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

I. Background

Substance use disorders (SUD) are related to criminality, such as violence[1], arrests[2] or incarceration[3]. A considerable proportion of people with SUD use multiple substances during active use in their lifetime[4,5]. People with polysubstance use (PSU) are considered a high-risk population not only due to its association with mortality[6], relapse[7] and other detrimental outcomes[6,8,9], but also because of its high prevalence among people in contact with the criminal justice system (CJS)[10,11]. Importantly, the mediating role of treatment completion on the link between PSU and contact with CJS remains unclear.

Completing SUD treatment is associated with better outcomes, including preventing contact with CJS[12–15]. Although PSU has been used to predict contact with CJS[16–18], the evidence regarding its role in treatment outcomes is mixed. Some studies report a lower likelihood of treatment completion among people with PSU[19–21], while others found no association[22] or higher completion rates[23]. Thus, it is crucial to determine the role of treatment completion in order to improve outcomes in people with PSU.

The relationship between people with PSU, treatment completion, and contact with CJS can be affected by factors such as treatment goals, patient characteristics, resource availability, and SUD severity profiles which are highly contingent on treatment settings[24–26]. Thus, analyses must account for differences in treatment settings.

Additionally, studying the role of treatment outcomes is challenging due to limited research on people with PSU in Latin America[27]. Furthermore, like many studies in the global north, high-risk populations have often been overlooked[28]. An analysis of data from studies conducted in six Latin American countries found that 21% of participants were people with PSU, and males, people aged 18-34 from Chile, Uruguay, and Argentina, were more likely to report PSU[28]. Similarly, studies conducted in Chilean hard-to-reach populations have associated PSU with school dropout, unemployment, sexual risk, and antisocial behaviors[29–31].

Although the relationship between SUD and contact with CJS is documented in the global north[32], little is known about the effect of treatment outcomes among people with PSU in other contexts. This study aims to estimate the mediating effects of completing SUD treatment on the link between PSU and contact with CJS among adult patients admitted to SUD treatment programs in Chile during 2010-2019. Understanding this relationship could inform effective prevention and intervention strategies for PSU and provide insight into the effectiveness of SUD treatment in reducing the risk of contact with CJS among individuals with baseline PSU in Chile. This study contributes to a growing literature on the importance of addressing longitudinal dynamics in specific profiles of SUD patients.

II. Research questions, aims, and hypothesis

- **Research question:** What are the mediating effects of completing SUD treatment on the relationship between baseline PSU and contact with CJS in Chile in the short (six months), middle (one year), and long term (three years)?
- **Aims:** Estimate the mediating effects of completing SUD treatment on the relationship between PSU at admission and contact with CJS among adult patients admitted to SUD treatment programs in Chile during 2010-2019. Specific: (1) To describe the prevalence of PSU, treatment completion, and contact with CJS in the sample, (2) to compare the risk of contact with CJS between people with poly and single-substance use, and (3) to estimate the proportion of the effect of PSU and treatment outcome on the contact with CJS.
- **Hypothesis:** Baseline PSU is related to lower treatment completion rates (1), baseline PSU is linked to a greater risk of contact with CJS (2), patients with PSU will have a differential risk of contact with CJS associated with treatment completion, and treatment completion will explain part of the relationship between PSU and contact with CJS (3).

III. Methodology

This research design is a retrospective cohort based on the administrative data's record linkage. The study will use data from Chilean SUTs programs and Prosecutor's Office through a deterministic linkage process. We will request an amendment to an existing ethical approval from a study using the same data. The exposure variable will be the baseline PSU (using more than one main substance among alcohol and illicit drugs at admission to SUD treatment, whether sequential or concurrent)[33,34], the mediator variable will be SUD treatment outcome (complete vs. dropout or spelled by misconduct), and the outcome will be contact with CJS (offense that led to a condemnatory sentence). The study will control for various confounding variables related to substance use, demographics, and social factors through weights generated through the inverse probability of PSU[27]. We will use the illness-death multistate model to simultaneously estimate transitions between admission and treatment

outcome, treatment outcome and contact with CJS, and admission and contact with CJS (without completing treatment). We will then calculate the Aalen-Johansen estimator for transition probabilities at 6 months, 1 and 3 years[35]. Secondary analyses will focus on mediation, estimating the effects of PSU given treatment outcome at 6 months, 1 and 3 years using a standard time-to-first-event approach. Proportions mediated will be estimated using the bootstrap method or m-estimation of standard errors. We also plan to run separate analyses on patients admitted to different treatment settings. Preliminary markdowns are available here.

