HHS Public Access

Perceived harms and benefits of tobacco, marijuana, and electronic vaporizers among young adults in Colorado: Implications for health education and research

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Abstract

Aims—To evaluate how young adults perceive and compare harms and benefits of marijuana and tobacco products in the context of a legal marijuana market in Colorado.

Design—Semi-structured qualitative interviews.

Setting—Denver, Colorado, USA.

Participants—Thirty-two young adults (18-26 years old) who used tobacco/marijuana/ vaporizers.

Measurements—Semi-structured interviews addressed perceived harms and benefits of various tobacco and marijuana products and personal experiences with these products.

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Findings—Young adults evaluated harms and benefits using five dimensions: (1) Combustion – smoking was considered more harmful than non-combustible products (e.g., e-cigarettes, vaporizers, and edibles); (2) Potency – edibles and marijuana concentrates were perceived as more harmful than smoking marijuana flower because of potential to receive too large a dose of THC (tetrahydrocannabinol); (3) Chemicals – products containing chemical additives were seen as more harmful than "pure" or "natural" plant products; (4) Addiction – participants recognized physiological addiction to nicotine, but primarily talked about psychological or lifestyle dependence on marijuana; (5) Source of knowledge – personal experiences, warning labels, campaigns, the media, and opinions of product retailers and medical practitioners affected perceptions of harms and benefits.

Conclusions—Among young adults in Colorado, USA, perceived harms and benefits of tobacco and marijuana include multiple dimensions. Health educational campaigns could benefit from addressing these dimensions, such as the potency of nicotine and cannabis concentrates and harmful chemicals present in the organic material of tobacco and marijuana. Descriptors such as "natural" and "pure" in the promotion or packaging of tobacco and marijuana products might be misleading.

Introduction

Marijuana legalization and the rising popularity of new delivery systems for psychoactive substances (such as electronic cigarettes (e-cigarettes) or vaporizers) [1 2] are changing the landscape of substance use. Uruguay legalized non-medical marijuana in 2013 and Canada will propose similar legislation in 2017 [3]. Eight US states and the District of Columbia have passed ballot initiatives legalizing adult possession and use, and 28 states have legalized medical marijuana [4]. Marijuana and tobacco are consumed similarly: rolled in paper, smoked in pipes, or electronic vaporizers (Supplementary Table 1). Tobacco and marijuana can also be consumed together through "blunts" (i.e., little cigar/cigarillo wrappers filled with marijuana) or "spliffs" (tobacco and marijuana mixed in a rolled cigarette, more common in Europe [5]).

Tobacco is the leading cause of preventable disease and premature death in the United States [6] and the second major cause of mortality worldwide [7]. US Federal prohibition of marijuana impeded studies quantifying the effects of marijuana use on population health. Many drug experts agreed that marijuana carries less personal and societal harm than drugs like alcohol, tobacco, heroin, and cocaine [8]. Emerging evidence, however, has linked marijuana use with negative physiological and psychological outcomes [9].

Compared to non-smokers, chronic, heavy marijuana smokers have been found to have impaired lung function [10-12]. Though marijuana smoke contains known carcinogens, light and moderate use does not seem to be linked to lung cancer, with mixed evidence linking heavy use to lung cancer [13 14]. Marijuana use, however, has been associated with increased cardiovascular disease including stroke and myocardial infarction [15-17]. Exposure to THC (tetrahydrocannabinol, the principal psychoactive component in marijuana) increases risk for depression, anxiety, and psychosis [18]. Long-term and heavy use likely results in persistent cognitive impairments especially if use begins during

adolescence [19 20]. Often, marijuana users also consume tobacco products [21], posing a challenge to determine effects solely of marijuana use not confounded by concomitant tobacco use. Administering nicotine and THC without combustion is arguably safer [11-13], but not harmless [22].

Policy and product transformations may affect comparative harm and benefit perceptions of various products and administration routes [6-8]. Research on comparative perceptions of tobacco and marijuana has been limited to a few quantitative surveys: US college students rated marijuana as safer than tobacco products (including e-cigarettes) [23]; a convenience sample of US marijuana users believed marijuana flower was less harmful than marijuana concentrates [24]; and an Australian population survey found a majority believed marijuana use can cause health, behavioral, and social problems [25-27]. In one qualitative study, California adolescents identified acute (i.e., yellow teeth, bad breath) and chronic (i.e., cancer) negative health outcomes for cigarettes, but were less certain about negative effects of e-cigarettes or marijuana [28]. The effect of changing delivery and potency of marijuana products, and the shifting legal landscape on perceptions of comparative harm or benefit remains largely unexplored.

