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Parental views on state cannabis laws and marijuana use for their medically vulnerable children

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ABSTRACT

Background: Given a rapidly changing policy landscape, we sought to characterize the effects of state marijuana laws on parents' views of marijuana use by their teenage children.
Methods: Data are from 595 respondents to a nationally administered, web-based survey of parents of adolescents (ages 13–18 years) with any of three chronic conditions (type 1 diabetes, rheumatic disease, attention-deficit/hyperactivity disorder). Multivariate ordinal logistic regression was used to model the effects of parents' reports of state cannabis laws on their views toward marijuana use by their child.
Results: While 89.9% said any marijuana use was risky for their child, 27.9% would approve of its use if prescribed as medicine. Parents reporting marijuana decriminalization (11.1%) were more amenable to teenage use, less concerned about how marijuana might impact their child's condition, more accepting of the safety of marijuana as medicine, and approved its use with a prescription. Parents reporting legal medical (35.6%) or recreational (5.7%) use were more likely to report that their child has tried or used marijuana regularly. Parents reporting legal recreational use were less likely to agree that marijuana has medical benefits for their child.
Conclusions: Among parents of medically vulnerable children, perceiving state marijuana policies as more permissive is strongly associated with lower perceived riskiness of marijuana use for their children. State marijuana policies are changing with implications for how parents of medically vulnerable youth view and potentially govern marijuana use by their medically vulnerable children.

1. Introduction

Laws regulating marijuana are rapidly changing in the US and this evolution is sparking a national conversation regarding whether and how the legal status of marijuana impacts its use and associated harms (Ghosh et al., 2016), especially among adolescents for whom harms associated with marijuana use have been most well documented (Carliner et al., 2017; Hasin, 2018). Actual changes in rates of use typically lag behind policy changes as it can take years for newly passed laws to be implemented and marketing and distribution systems to mature (Pacula et al., 2002, 2015). While rates of marijuana use by adolescents have not been noted to change in the first few years after policy implementation (Lynne-Landsman et al., 2013), changes in perceptions of risk can change quickly and are considered a reliable harbinger (Okaneku et al., 2015). Recent rapid decreases in perceived riskiness of marijuana use have been documented among youth (Johnston et al., 2018; Berg et al., 2015; Schmidt et al., 2016) and parents (Kosterman et al., 2016). However, there has been scant attention paid to perceptions of risk among youth with chronic medical conditions and their parents while these groups may be especially invested in understanding the health effects and safety concerns of marijuana use in general and medicinally.

The need to understand public health impacts of marijuana use is particularly acute for youth with chronic medical conditions (YCMC) because they are simultaneously more likely to use marijuana (Wisk and Weitzman, 2016; Suris et al., 2008) and more likely to experience adverse outcomes from its use (Hoffenberg et al., 2018; Weitzman et al., 2015). YCMC also represents an interesting bellwether for the larger

Abbreviations: CI, confidence interval; OR, odds ratio; YCMC, youth with chronic medical conditions; T1D, type 1 diabetes; RD, rheumatic disease; ADHD, attention-deficit/hyperactivity disorder; SD, standard deviation

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policy and public health debates around the idea of marijuana as medicine. Risk perception is complex for YCMC and their families who may consider marijuana to have medical benefits or ameliorative effects on symptoms and treatment side effects (Kerlin et al., 2018; Park and Wu, 2017) but who may also grapple with uncertainty around potential for adverse interactions with medications or disease management – issues of particular importance when considering treatment safety, efficacy, and cost.

For YCMC, knowledge of marijuana's legality, either medically or recreationally, may shape perceptions of risk and use, as may their parents' views (Kosterman et al., 2000). Parents of YCMC continue to play a significant role in their child's disease management even as their children mature (Ellis et al., 2008), so it is unsurprising that many of the most vocal critics and supporters of changing cannabis policy are parents (Maa and Figi, 2014). Moreover, parents' perceptions about marijuana's riskiness may provide an important context within which their chronically ill adolescent children evaluate messages about marijuana risk and legality. Yet, it is unclear how parents' perceptions about marijuana's riskiness and their child's use may be impacted by beliefs about the legal status of cannabis – factors that are likely interrelated with crucial bearing on child beliefs and behaviors.

To address this knowledge gap, we sought to characterize the perceptions of marijuana risk and use held by parents of adolescent children with any of three chronic medical conditions, and to evaluate how perceptions of marijuana's legality in their home state affected the level of risk and use perceived by parents.

2. Materials and Methods

2.1. Data Source and Sample

Data are from a national, cross-sectional study of parents of youth (ages 13–18 years) with either type 1 diabetes (T1D), rheumatic disease (RD), or attention-deficit/hyperactivity disorder (ADHD). Recruitment efforts (and thus survey items) were focused only on these three target conditions (T1D, RD, ADHD). To our knowledge, there is not a robust body of published work that identifies a medical benefit of marijuana for teenagers with these conditions; however, marijuana use may be particularly relevant for youth with these conditions as (1) some youth with RD may believe in the utility of marijuana for treating pain (a major symptom of RD), (2) some youth with T1D may believe that marijuana is a 'healthy' alternative to alcohol use (because of the diabetes-specific risks associated with alcohol) or may believe in the utility of marijuana to treat sleep disruptions associated with T1D, and (3) some youth with ADHD may believe that marijuana is a 'healthy' alternative to stimulant medication.

