to study as the areas of interest themselves evolve and change. There is no specific right answer to the question, ‘What is the best regulatory approach to take towards cannabis regulation?’ Rather there will be various elements of interest in the empirical literature to guide decision makers towards the area of greatest importance. This breadth makes any effort to synthesize the literature difficult. Recent reviews have focused primarily on the public health implications of cannabis law implementation (Bahji & Stephenson, 2019; Hall et al., 2019) and tend to take an ‘expert opinion’ or quantitative perspective. This offers valuable individual insights but does not rely on the whole of the literature and tends to examine a narrow part of this wicked problem.

Standard meta-analytic approaches are inappropriate as outcome measures vary widely, definitions of cannabis vary and the social and judicial regulations in different jurisdictions vary. No one analytic target of interest can be identified a priori using this approach. Nonetheless systematically searching and thematically reviewing the literature base across multiple disciplines informs the rapidly evolving landscape of reform by developing an understanding of the underlying themes that are emerging from the broad body of work evaluating the impacts of regulatory change.

**The present review**

The purpose of this paper is to undertake such a review, using a modern, fit for purpose review methodology. The aim of this qualitative analysis was to systematically search the broad literature base relating to cannabis regulatory change and to thematically review and synthesize the data to the point of thematic saturation, establishing super-ordinate themes. The purpose of this was to identify the underlying commonalities across the full breadth of disciplines that have considered the impact of legislative change relating to cannabis, to understand how these underlying commonalities can be considered thematically, and to consider how these themes might have a positive impact in future research design and policy development.

**Method**

**Theoretical approach**

We considered various approaches to literature synthesis described by the Equator network (www.equator-network.org). A meta-narrative approach (Greenhalgh et al., 2011) was considered most appropriate. A variety of epistemic positions have considered cannabis use; prominently legal, medical and sociological. A meta-narrative approach enables a coherent management process for reviewing a broad literature. This allows for the development of themes from a disparate research base. Such themes are descriptive in nature, with inferred directionality due to the pre/post design of the literature that was reviewed. This style of review is relatively new, although it provides a framework within which quality can be maintained whilst enabling a wide array of information to be included. Care was taken to ensure that each step of the review focused on the key question of the outcome of cannabis-related legislative or regulatory change.

The Preferred Reporting Items for Systematic Review (PRISMA) guidelines (Shamseer et al., 2015) were used to manage the literature search.

**Literature search**

Initial scoping was undertaken by reading the literature and talking to experts in policy development, medicine, pharmacology and regulation. A specialist librarian helped develop appropriate search strategies for each of the search engines of interest.

The search was designed to identify as many potentially important different research traditions examining pre- post-change as possible, to inform the results. It was decided early that specific case law reviews would be excluded as they were not pre/post in design and were considered unlikely to provide data. In the USA we treated each state as a separate jurisdiction. In deciding this we noted most research examines states individually and they are self-governing. It was decided that in order to encompass the full temporal effect of cannabis regulatory reform to not limit the dates of the searched.

**Search strategy**

The search strategy focused on the domains of ‘cannabis/ cannabinoids’, ‘regulations’, ‘jurisprudence’ and ‘legalization’. These primary domains were discussed with the specialist librarian who assisted in development and expansion of the appropriate search terminology needed to capture relevant literature, including the use of the Boolean operators, ‘AND, OR and NOT’ (Timmins & McCabe, 2005). The search strategies for each database are detailed in Supplement 1. Seven databases were searched: Ovid MEDLINE, EMBASE, PsycINFO, EBSCO, ProQuest, Web of Science and SCOPUS.

The primary search was from inception of each database and undertaken on December 14th 2018, and updated on November 25th 2019. All study designs were considered during the process of the review. Studies were included if they involved countries or states that had some form of cannabis regulations in place, and some ‘pre/post’ effect described following legislative change. Other specific inclusion/exclusion criteria were not defined a priori in order to capture as wide an array of literature as possible. Papers that did not discuss
the impact of cannabis legislative change were out of scope for this review. References from included studies were examined for other sources of data. Commentary and editorial papers that did not include primary data were reviewed for references as our interest was in analyzing and comparing empirical data. This additional searching occurred during the extraction and analysis phase.

**Screening**

A primary and secondary title and abstract review was undertaken by two authors (KO and SE), with two further authors (GN-H and IB) acting as referees in cases of disagreement. The Covidence systematic review software (n.d.) was used to assist with data management. In the process of screening, reported outcomes were used to guide inclusion. Outcomes were required to be a change identified from within each paper’s epistemic position.

**Data extraction**

Data extraction and full-text review were undertaken concurrently by two authors independently. Descriptive data were extracted from the papers to provide an understanding of both the basis of the researcher’s perspective of cannabis regulation and to ground the data geographically (Supplement 2). This was designed to ensure the primary changes related to judicial or policy change was appropriately captured and undertaken by extracting phrases from each paper that encapsulated the outcome. Comment and insights were managed in NVivo qualitative data analysis software (2018), enabling a rich picture of the outcomes of cannabis regulation to be built up from the evidence as opposed to using an a priori hypothesis. As domains of interest emerged, iteration and refinement of the data were undertaken to both capture the areas of interest across research fields and to potentially be of direct and implementable value.

