

Marijuana and Sexual Risk Behavior in Youth and Emerging Adults: What Do We Know?

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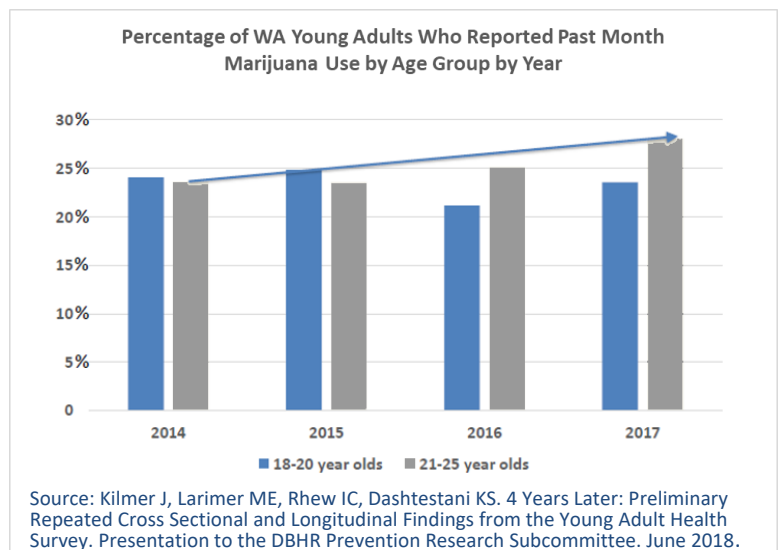
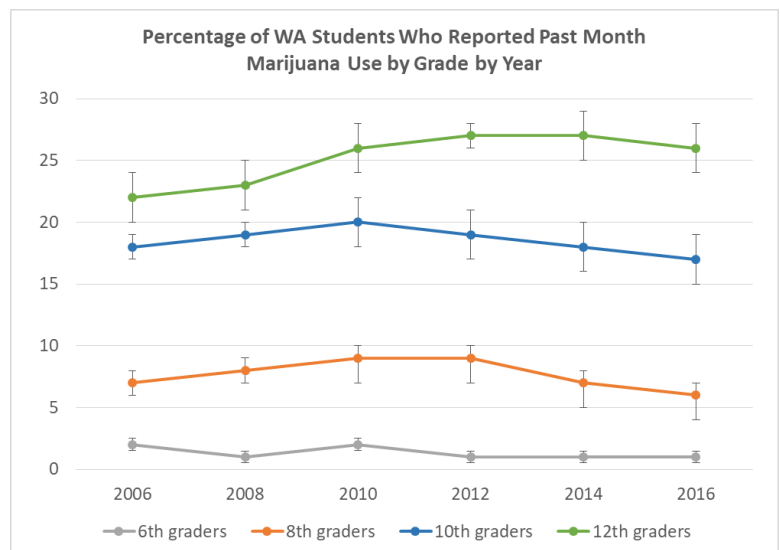
Introduction

In general, substance use has long been understood to increase sexual risk behavior, which may result in sexually transmitted infection or unintended pregnancy. In particular, a large and complex body of research shows alcohol use in the context of dating increases the likelihood of sex and decreases the likelihood of condom use. But what do we know about marijuana use and sexual risk behavior in youth and emerging adults?

Marijuana Use is Prevalent Among Youth and Emerging Adults

Use of marijuana is prevalent among youth and emerging adults. According to an annual, longitudinal, nationally representative survey of American youth called Monitoring the Future, in 2016, past month use of marijuana was reported by 5% of 8th graders, 14% of 10th graders, and 23% of 12th graders.¹ Past month use rates in Washington State in 2016 reported via the Healthy Youth Survey were slightly higher than national rates, coming in at 6% of 8th graders, 17% of 10th graders, and 26% of 12th graders.² In Washington State, marijuana use increased significantly between 2006 and 2016 among 12th graders but has not increased for other grades over the same time frame.