Parents were recruited from online disease communities between February and July of 2016 and were asked to complete an electronic survey assessing their demographics and health (including own substance use behaviors) and their views on teenage substance use. This study was approved by the Institutional Review Board and informed consent was obtained. For each completed survey, participants could select a charity / disease advocacy organization (related to T1D, RD, or ADHD) to receive a $5 donation.

The survey received 1319 link clicks with 1022 (77.5%) of those clicks from parents who were eligible to participate (i.e., had a child between the ages of 13 and 18 years living with T1D, RD, or ADHD). Of the 1022 parents who were deemed eligible on the survey's initial screening questions, 771 (75.4%) continued on and provided any subsequent responses to survey items. Of these, 90 had mostly incomplete survey data regarding views on teenage marijuana use and 86 at least partially completed survey data about their views concerning teenage marijuana use but did not respond to questions about perceived laws and were thus excluded; leaving 595 (77.2%) respondents eligible for inclusion in the current study. Compared to those included, excluded respondents were fairly similar in their views on marijuana use (marginally more likely to agree that occasional use is okay as long as no driving is involved, that they don't have to worry because they know their child will use responsibly, and that marijuana is safe to treat symptoms/side-effects) but more likely to be parents of children with T1D and of children on prescription medications (data not shown).

2.2. State Cannabis Laws

Parents were asked about their knowledge of "the current legal status of marijuana in [their] state" and could select any status from a list of options, including that marijuana is a felony/illegal, decriminalized, legal for medical use, legal for recreational use, and "I don't know." Responses were operationalized as provided (endorsed versus not) regardless of conflicting endorsements.

Information on actual state cannabis laws at the time of the survey (as of July 1, 2016, the date the survey closed) was drawn from various databases, including the NIAAA's Alcohol Policy Information System, and published literature (Carliner et al., 2017; Pacula et al., 2015; Choo et al., 2014; Hasin et al., 2015; Keyes et al., 2016; Wall et al., 2016; Cerda et al., 2017, 2018). Parent's perceptions of legality were compared against the actual legal status to determine accuracy.

2.3. Parental Views on Teen Marijuana use

Parents reported their views on **(1)** adolescent marijuana use generally, **(2)** concern about the impact of marijuana on their child's condition, **(3)** acceptability of their child's use of medical marijuana, and **(4)** perceptions of their child's actual marijuana use and risk. Nine questions about adolescent marijuana use (general opinions) were prompted "When thinking about your child with [condition], how much do you agree or disagree with the following statements about teenage marijuana use?"; responses were provided using a five-point Likert-scale ranging from "strongly disagree" to "strongly agree." Questions about parental concern about the impact of marijuana on their child's condition were prompted "If your child were to use marijuana, how concerned would you be about any of the following:…"; responses were provided using a four-point Likert-scale ranging from "not at all concerned" to "very concerned." Questions about parental acceptability of their child's use of medical marijuana were prompted "These next questions are about the use of marijuana as medicine. This does not include FDA approved Marinol. How much do you agree with the following statements:…"; responses were provided using a five-point Likert-scale ranging from "strongly disagree" to "strongly agree." For the 7.6% of participants that had missing values for $< 50\%$ of items within a single scale, the mean score of their non-missing items was used to impute these values.

Finally, parents were asked to report their risk perceptions around marijuana use for their child and their perceptions of their child's use behaviors. Perceived riskiness was assessed with the question "How many days of smoking marijuana in one month would you consider risky or dangerous for your child?" and responses ranged from "Any marijuana use is risky or dangerous" to "I don't consider marijuana risky or dangerous for my child"; responses for frequency of tolerable use were collapsed into either a couple times a month (1 or 2 days a month) or more than once a week (4 or more days a month). Parents reported perception of their child' ever and regular use of marijuana in the past twelve months; responses were provided using a four-point Likert-scale ranging from 'definitely yes' to 'definitely not.'

2.4. Sociodemographics and Health

Parents reported sociodemographic characteristics including their age (in years), sex, educational attainment (some college or less; college degree or more; unreported), own race/ethnicity **(white,** non-Hispanic; Hispanic or non-**white;** unreported), child's age (in years), child's sex, and child's diagnosis (T1D; RD; ADHD). Parent substance use in the past

30 days was determined by endorsement of either having more than 4 drinks of a beverage containing alcohol (beer, wine, liquor) over the course of a day or any use of marijuana. Parents were asked to report their current state of residence, which was used to assign participants to one of nine regional division outlined by the US Census Bureau (New England; Middle Atlantic; East North Central; West North Central; South Atlantic; East South Central; West South Central; Mountain; Pacific); 55 participants (9.2%) declined to report their current state of residence and were categorized in a tenth 'unclassified' division.

2.5. Statistical Analyses

All analyses were conducted using SAS version 9.4 (Cary, NC). Summary statistics were generated to describe sample characteristics; chi-square and Kruskall-Wallis tests were used to assess differences in sociodemographic characteristics and parental views by perceived legality.