**Data analysis plan**

Constant comparative analysis was used to collect and generate data to discover emerging themes (Chun Tie et al., 2019). We undertook an iterative comparative analysis to code and categorize data, revisiting the primary literature from the literature search until data saturation occurred (Chun Tie et al., 2019). This occurred over multiple rounds, whereby each author brought extracted data which was then analyzed by the group. In group discussion the principles of pragmatism, pluralism, historicity, contestation, reflexivity and review guided the discussion. Following this, each author then reconsidered the data available (with the opportunity to further extract data) before reconvening to repeat the process. The rationale for utilizing the constant comparative method was both to ensure a high-quality methodology was used and to provide a clear frame of reference for the reviewers to align and refine data extraction.

As an example of this process, in the first round of coding two investigators used an open coding technique to develop themes with supporting quotes from the primary literature. Memo writing was used to facilitate discussion. Two of the four investigators then met for a round-table review. After considering the initial themes and supporting data, a selected group of higher order themes were agreed upon. Consideration was given to the context of these themes, by research type/orientation, geography, judicial change and other unexpected contextual factors. All four investigators then continued to review the primary literature, modifying and validating the themes already noted and identifying any further themes. This iterative process continued until no further themes or areas of sub-interest emerged, indicating saturation (Saunders et al., 2018).

**Assessment of quality**

The research group considered a variety of mechanisms for assessing quality of the included work. A single tool was thought most likely to be widely applicable and we used the Hawker Quality Assessment for qualitative research (Hawker et al., 2002). This tool was developed by Hawker et al. (2002) to help examine the quality of the disparate literature commonly found in qualitative research that may not fit within traditional quantitative research tools. Papers received one of four grades (Very Poor, Poor, Fair, Good) with pre-determined criteria across nine domains (Abstract and title, Introduction and aims, Method and data, Sampling, Data analysis, Ethics and bias, Finding/results, Transferability/generalizability, Implications and usefulness). Grading criteria may be found in Appendix D of Hawker et al.’s (2002) paper. All included papers were graded at least once, with a random selection graded twice. The higher of the two grades was applied where there were disagreements. Papers were then given a score out of 36 to determine their overall quality (0–9 = Very Poor quality, 10–18 = Poor quality, 19–27 = Fair quality and 28–36 = Good quality).

The review was registered with and accepted by the International Prospective Register of Systematic Reviews (PROSEPRO) on the 16th January 2019: CRD42019119877.

**Synthesis**

**Characteristics of the included documents**

A total of 13,450 papers were identified as potentially containing information of interest. The title and abstract of these were screened by two authors. 627 studies were selected for secondary consideration for inclusion and 155 were reviewed prior to thematic saturation. The remaining 472 papers that were eligible for full text review and analysis are available at the reader’s request. Of the 155 papers reviewed, 92 contributed to thematic development, and 63 were deemed ineligible (Supplement 3). This process of searching the literature is displayed in the PRISMA diagram (Shamseer et al., 2015), (Figure 1).
Synthesis process

During the initial process, two authors randomly reviewed a selection of papers from the 627 available, considered the paper for inclusion, coded the paper and synthesized themes. Following extraction of the first 26 papers, two authors, GNH and KO, met to discuss the initial coding process and to iterate the emerging themes of interest, establishing 14 sub-themes. All authors (KO, SE, GNH and IB) then continued to randomly review papers, coding for new sub-themes and comparing to previously established themes, meeting to discuss findings at three further meetings. At each point of reconsideration, following round table discussion, each author then examined these papers iteratively to further develop and understand the results identified. During discussions, mapping and interactions of sub-themes was undertaken using a brainstorming approach, allowing authors to identify how each sub-theme fit into a super-ordinate theme, considering that the purpose of the study was not to identify specific outcomes of use as super-ordinate themes in their own right. Saturation of themes, or the point at which no further themes were uncovered, was reached after four rounds of review.

Principal finding

Five super-ordinate themes emerged. We labelled these: Normalization; Economics; Gatekeeping; Community and

Figure 1. PRISMA diagram showing selection of studies.
The implementation of cannabis regulations, whether medical or recreational, had a positive effect on the economics of the jurisdictions that implemented these laws. In those jurisdictions that undertook both medical and recreational cannabis regulations differing taxation policies were applied depending on whether the product was for recreational or medical use, with recreational products being subject to higher taxes than medical products (Zhang et al., 2017) (Quotes 24, 25). Some jurisdictions then directed the revenue received from taxation into research and public health messaging (Ghosh et al., 2017) (Quote 26).

Despite higher levels of taxation, the enactment of recreational cannabis regulations was often associated with a drop in price (L. Belle-Isle & Hathaway, 2007; Carnevale et al., 2017) (Quote 27). This related to all forms of cannabis products, despite increasing potency levels of tetrahydrocannabinol (THC) in concentrates and oils (Caulkins et al., 2018) (Quotes 28, 29). Jurisdictional taxation policy may impact potency levels, as taxation based on product weight rather than THC content results in higher potency plants having less tax applied as they weigh less than lower potency plants to achieve the same THC content (Hall & Weier, 2015) (Quote 30).

Neither medical nor recreational regulations stopped the existence of a cannabis black market (Cruz et al., 2018; Parnes et al., 2018) (Quotes 31, 32). Some studies related this to prices remaining lower on the black market due to taxation on legal products. Other contributing factors were gaps in the legal supply chain, privacy concerns around federal programs and the perceived ease with which consumers and patients felt that they could develop their own products (Bell et al., 2015; Belle-Isle & Hathaway, 2007) (Quotes 33, 34). It was noted the potential for the diversion of legal product into jurisdictions where cannabis use remained illegal contributed to the black market presence (Carnevale et al., 2017; Cruz et al., 2018) (Quotes 35, 36).

