

The Relationship between Having Ever Used Alcohol and Marijuana and Cocaine and Hallucinogen Usage in the Past Year

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Introduction

Research inspiration:

- Gateway theory– *the idea that the use of one drug may lead users to using drugs that are more illicit, serious, or severe in their effects*– is the focus of much scientific debate (Nkansah-Amankra, S. Minelli M., 2016) (Reed, Z.E., Wootton R.E., Munafo, M.R., 2022) (Barry, A.E., et. al., 2016) (Griffin Jr. E.A., et. al., 2017) (Fredriksson, I. et. al., 2017) (Bretteville-Jensen, A.L., Melberg H.O., Jones A.M., 2008) (Hall, W.D., Lynskey M., 2005).
- Marijuana has become increasingly more popular, accepted, and legal (Gallup 2025).
- Some prefer using marijuana over alcohol (Caulkins 2024) (NSDUH 2024). **Roughly 18.1% of Americans used marijuana before they drank alcohol** (more than a sip) (American Addictions Center 2024).
- Can Marijuana be treated as a 'soft drug' that leads to the use of harder drugs? (Kirby T, Barry A.E., 2012) (Golub, A. L., Johnson B.D., 1998) (Peele, S., Brodsky, A., 1997).

Research questions:

- Does gateway theory apply differently based on the type of soft drug used/preferred and the type of hard drug used/preferred?
- Specifically, Have people who have used only marijuana or only alcohol (or both) used more cocaine in the last year? What about Hallucinogens?

Methods

Sample:

- Respondents (**n = 6,426 for cocaine, n = 8,817 for hallucinogens**) were drawn from the 2024 National Survey on Drug Use and Health study (NSDUH).
- This study randomly collected data (confidential, either through interview or online) on substance use, mental health issues, and drug treatments of the noninstitutionalized population of the 50 states and D.C. aged 12 years and above.

Measures:

- Observations were removed if the soft drug was used after the use of the hard drug.
- The number of days one used a drug in the past year were measured by the preference of the respondent (# of days per week) (# of days per month) etc. and then converted back into # of days per year. **(This question was only asked after the participant said they had done the drug in the last year at least once).**
- Participants were additionally asked whether or not they had used a certain drug
 - (for alcohol, more than just a sip)
 - (marijuana includes any form)
- Hallucinogens included a vast group of drugs with hallucinogenic properties including but not limited to: molly, LSD, psilocybin, salvia, etc.
 - Questions were asked for every one of these drugs similar to: "Have you ever, even once, used LSD, also called 'acid'?"

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Results



Discussion

Chi-Square

- Two chi-square tests for significance found a significant relationship between drugs ever used (only alcohol, only marijuana, both, neither) and having ever used cocaine (p-value < 0.05). The same was true for Hallucinogens (p-value < 0.05) (n = 51,830, and 48,590 respectively).

