Poly-substance use, treatment completion, and contact with the justice system: a multistate analysis of treatments for substance use disorders between 2010-2019 in Chile

A. González-Santa Cruz[1,2], J. Ruiz-Tagle Maturana[1,3], M. Mateo Piñones[1,4], A. Castillo-Carniglia[5]

[1] Young Researcher, Millennium Nucleus for the evaluation and analysis of Drug Policies
[2] Ph.D. student, School of Public Health, Universidad de Chile
[3] Ph.D. student, Programa de Doctorado en Políticas Públicas, Universidad Mayor, Santiago, Chile.
[4] Ph.D. student, Griffith University, Australia
[5] Director, Millennium Nucleus for the evaluation and analysis of Drug Policies; Associate Professor, Society & Health Research Center

Background

Substance use disorders (SUD) often co-occur with criminality, including violence, arrests, and incarceration[1;2;3]. People with polysubstance use (PSU) are considered a high-risk population, as they are associated with mortality, relapse, and contact with the criminal justice system (CJS)[4;5;6]. Although completing SUD treatment is linked with better outcomes, including preventing contact with CJS, the role of treatment completion in the link between PSU and contact with CJS is unclear[7;8]. Studies have found mixed evidence regarding the association between PSU and treatment completion rates[9;10;11;12]. Thus, it is crucial to determine the role of treatment completion in order to improve outcomes in people with PSU. However, analyzing the role of treatment outcomes in people with PSU is challenging, as there is limited research on this population in Latin America, and high-risk populations have often been overlooked[13;14;15]. The study contributes to a growing literature on the importance of addressing longitudinal dynamics in specific profiles of SUD patients. Studying the link between PSU, treatment completion, and criminality is crucial for evidence-based strategies to address SUD-related issues. Effective interventions and tailored approaches for people with PSU can mitigate societal and individual harms stemming from SUDs and criminal behavior.

Objectives: We aim to estimate the effects of PSU at baseline (vs. single substance use) on the probabilities of (i) completing baseline drug treatment and (ii) contacting with the criminal justice system after treatment, using multistate survival models at 6 months, 1-, 3- and 5-years follow-ups.

Methods

Design: a retrospective cohort based on the administrative data's record linkage. **Data**: Chilean substance use treatment programs and Prosecutor's Office through a deterministic linkage process. **Ethics**: We are in the process of an amendment to an existing ethical approval from a study using the same data (by the Griffith University Human Research Ethics Committee GUHREC, GU Ref No: 2022/919).

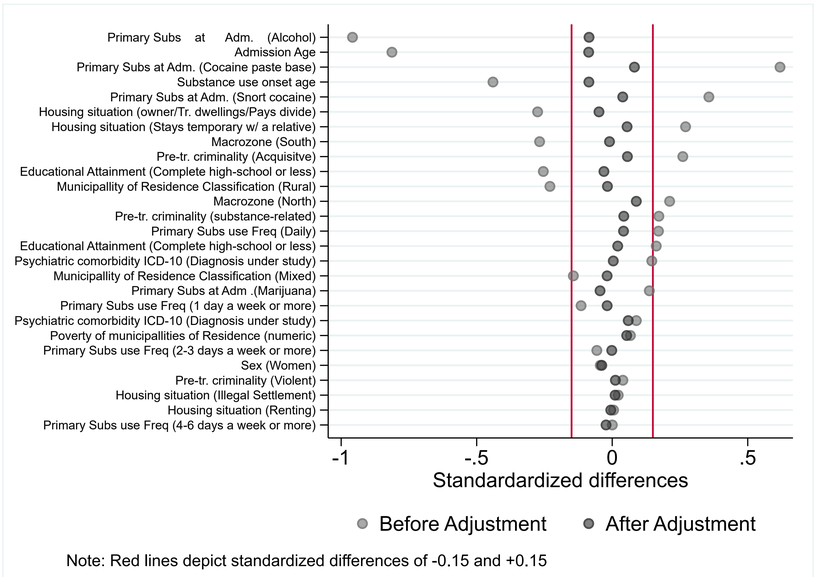
Variables

Exposure: baseline PSU (using more than one main substance among alcohol and illicit drugs at admission to SUD treatment); **Mediator**: SUD treatment outcome (complete vs. dropout or spelled by misconduct); **Outcome**: contact with CJS (committing an offense that led to a condemnatory sentence).

Analytical Plan

The study controlled for various confounding variables listed in Figure 1. Patients were weighted by the inverse probability of PSU (IPWs) based on several predictors. Weights were truncated at the 1st and 99th percentiles to avoid aberrant weights[16].

We described the cumulative incidence rate (x1,000 person-years) of patients with PSU and no PSU at admission, and incidence rate ratios (IRR) of treatment completion and contact with CJS, with and without weighting for the inverse probabilities of PSU at admission (`stset reset_time [pw=inverse_probability_weights] id(id) ...` command in Stata).



Note: Red lines depict standardized differences of -0.15 and +0.15

Figure 1: Covariate balance

We used the illness-death multistate structure to estimate transitions from admission to treatment outcome, treatment outcome to contact with CJS, and admission to contact with CJS (i.e., without completing treatment) for patients with PSU and no PSU.