Changes to cannabis regulations that reduced penalties were associated with reduced costs for criminal justice departments (Caulkins & Kilmer, 2016) (Quote 37). This has been present from the early inception of decriminalization policy (Maloff, 1981) (Quote 38).

**Gatekeeping**

The implementation of judicial change in cannabis regulations resulted in the emergence of various ‘Gatekeeper’ effects. The gatekeeper for access to cannabis varied with differing regulations, and could be seen in the progression of the cannabis legislation within some jurisdictions. Generally, legislation tended to follow a ‘tight medical’ followed by ‘publicly available’ route (Chhabra & Leikin, 2017) (Quotes 39, 40) though there have been exceptions where recreational legalization was enacted first (Cruz et al., 2018). If initially broad, it was not unusual for jurisdictions to significantly amend their cannabis regulations over the first year of implementation across the spectrum of production, from cultivation through to labelling and marketing of products (Belackova et al., 2015; Carnevale et al., 2017) (Quotes 41, 42). Within medical cannabis legislation, doctors usually became the gatekeepers while other legislative structures allowed for...

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**Normalization**

Many papers described a process of normalization of cannabis use associated with judicial changes to cannabis regulations. This occurred whether changes were intended to enable medical access, decriminalize (or relax policing policy) or legalize. Normalization occurred globally and across societal sub-groupings. For example, enabling access to cannabis lead to a decreased perception of risk in youth (Cerdà et al., 2017; Sobesky & Gorgens, 2016; Wall et al., 2011; Wen et al., 2019b) (Quotes 1, 2), though this was not present across all jurisdictions (Cerdà et al., 2017; Hall & Weier, 2015) (Quotes 3, 4). Youth perception of risk was lower in jurisdictions preparing to enact medical cannabis laws compared with those that had no medical cannabis access (Wall et al., 2011) (Quote 5). With the introduction of legalization for recreational use, a sense of increased legitimacy was conferred both in youth and adults, where perception of the ‘low risk’ associated with cannabis use contributed to its normalization (Sobesky & Gorgens, 2016) (Quote 6). This in turn contributed to the growing societal belief of cannabis as being ‘good for you’ (L. Belle-Isle & Hathaway, 2007; Sobesky & Gorgens, 2016; Wall et al., 2011) (Quotes 7, 8). In jurisdictions that allowed medical cannabis marketing, youth exposure to cannabis related advertisements was associated with increased intention to use cannabis and positive expectations associated with cannabis use contributed to its normalization (D’Amico et al., 2015; D’Amico et al., 2018) (Quotes 9, 10). Recreational cannabis laws increased youth’s perception of ease of access, however the presence of recreational cannabis stores near schools did not appear to have the same effect, unlike markets such as alcohol and tobacco (Harpin et al., 2018) (Quote 11). The potential detrimental impacts of normalization both in terms of increased uptake, and potentially damaging behavioral change, such as driving whilst intoxicated were described (Barry & Glantz, 2016; Parnes et al., 2018) (Quotes 12, 13). As the use of cannabis normalized, differing ways of administering cannabis became accepted, as opposed to simply smoking (Carnevale et al., 2017; Daniulaityte et al., 2018; Parnes et al., 2018) (Quotes 14–21). Cannabis users acknowledged that some forms of products may be more dangerous than others, such as concentrates (Daniulaityte et al., 2018) (Quote 22), however this was not a deterrent to the availability of these products within the market (Caulkins et al., 2018) (Quote 23).

**Economics**

Health. The themes relate to societal and health changes observed in the wake of judicial or legislative regulation change related to cannabis. The literature to underpin these resultant themes is described below with speculation as to the weighting, possible omission and overall context addressed in the discussion. Supporting quotations from the literature have been numbered and cited in the main text and may be found in the supplementary material (Supplement 4).

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producers, suppliers, dispensaries or regulators to fulfil this role (Carnevale et al., 2017; Cruz et al., 2018).

Where regulations for medical cannabis were initially implemented the role of doctor as gatekeeper was not always well received by would-be patients or doctors. Patients complained of the deleterious effects of limiting access to cannabis-based products through doctors (Belle-Isle & Hathaway, 2007) (Quote 43). Some doctors perceived the gatekeeping role to be an ‘unfair burden on physicians’ (Garmaise, 2002). There were a limited number of physicians who were willing to prescribe, and physician charges for the service were unregulated (Lynne Belle-Isle et al., 2014). This led to the emergence of the ‘medical marijuana specialist’. For example, in Colorado, 70% of the medicinal cannabis recommendations were completed by only 15 physicians’ (Caplan, 2012) (Quote 44). It was not unusual for some physicians to be associated with a medical cannabis dispensary, creating a de facto ‘cannabis specialty’ clinic (Caplan, 2012; Nussbaum & Thurstone, 2011) (Quote 45).

