Assessing the impact of substance use treatment for preventing criminal justice system contact in Chile

I. Background

Substance use can affect health and a variety of social dimensions, including criminal behaviour and the likelihood of contact with the justice system. Substance use treatment (SUT) is one possible intervention used to reduce such criminogenic issues, and indeed, there is considerable research showing that reducing substance abuse through effective treatment leads to a reduction in criminal activity [1].

However, most of the prior evidence comes from developed countries and regions (e.g., the United States, Australia, and Western Europe), and results from the Latin American context are largely unknown [2]. Using results from other regions, particularly from high-income countries, can be misleading because the context, populations, and specific nature of substance use disorders are different (e.g. prevalence rates in Latin-American tend to be lower for heroin, while higher for alcohol and noninjected drugs, such as cocaine [3]), along with the fact that such SUT are designed to the country-specific epidemiologic context (e.g., harm reduction or emphasis on detoxification) [4]. Moreover, international research usually assesses structured intervention approaches (e.g., cognitive-behavioural) that are differentiated according to specific substances (e.g., heroin); such targeted approaches may not reflect the reality of other contexts like Chile and other Latin-American countries. Indeed, Chilean SUT policy is an interesting case of study as it is one of the oldest and most developed systems in Latin America [5]. While it employs multiple SUT intervention approaches, it does not consider specific interventions according to specific substances. This feature makes it worthy of note, as most studies on SUT impact have been restricted to randomized controlled trials or pre-post observational studies, focusing on either a specific approach or specific substance. To date, there has been limited research on an integrated SUT approach across substances, into large-scale, longitudinal, multi-site treatment, as well as studies on administrative data-based outcomes [6]. This represents a gap in the research on SUT policy.

The present proposal aims to examine the impact of SUT for the prevention of contact with the criminal justice system in Chile, in the short (3 and 6 months), middle (1 year), and long term (3 years). To explore this, we use a retrospective cohort design, linking two administrative data sets, which include the population of people of 18+ years of age in publicly-funded Chilean SUT programs, with the National prosecutor's data of all criminal causes registered for this population in the period 2010-2019. This study will generate evidence to the body of literature on the effects of substance use treatment and on the drug-crime link in the criminology field. Also, this study tribute directly to nDP research related to the impact evaluation of drug policies. These results can have a direct public health impact by informing about the benefits and potential pitfalls of the current SUT system.

II. Research questions, aims, and hypothesis

- **Research question:** What is the impact of SUT on preventing contact with the criminal justice system in Chile, in the short (3 and 6 months), middle (1 year), and long term (3 years)?
- **Aims:** (1) Describe the contact with the criminal justice system of the Chilean population according to the end status of their recorded treatment (i.e., early dropout, therapeutic discharge) at baseline; (2) Estimate the short, middle, and long-term effect of SUT on the probability of contact with the criminal justice system, according to different treatment end statuses.
- **Hypothesis:** Patients who achieve treatment completion have a lower probability of being in contact with the criminal justice system compared to patients who do not complete treatment, although this effect may decrease as observation time passes (3 and 6 months, 1 year, and 3 years).

III. Methodology

This research relies on a population-based record-linkage retrospective cohort design. We will use a deterministic linkage process (using encryption of the Chilean Unique National ID) to merge electronic records of individuals in publicly funded SUT between 2010 and 2019 (n=85,048) with the Prosecutor's Office data at the national level (more information in Annex 1 & 3). The main exposure variables will be the treatment outcomes (administrative discharge, early and late dropouts, therapeutic discharge). However, the so-called "revolving-door syndrome" have been observed either in SUT and judiciary events [7]. Preliminary analyses showed that individual characteristics may be different between patients who completed treatment and who did not (See Annex 2). Hence, our main analytic approach will be to use non/semi/parametric survival models (e.g., multistate, incubation periods, hidden-Markov), to estimate the risks and time-to-event of different treatment outcomes to contact the criminal justice system while adjusting for characteristics of patients at baseline [8,9,10,11]. As the study progresses, we may incorporate other strategies or models to strengthen the analysis. For data analysis progress to date, please refer to Annex 1 to 4.

