Is 4/20 an Event-Specific Marijuana Holiday? A Daily Diary Investigation of Marijuana Use and Consequences Among College Students

ADRIAN J. BRAVO, PH.D.,[a,*] MATTHEW R. PEARSON, PH.D.,[a] BRADLEY T. CONNER, PH.D.,[b] & JAMIE E. PARNES, M.S.[b]

[a]*Center on Alcoholism, Substance Abuse, & Addictions, University of New Mexico, Albuquerque, New Mexico*
[b]*Department of Psychology, Colorado State University, Fort Collins, Colorado*

ABSTRACT. Objective: Given the popular association between April 20 ("4/20") and marijuana, the present study examined marijuana use and consequences on 4/20 compared with other days in order to test whether 4/20 is a high-risk, event-specific marijuana use holiday among college student marijuana users. **Method:** Fifty-nine college student marijuana users from three different, large U.S. universities located in Virginia, New Mexico, and Colorado completed daily brief surveys (<10 minutes) over a 12-day (April 15–April 26) period assessing prior-day marijuana use (i.e., percentage of users who consumed marijuana, number of unique marijuana use sessions, subjective high/intoxication while under the influence of marijuana, and number of grams of marijuana consumed) and marijuana-related consequences. **Results:** Using one-way repeated-measures analyses of variance, we found that (a) 50% of students reported using marijuana on 4/20, which was significantly more than weekdays (28%) and weekend days (37%); (b) students reported a significantly higher number of unique marijuana use sessions on 4/20 (M = 1.47) compared with weekdays (M = 0.91); and (c) students reported a significantly higher number of grams consumed on 4/20 (M = 0.79) compared with weekdays (M = 0.35) and weekend days (M = 0.47). **Conclusions:** Our study provides preliminary support that 4/20 is a day associated with increased marijuana use but provides little evidence for an association with more problematic use. (*J. Stud. Alcohol Drugs, 78,* 134–139, 2017)

RATES OF MARIJUANA USE and cannabis use disorder peak during traditional college years (ages 18–25 years) in the United States (Farmer et al., 2015). In a recent study across 11 different U.S. universities, Pearson and colleagues (in press-a) found that between 15.5% and 38.7% (M = 26.2%) of college students report using marijuana in the past month, which is consistent with other large epidemiological studies in the United States (e.g., 20.8%, Monitoring the Future, Johnston et al., 2015; 19.6%, National Survey on Drug Use and Health, Center for Behavioral Health Statistics and Quality, 2015). Although research indicates that marijuana use among college students is prevalent and chronic marijuana use is associated with various psychosocial and medical problems (Volkow et al., 2014), little is known about variance in day-to-day use of, motivations for, and consequences of marijuana use. For example, unlike days known for high-risk drinking (e.g., New Year's Eve; Neighbors et al., 2007, 2011) there is no research examining marijuana consumption and consequences on the day that is known for marijuana use (i.e., April 20 [4/20]).

Within the public eye, 4/20 has long been identified as a marijuana holiday, and many cities worldwide (Goodwin & Vandermeer, 2014) host 4/20 gathering events to celebrate that day. However, little research has examined whether marijuana users "choose to celebrate 4/20 as a special event or treat it as simply another day to consume marijuana" (Queally, 2016). Common perception suggests that marijuana users may experience increased use and consequences on this day (compared with other typical days); however, no research has empirically examined this notion. With the trend toward decriminalization and legalization of marijuana use in the United States (Pacula et al., 2015), the availability of marijuana (and perhaps use of marijuana) is likely to increase; thus, research is needed to examine whether event-specific marijuana use days place individuals at an increased risk for excessive marijuana use and consequences.

Within the alcohol research field, New Year's Eve, St. Patrick's Day, and legal-drinking-age birthdays have been shown to be event-specific drinking days that are associated with elevated risk of heavy drinking and negative alcohol-related consequences (see Neighbors et al., 2007, 2011, for an overview). Moreover, recent work has attempted to create prevention strategies (i.e., event-specific prevention) targeting these known high-risk drinking days (Neighbors et al., 2007, 2011). With regard to event-specific marijuana use, some studies have indicated that marijuana use is higher during Spring Break (Ragsdale et al., 2012), music festivals (Hesse et al., 2010), and both Mardi Gras and St. Patrick's Day (Buckner et al., 2015). However, these studies focused on specific events that also have high rates of alcohol use, and no research has examined marijuana consumption and consequences on a day that is solely known for marijuana