The gatekeeper theme included other perceived barriers to access such as cost, the negative stigma associated with asking for cannabis as a medicine, the need for completion of authorization paperwork and the requirement in some jurisdictions for users to be registered (Belle-Isle & Hathaway, 2007; Lynne Belle-Isle et al., 2014) (Quotes 46, 47). Within some medical cannabis programs there was a lack of trust in the cannabis strains that the government produced (L Belle-Isle & Hathaway, 2007) (Quote 48), resulting in some patients not utilizing the scheme. Some patients found the process of accessing the program too costly, as doctors’ fees to complete application forms were excluded from their health care plans and they felt the price charged for cannabis through the scheme was too high to acquire the amount they needed to manage their symptoms, despite the government produced product being priced lower than the black market (L Belle-Isle & Hathaway, 2007; Lynne Belle-Isle et al., 2014) (Quote 49).

In jurisdictions that required registration and identification cards (IDs) for medical cannabis, but also allowed recreational cannabis, there was less uptake in cannabis programs as patients could access recreational products instead (Zhang et al., 2017) (Quote 50). Despite this, registered users preferred to access products through a pharmacy (Boidi et al., 2016) (Quote 51).

**Community**

Literature considering the effect of judicial change on the community focused on cannabis use in youth, the impact on socially disadvantaged groups, the impact on work and driving as well as inter-jurisdictional tensions and crime rates.

There were disparate views on the effect of cannabis laws on use by youth. Medical cannabis legislation did not result in an increase in youth use (Carliner et al., 2017; Khatapoush & Halfors, 2004). It was hypothesized this may be due to the majority of cannabis use in youth being recreational, rendering medical cannabis laws effectively redundant in this group (Khatapoush & Halfors, 2004) (Quote 52). Additionally, this was mainly seen in jurisdictions that already had a comparatively high youth use rate prior to the implementation of legislation (Carliner et al., 2017; Wall et al., 2011) (Quotes 53–55). There was no consensus on the effect of use in youth following the introduction of recreational laws, which showed a range of results from no significant change (Cerdá et al., 2017; Melchior et al., 2019; Stormshak et al., 2019) (Quotes 56–58), to an increase in youth use in some jurisdictions (Cerdá et al., 2017) (Quote 59); with variations in the way that youth perceive harms from cannabis. It was noted that both medical and recreational cannabis products were diverted for youth use (Sobesky & Gorgens, 2016; Wang et al., 2014) (Quotes 60, 61), and there was some concern that the increasing potency of products resulted in a potential for increased dependency in youth users (Sobesky & Gorgens, 2016) (Quote 62).

The effect of judicial change on disadvantaged groups, such as ethnic minorities and those with criminal convictions relating to cannabis possession was described. There was variation in the policing of cannabis legislation (Firth et al., 2019; Parnes et al., 2018) (Quote 63). In some jurisdictions, cannabis related arrests decreased with the introduction of cannabis regulations, but the rate at which those arrests dropped varied significantly by ethnicity, despite cannabis use rates within ethnic groups being similar (Firth et al., 2019; Parnes et al., 2018; Thompson, 2017) (Quote 64,65). Minorities were more likely to have been affected by historical cannabis prohibition laws (Thompson, 2017) (Quote 66), which in some jurisdictions limited their involvement in a legal cannabis market. Some jurisdictions allowed previous ‘drug felons’ to enter the legal market in a strictly controlled manner, while other jurisdictions determined that any drug misdemeanor excluded them from participation in the legal market (Thompson, 2017) (Quotes 67–69). Jurisdictions also varied in the way they approached post-ameliorative relief within their legislation (Jensen & Roussell, 2016; Thompson, 2017) (Quote 70–72).

Medical cannabis laws and recreational cannabis laws were associated with an increase in positive cannabis tests in drivers and higher rates of traffic accidents (Carnevale et al., 2017; Couper & Peterson, 2014; Eichelberger, 2019; Ghosh et al., 2017; Jones et al., 2019; Parnes et al., 2018) (Quotes 73–77). This was especially true if cannabis and alcohol were combined, resulting in greater impairment (Parnes et al., 2018) (Quote 78). While the literature did not identify the cause of the increasing rates, they surmised this might be due to increasing availability increased testing, increased permissiveness and changing perceptions of safety.

Workplace impact is still yet to be determined. Some jurisdictions noted increases in positive cannabis tests in the workplace following recreational law implementation (Parnes et al., 2018) (Quote 79). However, it was noted that the presence of a positive drug test does not correlate with the level of impairment, limiting the interpretation of such results (Parnes et al., 2018) (Quote 80). There was an indication that self-reported work absences due to health conditions decreased in jurisdictions with medical cannabis laws (Ullman, 2017) (Quote 81).
Implementation of legislative change within one jurisdiction was not always geographically isolated, and could affect neighboring jurisdictions. Those jurisdictions where cannabis remains illegal and which share a contiguous border with a jurisdiction that has undergone judicial change noted an increase in illegal cannabis products entering their jurisdiction, as well as increased cannabis related arrests at borders (Carnevale et al., 2017; Ellison & Spohn, 2017; Hao & Cowan, 2020; Parnes et al., 2018; Ward et al., 2019) (Quotes 82–85). This may be due to increased law enforcement in these areas, resulting in an over-inflation of the inter-jurisdictional impact (Ellison & Spohn, 2017; Hao & Cowan, 2020) (Quotes 86, 87). Judicial change, local bylaws and zoning restrictions also affected community demographics with deliberate movement of families both into and out of legalization zones (Baggio & Choi, 2017; Dilley et al., 2017) (Quote 88), and lower socio-economic areas having higher density of cannabis retailers (Amiri et al., 2019) (Quote 89).