IV. Project milestones

- **Progress report:** It will include: (1) A theoretical framework of the mechanisms linking substance use, SUT and criminal behaviours; (2) a descriptive analysis (Aim 1).
- **Paper:** Sent to a Substance Abuse, Criminology or Public Health international journal before the months 12 of the study (Aim 1 and 2).
- **Presentation in Scientific meetings:** Our goal is to present this study at least at one international conference such as the National Institute on Drug Abuse International Forum, or similar, and in possible scientific community activities organized either by Griffith University (Australia), Universidad de Chile or other national institutions.

V. Research team

Our research team has extensive experience in the fields of public health and criminology and has strong skills in the use of 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 [12, 13,14].

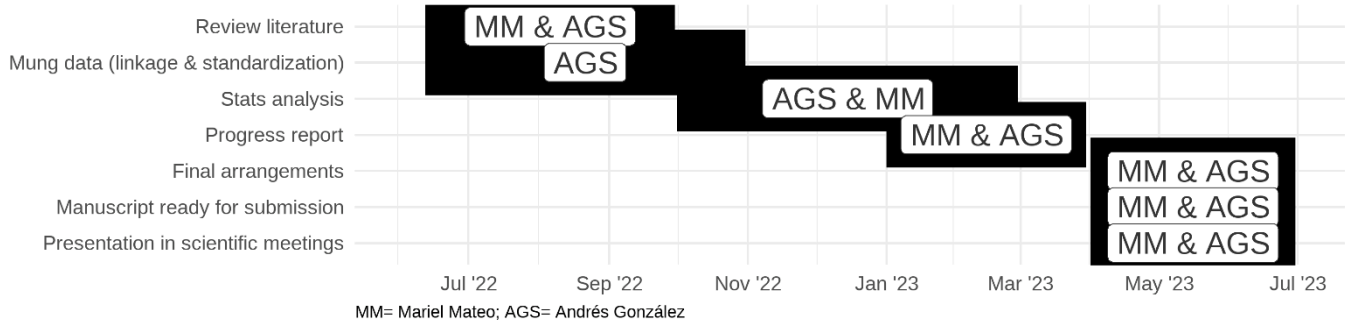
Table 1. Research Team

	Role	Expertise	Time spent on the project
Mariel Mateo	P.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 [15] and led the Drug research area in the Justice and Society Studies Centre (Pontificia Universidad Católica) between 2015 and 2019.	*6 hours per week*
Andrés González	Co-I	Ph.D. student (School of Public Health, Universidad de Chile). He has worked as technical staff in research related to occupational health and substance use treatments. He has been working on the dataset on Treatment patients since 2019 along with Dr. Castillo-Carniglia. He collaborated in the analysis of several papers [13,14]	*3 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 background in epidemiology and his main research areas are the measurement of alcohol and other drug use in the population. He has co-directed several theses in public health related to treatment dropouts and readmissions.	*2 hours fortnight*
Christine Bond	Sup.	Ph.D., Professor, Griffith University. She has a background in criminology and outcome evaluations. Her role in this project will be to guide the analysis.	*2 hours fortnight*
Tara McGee	Sup.	Ph.D., Professor, Griffith University. She holds a long experience in criminology and longitudinal data analysis.	*2 hours fortnight*
Note: P.I.: Principal Investigator; Co-I: Co-Investigator; Sup.: Supervisor.			

VI. Timeline

As the exercise of merging two different administrative datasets is demanding, an important part of the time will be devoted to the validation and merging of the data. Such exercise will allow answering not just the present research question but also for future research.

Figure 1. Gantt chart of activities involved in research progress



Note. MM= Mariel Mateo; AGS= Andrés González.

VII. Budget

The study budget will be used as conference registration (if needed), workshops helpful to update and strengthen knowledge necessary to analyze time-to-event data, manuscript edition, and as an incentive for the researcher who will lead and spend more time working on the study (Mariel Mateo).

References

[1] Prendergast, M., Podus, D., Chang, E., & Urada, D. (2002). The Effectiveness of Drug Abuse Treatment: a Meta-analysis of Comparison Group Studies. *Drug and Alcohol Dependence*, 53-72.

[2] Klingemann, H. (2020). Successes and Failures in Treatment of Substance Abuse: Treatment System Perspectives and Lessons from the European Continent. *Nordisk Alkohol-* and *Narkotikatidskrift: NAT* 37.4: 323-37. Web.