With regard to young adults, the 2016 Monitoring the Future survey found that 22.2% of college students and 21.6% of their non-college peers aged 19-28 reported recent marijuana use.³ The 2016 Healthy Young Adult Survey conducted in Washington State found a comparable rate in 18-20 year olds at around 22% but a slightly higher rate in 21-25 year olds at around 25%. The former group showed no increase over time since the annual survey was begun 4 years ago, but the latter group showed a linear increase over time since 2014.⁴



Global Association Studies Show a Relationship Between Marijuana Use and Sexual Risk Behavior

A substantial number of studies have found some relationship between marijuana use and sexual risk behavior. Most of these are global association studies, which generally examine whether marijuana users engage in more sexual risk behavior compared to nonusers or whether degree of use is related to degree of sexual risk-taking. A typical finding is that, compared to non-users, study participants aged 16-24 who report using marijuana also report engaging in sexual risk behaviors more often in the previous 12-months, with men and women who reported using marijuana at least weekly being 2 to at least 3 times more likely to report sexual risk behavior.⁵

It has long been recognized that adolescents^{6,7,8} and young adults⁹ are more likely to engage in high-risk sexual behavior when they are engaging in other forms of problem behavior, including marijuana use. Over the years, research studies have replicated findings of a relationship between marijuana use and sexual risk behavior and refined our understanding the association. For instance, using biomarkers to study a sample of African-American adolescent women, Liao et al.¹⁰ found that those who tested positive for recent marijuana use were less likely to have used condoms consistently in the past 6 months, more likely to report never having used, condoms in the past 30 days, and substantially more likely to test positive for gonorrhea or chlamydia, adding to the literature linking marijuana use to sexually transmitted infections in adolescents^{11,12} and young adults.^{12,13,14} Schwartzendruber et al. examined whether baseline alcohol and/or marijuana use among African American adolescent women aged 14-20 predicted sexual risk outcomes over the following 18 month period. They found that, compared to those who used alcohol only, women who used marijuana only were less likely to report condom use at last sex. Users of both alcohol and marijuana were more likely than those who used only either one to become pregnant.¹⁵

Agrawal et al.¹⁶ found that emerging adult sexually active women who reported adolescent marijuana use were much more likely to engage in repeated voluntary unprotected sex as an adult. Green et al.¹⁷ examined developmental trajectories of alcohol and marijuana use starting in adolescence and their relationship to emerging adulthood sexual risk-taking in an urban, mostly African-American sample. Using longitudinal data, they classified individuals' according to their substance use over time as 1) consistent non-users, 2) moderate alcohol users, 3) moderate alcohol/increasing marijuana users, and 4) high dual users of both substances. They found that all three substance use classes demonstrated elevated sexual risk behavior compared to the non-use class, including engaging in sex without a condom more frequently, having 1.5–2 times higher number of sexual partners, 2-3 times the rate of sexually transmitted infection, and higher rates of teenage pregnancy. High dual use of marijuana and alcohol was associated with teenage pregnancy; approximately 70% of those in the high dual use class either became pregnant or impregnated a partner compared to 55% of those in the moderate alcohol/increasing marijuana class and 53% of those in the moderate alcohol class. The moderate alcohol/increasing marijuana class was almost twice likely as the moderate alcohol class to report having multiple sexual partners in the past month during at least one of their interviews in emerging adulthood. Thus, the contribution of marijuana use over and above moderate alcohol use appears to be important with regard to sexual risk behavior.