Modelling of major crime rates post medical legislation demonstrated no consistent effects on crime rates (Chu & Townsend, 2019) (Quote 90) and post recreational legalization modelling demonstrated an initial short term increase in crime that was not sustained in the long term (Lu et al., 2019) (Quotes 91, 92), as well as increased police clearance rates (Makin et al., 2019) (Quote 93).

**Health**

The impacts of cannabis legislation on both mental and physical related health outcomes has been one of the more significantly studied areas.

The mental health impacts of judicial change were seen in both the adult and adolescent population (Carliner et al., 2017; Nelson & Tarshis, 2019) Residents of states with medical cannabis laws had higher levels of marijuana use, abuse and dependence (Cerdà et al., 2012) (Quote 94). Increasing cannabis use was reported in new adolescent patients presenting to mental health clinics following recreational legalization (Nelson & Tarshis, 2019) (Quote 95). There was a trend towards increased adult use of cannabis with a subsequent increase in cannabis use disorders (Carliner et al., 2017) (Quote 96). In teens who were seen for cannabis use disorder the passing of cannabis laws increased legitimacy of use (Sobesky & Gorgens, 2016) (Quote 97). Increasing potency of products was seen as a concern in regard to the development of cannabis use disorder in adolescents (Sobesky & Gorgens, 2016) (Quotes 98, 99). Health care workers engaged in the treatment of such disorders perceived that there was a lack of resources to cope with the increased demand on services following law changes (Sobesky & Gorgens, 2016) (Quotes 100,101). It was initially proposed that medical cannabis laws may have a protective effect on suicide risk, but this was not borne out with robust analysis (Gruca et al., 2015) (Quotes 102–105).

An increase in drivers involved in fatal accidents who tested positive for cannabis was identified (Ghosh et al., 2017) (Quote 106), as was an increased cardiac mortality in those states with medical cannabis laws (Abouk & Adams, 2018) (Quotes 107,108). Emergency departments have reported an increase in the rates of cannabis detected in trauma patients with four case reports of fatalities relating to accidents/injuries following edible cannabis ingestion in jurisdictions with recreational cannabis laws (Chung et al., 2019; Ghosh et al., 2017; Levine et al., 2019) (Quotes 109–111).

The implementation of medical and recreational laws appears to have had a health impact in children, with unintentional ingestions of cannabinoid products resulting in increased emergency room visits and poison center phone calls (Wang et al., 2014; Ward et al., 2019) (Quotes 112, 113). Lack of regulations around packaging of products that could appeal to children, such as edible candies, and the lack of need for child-proof containers in some jurisdictions is thought to have contributed to this (Wang et al., 2014) (Quotes 114, 115). The impact of laws in the use of cannabis in pregnancy is an emerging area of research, with a trend to increase use during pregnancy following legislative changes (Gnoffo et al., 2019) (Quote 116).

Physical impacts included those resulting from the manufacture of cannabis products, such as the increase in burns as a result of making butane hash oil at home (Bell et al., 2015; Boyle, 2014; Parnes et al., 2018) (Quotes 117–120) and the risk of plant and product contamination during the growing and extraction process (Caulkins et al., 2018; Daniulaityte et al., 2018; Parnes et al., 2018) (Quotes 121–123). Allowing home cultivation practices raised concerns that a lack of more stringent regulations may lead to more contamination in cultivations by new growers, with increased risks particularly in the extraction process (Lynne Belle-Isle et al., 2014; Parnes et al., 2018) (Quotes 124–127).

There were also correlations drawn between legislative change allowing cannabis use and worsening disease states such as anxiety (Parnes et al., 2018) (Quote 128), cannabis hyperemesis syndrome (Kim et al., 2015) (Quote 129), cognitive disturbance (Parnes et al., 2018) as well as increased emergency department and hospital visits for cannabis related health problems (Calcaterra et al., 2018; Carnevale et al., 2017) (Quotes 130–131). However, there have been some reductions in opioid use noted in specific groups (Bradford & Bradford, 2018; Lo et al., 2019) (Quotes 132–134).

**Quality of evidence**

The results of the grading are included in Supplement 5. The quality of papers varied widely in the quality of evidence across the assessed domains, with the ethics and bias domains showing the most disparate grading, likely a reflection of the range of literature included in the review. Due to the complexity of the type of papers involved it was found at times that not all domains could be graded, which in turn affected the overall grading of a paper, potentially underestimating or overestimating the overall quality of the paper. Over 80% of the papers were graded overall as Fair or Good (n = 24 and n = 53 respectively), with six papers graded as very poor. All graded papers were included within the data analysis and synthesis process.
Discussion

Main finding

This review offers a meta-narrative approach to elicit major themes that emerged in the literature after cannabis regulation change, whether medical or recreational in nature. We found that the same five themes emerged across the breadth of the literature: normalization; economics; health; community and gatekeeping. This is regardless of the origin or methodology of the papers, the focus or expertise of the specific authors, or the jurisdictions in which the regulations are developed.

Normalization occurred irrespective of the specific legislative changes made, mainly in the context of positive perceptions of laws increasing cannabis access and perceived reductions in the harms associated with cannabis use. Economically, benefits generally accrued to governments that enacted legislative change, whilst not necessarily to the detriment of any pre-existing black market. Almost all legislative change required some kind of gatekeeper. In the context of medical cannabis legislation this primarily fell to prescribers/practitioners, but in the recreational context could involve a number of roles and bureaucratic processes that might be quite independent of the legislative changes made. In the community theme, the impact of increasing access to cannabis on youth is much explored, but by no means certain. Policing of new regulations in some jurisdictions appeared to continue to apply criminality to some ethnicities and to be more forgiving to others, thereby maintaining inequities. Further exacerbation was noted following legislative change that applied retrospective drug convictions to potential new market entrants preventing them from developing now legitimate businesses. And finally, in health, there were clear signals that legislatively enabling access to cannabis was associated with increased mental health and cannabis use disorders, may have contributed to higher driving fatality rates and almost certainly contributed to an increase in unintended childhood overdoses.