Regression of # of days used Cocaine

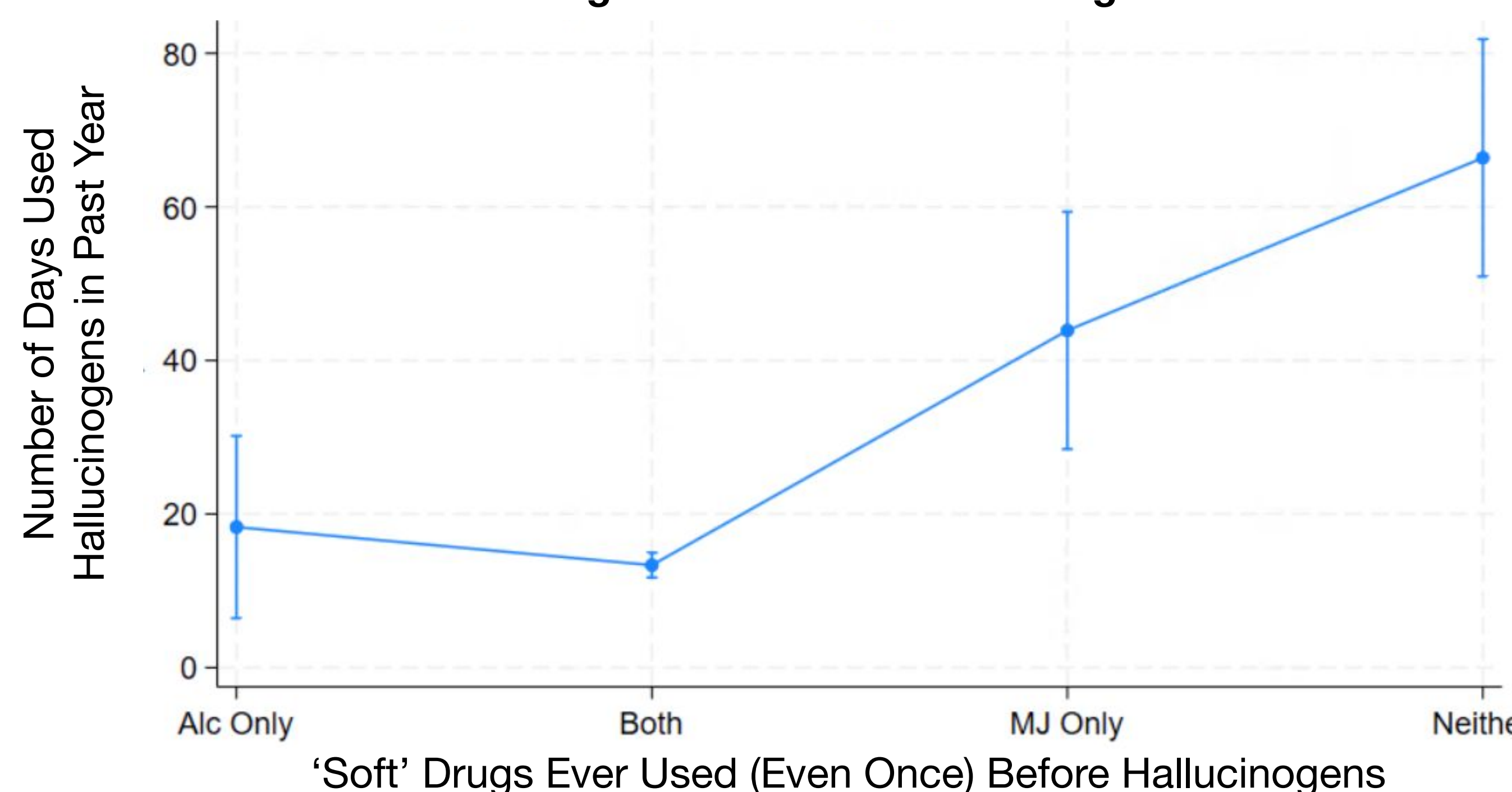
- The relationship between the number of days of cocaine used in the past year and having ever used alcohol was the only significant relationship (p-value < 0.05).
- The relationship was not significant for having used both, only marijuana, or neither (p-value = 0.054, 0.661, and 0.1 respectively).
- The constant for someone who has only consumed alcohol was 67.5 days per year.
- The correlation coefficient was negative for marijuana only (-13.36) and both (-30.29) but positive for neither (50.21)