Like the Green et al. study, other studies have found dual use of marijuana and alcohol to be a potent risk factor for sexual risk behavior. Surveying a diverse sample of sexually active adolescents presenting to a primary care clinic, Storholm et al.¹⁸ found that, compared to non-users, adolescents who reported using both alcohol and marijuana use were more likely to report having had two or more sexual partners (OR = 3.90) or sex without a condom (OR = 3.19) in the past 3 months. Those who drank alcohol only were also more likely than non-users to report multiple sexual partners (OR = 2.51) or condomless sex (OR = 3.41). Thus, the contribution of marijuana use over and above alcohol use in this study affected the number of sexual partners but not condom use. Similarly, those who used marijuana only (did not drink) were more likely than non-users to report multiple

sexual partners (OR = 1.89) but not condomless sex. Tyurina et al.¹⁹ had strikingly similar findings in a study of HIV-infected risky drinkers in Russia; compared to non-users, those with current or recent marijuana use were more likely to report multiple sex partners but not more episodes unprotected sex. A study of treatment-seeking polysubstance users found that, controlling for other drug use diagnoses, marijuana use was associated with a larger number of sexual partners and greater frequency of unprotected sex with casual partners.²⁰

Since polysubstance use is common, many studies have examined the relationship of multiple substances and sexual risk behavior. Ritchwood et al.²¹ conducted a meta-analysis of 87 studies that examined the relationship between substance use and sexual risk-taking in over 120,000 adolescent participants. Over three quarters of the effect sizes were from global association studies. Controlling for the effects of other substances, the analysis found a modest relationship between marijuana use and sexual risk behavior, with mean weighted correlations between marijuana use and unprotected sex of $r = .13$ (17 effects sizes, $p < .001$) and number of partners of $r = .33$ (11 effect sizes, $p < .001$). Notably, results were comparable regardless of the substance(s) used: alcohol, marijuana, hard drugs, or multiple drugs. The range of effect sizes for condom use between substances was $r = .11$ to $.18$ (all within the small range), and range for number of partners between substances was $r = .25$ to $.33$ (all within the small to moderate range).

A number of studies have sought to understand what might be driving the association between marijuana use and sexual risk-taking. Studying a sample of adolescents and young adults, Dir et al.²² found that, compared to non-users and users of alcohol or marijuana only, dual users of both marijuana and alcohol perceived less risk of harm from unprotected sex. Buckner et al.²³ found that, compared to non-users, college student marijuana users generally reported less frequent engagement in condom-related protective behavioral strategies, such as talking about condom use with a partner prior to sex and carrying a condom and keeping it handy. Schuster et al.²⁴ examined neurocognitive performance in marijuana users in addition to their level of recent cannabis use and risky sexual behavior. They found that the link between marijuana use and risky sex was greatest among those with worse neurocognitive performance.

While these studies implicate marijuana use in sexual risk-taking, because they only look at the global association between substance use and risk-taking behaviors, they cannot establish causality, that is, that being high on marijuana resulted in taking a sexual risk. These studies do not demonstrate that marijuana use and sexual risk-taking occurred on the same day. Thus, these studies cannot rule out the simple explanation that riskier people generally do riskier things and/or find themselves in riskier situations, in which case marijuana use would not be the reason for the sexual risk behavior.

Situational Association Studies

Situational association studies get closer to demonstrating causality by examining whether people who use marijuana more in dating or sexual situations also engage in more sexual risk behavior compared to those who don't use marijuana as much or at all in those situations.

Kingree and Thompson²⁵ surveyed juvenile detainees to examine their beliefs about the effects that marijuana and alcohol have sexually (i.e., sex-related marijuana and alcohol expectancies). They found that marijuana use was generally perceived as posing less sexual risk than alcohol but that beliefs varied by age. Older detainees perceived that marijuana posed less sexual risk than alcohol but believed both substances enhanced sex to a comparable degree. Younger detainees, by contrast, saw no difference between alcohol and marijuana in terms of sexual risk but believed marijuana enhanced sex more than alcohol. Hendershot et al.²⁶ examined sex-related marijuana expectancies among juvenile probationers. They found that stronger sexual enhancement expectancies predicted more frequent marijuana use in sexual contexts while stronger sexual risk expectancies predicted lower intentions to use condoms while having sex under the influence of marijuana in the future.