Main finding within the context of the literature

Many reviews of the outcomes of cannabis regulatory change are either quantitative in nature with a focus on a priori outcomes of interest or contained within the breadth of author expertise (Hall et al., 2019; Kilmer, 2019; Murray & Hall, 2020). These studies focus on very specific issues such as blurred boundaries between medical and non-medical use, lack of regulation regarding potency and difficulties in establishing the true public health effects (Hall et al., 2019; Kilmer, 2019). A recent realist review examining alternatives to criminalisation for illicit drug possession focused on the contexts, mechanisms and outcomes of such alternatives to develop a realist program theory to guide future policy (Stevens et al., 2019). This review, though not solely focused on cannabis, identified the following outcomes to be of interest to policy stakeholders: ‘level and type of drug use’; ‘social integration of people who use drugs’; ‘other crime’; ‘health harms’ and ‘social costs’ (Stevens et al., 2019). These outcomes map onto the themes that we have synthesized from our review, albeit with a different emphasis. It is reassuring that the themes derived during our review are in keeping with previous literature as it provides validity to the methodology undertaken.

How and why it is important

This review highlighted the underlying commonalities across the broad range of disciplines examining the effect of cannabis legislation. The following examples demonstrate how the emergent themes may be a point of focus for reflection when considering cannabis legislation from both a jurisdictional view, taking into account cultural context and a ‘domain of practice’ view, in this case healthcare.

Uruguay, who had a strong history of drug related crime, became the first country to legalize non-medical cannabis in 2013. Motivated by concerns about drug related crime, and despite wide-spread opposition, legislators provided for three access points to cannabis (home grown, cannabis social clubs and state-controlled pharmacy-only products) of which adults over the age of 18 must choose one and also prohibited advertising of pharmacy products (Cerdà & Kilmer, 2017). Within this cultural context it could be argued that the government attributed weight not only to community (to decrease crime rates), but in developing their legislative solution, gave weight to gatekeeping (controlling access within the government framework) with less emphasis on economic benefit (by limiting the commercial market).

In New Zealand, the use of cannabis has been historically entrenched in society with a strong black market presence (Abel, 1997; Wilkins & Casswell, 2002). Already medical cannabis legislation has been enacted (Misuse of Drugs (Medical Cannabis) Amendment Act, 2018) with prescribing practitioners as gatekeepers, and a government initiated referendum to establish support for or against the proposed Cannabis Legislation and Control Bill (‘Cannabis Legalisation and Control Referendum,’ 2020) was undertaken in October 2020. This legislation primarily encompassed four of the themes found in this review; health and gatekeeping as a primary focus, with an overall goal of trying to decrease cannabis consumption and associated negative community impacts whilst acknowledging that economic growth from the implementation of legislation may be redirected towards reaching health goals.

When considering domains of practice, health was of particular interest to the authors. In jurisdictions with medical cannabis laws, the theme of gatekeeping was prominent, with the role of ‘approving’ access to products usually attributed to the doctor or physician. Following the review of the literature it is apparent that is has not been universally successful, has been described as an impediment by many would-be cannabis users, and has not been the choice of doctors themselves. Doctors would be likely to argue gatekeeping places a strain on patient-doctor relationships, the costs of consultation may increase inequity and that they themselves will become complicit in normalization by being required to prescribe products outside traditional medical provenance. Would-be patients might argue that gatekeeping
meant their needs are not being met, they are incurring additional expense to access cannabis, and that bureaucracy is driving them towards the black market.

**Limitations of the paper**

It is important to note that a significant amount of the literature emerges from the USA where cannabis has an uneasy status, remaining illegal at the Federal level with varying levels of regulatory approaches at the state level. As such, papers that solely focused on the federal/state divide were excluded from the analysis. Whilst countries outside of the USA have also enacted primarily medical cannabis legislation, with the exception of Uruguay and Canada, there is somewhat limited research available about the effects in these jurisdictions which alters the base from which we were able to draw our analysis.

It is also acknowledged that the time since the enactment of legalization affects the amount of research available to fully assess the impact of such changes with most studies included relatively close to the time of change being implemented. This issue is seen in all health research using a variety of methodologies and outcomes. In fact, the relative closeness of the research to the regulatory change is potentially beneficial, identifying early problems and allowing early policy changes.

We note that one of the limitations of an empirical approach is how the search strategies are developed, the data sources available and the type of research that has been undertaken. Although we undertook a very broad systematic search of the literature, using the advice and support of an IT expert, the search will never capture all that is written on the subject. Omissions such as this are akin to omission in other fields.

Unlike a traditional quantitative systematic review, much of the quality of the synthesis comes from the depth and breadth of included papers. It is acknowledged that the synthesis process will in some form be shaped by the authors’ professional and personal background. For this analysis, a decision was made to exclude a variety of subthemes, as these were felt to add little but significantly increase the complexity and feasibility of the synthesis. Decisions such as this are part of any meta-narrative review and indeed most systematic reviews of any sort. Only very narrow double-blind randomized controlled systematic review and meta-analysis avoid this problem however this method is unusable in combining data such as this and in many spheres. The use of four authors for triangulating of results helps counter this bias during the constant comparative phase.