[3] Pacurucu-Castillo SF, Ordóñez-Mancheno JM, Hernández-Cruz A, Alarcón RD.(2019) World Opioid and Substance Use Epidemic: A Latin American Perspective. Psychiatric Research and Clinical Practice.

[4] Castro, F., Barrera M., & Marsiglia F. (2021). Cultural Adaptation of Empirically Validated Therapies for Treating Drug Dependence: International Considerations. In: el-Guebaly N., Carrà G., Galanter M., Baldacchino A.M. (eds) *Textbook of Addiction Treatment*. Springer, Cham.

[5] Marín-Navarrete, R., Medina-Mora, M., Pérez-López, A., & Horigian, V. (2018). Development and Evaluation of Addiction Treatment Programs in Latin America. *Current Opinion in Psychiatry* 31.4 : 306-14. Web.

[6] Teesson, M., Marel, C., Darke, S., Ross, J., Slade, T., Burns, L., Lynskey, M., Memedovic, S., White, J., & Mills, K. L. (2015). Long-term mortality, remission, criminality and psychiatric comorbidity of heroin dependence: 11-year findings from the australian treatment outcome study: Long-term outcomes of heroin dependence. *Addiction (Abingdon, England), 110(6), 986-993. https://doi.org/10.1111/add.12860*

[7] White, W., Recovery/remission from substance use disorders: an analysis of reported outcomes in 415 scientific reports, 1868–2011. (2012). Philadelphia Department of Behavioral Health and Intellectual disability Services and the Great Lakes. Addiction Technology Transfer Center: Chicago, Illinois & Philadelphia, PA Available from: http://www.williamwhitepapers.com/pr/2012%20RecoveryRemission%20from%20Substance%20Use%20DisordersFinal.pdf.

[8] Jackson, C. H. (2016). flexsurv: A Platform for Parametric Survival Modeling in R. Journal of Statistical Software, 70, i08. doi:10.18637/jss.v070.i08

[9] Williams, C., Lewsey, J. D., Briggs, A. H., & Mackay, D. F. (2017). Cost-effectiveness analysis in R using a multi-state modeling survival analysis framework: A tutorial. Medical Decision Making, 37(4), 340-352. https://doi.org/10.1177/0272989X16651869

[10] Luchansky, B., He, L., Krupski, A., & Stark, K. D. (2000). Predicting readmission to substance abuse treatment using state information systems: The impact of client and treatment characteristics. Journal of Substance Abuse, 12(3), 255-270.

[11] Titman, A.C., Putter, H. (2020) General tests of the Markov property in multi-state models, Biostatistics, 2020; kxaa030, DOI:10.1093/biostatistics/kxaa030

[12] Mateo Pinones,M.; Gonzalez-Santa Cruz, A.; Castillo-Carniglia, A. (2022) Evidence-based policymaking: lessons from the Chilean substance use treatment policy. [*R&R in the International Journal of Drug Policy*]

[13] Castillo-Carniglia, A., González-Santa Cruz, A., Cerdá, M., Delcher, C., Shev, A. B., Wintemute, G. J., & Henry, S. G. (2021). Changes in opioid prescribing after implementation of mandatory registration and proactive reports within California's prescription drug monitoring program. Drug and Alcohol Dependence, 218, 108405-108405. https://doi.org/10.1016/j.drugalcdep.2020.108405

[14] Olivari, C. F., González-Santa Cruz, A., Mauro, P. M., Martins, S. S., Sapag, J., Gaete, J., Cerdá, M., & Castillo-Carniglia, A. (2022;2021;). Treatment outcome and readmission risk among women in women-only versus mixed-gender drug treatment programs in chile. Journal of Substance Abuse Treatment, 134, 108616-108616. https://doi.org/10.1016/j.jsat.2021.108616

[15] DIPRES (2020) Outcome Evaluation of the Treatment and Rehabilitation Programs of the National Service for the Prevention and Rehabilitation of Drug and Alcohol Consumption, SENDA. Financed by Budget Management Department (DIPRES), Ministry of Finance OF Chile.