Multivariate ordinal logistic regression was used to model the effect of perceived state cannabis laws on parental views regarding marijuana use, adjusting for parent age, education, race/ethnicity, own substance use, child age, sex, diagnosis; models were estimated with generalized estimating equations to account for clustering within regional divisions. Unadjusted regression estimates are provided in the Appendix. The proportional odds assumption was satisfied for the majority of main exposure-outcome pairs.

As a sensitivity analysis, we looked both at actual state laws as an independent predictor and as a covariate in models estimating the effect of perceived legality, results were consistent but effects were predominantly driven by parent perceptions about legality rather than actual legal status. The notable exception was for recreational use, where actual laws showed significant associations (in the same direction as perceived legality) for some outcomes where perceived recreational use was not significant (data not shown).

3. Results

Individuals from 49 states participated. Most respondents were female (93.9%), **white,** non-Hispanic (89.4%), with a college degree (66.6%), and mean age 45.9 (± 6.6 years; Table 1). Nearly a quarter (23.5%) of parents reported past 30 day substance use. About half (52.1%) of children were male with a mean age of 15.2 (± 1.5 years). Respondents were approximately evenly split between having children with a primary diagnosis of ADHD (37.5%), T1D (38.5%), and RD (24.0%), and 88.4% of children were currently taking any prescription medication.

The plurality of parents (42.2%) said that marijuana was a felony in their state, with 11.1% reporting decriminalization, 35.6% and 5.7% endorsing it as legal for medical or recreational use (respectively), while 22.5% endorsed that they were unsure of the status in their state (Fig. 1); 60.5%, 60.0%, 74.8%, and 98.0% of respondents correctly identified either the presence or absence of laws about felony, decriminalization, medical use, and recreational use (respectively). Only 15.5% of respondents endorsed more than one statement (data not shown).

Regardless of the legal status of marijuana in their state, most parents reported disapproving of teenage marijuana use (e.g., 94.6% disagreed or strongly disagreed that marijuana use was a sign of a healthy social life, Table 2) and were likely to believe that their child would abstain from use either because of their chronic condition (36.8% agreed or strongly agreed) or because of other reasons (57.8% agreed or strongly agreed). Endorsing that marijuana was a felony in their state was associated with lower odds of believing that marijuana was a sign of a healthy social life (OR: 0.59, 95% CI: 0.41–0.86, Table 3) while endorsing decriminalization increased the odds of favorable views (healthy social life OR: 1.73, 95% CI: 1.07–2.82; most use is harmless OR: 1.81, 95% CI: 1.24–2.66), as did believing that medical marijuana was legal (most use is harmless OR: 1.24, 95% CI: 1.03–1.49). Endorsing decriminalization was also associated with decreased odds of believing their child would abstain from marijuana use, either because of their condition (OR: 0.54, 95% CI: 0.33–0.89) or because of other reasons (OR: 0.52, 95% CI: 0.37–0.71).

Parents similarly reported high concern about the impact of marijuana use on their child's condition, including with respect to medication adherence (61.8% were very concerned, Table 2). As with general views, parents who believed that marijuana use was a felony were significantly more likely to report high levels of concern about the impact of marijuana on effectiveness of medications, severity of disease symptoms, and medication interactions while those endorsing either decriminalization or legal recreational use reported significantly lower levels of concern about the impact of marijuana on symptom severity or medication interactions (Table 3).

Only 8.1% of respondents agreed or strongly agreed that marijuana has medical benefits for their child; yet, 27.9% agreed or strongly agreed that they would approve of their child's use of medical marijuana with a doctor's prescription (Table 2). Perceived decriminalization was associated with greater acceptability of medical marijuana for all items; parents who believed that recreational use was legal were less likely to agree that medical marijuana was safe and had medical benefits for their child (Table 3).

Finally, most parents did not believe that their teenager had tried marijuana (86.4%) or used it regularly (94.6%) in the past year, and believed that any amount of marijuana use was risky/dangerous for their child (89.9%, Table 2). Parents who thought marijuana was illegal were less likely to think that their child has tried or used marijuana regularly while those who believed that medical or recreational use were legal were more likely to think that their child has tried or used marijuana regularly (Table 3). Endorsing decriminalization was associated with lower perceived riskiness (i.e., they reported a higher level of use as dangerous for their child).

4. Discussion

We find that parents report high perceived risk of marijuana use, both medical and otherwise, by their child with a chronic condition. Further, parent perceptions of the legality of marijuana are strongly associated with their views about their medically vulnerable child's use, even controlling for their own use behaviors; specifically, perceiving state policies as more permissive of use is associated with decreased perceptions of riskiness of recreational and medical marijuana use by their children. In the context of shifting policy controls, parent perceptions may presage and also affect child marijuana use, with implications for both child health/safety and the broader related picture of treatment participation, issues that warrant specific ongoing attention.