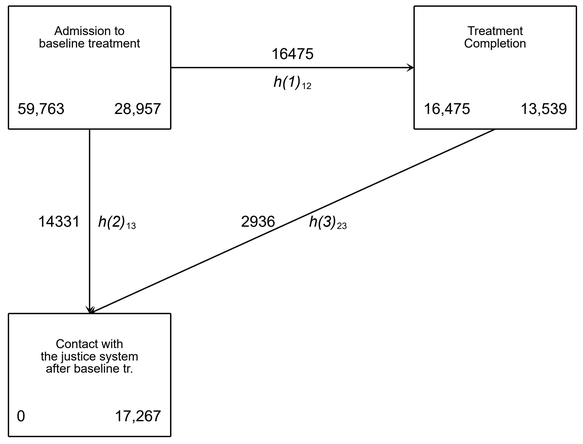


Figure 2: Multistate scheme

We calculated the Aalen-Johansen estimator for transition probabilities at 6 months, 1, 3 & 5 years using `multistate` in Stata [17]. Future analyses will focus on mediating effects of treatment outcome and using a time-to-first-event approach[18;19;20]. Markdowns & codes are available on https://fondecytacc.github.io/nDP/index_prop_grant23_24.html.

Preliminary Results

- Before IPWs, patients with PSU (56.4 95%CI: 55.3,57.5) had lower incidence rates of treatment completion vs. patients with no PSU (107.5 95%CI: 104.4,110.5) IRR=0.53 95%CI: 0.51,0.54. However, patients with PSU (90.7 95%CI: 89.4,92.1) had greater rates of contact with the CJS vs. patients with no PSU (54.1 95%CI: 52.3,55.9) IRR=1.68 95%CI: 1.62,1.74.
- After IPWs, patients with PSU (67.4 95%CI: 65.9,69.0) still had lower rates of treatment completion vs. patients with no PSU (87.0 95%CI: 83.5,90.6) IRR=0.77 95%CI: 0.74,0.8, and patients with PSU (80.3 95%CI: 78.8,81.7) also had greater rates of contact with the CJS vs. patients with no PSU (72.2 95%CI: 69.0,75.5) IRR=1.11 95%CI: 1.06,1.17.

Table 1: Transition probabilities in states

Transition	Time	PSU	No PSU
From admission to contact with CJS	6_mths	2.2 (2.1,2.3)	1.8 (1.7,1.9)
From admission to contact with CJS	1_yr	7.9 (7.6,8.1)	6.6 (6.4,6.8)
From admission to contact with CJS	3_yrs	24.4 (24.0,24.7)	20.7 (20.3,21.1)
From admission to contact with CJS	5_yrs	33.3 (32.8,33.7)	29.5 (29.0,30.0)
From admission to tr.completion	6_mths	3.1 (2.9,3.2)	4.0 (3.9,4.2)
From admission to tr.completion	1_yr	14.6 (14.3,14.8)	17.6 (17.3,18.0)
From admission to tr.completion	3_yrs	23.6 (23.2,23.9)	27.0 (26.6,27.4)
From admission to tr.completion	5_yrs	21.4 (21.0,21.8)	24.9 (24.4,25.3)
From tr.completion to contact with CJS	6_mths	3.0 (2.0,4.0)	2.4 (1.3,3.4)
From tr.completion to contact with CJS	1_yr	8.7 (7.5,9.8)	5.9 (4.8,7.0)
From tr.completion to contact with CJS	3_yrs	21.1 (20.0,22.3)	16.2 (15.1,17.3)
From tr.completion to contact with CJS	5_yrs	28.6 (27.4,29.8)	23.0 (21.8,24.2)

Transition probabilities: People with PSU have higher probabilities of contact with the CJS, both post-admission and post-treatment, vs. those without PSU. Similarly, they are less likely to complete treatment. Treatment completers had lower probabilities of CJS contact vs. non-completers after 3 years since admission (Table 1).

Discussion

Treatment completion can reduce the risk of criminal justice involvement, evident at the 3-year point when most users have finished treatment. Further analysis is needed. People with PSU may need enhanced treatment to complete treatments and avoid contact with the CJS.

References

[1] A. A. Duke et al. "Alcohol, drugs, and violence: A meta-meta-analysis.". In: *Psychology of Violence* 8.2 (mar.. 2018), pp. 238-249. ISSN: 2152-081X. DOI: 10.1037/vio0000106.

[2] N. F. Sugie et al. "Beyond Incarceration: Criminal Justice Contact and Mental Health". In: *American Sociological Review* 82.4 (ago.. 2017), pp. 719-743. ISSN: 0003-1224. DOI: 10.1177/0003122417713188.

[3] E. G. Thomas et al. "Association between contact with mental health and substance use services and reincarceration after release from prison". In: *PLOS ONE* 17.9 (sept.. 2022), p. e0272870. ISSN: 1932-6203. DOI: 10.1371/journal.pone.0272870.