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*Correspondence may be sent to Adrian J. Bravo at the Center on Alcoholism, Substance Abuse, & Addictions, University of New Mexico, 2650 Yale Blvd. SE, Albuquerque, NM 87106, or via email at: ajbravo@unm.edu.

use (i.e., 4/20). Moreover, most of these studies relied on retrospective reports (spanning 30–60 days) of marijuana use and consequences, a limitation that can be overcome by daily diary methods. In addressing these limitations, researchers have advocated for specifically testing whether 4/20 is a high-risk cannabis use day using prospective designs (Buckner et al., 2015).

Purpose of study

The present study compared daily use of marijuana and negative consequences before (6 days), on, and after (5 days) 4/20 to empirically determine if it is an event-specific marijuana use day. Based on previous event-specific marijuana use studies (e.g., Buckner et al., 2015), we hypothesized that there would be a higher frequency of students using marijuana on 4/20 compared with other typical days (i.e., weekdays and weekend days). Further, on days that individuals consumed marijuana, we expected that the highest rates of marijuana use (i.e., subjective high, number of grams consumed, and number of different marijuana use sessions) and marijuana-related consequences would occur on 4/20 (compared with typical weekend days and weekdays).

Method

Participants and procedure

Participants were undergraduate students from psychology department participant pools at three different, large U.S. universities located in Virginia, New Mexico, and Colorado. Students who were at least 18 years of age, reported smoking marijuana at least once in the previous month (Pearson et al., in press-a), and had daily access to the Internet for the period of data collection were invited to participate (n = 274), of whom 59 students participated. The majority of participants identified as being either White, non-Hispanic (n = 36; 61.0%) or Hispanic/Latino (n = 14; 27.3%), were female (n = 41; 69.5%), and reported a mean age of 23.24 (SD = 8.21) years. For 12 days (April 15–April 26, 2016), participants completed daily brief surveys (<10 minutes) assessing marijuana-related constructs.

At all sites, participants were emailed a survey link once each morning (approximately 7 A.M.–10 A.M.) and asked to complete the survey by the end of the day. At the New Mexico and Colorado sites, reminder emails were sent in the evening to participants who had yet to complete their survey that day. At all sites, participants received research participation credit for completing the daily surveys. At the Virginia and Colorado sites, students were entered for a chance to win one of two $50 prizes for every daily entry completed to provide additional incentive for providing complete data. With 59 participants reporting their behavior for up to 12 days, respondents could have submitted a total of 708 daily surveys. We received 570 daily reports (73.1%); thus, participants reported behavior for an average of 9.66 days (SD = 3.23; range: 1–12 days). Participants recorded an average of 3.27 (SD = 3.65; range: 0–12 days) marijuana use days across the 12-day assessment. The study was approved by the institutional review boards at the participating institutions.

Measures

Marijuana use. Marijuana use was broken down across four unique indicators: percentage of users who consumed marijuana each day (coded dichotomously 0 = *no,* 1 = *yes*), number of unique marijuana use sessions (different occasions in which the feeling of being high has surpassed), number of grams of marijuana consumed, and subjective high/intoxication while under the influence of marijuana. To assess grams consumed, students were first presented with two visual guides of various amounts of marijuana (both in joints and as loose plant material) to help orient them to various amounts of marijuana in grams. Students then provided an open-ended estimate to the question, "Please enter the number of grams, rounded to the nearest 0.25 g (ex. 0.25, 1.5, 2.75 . . .). If less than 0.25 g, please enter either 0.10 or 0.20, depending on how much you used." For subjective high/intoxication, students answered "how high" they felt yesterday on a scale ranging from 0 (*extremely sober*) to 100 (*extremely high*) using a visual analog scale at the Virginia and Colorado sites and a free text box at the New Mexico site.

Marijuana-related consequences. To assess daily marijuana-related consequences, we extracted 8 items from the 50-item Marijuana Consequences Questionnaire (Simons et al., 2012), covering seven domains of marijuana consequences: social–interpersonal consequences, impaired control, negative self-perception, self-care, risk behaviors, physical dependence, and blackout use. Participants were asked whether they experienced each of these consequences because of their marijuana use in the past 24 hours. Participants responded to dichotomously coded responses (0 = *no,* 1 = *yes*).