To begin filling these gaps, we conducted a qualitative study with young adults (ages 18-26) in Colorado to understand comparative perceptions of tobacco and marijuana products. We chose Colorado as the case study because it was the first state to legalize retail marijuana sales and distribution in 2014, five years after introducing a state licensing system for medical marijuana dispensaries in 2009. We focused on young adults because they have the highest rates of marijuana and tobacco use in the US compared to other age groups [29 30], and had legal access to at least the medical marijuana market.

Methods

Sample recruitment

Thirty-two young adults (18-26 years old) were recruited based on current (past month) use of at least one of three products (marijuana, tobacco, e-cigarettes). We placed flyers in marijuana dispensaries, vape shops, cafes, stores, on bulletin boards at community colleges, and on Craigslist and Facebook. We attempted to interview participants twice, in order to allow conversations to develop more deeply and to use the content of the first interview to inform questions in the second. Out of 32 enrolled participants, 24 completed the second interview. This study was approved by the University of California, San Francisco Committee on Human Research. Participants provided written informed consent. We used pseudonyms for this and all publications.

Data collection

Semi-structured qualitative interviews lasting 60-90 minutes were conducted between January and August 2015 by six trained interviewers. Discussion topics included definitions of smoking, experiences with tobacco, e-cigarettes, marijuana, marijuana vaporizers, and other products. To further generate discussion of comparative harms and benefits of products, participants were asked to arrange labeled pictures of various products from the

least harmful to the most harmful and talk through their sort process. Participants completed brief questionnaires with demographic and substance use history.

Data analysis

We audio recorded and professionally transcribed the interviews and coded transcripts using Dedoose software. LP and SS independently blind-coded and compared a sub-set of transcripts to develop the study's coding guidelines. We created code definitions, developed a consistent coding scheme and discussed the coding results to ensure codes were applied consistently. SS coded the larger set of remaining transcripts. Given the emerging nature of the legalized marijuana market and the lack of existing research in this context, we adopted a thematic analysis approach [31-33] that would allow us to discover emerging behaviors and meaningful categories for our participants and to generate themes iteratively during review of coded transcripts. All authors reviewed memos with illustrative quotes summarizing each theme and discussed themes iteratively to reach consensus and theme saturation.

Sample characteristics

Participants were 32 young adults with a mean age of 23 (SD=2.36), 44% were women; 34% were Hispanic, 31% Non-Hispanic White, 19% Non-Hispanic Black, and 13% more than one race, Non-Hispanic. Out of 19 (59%) participants not currently enrolled or attending school, 14 reported working for pay in the previous week. Almost all (97%) had ever smoked marijuana and 44% were daily marijuana smokers. Slightly fewer (91%) had ever smoked a tobacco cigarette, while 16% were daily cigarette smokers; 78% had ever used an e-cigarette, and 9% were daily e-cigarette users.

Results

Participants primarily evaluated products along five dimensions: (1) whether or not the product was combusted, (2) potency of the psychoactive agent delivered, (3) presence of unnatural chemicals, (4) addictiveness, and (5) source of information about the product. Participants generally assessed harms in the context of perceived benefits, and frequently discussed alternative products delivering similar benefits, but with less harm. They gauged harms in nuanced ways, with criteria for judging harm differing between tobacco and marijuana products and comparing them with alcohol, illicit drugs, and pharmaceuticals.

Combustion

Some participants recognized combustion as a health risk and regarded noncombustible products (e-cigarettes, marijuana vaporizers, and edibles) as safer. For example, 'Hunter', age 21, commented, "I know that smoking anything isn't good for you. Carbon monoxide, right? You look at your pipe or … your bong, and it's super black and resined [sic]. Obviously, my lungs are like that too. I cough up a lot of shit all the time, and it kind of looks gnarly." Products delivering the same psychoactive substance without combustion were viewed as safer. 'Travis', age 26, observed that with e-cigarettes, "it's not burning, so that chemical change isn't being absorbed into my lungs anymore. It's more of a haze… It seemed like a better alternative." 'Alexandra' perceived e-cigarettes as producing only "water vapor", "It makes you feel like you're smoking… but it's just water vapor. It's not

nicotine [or] tobacco… It's like smoking water." Some participants perceived edibles and vaporizers as safer than combusted marijuana. Comparing these three products, 'Travis', age 26, explained: "In terms of edibles…there's no carcinogens, no pathogens or anything going into your lungs. [With] vaporization, there is really no smoke…eliminating the same thing that the edibles eliminate. It's safer for your lungs…Plant matter would be [most dangerous] because it has all the carcinogens still. It has been proven to be a little bit more harmful in tar levels to your lungs than tobacco."