We found that the majority of responding parents of YCMC disapproved of adolescent marijuana use in general and expressed concern about the impact of marijuana on their child's condition, while only a small minority agreed that marijuana has medical benefits for their child. Nonetheless, there were significant differences in perceived risk regarding teenage use among parents who believe marijuana was illegal in their state versus those who believed that marijuana was legal or decriminalized. It may be that adults living in states where marijuana has been legalized had fewer concerns about marijuana prior to legalization, as pre-existing permissive views would likely create a political climate conducive to legalization by ballot initiative. It is also possible that legalizing marijuana results in changing perceptions and softening concerns over time as the population becomes accustomed to a changing status. These processes are not mutually exclusive and both may contribute to our findings. A longitudinal study of families that lived in Washington state for more than one generation found that after marijuana legalization parents were three times more likely to say they would tolerate marijuana use compared to the prior generation,

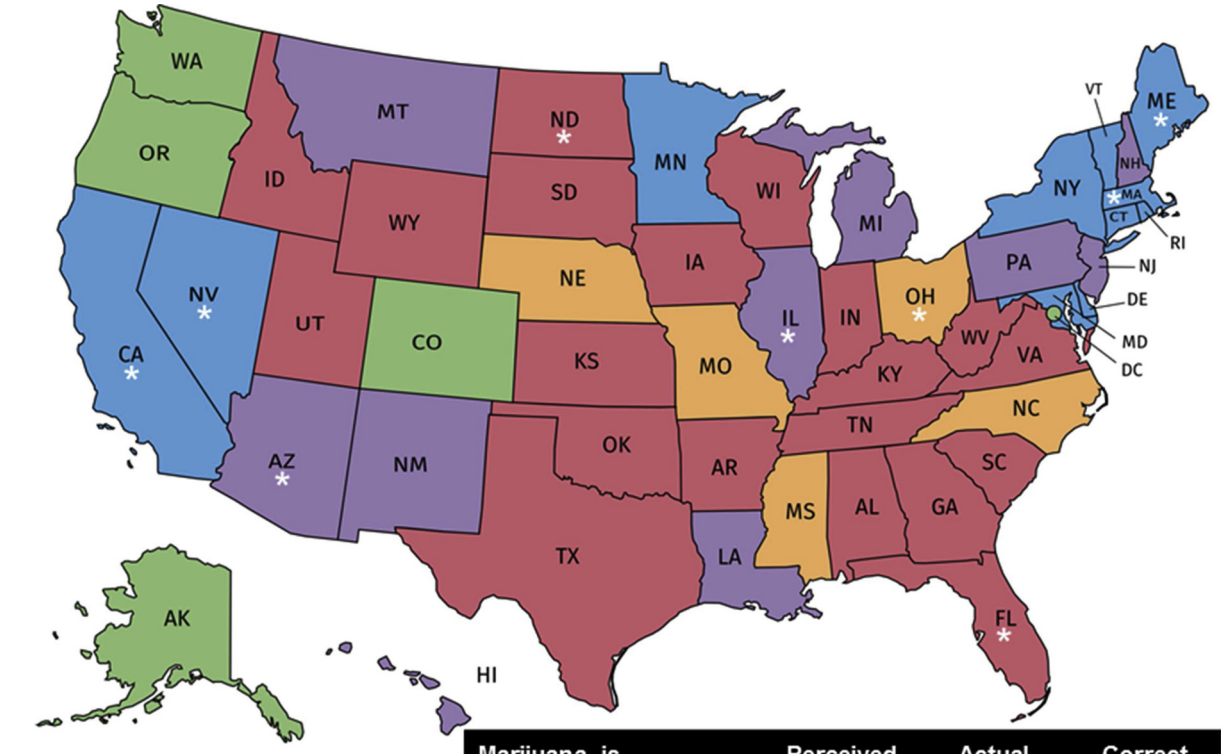
Table 1
Sample Sociodemographics Overall and by Perceived Cannabis Legality.