Statistical analyses

Before analyses were conducted, data were cleaned and statistical assumptions were tested. All marijuana use outcomes were substantially positively correlated across Level 1 (within person) and Level 2 (between person), and intraclass correlations ranged from .39 to .61 across outcomes (a correlation matrix is available on request from the authors). Based on recommendations found in the college alcohol literature (e.g., Del Boca et al., 2004), we coded Sunday to Tuesday as weekdays, 4/20 fell on Wednesday, and we coded Thursday

Table 1. One-way repeated-measures analysis of variance results for comparisons of weekday, 4/20, and weekend marijuana use and consequences

Variable	Day			F	p	η^2
	Weekday	4/20	Weekend			
% of students who consumed marijuana	28 (37)	50 (51)	38 (38)	9.78**	.001	.172
Number of sessions	0.91 (1.37)	1.47 (2.23)	1.10 (1.11)	4.33*	.025	.084
Number of grams consumed	0.35 (0.79)	0.79 (1.45)	0.47 (0.66)	6.71**	.006	.127
Subjective high[a]	29.54 (33.85)	33.60 (38.84)	37.90 (32.54)	1.57	.213	.033
Consequences[b]	0.44 (0.94)	0.65 (1.32)	0.70 (1.11)	1.53	.223	.033

Notes: Means and standard deviations (in parentheses) are presented across the groups. See text for description of significant group mean differences. All values based off of 48 individuals who reported entries on each of the days. [a]Students answered "how high" they felt on a scale ranging from 0 (*extremely sober*) to 100 (*extremely high*); [b]8 items from the 50-item Marijuana Consequences Questionnaire (0 = *no,* 1 = *yes*), with a range of 0 (*no consequences*) to 8 (*significant consequences*).
*$p < .05$; **$p < .01$.

to Saturday as weekend days. To examine differences in marijuana use and consequences between 4/20, weekdays, and weekends, we conducted one-way repeated-measures analysis of variance (ANOVA) models in IBM SPSS Statistics for Windows, Version 21 (IBM Corp., Armonk, NY).[1] Among significant group differences, statistical significance of pairwise comparisons was concluded if the 95% confidence intervals (CIs) did not contain zero.

Results

Descriptive statistics of marijuana use and consequences on 4/20

Students who consumed marijuana on 4/20 (n = 24; 50% of reported entries) experienced 2.94 unique marijuana use sessions on average, consumed on average of 1.54 g, reported an above average subjective high (M = 65.79), and reported experiencing 1.3 marijuana-related consequences on average. The descriptive statistics of marijuana use and consequences across days are shown in the Supplemental Figures. On marijuana use days, 4/20 was associated with the highest number of marijuana use episodes and number of grams consumed. However, subjective high/intoxication was nearly uniform, exhibiting very little variability across days, and 4/20 was not the day associated with experiencing the most marijuana consequences and was not much different than many other days.

Comparison of marijuana use and consequences by day

Before we conducted statistical analyses, values of marijuana outcomes were coded as zero for individuals who reported not consuming marijuana on a specific day. Students who did not have an entry on all three of the day types (i.e., weekdays, 4/20, and weekend days) were excluded, leaving an analytic sample of 48 students. The results of the one-way repeated-measure ANOVAs[2] are shown in Table 1.

Percentage of users who consumed marijuana. Mauchly's test indicated that the assumption of sphericity was violated, $\chi^2(2) = 36.87$, $p < .001$; therefore, degrees of freedom were corrected using Greenhouse–Geisser estimates of sphericity ($\varepsilon = .65$). The results show that there was a significant effect of day on the percentage of students who consumed marijuana, $F(1.29, 60.59) = 9.78$, $p < .01$, partial $\eta^2 = .17$. Specifically, half of students (50%) reported using marijuana on 4/20, which was significantly more than on weekdays (28%), $M_{difference}$ = 22%, 95% CI [9, 34], and weekend days (37%), $M_{difference}$ = 12%, 95% CI [2, 23]. Further, students reported using marijuana on weekend days significantly more than on weekdays, $M_{difference}$ = 9%, 95% CI [4, 15].