Medicinal marijuana led to questions about whether there were any significant health risks of combusted marijuana, as 'Nia', age 19, stated, "I know smoking in general is bad for your lungs… but weed out of all these, to me, is not as harmful… because they suggest it to cancer patients. It's medicinal." Participants mentioned that marijuana mitigated seizures, insomnia, depression, celiac disease, diabetic neuropathy, cancer, and pain from work-related injuries or menstrual cramps. Some participants stated that marijuana is safer and more effective than pharmaceuticals. For some, using marijuana recreationally confers the same medicinal benefits. Deon, 24, said: "I smoke recreationally, but it still has those medical effects because I work at UPS, and I lift boxes all day… I'm sore a lot of the times. But I don't even notice these days because I'm so medicated."

Both e-cigarettes and marijuana were mentioned as a means for quitting smoking cigarettes. 'Angela', 18, said "I think that's a lot of the reason why I quit smoking, actually, is because I replaced it with joints. I wasn't smoking joints a lot before when I was smoking cigarettes, so…" She then continued, "And a lot of times, this makes me cough, which is okay because then I don't have to go seek that other harsh feeling on my throat," indicating that the physiological sensations of smoking marijuana (the throat hit) substituted for sensations achieved by smoking cigarettes. The (incomplete) similarity between e-cigarettes and cigarettes was mentioned as something that might make quitting smoking with e-cigarettes more difficult. For 'Rachel', 24, quitting with e-cigarettes was "almost harder than the cold turkey, because it was like sort of feeling what you were looking for out of a cigarette, but not quite, and just enough to be like, oh, I kind of miss real cigarettes."

Unlike combustible products, e-cigarettes and marijuana vaporizers could be easily concealed and used in public, which was viewed as their major benefit. "Mobile. You can take [vaporizers] anywhere." ('Joaquin', 24)

Potency

Potency was discussed as affecting the level of control the user had over administering an appropriate dose, based on a self-defined tolerance level. Potency also affected risk of overdosing – defined by participants as psychological (e.g., a panic attack) rather than physical harms (e.g., death). Comparing combustion to other forms of marijuana, 'Jeremy', age 26, explained, "I still think that the dangers of a panic attack from a vaporizer or an edible outweigh possible dangers of inhaling smoke from cannabis." While potency was not typically discussed for tobacco products, it was important for marijuana. Participants evaluated marijuana as safer than alcohol and other drugs because "there's been no overdoses on marijuana," as 'Angela', age 18, noted. However, some participants believed that highly potent marijuana products (i.e., concentrates and edibles) could lead to death.

'Jesse', age 22, commented, "It just depends on the milligrams… [I]t could be one small cookie and you could be higher than you've ever been. … A lot of people die from that, as well. They just keep eating, and have no idea what it is. So, it's actually a dangerous part."

Participants reported using marijuana concentrates (e.g., dabs and shatter) through a delivery system known as a "dab rig," which involves heating a titanium or quartz nail with a handheld torch (Supplementary Table 1). Because some participants associated this method of delivery with harder drugs, it was viewed as less safe. 'Ben', age 22, commented, "it just feels very meth-like to me, or looks like something the FBI could kick down my door for. So it's just not something I have any desire to do."

Some participants perceived the benefits of marijuana concentrates and edibles as a more efficient way to receive higher or longer-lasting doses of THC. 'Jesse,' age 22, explained, "They say dabs…get you higher than marijuana…the fact that you can get higher off of a few drops of a hit." Marijuana was also viewed as a way to reduce consumption of other drugs, especially alcohol. For some, marijuana helped alleviate nausea associated with heavy alcohol use. 'Renata', 20, said: "I'll use marijuana … if I feel like I'm drinking too much or I'm going to get nauseous or sick, I'll smoke just to bring me back down to make me feel better."