	Total	Felony	Decriminalized	Legal for Medical Use	Legal for Recreational Use
Total N (%)	595 (100%)	251 (42.2%)	66 (11.1%)	212 (35.6%)	34 (5.7%)
Parent Age (years)		†			
Mean ± SD	45.9 ± 6.6	45.4 ± 6.6	46.8 ± 5.6	46.5 ± 6.0	45.1 ± 8.3
Parent Sex					
Male	35 (5.9%)	14 (5.6%)	5 (7.6%)	9 (4.2%)	3 (8.8%)
Female	559 (93.9%)	236 (94.0%)	61 (92.4%)	203 (95.8%)	31 (91.2%)
Declined to state	1 (0.2%)	1 (0.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Parent Education					
Some college or less	195 (32.8%)	79 (31.5%)	18 (27.3%)	65 (30.7%)	8 (23.5%)
College degree or more	396 (66.6%)	169 (67.3%)	48 (72.7%)	147 (69.3%)	26 (76.5%)
Declined to state	4 (0.7%)	3 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Parent Race/Ethnicity					†
White, non-Hispanic	532 (89.4%)	230 (91.6%)	62 (93.9%)	187 (88.2%)	27 (79.4%)
Hispanic or non-white	59 (9.9%)	21 (8.4%)	3 (4.5%)	22 (10.4%)	6 (17.6%)
Declined to state	4 (0.7%)	0 (0.0%)	1 (1.5%)	3 (1.4%)	1 (2.9%)
Parent Substance Use		*			
Any in past 30 days	140 (23.5%)	70 (27.9%)	15 (22.7%)	50 (23.6%)	11 (32.4%)
None in past 30 days	455 (76.5%)	181 (72.1%)	51 (77.3%)	162 (76.4%)	23 (67.6%)
Child Age (years)		†			
Mean ± SD	15.2 ± 1.5	15.1 ± 1.6	15.3 ± 1.6	15.3 ± 1.5	15.1 ± 1.3
Child Sex					
Male	310 (52.1%)	130 (51.8%)	35 (53.0%)	103 (48.6%)	17 (50.0%)
Female	285 (47.9%)	121 (48.2%)	31 (47.0%)	109 (51.4%)	17 (50.0%)
Child Diagnosis		*	*		
ADHD	223 (37.5%)	97 (38.6%)	16 (24.2%)	78 (36.8%)	12 (35.3%)
T1D	229 (38.5%)	108 (43.0%)	26 (39.4%)	84 (39.6%)	9 (26.5%)
RD	143 (24.0%)	46 (18.3%)	24 (36.4%)	50 (23.6%)	13 (38.2%)
Child on Medications				†	
Yes	526 (88.4%)	219 (87.3%)	57 (86.4%)	194 (91.5%)	29 (85.3%)
No	69 (11.6%)	32 (12.7%)	9 (13.6%)	18 (8.5%)	5 (14.7%)
Census Division		**	**	**	**
New England	51 (8.6%)	8 (3.2%)	15 (22.7%)	33 (15.6%)	2 (5.6%)
Middle Atlantic	81 (13.6%)	34 (13.5%)	5 (7.6%)	34 (16.0%)	0 (0.0%)
East North Central	83 (13.9%)	34 (13.5%)	9 (13.6%)	33 (15.6%)	1 (5.6%)
West North Central	62 (10.4%)	36 (14.3%)	0 (0.0%)	20 (9.4%)	0 (0.0%)
South Atlantic	94 (15.8%)	49 (19.5%)	12 (18.2%)	13 (6.1%)	0 (0.0%)
East South Central	34 (5.7%)	25 (10.0%)	3 (4.5%)	1 (0.5%)	0 (0.0%)
West South Central	49 (8.2%)	28 (11.2%)	7 (10.6%)	3 (1.4%)	0 (0.0%)
Mountain	25 (4.2%)	7 (2.8%)	2 (3.0%)	11 (5.2%)	8 (23.5%)
Pacific	61 (10.3%)	3 (1.2%)	6 (9.1%)	49 (23.1%)	17 (50.0%)
Declined to state	55 (9.2%)	27 (10.8%)	7 (10.6%)	15 (7.1%)	6 (17.6%)

Data are from 595 respondents to a nationally-administered, web-based survey.
Column totals and percentages are reported unless otherwise specified.
ADHD – attention-deficit/ hyperactivity disorder; T1D – type 1 diabetes; RD – rheumatic disease; SD – standard deviation.
Statistical significance is denoted as follows:
† $p < 0.1$.
* $p < 0.05$.
** $p < 0.001$.

suggesting that changes in legal status can indeed impact risk perception (Kosterman et al., 2016). Our findings further suggests a potential impact of state policy on parental views and underscores the need for public education regarding youth marijuana use, particularly in the context of rapidly changing laws. Moreover, while these findings control for parents' own past month substance use, future work should investigate the potential impact of state policies on parent attitudes and reasons for their own marijuana use (or acceptance of marijuana use by adults) and how these may impact attitudes towards their child's use.

While only a small proportion of parents believed that marijuana has medical benefits for their child, over three times as many would consider marijuana as a therapeutic option if recommended by a physician. Although believing that medical use was legal was not significantly associated with greater acceptability of medical marijuana (across any of the items), perceived legality for medical use was significantly associated with 24% greater agreement that most teen use was harmless and 50–90% increased odds of reporting that their child has tried or uses marijuana regularly. Similarly, a study of marijuana risk perception among adolescents with inflammatory bowel disease found that the majority of marijuana users endorsed at least one medical motivation for use and this group was more than ten times more likely to perceive low risk of harm with regular use (Hoffenberg et al., 2018). These findings suggest that promotion of marijuana as a medication may decrease concerns about the harms of use in general, potentially by reducing the cognitive dissonance individuals may experience when reconciling beliefs about risks from recreational use with potential for benefit from medical use (Cermak, 2016). The potential for harm from resolving such a disconnect with incomplete or low-grade safety/efficacy information is evidenced by previous drug use epidemics that have been ignited by marketing of addictive substances as health promoting; for example, the promotion of opioids as safe and non-addictive medications helped to spark the current opioid addiction



Marijuana is…	Perceived	Actual	Correct
Illegal/felony	42.2%	48.4%	60.5%
Decriminalized	11.1%	42.4%	60.0%
Legal for medical use	35.6%	50.4%	74.8%
Legal for recreational use	5.7%	4.7%	98.0%
Don't know	22.5%	-	-

Fig. 1. Actual State Cannabis Laws in 2016 and Parental Accuracy.
This map indicates the legal status of marijuana as of July 1, 2016 (date the survey closed) in all fifty states; the inset table describes the prevalence of parents residing in states with each status and the prevalence of parents who correctly identified their state's status. Nine states (AZ, CA, FL, IL, MA, ME, ND, NV, OH) experienced a change in the legal status of marijuana within the six months after the survey closed (by December 2016), indicated with an asterisk.

crisis.