Number of unique marijuana use sessions. Mauchly's test indicated that the assumption of sphericity was violated, $\chi^2(2) = 16.81$, $p < .001$; therefore, degrees of freedom were corrected using Greenhouse–Geisser estimates of sphericity ($\varepsilon = .77$). The results show that there was a significant effect of day on the number of unique marijuana use sessions, $F(1.53, 71.97) = 4.33$, $p = .03$, partial $\eta^2 = .08$. Specifically, students reported a significantly higher number of unique marijuana use sessions on 4/20 (M = 1.47) compared with weekdays (M = 0.91), $M_{difference}$ = 0.56, 95% CI [0.11, 1.02]. Findings were inconclusive as to whether significant dif-

[1]In addition, we conducted multilevel analyses in Mplus 7 (Muthén & Muthén, 1998–2012) using a dummy-coded indicator for 4/20 predicting marijuana-related outcomes.

[2]Results from the multilevel analysis indicated that the dummy-coded 4/20 variable significantly predicted marijuana use episodes (b = 1.108, p = .003), number of grams used (b = 0.805, p = .001), and marijuana intoxication (b = 10.788, $p < .001$), but not marijuana consequences (b = 0.233, p = .285). In another model, we used an additional dummy-coded variable indicating weekday (0 = *Sunday–Wednesday*) vs. weekend (1 = *Thursday–Saturday*). Even when we controlled for this weekday/weekend indicator, the 4/20 indicator significantly predicted marijuana use episodes (b = 1.068, p = .011), number of grams used (b = 0.861, $p < .001$), and marijuana intoxication (b = 10.481, p = .001), but not marijuana consequences (b = 0.298, p = .177).

ferences were present between 4/20 and weekend days or weekend days and weekdays.

Number of grams consumed. Mauchly's test indicated that the assumption of sphericity was violated, $\chi^2(2) = 27.94$, $p < .001$; therefore, degrees of freedom were corrected using Greenhouse–Geisser estimates of sphericity ($\varepsilon = .68$). The results show that there was a significant effect of day on the number of grams consumed, $F(1.37, 62.91) = 6.71$, $p = .01$, partial $\eta^2 = .13$. Specifically, students reported a significantly higher number of grams consumed on 4/20 ($M = 0.79$) compared with weekdays ($M = 0.35$), $M_{difference} = 0.43$, 95% CI [0.17, 0.70], and weekend days ($M = 0.47$), $M_{difference} = 0.31$, 95% CI [0.10, 0.61]. Findings were inconclusive as to whether significant differences were present between weekend days and weekdays.

Subjective high/intoxication and consequences. With regard to subjective high/intoxication and marijuana consequences, findings were inconclusive as to whether significant differences were present across days.

Discussion

The present study aimed to examine the patterns of marijuana use on a day (4/20) considered to be a "marijuana holiday" using a 12-day daily diary design. In our analyses, we compared the percentage of users, number of unique marijuana use episodes, quantity of marijuana use measured in grams, levels of subjective high/intoxication, and number of consequences experienced on 4/20 to other days during the assessment period (both individual days and type of day, i.e., weekdays vs. weekend days). Our results suggest that college student marijuana users are indeed more likely to use marijuana, have more unique marijuana use episodes, and consume a somewhat higher quantity of marijuana on 4/20 compared with other days. However, they do not appear to reach higher levels of subjective intoxication or experience a larger number of negative consequences.

Although 4/20 is widely considered a marijuana holiday by active marijuana users, no empirical research exists to quantify how different this day is for the typical marijuana user. There is much anecdotal evidence of increased hospitalizations during large 4/20 "smoke out" events (e.g., 64 people hospitalized in Vancouver, BC, Canada; Toppa, 2015), but such reports do not account for a number of confounding variables (e.g., experience and tolerance of users, polysubstance use). The contrast between increased rates and amount of use with no (or less) observable changes in subjective intoxication and consequences is an important one that warrants additional research attention. Our study provides preliminary support that 4/20 is a day associated with increased marijuana use, but it provides little evidence for an association with more problematic use. Nonetheless, our findings corroborate previous research that has found that marijuana users consume more marijuana on event-specific holidays (i.e., Mardi Gras and St. Patrick's Day) compared with weekdays and weekend days (Buckner et al., 2015). However, to place these findings in context, it is important to examine how 4/20 compares with these other possible marijuana holidays as has been done in the alcohol field (Neighbors et al., 2011).