Risks from higher-potency marijuana products were not thought to apply equally to all users. Participants reported some people might be more susceptible to negative effects of high-potency marijuana, or that a mismatch between user and product type/potency resulted in negative outcomes. 'Gabriella', age 21, explained, "I don't think [shatter] is risky for everybody. For me it is, because of my anxiety issues." Participants indicated that this problem could potentially be solved by selecting a different strain or a lower potency product (such as marijuana flower) where users could titrate dosing.

Chemical vs. natural

Chemicals were an important element affecting the harms and benefits of both tobacco and marijuana products. Manufactured tobacco and marijuana products were viewed as harmful because they were chemically manipulated, whereas participants perceived unprocessed plants as "natural", which made them safer. For example, 'Antonio', age 22, explained, "marijuana would be the least harmful because it's a plant. … It's as natural as it gets. Especially because it's organically grown and it's organically fed. It's not man-touched. There shouldn't be a reason why you should have to worry." Marijuana – smoked as flower – was perceived as the least harmful and most natural. As 'Timothy', age 25, explained, "They do say marijuana has more tar than tobacco. But I don't know if the body can break that down easier, because it's just a natural tar, as opposed to a chemical-filled tobacco product."

When asked where chemicals in cigarettes come from, one response was "tobacco laboratories." Tobacco products with descriptors like "natural" (such as "Natural American Spirit") were perceived as less harmful. As explained by 'Charles', age 21, "I started smoking American Spirits that are all natural. They're just tobacco and [don't have] additives sprayed on it…."

Chemicals used during extraction to produce cannabinoid concentrates were seen as a source of harm, particularly when the process involved butane. 'Patricia", age 24, reasoned, "…the vaporizer is probably more healthy [sic], but it just depends on how the THC was made; if it's [made with] butane, it's probably not better, because then you're smoking that…butane doesn't sound like a good thing that you would want to ingest."

Participants believed water could purify chemicals in tobacco smoke, and water in a bong could filter chemicals from marijuana smoke. Similarly, participants considered e-cigarettes safer because they believed the nicotine was delivered by water vapor rather than smoke.

Addiction

Participants commented on the addictive nature of tobacco compared to alcohol, opiates, and prescription drugs. In contrast, participants spoke about the habitual urges to use marijuana but rarely reported physiological withdrawal symptoms. Several participants also explicitly mentioned physiological changes in the body associated with addiction to marijuana. 'Ben', age 22, commented, "I feel that for a lot of people, especially in Colorado, it's very much emotionally dependent, mentally dependent, on marijuana…Over a chronic period of [using] it, your body adjusts and lowers the blood flow to your cerebellum so that when you smoke, you have normal flow." Some, like 'Brad', age 25, acknowledged that they "need [marijuana] to function."

Some participants discussed addiction to marijuana as affinity for euphoria or the positive feelings associated with getting high. Thus, it was the psychological benefits of marijuana that were viewed as addictive. When asked what the addictive component in marijuana is, 'Owen', age 20, said, "Euphoric feeling;" an observation confirmed among several other participants.

Participants did not generally identify tolerance as a sign of addiction. Instead, some marijuana users discussed high potency products as a useful way to overcome tolerance and reclaim positive effects. Participants also discussed tolerance increasing with use; some temporarily stopped use for a few days or weeks to bring their tolerance level down in order to be able to better feel the effects of marijuana when using smaller doses or less concentrated products. The ability to abstain from use without physical withdrawal validated for some participants that marijuana was not addictive. As 'Erin', age 24, commented, "I smoke [marijuana] because I like it, but, I don't have to wake up in the morning and smoke a bowl like I have to wake up in the morning and smoke a cigarette. I've gone periods of time without smoking marijuana, and you can quit like that. I don't feel like it has the addictive properties that cigarettes have."

Because of its perceived naturalness, marijuana was also believed to be superior for therapeutic functions to pharmaceutical "pills" (such as antidepressants, opioid pain medications, or anxiolytics), which were perceived as more addictive.