Given the link between parent perceptions about legality of marijuana as a medication and their views on its use, attention to unintended consequences of the promotion of marijuana as medicine and to 'spillover effects' on more general attitudes and use is warranted. The picture is not entirely straightforward however, as perceiving that recreational use is legal was associated with *lower* reported acceptability of medical marijuana. These findings suggest a complicated and perhaps conflicting relationship between beliefs about use of marijuana as a therapeutic agent versus as a recreational substance and may point to confusion about the nature of the substance, its safety, and formulation for these different purposes.

Given mixed evidence on the effects of cannabis laws on teen use and risk perceptions (Choo et al., 2014; Cerda et al., 2017; Salas-Wright et al., 2017; Schuermeyer et al., 2014; Harpin et al., 2018), there continues to be vibrant debate regarding whether changing laws (Choo and Emery, 2017), especially with regard to recreational use, impacts the availability and use of marijuana by adolescents. The majority of parent respondents in this survey believed that their child had not used marijuana in the past year. These parent-perceived rates of child use are lower than self-reported rates in teenage YCMC, including youth with T1D, RD or ADHD in Boston (Weitzman et al., 2015; Harstad et al., 2017) and youth with inflammatory bowel disease in Colorado (Hoffenberg et al., 2018), and lower than adolescent use reported nationally (Johnston et al., 2018). While parents and clinicians tend to underestimate adolescent substance use (Fisher et al., 2006; Wilson et al., 2004), we found that parents who believed that medical or recreational use was legal in their state were more likely to believe that their child has tried or used marijuana. It is possible that legalization of marijuana is associated with diminished concern from parents as use becomes more normative and less stigmatized; in this context, adolescents may be less likely to hide use of marijuana and thus parents more likely to be aware. While honest discussions about marijuana use between parents and children are important and may be facilitated by legalization, diminished parental concerns or attention may also enable adolescent use (Lac and Crano, 2009).

4.1. Limitations

This study adds to the existing literature on marijuana perceptions in the context of marijuana policies and extends this literature to consideration of how these issues pattern among parents of youth with three chronic conditions. Yet several limitations should be considered. Parents were recruited from online disease communities, and we do not know whether their opinions are representative of all parents of YCMC. Notably, respondents were more accurate in their knowledge of state laws than described previously (MacCoun et al., 2009), and thus may have been a group with particular interest in or concerns regarding the

Table 2
Parental Views on their Child's Marijuana Use.

When thinking about your child, how much do you agree or disagree with the following statements about teenage marijuana use?	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Marijuana use is a sign of a healthy social life	443 (74.5%)	120 (20.2%)	23 (3.9%)	6 (1.0%)	3 (0.5%)
Marijuana use is inevitable	360 (60.5%)	151 (25.4%)	47 (7.9%)	32 (5.4%)	5 (0.8%)
Most marijuana use is harmless	310 (52.1%)	159 (26.7%)	83 (13.9%)	34 (5.7%)	9 (1.5%)
Occasional marijuana use is okay under my supervision	453 (76.1%)	111 (18.7%)	21 (3.5%)	6 (1.0%)	4 (0.7%)
Occasional marijuana use is okay under the supervision of another adult	469 (78.8%)	105 (17.6%)	13 (2.2%)	4 (0.7%)	4 (0.7%)
Occasional use is okay without supervision as long as no driving is involved	336 (56.5%)	123 (20.7%)	85 (14.3%)	37 (6.2%)	14 (2.4%)
I think my child will abstain from marijuana because of his or her condition	68 (11.4%)	123 (20.7%)	185 (31.1%)	110 (18.5%)	109 (18.3%)
I think my child will abstain from marijuana because of other reasons	65 (10.9%)	75 (12.6%)	111 (18.7%)	158 (26.6%)	186 (31.3%)
I don't have to worry about my child … I know they will use responsibly	157 (26.4%)	142 (23.9%)	181 (30.4%)	52 (8.7%)	63 (10.6%)

If your child were to use marijuana, how concerned would you be about any of the following:	Not concerned	A little concerned	Moderately concerned	Very concerned
*The impact of marijuana on the effectiveness of my child's medication(s)	68 (12.9%)	55 (10.5%)	98 (18.6%)	305 (58.0%)
*The impact of marijuana on my child's medication adherence	70 (13.3%)	52 (9.9%)	79 (15.0%)	325 (61.8%)
*The effects of mixing marijuana with prescription medication	66 (12.5%)	51 (9.7%)	89 (16.9%)	320 (60.8%)
The impact of marijuana on my child's ability to manage his or her condition	92 (15.5%)	61 (10.3%)	89 (15.0%)	353 (59.3%)
The impact of marijuana on the severity of my child's disease symptoms	84 (14.1%)	62 (10.4%)	105 (17.6%)	344 (57.8%)