IV. Project milestones

- **Progress report:** It will include: a theoretical framework and descriptive analyses exploring the connections between PSU, SUT outcome, and contact with CJS.
- **Paper:** Sent to a Substance Abuse, Criminology or Public Health international journal before month 12 of the study.
- **Presentation in Scientific meetings:** Our goal is to present this study at least at one international conference, such as the Society for Epidemiologic Research or similar, and in possible scientific community activities organized by Universidad de Chile or other national institutions.

V. Research team

Our research team has experience in public health and criminology and skills in using large datasets in substance use epidemiology, program and policy evaluation, and treatment research (See Table 1). Previously, part of the team collaborated on SUT policy analysis publications.

Table 1. Research team.

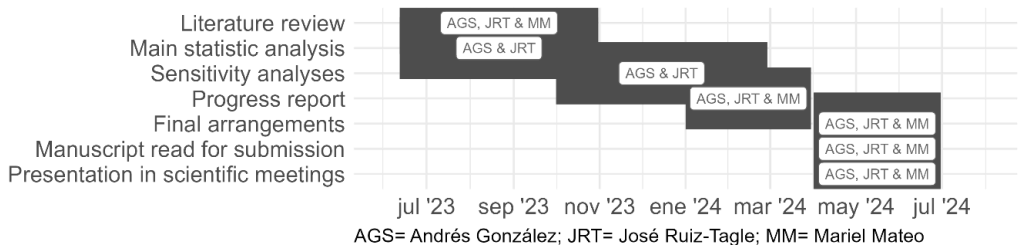
Name	Role	Expertise	Time spent
Andrés González	P.I.	Ph.D. student (School of Public Health, Universidad de Chile). He has worked as technical staff in research related to occupational health and SUD treatments. He has been working on the Treatment patient's dataset since 2019, collaborating with Dr. Castillo-Carniglia o several papers	*6 hours per week*
José Ruiz-Tagle	Co-I	Ph.D. student (Public Policy, Universidad Mayor). He has worked on research projects related to substance use treatments. He also has been working on the dataset on Treatment patients since 2019 along with Dr. Castillo-Carniglia. He collaborated in the analysis of several papers linked to SUD.	*3 hours per week*
Mariel Mateo	Co-I	Ph.D. student (School of Criminology and Criminal Justice, Griffith University, Australia). She coordinated the first Outcome Study of Substance Use Treatment in Chile and led the Drug research area in the Justice and Society Studies Centre (Pontificia Universidad Católica) between 2015 and 2019.	*2 hours per week*
Álvaro Castillo-Carniglia	Sup	Ph.D., Associate professor, and Director of the Ph.D. Programme in Public Policy, Universidad Mayor. He has a background in epidemiology, and his main research areas are the measurement of SUDs in the population. He has co-directed several theses in public health related to treatment dropouts and readmissions.	*2 hours fortnight*

Note: P.I.: Principal Investigator; Co-I: Co-Investigator; Sup.: Supervisor.

VI. Timeline

Based on the work carried out in the 2022 intramural fund, we will delve into the transformation and processing of data following a longitudinal perspective of nested events by subjects. Additionally, a significant amount of time will be devoted to discussing and implementing knowledge of causal inference involved in the analysis. The process is summarized in Figure 1.

Figure 1. Gantt chart of activities involved in research progress.



AGS= Andrés González; JRT= José Ruiz-Tagle; MM= Mariel Mateo

VII. Budget

Funds will be used to cover expenses for attending international conferences and a virtual computer (e.g., an annual subscription to DataCamp Teams). The cost of attending international conferences is between 2,000-4,000 USD[36]. Thus, the funds should cover a great portion of these expenses. Also, it can be used for workshops, manuscript editing (if needed), and as an incentive for the researchers.

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