A number of other studies demonstrate sexual enhancement and disinhibition expectancies^{27,28,29} and subjective effects^{30,31,32} for marijuana, which would be expected to drive use of marijuana in dating or sexual situations. Indeed, a survey of young nightlife participants age 16-35 in 9 European cities found that the most common reason for using marijuana before sex was to enhance sensations and arousal (endorsed by 25.8%). Among regular marijuana users, 16.2% reported they had sex always or mostly under the influence of drugs, compared to 5.0% of occasional marijuana users, 4.5% of former marijuana users, and 5.6% of those who had never used marijuana. Compared to those who never used, regular marijuana users were much more likely to report having had regretted sex after alcohol or drugs (AOR = 3.29), as were occasional users (AOR = 2.22), and former users (AOR = 2.16) but to a lesser degree.³³ A study of African American men who have sex with men by Morgan et al. found that marijuana use both in general and in the context of sex were related to increased participation in condomless sex, and this association remained when adjusting for other drug use in general and in the context of sex.³⁴

Taken together, like global association studies, these situational association studies also implicate marijuana use in sexual risk-taking, particularly when marijuana use occurs in the context of sex. However, while relationships found in situational association studies are more suggestive of a causal link between marijuana and sexual risk-taking, they still do not clearly establish that marijuana use caused the sexual risk behavior.

Event-Level Association Studies

Event-level association studies carry the most weight in evaluating whether marijuana use causes sexual risk behavior in persons' daily lives. These studies investigate the co-occurrence of marijuana use and sexual risk behavior in a single event or multiple events. For example, a single event study might ask people to recall and report on their marijuana use and sexual risk behavior in their first sexual encounter with their most recent sexual partner. A multiple event study might ask people to document their marijuana use and sexual risk behavior over a period of several weeks or months retrospectively using a timeline follow back interview or prospectively using daily diary. Investigators look for patterns of co-occurrence over time.

Single event studies

A recent meta-analysis by Schumacher et al.³⁵ examined 11 studies that looked at the event level relationship between marijuana and sexual risk behavior in a single event. More than half of these studies focused on youth, primarily juvenile detainees or probationers and homeless youth. Nine studies asked participants to recall their most recent sexual experience in general or with a specific partner type while two had them recall their first time with their current or most recent partner. The meta-analysis found that use of marijuana in a sexual encounter was associated with lower odds of condom use, and this effect tended to be stronger for female respondents. When the analysis was stratified by age, the effect was significant for adolescents but not for adults. In considering why this might be the case, the authors noted that previous studies have shown that self-efficacy for condom use in the context of marijuana use is lower among adolescents compared to adults. They also noted that, being involved with homelessness or the criminal justice system, the youth in the studies they examined did not come from the general population, as did many of the adults in their analysis. More studies are needed with youth in the general population to determine if a similar relationship between marijuana and sexual risk behavior holds among youth in general.

Multiple event studies

Findings from multiple-event studies have not borne out findings from single-event studies. Brodbeck et al.⁵ asked participants aged 16-24 years to recall their most recent protected and unprotected episodes of intercourse with a new partner in the previous 2-year period. For the two episodes, they were asked to report on their marijuana and alcohol use and their intoxication before or during intercourse. Findings from the event

analyses indicated that participants used condoms just as frequently after having used marijuana as when having not used marijuana. In this sample, marijuana was seldom used prior to the most recent sexual event. In general, compared to nonusers, marijuana users had decreased intentions to use HIV protection, lower self-efficacy, and a more hedonistic and risky lifestyle, leading to more frequent risky sexual behavior.

Walsh et al.³⁶ assessed 297 college women monthly over a 12-month period. In each monthly survey, women who reported having engaged in either oral or vaginal sex during the past month were asked to report on their most recent encounter with both a romantic and a casual partner. Thus, each participant reported on 0-2 events per month for 12 months. They were asked if they had used a condom, consumed alcohol, or used drugs. If drug use was endorsed, participants were asked if they used marijuana, another drug, or both marijuana and another drug. They found no main effect of marijuana use on condom use; however, there was some indication that marijuana use with established romantic partners (i.e., lower risk partners) may increase the likelihood of unprotected sex. Condoms were used in 67% of events involving marijuana use and 61% of events not involving marijuana use.