We note, however, that experts with a specific interest may consider other themes, subthemes or an emphasis on one of the themes identified as of particular importance.

Another common limitation of reviews of this nature is that once thematic saturation is reached, no further papers are reviewed. This may lead readers to believe that some sentinel papers have been omitted from the review or that more powerful supportive statements for the themes have been overlooked, whereas in fact the themes have become saturated, and it is anticipated that those papers not formally reviewed will in fact only provide further supportive evidence of the identified themes. However, this does not detract from the overall thematic analysis, as the themes do not change according to the strength of the supportive quotes. This is an unavoidable limitation of all qualitative work and is minimized by qualitative techniques such as triangulation.

**Quality of evidence**

The grading of evidence within a qualitative review presents its own limitations. Commonly used assessment tools heavily weigh the methodological approach of RCTs as the gold standard for the grading of evidence, and as such these tools are not appropriate to grading of literature that falls outside this approach. The use of the Hawker Assessment Tool (2002) was used to grade such disparate evidence. It was not without its limitations, as we found that even within the tool were there were papers that did not fulfil all the criteria met, as the way they were written or the field that were contained in may not have called for the assessed domains to be present. A further barrier was noted when trying to use the tool to appraise conference abstracts, which contain valuable information, but only fulfil one of the nine domains within the criteria- as such these received an overall grade of Very Poor, despite receiving a Good score in the Abstract domain. It was therefore determined that all papers graded would be included within the synthesis due to the presence of only a small number of poor and very poor papers assessed.

**Future directions**

From undertaking this review process, it is apparent that there is much commentary and opinion about the effect of cannabis regulations, creating a large amount of ‘white noise’ within the field and yet there is limited pre and post implementation data available. For those jurisdictions looking to implement a change in their regulatory process, such as introducing new legislation, it is imperative that prospective data be collected prior to the law change, rather than retrospectively. This will allow greater audit and robust data examining the impact of the effects of such law changes.

The approach that this study used, synthesizing themes from multiple disciplines in the literature using a single tool, may be applied to other areas of legislative change outside of cannabis that are considered ‘wicked’ problems, to empirically assess the impact of such changes and provide a thematic focus for discussion regarding future research and policy development.

**Conclusion**

This review provides a formal qualitative approach to the analysis of literature related to cannabis regulations which is in keeping with previous traditional systematic reviews and contributes to the literature in an area where discipline-specific expertise and comment dominates. By systematically searching a wide literature base and applying a formal social sciences technique
to data synthesis it moves the field of understanding forward in respect to the way cannabis regulation is changing the social landscape. This emphasizes that the effect of cannabis legislation can be thematically synthesized into five themes across all disciplines, regardless of the source of the literature that may then be weighted according to the cultural context of the jurisdiction. Such consideration of the themes derived may provide a focus for discussion of legislation and policy not only relating to cannabis, but possibly legislation relating to other broad-ranging areas such as social policy, welfare, education and health.

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Data availability statement
The data that support the findings are available from the corresponding author, KO, upon reasonable request.