Regression of # of days used Hallucinogens

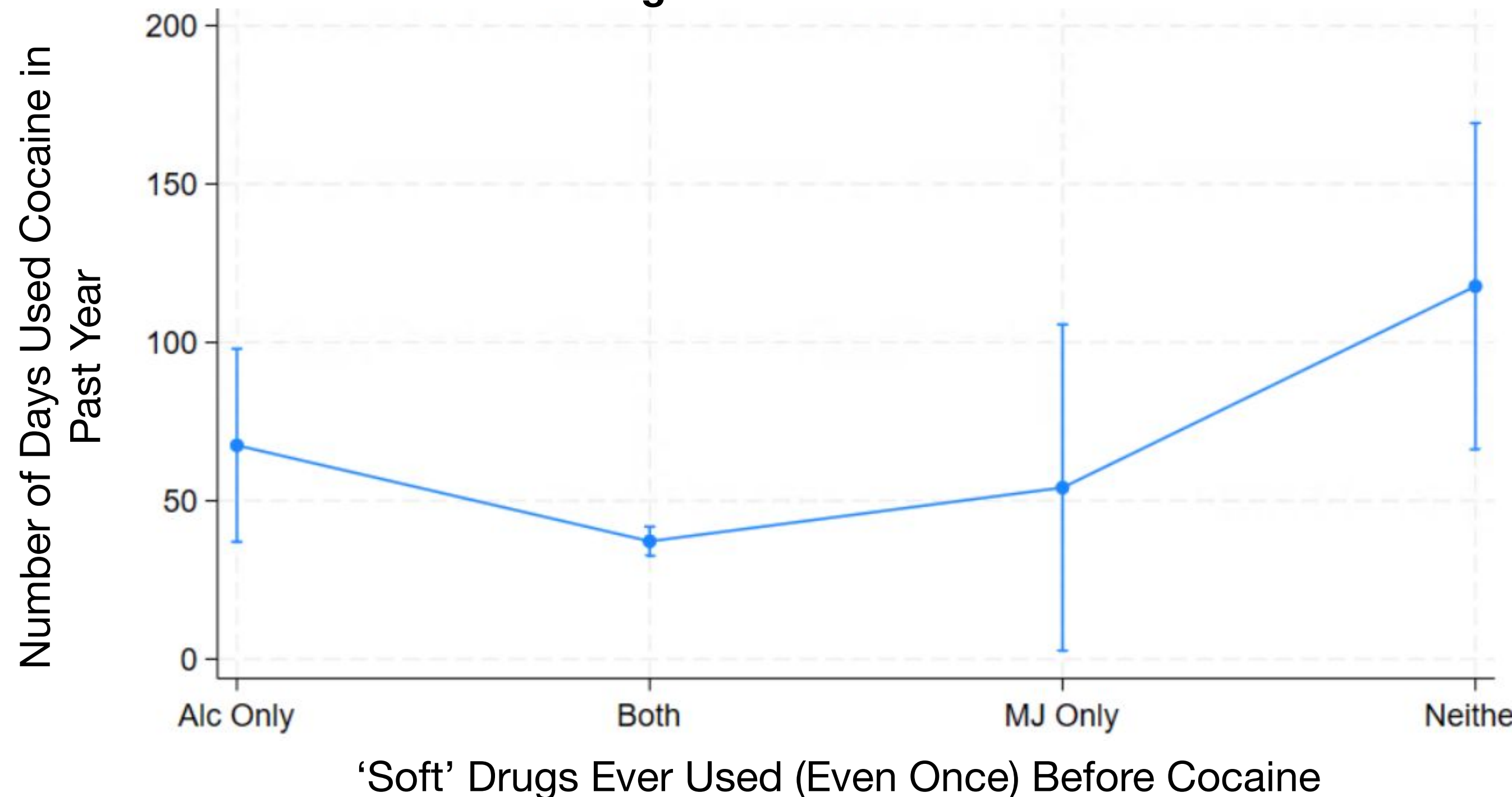
- The relationship between the number of days of hallucinogens used in the past year and having ever used **both** alcohol and marijuana was the only **not** significant relationship (p-value = 0.417).
- The relationship **was** significant for having used only alcohol, only marijuana, or neither (p-values < 0.05).
- The constant for someone who has only consumed alcohol was 18.31 days per year.
- The correlation coefficient was positive for marijuana (25.61) and neither (48.08) and but negative for both (-4.96).

- There was not a significant enough relationship to determine if this was true for marijuana and to conclude that people who have only ever used marijuana have used cocaine on more days in the past year than people who have used only alcohol.
 - Although no significant relationships could be determined, those who have only done marijuana on average have done less cocaine in the past year than those who have only ever consumed alcohol (out of cocaine users in the past year).
- There was a significant relationship between having used only marijuana, only alcohol, or neither and the number of days one has done hallucinogenic drugs in the past year. However, the large values of standard deviations of these results indicate that further research is necessary.
 - Having only ever used marijuana is indicated as having a stronger relationship with hallucinogenic usage in the past year than having only ever used alcohol.
- There is much more to be discussed about the preference in 'soft drugs' which was not explored here but still important to study.
- The 'neither' category may have unexpected results because of the small sample size
- The amount of people who have done marijuana and cocaine (or hallucinogens) but have never done alcohol is similarly small
- The both category had a larger standard deviation than displayed

The Number of Days Done Hallucinogens in the Past Year Versus Drugs Used Before Hallucinogens



The Number of Days Done Cocaine in the Past Year Versus Drugs Used Before Cocaine



- After controlling for both race and gender, the significance of the relationship between the number of days used cocaine in the past year and having used alcohol remained still significant (p-value < 0.05). The others remained insignificant.
- After controlling for both race and gender, the relationship between hallucinogen usage in the past year and having ever used marijuana, neither alcohol nor marijuana, and alcohol remained significant (p-value < 0.05), and remained not significant for both.