These next questions are about the use of marijuana as medicine. How much do you agree with the following statements:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe marijuana has medical benefits for my child's condition	169 (28.4%)	132 (22.2%)	246 (41.3%)	32 (5.4%)	16 (2.7%)
Marijuana is safe for my child to use to treat symptoms and/or side effects of his or her medications	193 (32.4%)	136 (22.9%)	229 (38.5%)	27 (4.5%)	10 (1.7%)
I would approve of my child using marijuana as medicine with a doctor's prescription	143 (24.0%)	90 (15.1%)	196 (32.9%)	123 (20.7%)	43 (7.2%)

In the past 12 months, I believe:	Definitely not	Probably not	Probably yes	Definitely yes
My child has tried marijuana	422 (70.9%)	92 (15.5%)	27 (4.5%)	54 (9.1%)
My child uses marijuana regularly (more than once a month)	512 (86.1%)	51 (8.6%)	15 (2.5%)	17 (2.9%)

	Any use is risky	A couple times/month	More than once a week	Use is not risky
How many days of smoking marijuana in one month would you consider risky or dangerous for your child?	535 (89.9%)	30 (5.0%)	19 (3.2%)	11 (1.8%)

Data are from 595 respondents to a nationally-administered, web-based survey. Row totals and percentages are reported. *Only asked of parents whose child is currently taking any prescription medications (N = 526).

Table 3
Adjusted Ordinal Regressions Modeling the Effects of Perceived State Cannabis Laws on Parental Views.

Marijuana use is…	Felony	Decriminalized	Legal for Medical Use	Legal for Recreational Use
When thinking about your child, how much do you agree or disagree with the following statements about teenage marijuana use?				
Marijuana use is a sign of a healthy social life	**0.59 (0.41-0.86)**	**1.73 (1.07-2.82)**	1.05 (0.81-1.35)	0.89 (0.55-1.43)
Most marijuana use is harmless	0.80 (0.62-1.04)	**1.81 (1.24-2.66)**	**1.24 (1.03-1.49)**	0.97 (0.63-1.51)
I think my child will abstain from marijuana because of his or her condition	1.26 (0.96-1.65)	**0.54 (0.33-0.89)**	0.88 (0.70-1.10)	0.61 (0.36-1.02)
I think my child will abstain from marijuana because of other reasons	1.03 (0.86-1.24)	**0.52 (0.37-0.71)**	1.16 (0.97-1.38)	0.61 (0.29-1.30)
If your child were to use marijuana, how concerned would you be about any of the following:				
*The impact of marijuana on the effectiveness of my child's medication(s)	**1.31 (1.02-1.70)**	**0.48 (0.37-0.64)**	0.84 (0.60-1.17)	0.72 (0.40-1.30)
*The impact of marijuana on my child's medication adherence (forgetting, skipping, or taking an incorrect dose)	1.25 (0.88-1.79)	**0.60 (0.43-0.84)**	0.87 (0.64-1.18)	0.61 (0.30-1.27)
*The effects of mixing marijuana with prescription medication used to treat my child's condition	**1.32 (1.05-1.66)**	**0.52 (0.39-0.70)**	0.83 (0.62-1.11)	**0.50 (0.27-0.94)**
The impact of marijuana on my child's ability to manage his or her condition	1.30 (0.97-1.73)	**0.51 (0.38-0.68)**	0.91 (0.64-1.28)	0.65 (0.37-1.16)
The impact of marijuana on the severity of my child's disease symptoms	**1.28 (1.05-1.56)**	**0.47 (0.33-0.66)**	0.82 (0.62-1.08)	**0.58 (0.34-1.00)**
These next questions are about the use of marijuana as medicine. How much do you agree with the following statements:				
I believe marijuana has medical benefits for my child's condition	1.08 (0.86-1.35)	**1.76 (1.08-2.86)**	1.04 (0.72-1.50)	**0.60 (0.37-0.96)**
Marijuana is safe for my child to use to treat symptoms and/or side effects of his or her medications	0.94 (0.70-1.27)	**1.84 (1.18-2.87)**	1.26 (0.84-1.87)	**0.64 (0.44-0.94)**
I would approve of my child using marijuana as medicine with a doctor's prescription	0.93 (0.75-1.14)	**1.70 (1.17-2.46)**	1.11 (0.76-1.62)	0.84 (0.61-1.14)
In the past 12 months, I believe:				
My child has tried marijuana	**0.67 (0.51-0.87)**	1.67 (0.99-2.85)	**1.53 (1.01-2.33)**	1.13 (0.61-2.10)
My child uses marijuana regularly (more than once a month)	**0.59 (0.41-0.86)**	1.49 (0.66-3.34)	**1.91 (1.25-2.91)**	**1.80 (1.17-2.76)**
How many days of smoking marijuana in one month would you consider risky or dangerous for your child?	0.80 (0.39-1.65)	**2.46 (1.47-4.13)**	1.20 (0.60-2.42)	1.33 (0.46-3.87)

Data are from 595 respondents to a nationally-administered, web-based survey. Adjusted odds ratios and 95% confidence intervals are reported. Adjusted models control for parent age, education, race/ethnicity, own substance use, child age, sex, diagnosis, and account for clustering within regional divisions. Bolded values indicate statistically significant regression coefficients at $p < 0.05$. *Only asked of parents whose child is currently taking any prescription medications (N = 526).

topic. As this sample was active in online disease groups, it is possible they are more engaged around their child's health and condition than parents of YCMC generally. We assessed various domains of parental views on marijuana use, however to our knowledge there are no existing validated scales in this area and so the extent to which reported opinions were comprehensive or associated with youth's actual use is unknown. Further, as our questions were novel, we do not know whether they were interpreted similarly by parent respondents; for example, questions about "medical marijuana" can have broad meaning in lay terms – from FDA approved cannabinoid products to use of illicit drug for "medical purposes." Finally, nine states experienced a change in the legal status of marijuana within the six months after the survey closed (by December 2016) and some respondents may have been influenced by pending legislation or surrounding community conversations.