Source of knowledge

Informational sources mentioned by participants can be broadly classified as external (governmental agencies, media, healthcare providers, industry, friends) and internal (own

body). Participants described information from governmental agencies as exclusively concerning harms of products, and mostly related to tobacco use. Participants reported seeing warning labels on tobacco products, which was particularly salient to 'Rashawn', age 24, who had lost his grandmother to tobacco-related illness. As he explained, "my friends wanted to do [blunt wraps]…but I looked at them and it has this warning. … and I thought that was just for cigarettes. I wasn't really prepared to have a warning of cancer on the blunt wrap. I was like, so you guys see this? … I'm not okay with it. I could possibly have cancer because my grandmother, she's my favorite person in the world, she died of lung cancer." While several participants explicitly referenced media campaigns when discussing tobacco-related harms (e.g., *Truth Campaign*, *Tips for Former Smokers*, and local anti-tobacco educational campaigns), it was less common for participants to cite health authorities as sources of knowledge on the harms of e-cigarettes or marijuana.

Some participants noted the contradiction between government information on harms and their own experiences. 'Sadie', 24, shared, "My whole life I was taught that weed was really bad, and then when I smoked it, I was like, wow, this really makes me feel good. And I was depressed at the moment. And that was … the first time … I was okay." Participants' own bodies were a primary source of knowledge when discerning whether something was harmful or beneficial. 'Timothy', age 25, explained, "generally when things make you feel bad, they're bad for you." Similarly referencing bodily sensations, 'Angela', age 18, reflected, "Dabbing is really harsh on your lungs. It feels like someone is stabbing you in the lungs." Participants often continued to use a product if their bodies did not communicate acute harms (e.g., lung impairment). 'Timothy', age 25, commented, "if I felt it affecting my lungs, then I would consider something else."

Few participants cited medical providers as a source of information about marijuana. Employees of marijuana dispensaries and vape shops were an important source of guidance about benefits of particular products and strains. If a product yielded an unpleasant experience, retailers would recommend a different product or a lower dose rather than abstention. One of our participants, 'Sadie', age 24, worked at a marijuana dispensary and reported, "we have to find different strains out and what they do, how it affects people, and of course it affects people in a different way… if it's an upper, a downer, if it's a mellow one…" In sum, among our participants, retailers served as a source of information on product selection and customization, but not on potential harms.

Discussion

Our participants judged the harms and benefits of various tobacco and marijuana products along the dimensions of combustion, potency, presence of chemicals, potential addictiveness, and sources of knowledge. The narrative that non-combustible products are safer appears in the scientific literature [34], tobacco industry statements [35 36], and documents from regulatory agencies [37]. While some participants recognized that smoking anything - tobacco or marijuana - was dangerous, more often combusted marijuana (flower) was perceived as safer because it was seen as having fewer chemicals and lower potency.

Our findings complement the small literature on the comparative perceptions of harm of various tobacco and marijuana products, where perceptions of risk were lowest for marijuana flower [23 24]. Our study enriches previous research by examining the reasons behind differential perceptions. Contrary to a previous hypothesis that marijuana flower was perceived as safer than marijuana concentrates because it was less addictive [24], few participants in our study considered the dependence risks of marijuana concentrates, but viewed them as a way to overcome increased tolerance. Perceived harm of marijuana concentrates was due in part to immediate adverse psychological effects, such as panic attacks. Chemicals were commonly perceived as harmful, particularly when used to manufacture tobacco or process marijuana into concentrates. Few participants associated harm with chemicals that naturally occur in tobacco or marijuana plants, thus perceiving "natural" tobacco products, such as Natural American Spirit cigarettes as less harmful, which may be unintentionally reinforced by national media campaigns educating youth about chemicals added to tobacco [38 39].

Participants utilized distinct sources of knowledge to evaluate the harms and benefits of tobacco and marijuana products. Anti-tobacco campaigns informed tobacco-related harm perceptions, whereas few public education campaigns informed perceptions of marijuana and e-cigarettes. Unpleasant personal experiences with marijuana intoxication were mentioned as potential harms more often than marijuana-related diseases or addiction, which might reflect a lack of information from government agencies on the health risks of marijuana and e-cigarettes. Even though the Colorado public awareness campaign 'Good To Know' publicized risks of highly potent marijuana edibles [40], our participants were experienced marijuana users, which may explain why no participants discussed how retailers had warned them to "go slow" with initial marijuana use.

The findings from our study with a small convenience sample limited in age and geographically to young adults in Denver, CO, may not be generalizable. However, they point to issues worthy of future exploration and, together with other tobacco research, have implications for health education and product labeling.