Clinical implications

Although preliminary, our results suggest that 4/20 is an event-specific marijuana holiday that may place college students at an elevated risk for heavy marijuana consumption. Consistent with the alcohol literature, event-specific prevention strategies may be one avenue to deter excessive marijuana consumption among users on this holiday. Based on a typology matrix by DeJong and Langford (2002), event-specific prevention strategies (see Neighbors et al., 2007, for an overview) could be implemented across various social ecological systems (e.g., individual, institution, and community) and target specific intervention areas (e.g., changing attitudes and behavioral intentions) to deter excessive marijuana consumption on 4/20. For example, within the present study, students reported that it was quite easy for them to obtain marijuana ($M = 4.48$, $SD = 0.65$; range: 1 = *very difficult* to 5 = *very easy*) on 4/20 and they believed it was quite easy for typical college students to obtain marijuana ($M = 4.29$, $SD = 1.34$; range: 1 = *very difficult* to 5 = *very easy*). Thus, campuses and community coalitions could target marijuana availability on this day as a way to decrease excessive consumption rates. Future empirical work is needed to examine whether and which event-specific prevention strategies may decrease excessive marijuana consumption on 4/20.

Strengths and limitations

Our findings must be understood with consideration of the strengths and limitations of the present study. A strength of the present study is that we recruited subjects from three different U.S. universities, including one state with legal recreational marijuana use (Colorado), one state with legal medical marijuana use (New Mexico), and one state with no legal marijuana use (Virginia) at the time of data collection. This approach increases the likelihood that our findings are generalizable to students across states with different policies regarding marijuana; however, our modest sample size ($n = 59$) and slight methodological difference across sites precludes a powerful examination of site differences. Future studies more adequately powered to examine such site differences and differences across states are needed to inform public policy.

Given our daily diary design, we had substantial statistical power to examine within-subject differences ($n = 570$), but our ability to examine between-subject differences was more limited ($n = 59$). We also could not capture new initi-

ates who used marijuana for the first time on 4/20, so our data provide good preliminary information on marijuana use patterns on 4/20 among current marijuana users, and not in the larger college student population, which includes individuals who use much more sporadically (i.e., less than monthly). Moreover, given that a recent study found heterogeneity in types of marijuana users (Pearson et al., in press-b), future research is needed to examine how different types of marijuana users across various states celebrate 4/20, which would supply unique information as to who might be at risk for excessive consumption and/or consequences on 4/20. Additionally, given that alcohol use and marijuana use are complementary among college students (O'Hara et al., 2016), future research is needed to examine how polysubstance use may place students at elevated risks for negative consequences on 4/20.

Finally, given that we conducted the present study during a single 12-day period in 2016, we are unable to determine the unique and potentially interactive effects of days of the week with the 4/20 "holiday." Specifically, 4/20 fell on a Wednesday in 2016, so we do not know what patterns of marijuana use one would expect if 4/20 fell on a weekend day when students have fewer role obligations. In other words, it is not clear if the elevated rates and amount of use observed in this study were somewhat attenuated compared with years when 4/20 falls on a weekend. Provided that for the next 3 years (based on Gregorian calendar) 4/20 falls on a weekend day (i.e., Thursday–Saturday), future research can begin to examine different interactive effects of days of the week with the 4/20 holiday on consumption/consequence rates among marijuana users.

Conclusions

Using a daily diary methodology across three U.S. universities, the present study aimed to examine marijuana use and negative consequences on 4/20 (an event-specific marijuana use day) and compare these rates with other typical days (i.e., weekdays and weekend days) among current (i.e., at least once a month) college marijuana users. The present study provides preliminary support for 4/20 as an event-specific marijuana holiday, such that college student marijuana users are indeed more likely to use marijuana on 4/20, more likely to have more unique marijuana use episodes, and more likely to consume a somewhat higher quantity of marijuana than on other days (i.e., weekend days and weekdays). However, given that 4/20 fell on a Wednesday, it is unknown whether marijuana use on 4/20 substituted regular use that would have occurred on a weekend or whether use would be further increased if it occurred on a weekend day. To inform public policy, future studies assessing 4/20 over multiple years across different states are needed to more adequately quantify the rates of marijuana use and consequences on 4/20.

References

Buckner, J. D., Henslee, A. M., & Jeffries, E. R. (2015). Event-specific cannabis use and use-related impairment: The relationship to campus traditions. *Journal of Studies on Alcohol and Drugs, 76,* 190–194. doi:10.15288/jsad.2015.76.190

Center for Behavioral Health Statistics and Quality. (2015). *2014 National survey on drug use and health: Detailed tables.* Rockville, MD: Substance Abuse and Mental Health Services Administration.

Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S. (2004). Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology, 72,* 155–164. doi:10.1037/0022-006X.72.2.155

DeJong, W., & Langford, L. M. (2002). A typology for campus-based alcohol prevention: Moving toward environmental management strategies. *Journal of Studies on Alcohol, Supplement, 14,* 140–147. doi:10.15288/jsas.2002.s14.140

Farmer, R. F., Kosty, D. B., Seeley, J. R., Duncan, S. C., Lynskey, M. T., Rohde, P., . . . Lewinsohn, P. M. (2015). Natural course of cannabis use disorders. *Psychological Medicine, 45,* 63–72. doi:10.1017/S003329171400107X

Goodwin, C., & Vandermeer, J. (2014, April 17). 4/20 2014: Marijuana rallies in cities around the world. *Cannabis Culture.* Retrieved from http://www.cannabisculture.com/content/2014/04/17/420-2014-marijuana-rallies-cities-around-world

Hesse, M., Tutenges, S., & Schliewe, S. (2010). The use of tobacco and cannabis at an international music festival. *European Addiction Research, 16,* 208–212. doi:10.1159/000317250

Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2015). *Monitoring the Future national survey results on drug use, 1975–2014: Volume 2, College students and adults ages 19–55.* Ann Arbor, MI: Institute for Social Research, The University of Michigan.

Neighbors, C., Atkins, D. C., Lewis, M. A., Lee, C. M., Kaysen, D., Mittmann, A., . . . Rodriguez, L. M. (2011). Event-specific drinking among college students. *Psychology of Addictive Behaviors, 25,* 702–707. doi:10.1037/a0024051

Neighbors, C., Walters, S. T., Lee, C. M., Vader, A. M., Vehige, T., Szigethy, T., & DeJong, W. (2007). Event-specific prevention: Addressing college student drinking during known windows of risk. *Addictive Behaviors, 32,* 2667–2680. doi:10.1016/j.addbeh.2007.05.010

O'Hara, R. E., Armeli, S., & Tennen, H. (2016). Alcohol and cannabis use among college students: Substitutes or complements? *Addictive Behaviors, 58,* 1–6. doi:10.1016/j.addbeh.2016.02.004

Pacula, R. L., Powell, D., Heaton, P., & Sevigny, E. L. (2015). Assessing the effects of medical marijuana laws on marijuana use: the devil is in the details. *Journal of Policy Analysis and Management, 34,* 7–31. doi:10.1002/pam.21804

Pearson, M. R., Liese, B. S., Dvorak, R. D., & Marijuana Outcomes Study Team. (in press-a). College student marijuana involvement: Perceptions, use, and consequences across 11 college campuses. *Addictive Behaviors*.

Pearson, M. R., Bravo, A. J., Conner, & Marijuana Outcomes Study Team. (in press-b). Distinguishing subpopulations of marijuana users with latent profile analysis. *Drug and Alcohol Dependence.*

Queally, J. (2016, April 20). 4/20 2014: Dude, you ever wonder, like, why people celebrate pot on 4/20? *Los Angeles Times.* Retrieved from http://www.latimes.com/local/lanow/la-me-ln-420-history-20160420-story.html

Ragsdale, K., Porter, J. R., Zamboanga, B. L., St. Lawrence, J. S., Read-Wahidi, R., & White, A. (2012). High-risk drinking among female college drinkers at two reporting intervals: Comparing spring break to the 30 days prior. *Sexuality Research & Social Policy, 9,* 31–40. doi:10.1007/s13178-011-0071-0

Simons, J. S., Dvorak, R. D., Merrill, J. E., & Read, J. P. (2012). Dimensions and severity of marijuana consequences: Development and validation of the Marijuana Consequences Questionnaire (MACQ). *Addictive Behaviors, 37,* 613–621. doi:10.1016/j.addbeh.2012.01.008

Toppa, S. (2015, April 22.). Vancouver's 4/20 marijuana smoke fest sees 64 taken to hospital. *Time.* Retrieved from http://time.com/3830815/vancouver-420-pot-weed-marijuana-celebration-hospital/

Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. (2014). Adverse health effects of marijuana use. *The New England Journal of Medicine, 370,* 2219–2227. doi:10.1056/NEJMra1402309