Timeline follow back studies

A number of studies have used the timeline follow back (TLFB) calendar method to have participants report on their marijuana use and sexual risk behavior over the preceding 30-, 60-, or 90-day time period. Though retrospective and potentially covering multiple events over a large number of days, the TLFB method is considered to be highly reliable. Anderson et al.³⁷ used a 90-day TLFB interview with 308 women aged 18-24 who used marijuana. Findings indicated that a higher probability of sexual intercourse in general and unprotected sex in particular on days when marijuana was used. Marijuana use was strongly associated with condom nonuse on days participants had sex with casual (i.e., riskier) partners.

Metrik et al.³⁸ used a 60-day TLFB interview with 151 weekly (or more) marijuana users aged 18-30 to assess alcohol and marijuana use and sexual risk behavior. Results indicated that both alcohol and marijuana use were independently associated with greater odds of having sexual intercourse on a given day but were not associated with increased odds of unprotected sex with a casual partner. Marijuana had no other independent effect on sexual behavior; however, drinking heavily and using marijuana synergistically increased the likelihood of unprotected sex with a main partner. Notably, no women engaged in casual unprotected sex in the study sample.

Hayaki et al.³⁹ assessed alcohol and marijuana use and sexual risk behavior using a 90-day TLFB interview with 290 young adults aged 18-25 who reported use of alcohol or marijuana in the past 30 days and at least one episode of sex without a condom in the preceding 90 days. Findings indicated the likelihood of engaging in condomless vaginal intercourse with an opposite-sex partner increased under the influence of alcohol or marijuana alone, but even more so when both substances were used. Effects were stronger among women, who appeared more greatly affected by the influence of alcohol or marijuana use alone, but especially when combined with regard to the likelihood of engaging in condomless sex.

Finally, Gillman et al.⁴⁰ used a 30-day TLFB interview to assess quantity and frequency of marijuana and alcohol use and risky sexual behavior in 301 adolescents aged 14-18 years who were approaching release from a short-term youth detention facility. Participants were categorized as primary marijuana users (monthly marijuana use of 4-5 times or more and alcohol use of 2-3 times or less), primary alcohol users (monthly alcohol use of 4-5 times or more and marijuana use of 2-3 times or less), or dual marijuana and alcohol users (monthly marijuana and alcohol use of 4-5 times or more). Global and situational measures of substance use and sexual risk behavior were also examined. Results indicated that, both cross-sectionally and prospectively, primary marijuana users reported significantly less risky sexual behavior and greater intentions to use condoms than either primary alcohol users or dual users, with the latter groups consistently not differing from each other.

Daily diary studies

Daily diary studies are considered the most reliable of the multiple-event event-level studies because they do not rely on retrospective reports. Such studies should yield findings that speak the most to the question of whether marijuana use causes sexual risk-taking because they can look at the relationship within persons on the same day, over a span of days.

Hensel et al.⁴¹ studied 387 adolescent women who provided daily sexual diaries for 84 days that asked whether, on each day, they had vaginal sex, used a condom, used marijuana, and used alcohol. Each was a yes/no answer and timing of substance use and sex was not assessed. They found that marijuana and alcohol use were independently associated with an increased likelihood of vaginal sex (with or without condom use) but that neither alcohol nor marijuana use was associated with decreased likelihood of condom use if vaginal sex occurred.

Kerr et al.⁴² studied 284 college students (mostly women) who provided daily web-based reports for 24 days. Each day they were asked whether they had had vaginal intercourse or used marijuana (yes/no) and how many alcoholic beverages they drank. If they reported intercourse, they were asked whether they were drunk, were high on marijuana, used a condom, or used another form of birth control. Like Hensel et al., they found that marijuana and heavy alcohol use were independently associated with an increased likelihood of intercourse. However, condom use was no less likely when participants reported being high on marijuana during sex than when they reported they were not.