Implications for Health Education Campaigns

Educational campaigns about tobacco and marijuana products may be more relevant to young adults if they include diverse messages reflecting multiple dimensions of harms and benefits of tobacco and marijuana. Some aspects of tobacco harm might be relevant to marijuana, such as the dangers of marijuana combustion, as marijuana smoke impairs vascular function in ways similar to tobacco smoke [41]. The harms of secondhand tobacco smoke exposure has been an effective theme in tobacco prevention and control media campaigns [42].

However, educational messages that focus solely on dangers of combustion (i.e., "any smoke is dangerous") may be missing important nuances in how young people understand tobacco and marijuana related harms. Young adults in our study reported that they would rather smoke marijuana than use edibles, primarily because edibles were seen as more potent and more difficult to titrate dosage. While additional research is needed to ensure the generalizability of these findings, this study suggests that the availability of lower dose

marijuana edibles may mitigate the tendency for users to choose combustible over edible products due to potency concerns.

Our study also identified little awareness that there are harmful, naturally-occurring chemicals in tobacco in addition to chemicals added by manufacturers. This may be an opportunity for tobacco education [43] that is also relevant to marijuana and e-cigarettes. These messages should be carefully tested to ensure they do not unintentionally encourage the belief that tobacco chemicals are harmless because they are natural. Studies are needed to determine how reduced risk perceptions of organic plant matter, whether tobacco or marijuana, impact use and prevalence among young people, and what education messages would address these misperceptions.

Our findings suggest that messages using the words "addiction" or "dependence" may not resonate with young adults, particularly with respect to marijuana. Messages about tolerance or dose escalation may be the dimensions of addiction most relevant to marijuana users. Illustrating physical changes in the body or the brain as a result of long-term marijuana use may also aid understanding that marijuana dependence has physiological in addition to psychological risks. Stories from young users who have difficulty controlling their use would be worth exploring, similar to how the FDA's *Real Cost* Campaign focused on "loss of control" as the relevant dimension of nicotine addiction [44]. Future studies should evaluate these messages with larger representative samples. Additional research on the addictive qualities of marijuana and which demographics are particularly susceptible to these qualities is also needed.

Medical professionals have important opportunities to educate patients about health risks of tobacco and marijuana use when screening for substance use. Recommendations will need to be updated continuously to address new products and delivery systems and provide guidance for medical professionals in this arena [45].

Implications for Product Labeling

Our finding that marketing describing products as "natural", "pure", "clean", "additive-free", or "organic" may increase product appeal or reduce perceived harm is in line with other studies [38 46-48]. Taken together, these findings indicate the need for regulatory agencies to prohibit the use of such terms on tobacco and marijuana products (including e-cigarettes and hookah). It is important that consumers receive accurate information on whether or not a product is organic. The European Union prohibits the use of "organic" on any product label where less than 95% by weight of ingredients of agricultural origin are not organic, or any product produced with or containing genetically-modified organisms (GMOs) [49]. Similar provisions are included in US product labeling law [50]. Due to federal prohibition of marijuana in the United States, however, marijuana companies are not allowed to market marijuana products as 'organic'. If federal prohibition is lifted, companies may use the term 'organic' in marijuana packaging and marketing to increase product appeal. More research is needed to understand how organic labeling on marijuana packages impacts risk perceptions and use, and what public health messages could counteract misperceptions of risk.

Implications for Warning Labels

Young adults may be receptive to health-related content on tobacco warnings and this could be translated to warning labels for hookah, e-cigarettes, and marijuana. While these findings should be validated with a larger sample, for many participants chemicals, toxins, and additives were associated with greater harm. Warnings for hookah, e-cigarettes, and marijuana could address chemicals and toxins found in the organic matter, as well as chemicals used to produce marijuana concentrates and e-liquids. Warning labels could address the misperception that a product is safer because it contains, or was extracted with, water.

Warning labels reflecting the novel themes identified in this study might be more effective if they follow the current state of the art for tobacco warning labels, including use of images in addition to text [29-31], and if warning label messages are reinforced by mass media educational campaigns [51 52].

Conclusion

This in-depth study highlights the complex ways young people weigh the harms and benefits of various products and delivery systems in a rapidly evolving policy environment. Integrating multiple dimensions of perceived harm into messaging campaigns may be more relevant to the experiences of young people. Perceptions of chemicals or high potency should be considered for new educational campaigns or warning labels for marijuana and tobacco products.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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