[4] A. N. Hassan et al. "Polydrug use disorders in individuals with opioid use disorder". In: *Drug and Alcohol Dependence* 198 (may.. 2019), pp. 28-33. ISSN: 03768716. DOI: 10.1016/j.drugalcdep.2019.01.031.

[5] L. Wang et al. "Polydrug use and its association with drug treatment outcomes among primary heroin, methamphetamine, and cocaine users". In: *International Journal of Drug Policy* 49 (nov.. 2017), pp. 32-40. ISSN: 09553959. DOI: 10.1016/j.drugpo.2017.07.009.

[6] J. A. Ford et al. "Types of criminal legal system exposure and polysubstance use: Prevalence and correlates among U.S. adults in the National Survey on Drug Use and Health, 2015â€ 2019". In: *Drug and Alcohol Dependence* 237 (ago.. 2022), p. 109511. ISSN: 03768716. DOI: 10.1016/j.drugalcdep.2022.109511.

[7] H. W. Andersson et al. "Relapse after inpatient substance use treatment: A prospective cohort study among users of illicit substances". In: *Addictive Behaviors* 90 (mar.. 2019), pp. 222-228. ISSN: 03064603. DOI: 10.1016/j.addbeh.2018.11.008.

[8] C. Timko et al. "Systematic Review of Criminal and Legal Involvement After Substance Use and Mental Health Treatment Among Veterans: Building Toward Needed Research". In: *Substance Abuse: Research and Treatment* 14 (ene.. 2020), p. 117822181990128. ISSN: 1178-2218. DOI: 10.1177/1178221819901281.

[9] J. Levola et al. "Psychosocial difficulties and treatment retention in inpatient detoxification programmes". In: *Nordic Studies on Alcohol and Drugs* 38.5 (oct.. 2021), pp. 434-449. ISSN: 1455-0725. DOI: 10.1177/14550725211021263.

[10] H. W. Andersson et al. "Emerging Adults in Inpatient Substance Use Treatment: A Prospective Cohort Study of Patient Characteristics and Treatment Outcomes.". In: *European addiction research* 27.3 (2021), pp. 206-215. ISSN: 1421-9891. DOI: 10.1159/000512156.

[11] H. W. Andersson et al. "Predictors of Dropout From Inpatient Substance Use Treatment: A Prospective Cohort Study". In: *Substance Abuse: Research and Treatment* 12 (ene.. 2018), p. 1178221818760555. ISSN: 1178-2218. DOI: 10.1177/1178221818760551.

[12] D. Basu et al. "Initial treatment dropout in patients with substance use disorders attending a tertiary care de-addiction centre in north India". In: *Indian Journal of Medical Research* 146.8 (2017), p. 77. ISSN: 0971-5916. DOI: 10.4103/ijmr.IJMR_1309_15.

[13] J. C. Reyes et al. "Prevalence and Patterns of Polydrug Use in Latin America: Analysis of Population-based Surveys in Six Countries". In: *Review of European Studies* 5.1 (feb.. 2013). ISSN: 1918-7181. DOI: 10.5539/res.v5n1p10.

[14] R. Santis B et al. "Consumo de sustancias y conductas de riesgo en consumidores de pasta base de caca'ina no consultantes a servicios de rehabilitación". In: *Revista médica de Chile* 135.1 (ene.. 2007). ISSN: 0034-9887. DOI: 10.4067/S0034-98872007000100007.

[15] C. F. Olivari et al. "Polydrug Use and Co-occurring Substance Use Disorders in a Respondent Driven Sampling of Cocaine Base Paste Users in Santiago, Chile". In: *Journal of Psychoactive Drugs* 54.4 (ago.. 2022), pp. 348-357. ISSN: 0279-1072. DOI: 10.1080/02791072.2021.1976886.

[16] S. R. Cole et al. "Constructing Inverse Probability Weights for Marginal Structural Models". In: *American Journal of Epidemiology* 168.6 (jul.. 2008), pp. 656-664. ISSN: 0002-9262. DOI: 10.1093/aje/kwn164.

[17] M. J. Crowther et al. *MULTISTATE: Stata module to perform multi-state survival analysis.* ene.. 2023. <URL: https://econpapers.repec.org/RePEc:boc:bocode:s458207>.

[18] T. J. VanderWeele. "Causal Mediation Analysis With Survival Data". In: *Epidemiology* 22.4 (jul.. 2011), pp. 582-585. ISSN: 1044-3983. DOI: 10.1097/EDE.0b013e318211db37e.

[19] P. Lambert. *STPM2: Stata module to estimate flexible parametric survival models.* Statistical Software Components, Boston College Department of Economics. feb.. 2010. <URL: https://ideas.repec.org/c/boc/bocode/s457128.html>.

[20] M. Hill. "Development and application of methods in parametric survival models: interval censoring, inverse probability weighting and multistate survival models". University of Leicester, 2022. <URL: https://doi.org/10.25392/leicester.data.21533514.v1>.

Funding sources

- This work was funded by ANID -Millennium Science Initiative Program- N° NCS2021_003 (Castillo-Carniglia) and N° NCS2021_013 (Calvo); The authors have no conflict of interest to declare