4.2. Conclusions

While the majority of parents of YCMC in this sample remain opposed to teenage marijuana use, we find parent perceptions of the legality of marijuana are strongly associated with their views about teenage use both generally and medically. As state policies evolve toward legalization or decriminalization, clinicians and public health practitioners should be aware that parents may be more inclined to explore marijuana as a treatment option for their children and be less concerned about the health impacts of marijuana use generally as well as the potential for interactions between marijuana and existing medications and treatment regimens. Additional work examining the impact of marijuana legality and use on utilization, costs, and outcomes (like adherence) for this population is needed.

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The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Contributors

All listed authors take responsibility for the work and satisfy the requirements of authorship. All authors read and approved the final manuscript.

Conflict of Interest

No conflict declared.

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Appendix A. Unadjusted Ordinal Regressions Modeling the Effects of Perceived State Cannabis Laws on Parental Views

Marijuana use is…	Felony	Decriminalized	Legal for Medical Use	Legal for Recreational Use
When thinking about your child, how much do you agree or disagree with the following statements about teenage marijuana use?				
Marijuana use is a sign of a healthy social life	**0.64 (0.44–0.92)**	1.56 (0.97-2.51)	1.06 (0.80-1.40)	0.90 (0.51-1.59)
Most marijuana use is harmless	0.82 (0.62-1.10)	1.58 (0.99-2.54)	1.23 (0.98-1.54)	1.02 (0.68-1.54)
I think my child will abstain from marijuana because of his/her condition	1.17 (0.88-1.57)	**0.57 (0.35-0.95)**	0.88 (0.71-1.10)	0.68 (0.42-1.09)
I think my child will abstain from marijuana because of other reasons	1.00 (0.89-1.13)	**0.60 (0.43-0.84)**	1.13 (0.93-1.37)	0.68 (0.33-1.42)
If your child were to use marijuana, how concerned would you be about any of the following:				
*The impact of marijuana on the effectiveness of my child's medication(s)	1.30 (0.99-1.71)	**0.51 (0.38-0.69)**	0.83 (0.61-1.14)	0.72 (0.45-1.16)
*The impact of marijuana on my child's medication adherence (forgetting, skipping, or taking an incorrect dose)	1.25 (0.86-1.81)	**0.69 (0.52-0.90)**	0.88 (0.64-1.21)	0.60 (0.35-1.01)
*The effects of mixing marijuana with prescription medication used to treat my child's condition	1.25 (0.97-1.60)	**0.55 (0.38-0.81)**	0.85 (0.63-1.13)	**0.51 (0.29-0.92)**
The impact of marijuana on my child's ability to manage his/her condition	1.26 (0.95-1.68)	**0.61 (0.48-0.77)**	0.95 (0.67-1.37)	0.70 (0.42-1.16)
The impact of marijuana on the severity of my child's disease symptoms	1.24 (1.00-1.54)	**0.52 (0.36-0.73)**	0.84 (0.63-1.14)	**0.61 (0.39-0.95)**
These next questions are about the use of marijuana as medicine. How much do you agree with the following statements:				
I believe marijuana has medical benefits for my child's condition	1.01 (0.79-1.29)	1.63 (0.96-2.76)	1.04 (0.67-1.59)	0.72 (0.45-1.16)
Marijuana is safe for my child to use to treat symptoms and/or side effects of his or her medications	0.88 (0.64-1.20)	**1.76 (1.04-2.95)**	1.25 (0.81-1.95)	0.71 (0.46-1.08)
I would approve of my child using marijuana as medicine with a doctor's prescription	0.88 (0.70-1.11)	**1.75 (1.12-2.75)**	1.14 (0.76-1.71)	0.97 (0.70-1.34)
In the past 12 months, I believe:				
My child has tried marijuana	**0.68 (0.50-0.93)**	1.33 (0.77-2.31)	**1.50 (1.02-2.21)**	1.12 (0.72-1.74)
My child uses marijuana regularly (more than once a month)	**0.61 (0.40-0.92)**	1.43 (0.65-3.14)	**1.75 (1.13-2.73)**	1.45 (0.99-2.13)
How many days of smoking marijuana in one month would you consider risky or dangerous for your child?	0.66 (0.35-1.28)	**2.33 (1.17-4.63)**	1.22 (0.66-2.27)	1.53 (0.53-4.43)

Data are from 595 respondents to a nationally-administered, web-based survey. Unadjusted odds ratios and 95% confidence intervals are reported. Unadjusted models account for clustering within regional divisions only. Bolded values indicate statistically significant regression coefficients at $p < 0.05$. *Only asked of parents whose child is currently taking any prescription medications (N = 526).

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