References
Abel, S. (1997). Cannabis policy in Australia and New Zealand. Drug and Alcohol Review, 16(4), 421–428. https://doi.org/10.1080/09595229700186821
Abouk, R., & Adams, S. (2018). Examining the relationship between medical cannabis laws and cardiovascular deaths in the US. International Journal of Drug Policy, 53, 1–7. https://doi.org/10.1016/j.drugpo.2017.11.022
Amiri, S., Monsivais, P., McDonell, M. G., & Amram, O. (2019). Availability of licensed cannabis businesses in relation to area deprivation in Washington State: A spatiotemporal analysis of cannabis business presence between 2014 and 2017. Drug and Alcohol Review, 38(7), 790–797. https://doi.org/10.1111/dar.12987
Baggio, M., & Choi, J. (2017). Is access to medical marijuana a disamenity? Economics Bulletin, 37(2), 1267–1273.
Bahji, A., & Stephenson, C. (2019). International perspectives on the implications of cannabis legalization: A systematic review & thematic analysis. International Journal of Environmental Research and Public Health, 16(17), 3095. https://doi.org/10.3390/ijerph16173095
Barry, R. A., & Glantz, S. (2016). A public health framework for legalized retail marijuana based on the US experience: Avoiding a new tobacco industry. Plos Medicine, 13(9), e1002131. https://doi.org/10.1371/journal.pmed.1002131
Belackova, V., Maalste, N., Zabransky, T., & Grund, J. P. (2015). “Should I Buy or Should I Grow?” How drug policy institutions and drug market transaction costs shape the decision to self-supply with cannabis in the Netherlands and the Czech Republic?”. International Journal of Drug Policy, 26(3), 296–310. https://doi.org/10.1016/j.drugpo.2014.12.002
Bell, C., Slim, J., Flaten, H., Lindberg, G., Arek, W., & Monte, A. (2015). Butane hash oil burns associated with marijuana legalization in Colorado. Journal of Medical Toxicology: Official Journal of the American College of Medical Toxicology, 11(4), 422–425. https://doi.org/10.1007/s13181-015-0501-0
Belisle-Ise, L., & Hathaway, A. (2007). Barriers to access to medical cannabis for Canadians living with HIV/AIDS. AIDS Care, 19(4), 500–506. https://doi.org/10.1080/09540120701207833
Belle-Isle, L., Walsh, Z., Callaway, R., Lucas, P., Capler, R., Kay, R., & Holtzman, S. (2014). Barriers to access for Canadians who use cannabis for therapeutic purposes. International Journal of Drug Policy, 25(4), 691–699. https://doi.org/10.1016/j.drugpo.2014.02.009
Bennett, C. (2014). The magic and ceremonial use of cannabis in the ancient world. In J. Harold Ellens (Ed.), Seeking the sacred with psychoactive substances: Chemical paths to spirituality and to God. (1st ed., Vol. 1). Praeger.
Boidi, M. F., Queirolo, R., & Cruz, J. M. (2016). Cannabis consumption patterns among frequent consumers in Uruguay. International Journal of Drug Policy, 34, 34–40. https://doi.org/10.1016/j.drugpo.2016.05.008
Boyle, C. (2014). Butane hash oil manufacturing related burn injury: A disturbing trend. Journal of Burn Care and Research, 35(Suppl 3), S112. https://doi.org/10.1177/01480071386819.9d
Bradford, A. C., & Bradford, W. D. (2018). The impact of medical cannabis legalization on prescription medication use and costs under medicare part D. The Journal of Law and Economics, 61(3), 461–487. https://doi.org/10.1086/699620
Bridgeman, M. B., & Abazia, D. T. (2017). Medicinal cannabis: History, pharmacology, and implications for the acute care setting. P & T: A Peer-Reviewed Journal for Formulary Management, 42(3), 180–188. https://doi.org/10.1177/2045123112457586
Calcaterra, S. L., Keniston, A., & Hull, M. (2018). The impact of the legalization of recreational marijuana on a safety-net health system. Journal of General Internal Medicine, 33(2), Suppl 1, 366.
Cannabis Legalisation and Control Referendum. (2020). https://ndhadesh-liver.natlib.govt.nz/webarchive/wayback/20191205054948/https://www.referendum.govt.nz/cannabis/index.html
Caplan, G. (2012). Medical marijuana: A study of unintended consequences. In McGeorge Law Review. McGeorge School of Law.
Carliner, H., Brown, Q. L., Sarvet, A. L., & Hasin, D. S. (2017). Cannabis use, attitudes, and legal status in the U.S.: A review. Preventive Medicine, 104, 13–23. https://doi.org/10.1016/j.ypmed.2017.07.008
Carnevale, J. T., Kagan, R., Murphy, P. J., & Esrick, J. (2017). A practical framework for regulating for-profit recreational marijuana in US States: Lessons from Colorado and Washington. International Journal of Drug Policy, 42, 71–85. https://doi.org/10.1016/j.drugpo.2017.03.001
Caulkins, J. P., & Kilmer, B. (2016). Considering marijuana legalization carefully: Insights for other jurisdictions from analysis for Vermont. Addiction (Abingdon, England), 111(12), 2082–2089. https://doi.org/10.1111/add.13289
Caulkins, J. P., Bao, Y., Davenport, S., Fahl, I., Guo, Y., Kinnard, K., Najewicz, M., Renaud, L., & Kilmer, B. (2018). Big data on a big new market: Insights from Washington State’s legal cannabis market.
Colorado. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine*, 22(6), 694–699. https://doi.org/10.1111/acem.12655

Levine, M., Jontz, A., Dabrowski, P., Yee, N., Claudius, I., Kreisler, R., & LoVecchio, F. (2019). Prevalence of marijuana use among trauma patients before and after medical marijuana became legal. *Journal of Trauma and Acute Care Surgery*, 35(2), 78–79. https://doi.org/10.1097/TA.00000000000019969-9

Lo, S.-Y.Y., Winston-McPherson, G. N., Starosta, A. J., Sullivan, M. D., Baird, 450 Pedersen, W., & Sandberg, S. (2013). The medicalisation of revolt: A socio-

Melchior, M., Nakamura, A., Bolze, C., Hausfater, F., El Khoury, F., Mary-

Murray, R. M., & Hall, W. (2020). Will Legalization and Commercialization of Cannabis Policy Influence Levels of Use in Adolescents and Young Adults? *Journal of the Society for Prevention Research*, 20(2), 215–224. https://doi.org/10.1007/s11121-019-01001-9

Wen, H., Hockenberry, J. M., & Druss, B. G. (2019a). The effect of medical marijuana laws on marijuana-related attitude and perception among US adolescents and young adults. *Prevention Science*, 20(2), 223–224. https://doi.org/10.1007/s11121-019-01001-9

Wen, H., Hockenberry, J. M., & Druss, B. G. (2019b). Addendum to “the effect of medical marijuana laws on marijuana-related attitude and perception among US adolescents and young adults.” *Prevention Science: The Official Journal of the Society for Prevention Research*, 20(2), 215–223. https://doi.org/10.1007/s11121-018-0903-8

Wilkins, C., & Casswell, S. (2002). The cannabis black market and the case for the legalisation of cannabis in New Zealand. *Social Policy Journal of New Zealand*, (18), 31–43.

Zhang, K., Sauls, S., Wagner, L., & Throupe, R. (2017). A review of the impact of Marijuana’s legalisation on Colorado’s industrial warehouse lease rates: How high is high? *Journal of Real Estate Literature*, 25(1), 3–29.