References

- Kirby T, Barry A.E. (2012). Alcohol as a gateway drug: a study of US 12th graders. *J Sch Health*. Aug; 82 (8):371-9. doi: 10.1111/j.1746-1561.2012.00712.x. PMID: 22712674. <https://pubmed.ncbi.nlm.nih.gov/22712674/>
- Lindsay JA, Stotts AL, Green CE, Herin DV, Schmitz JM. (2009). Cocaine dependence and concurrent marijuana use: a comparison of clinical characteristics. *Am J Drug Alcohol Abuse*. 2009;35(3):193-8. doi: 10.1080/00952990902933860. PMID: 19462304; PMCID: PMC3788597. <https://pubmed.ncbi.nlm.nih.gov/articles/PMC3788597/>
- Bretteville-Jensen, A.L., Melberg H.O., Jones A.M. (2008). Sequential patterns of drug use initiation - Can we believe in the gateway theory? *B E Journal of Economic Analysis & Policy*, 8 (2) Jan. 01 2008. <https://ideas.repec.org/a/bpp/beieap/v8y2008i2n1.html>
- Fredriksson, I. et. al. (2017). Prior Exposure to Alcohol Has No Effect on Cocaine Self-Administration and Relapse in Rats: Evidence from a Rat Model that Does Not Support the Gateway Hypothesis. *Neuropsychopharmacology*, 42 (5), 1001-1011 DOI:10.1038/npp.2016.209 <https://pubmed.ncbi.nlm.nih.gov/27649640/>
- Barry, A.E., King J., Sears C., Harville C., Bondoc I., Joseph K. (2016). Prioritizing Alcohol Prevention: Establishing Alcohol as the Gateway Drug and Linking Age of First Drink With Illicit Drug Use. *J School Health*, 86: 31-38. <https://doi.org/10.1111/josh.12351>
- Caulkins, J. P. (2024). Changes in self-reported cannabis use in the United States from 1979 to 2022. *Addiction*, 119 (9), 1648-1652. <https://doi.org/10.1111/add.16519>
- Hall, W.D., Lynskey M. (2005). Is cannabis a gateway drug? Testing hypotheses about the relationship between cannabis use and the use of other illicit drugs. *Drug and Alcohol Review*, 24: 39-48. <https://doi.org/10.1080/09595230500126698>
- Nkansah-Amankra, S. Minelli M. (2016). 'Gateway hypothesis' and early drug use: Additional findings from tracking a population-based sample of adolescents to adulthood. *Preventive Medicine Reports*, 4: 134-141, ISSN 2211-3355. <https://doi.org/10.1016/j.pmedr.2016.05.003>
- Golub, A. L., Johnson B.D. (2002). The misuse of the 'Gateway Theory' in US policy on drug abuse control: A secondary analysis of the muddled deduction. *International Journal of Drug Policy*, 13, 1: 5-19. ISSN 0955-3959. [https://doi.org/10.1016/S0955-3959\(01\)00111-6](https://doi.org/10.1016/S0955-3959(01)00111-6)
- Wagner, F.A. Anthony J.C. (2002). Into the World of Illegal Drug Use: Exposure Opportunity and Other Mechanisms Linking the Use of Alcohol, Tobacco, Marijuana, and Cocaine. *American Journal of Epidemiology*, 155 (10), 918-925. <https://doi.org/10.1093/aje/k155.10.918>
- Peele, S., Brodsky, A. (1997). Gateway to Nowhere: How Alcohol Came to be Scapegoated for Drug Abuse. *Addiction Research*, 5(5), 419-425. <https://doi.org/10.3109/16066359709004356>
- Wagner, F., Anthony, J. (2002). From First Drug Use to Drug Dependence: Developmental Periods of Risk for Dependence upon Marijuana, Cocaine, and Alcohol. *Neuropsychopharmacol* 26, 479-488. [https://doi.org/10.1016/S0893-133X\(01\)00367-0](https://doi.org/10.1016/S0893-133X(01)00367-0)
- Griffin Jr. E.A., et. al. (2017). Prior alcohol use enhances vulnerability to compulsive cocaine self-administration by promoting degradation of HDAC4 and HDAC5. *Sci. Adv.* 3, e1701682 (2017). DOI:10.1126/sciadv.1701682 <https://pubmed.ncbi.nlm.nih.gov/29109977/>
- Editorial Staff. The Real Gateway Drug. *American Addictions Centers*. Dec. 31, 2024. Accessed Jan. 30, 2026. <https://americanaddictionscenters.org/the-real-gateway-drug>
- McCarthy, Justin. Americans Much More Positive About Progress on Drugs. *Gallup*. Social & Policy Issues, Nov. 5, 2025. <https://news.gallup.com/poll/697445/americans-positive-progress-drugs.aspx?text=Sup%20port%20for%20legal%20marijuana%20remains.60%25%20or%20higher%20since%2006>