Basic Studies Elucidating Marijuana and Sexual Risk Behavior

Laboratory-based substance and placebo administration studies can eliminate confounding factors, determine dosage, control the timing so that substance use precedes sexual risk behavior, and measure intoxication levels in real time, but of course it is impossible to observe naturalistic sexual risk behavior in a laboratory setting. In these studies, researchers can establish causality, but they have to study outcomes that are mediators or indicators of actual sexual risk behavior, and there is always a question of how much these apply to persons' daily lives. Such studies can also help to contextualize equivocal findings from the other study types.

Metrik et al.⁴³ examined the effects of marijuana on risk-taking in the laboratory with 136 weekly (at least) marijuana users aged 18-30 using a balanced placebo design. In this design, whether participants are told they are receiving marijuana is independent of whether they actually receive marijuana. Accordingly, participants are randomly assigned to one of four groups: told no marijuana/receive no marijuana (control), told marijuana/receive no marijuana (placebo), told no marijuana/receive marijuana (anti-placebo), and told marijuana/receive marijuana (known-drug). This design enables researchers to disaggregate the effects of expecting to receive a drug (i.e., expectancy effects) from the effects of actually receiving a drug (i.e., pharmacological effects). Dependent measures included subjective intoxication, behavioral impulsivity, and decision-making related to risky behaviors. Findings indicated that those who expected to receive marijuana were more cautious, and among them, women perceived more risk from coercive sex. By contrast, actually receiving marijuana contributed to impaired inhibition and decreased expected positive consequences from risky sex. The authors posited that cautious expectancy effects for marijuana could offset the relatively mild pharmacological effects observed for marijuana and thus help to explain mixed findings in prior studies.

Skalski et al.⁴⁴ also used the balanced placebo design to examine whether marijuana acutely increased perceived sexual risk on a behavioral decision-making task and whether sex-related marijuana outcome expectancies influenced sexual risk decisions after marijuana administration. Participants were 126 heterosexual weekly (at least) marijuana users, 18-30 years old. Contrary to expectations, neither pharmacologic nor expectancy effects of marijuana influenced sexual decision making in the behavioral decision-making task. However, sex-related

outcome expectancies for marijuana use increased risk-taking among men in the placebo condition and among women in general. The researchers concluded that the relationship between marijuana use and risky sex is complex, with individual differences in cognitive factors such as sex-related marijuana outcome expectancies appearing to play a more important role than the observed minimal pharmacological impairments in decision-making.

Summary and Conclusions

In summary, marijuana use is relatively common among sexually active adolescents and emerging adults, populations at risk of harm from unprotected sex. The relationship between marijuana and sexual risk behavior has been widely researched in these populations using multiple levels of analysis. Global association studies consistently have shown a relationship between marijuana use and sexual risk taking in both adolescents and emerging adults, but these studies do not demonstrate that marijuana use causes sexual risk behavior. Effects could be accounted for by other variables such as use of other substances or individual differences in impulsivity or sensation seeking. These studies may simply show that riskier people do riskier things, including use marijuana and take sexual risks. Situational association studies are more strongly suggestive of a link, but also do not demonstrate that marijuana use causes sexual risk behavior. Event level studies provide the best evidence for causality, and while single event studies show a relationship between marijuana use and sexual risk-taking, evidence of a relationship diminishes in studies of multiple events, particularly daily diary studies, which would provide the strongest naturalistic evidence for causality. Accordingly, in the meta-analysis by Ritchwood et al.²¹, moderator analyses indicated that the largest effects for a relationship between adolescents' sexual risk behavior and substance use in general (and, by extension, marijuana use in particular) were found in studies in which substance use was measured at the situational level, followed by studies that measured substance use globally, and lowest in studies that measured substance use at the event level, with nonsignificant effects found in the event-level studies. Findings from lab-based studies may help to reconcile these equivocal findings. While marijuana use may indeed be capable of causing sexual risk-taking, it appears that individual differences in cognitive factors such as marijuana outcome expectancies are more important with regard marijuana's role in sexual risk behavior.

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