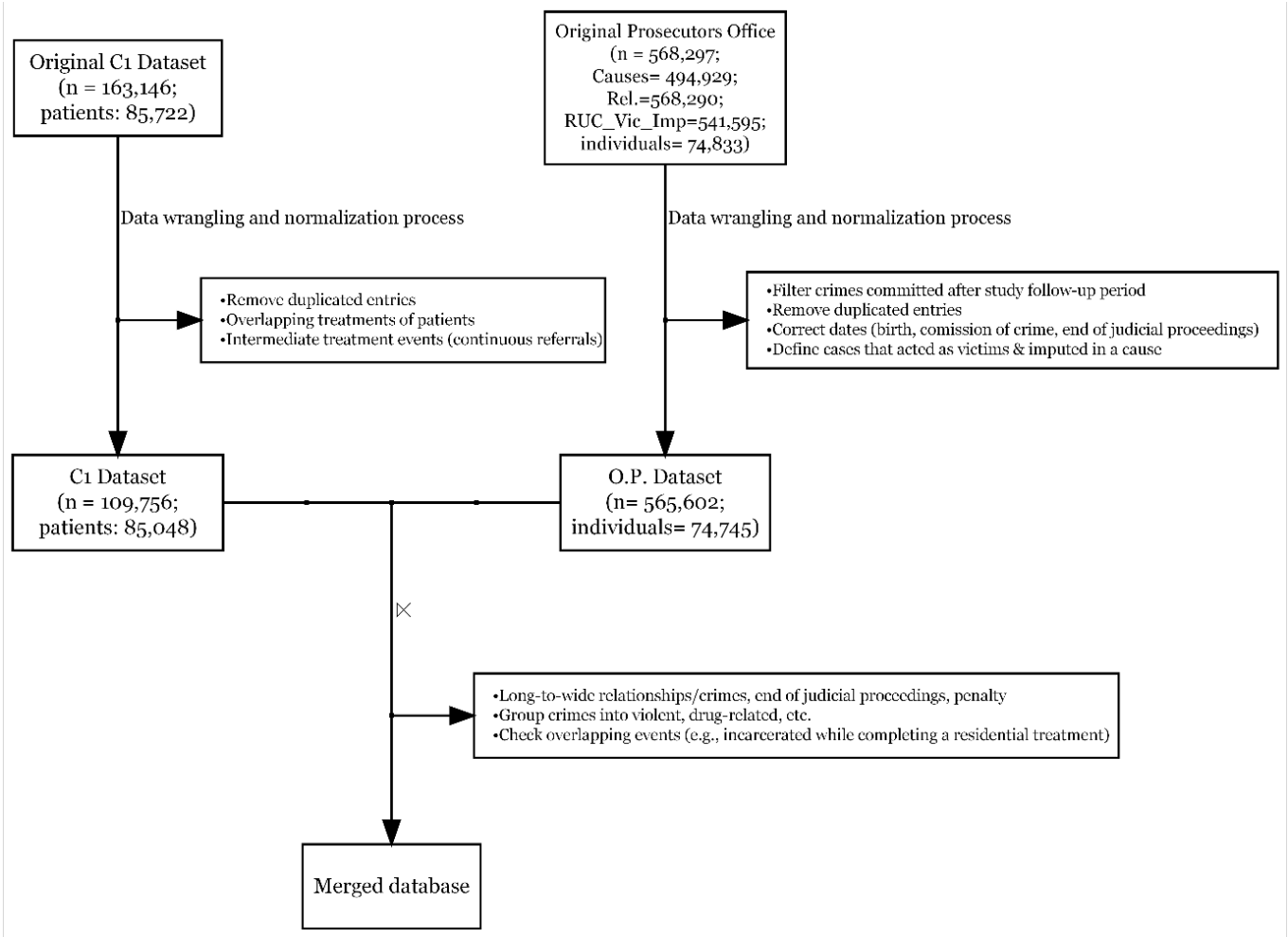
Annex 1 - Database description and data linking processing

Since justice system records were recently obtained (December 2021), we are advancing in a preliminary codebook of the data and we explore their structure in terms of conditional variables, determine the granularity (e.g., analyse contacts by cause or by relationships as a unit of study), check discordant dates (See Annex 4 for preliminary products).

As part of the FONDECYT No. 1191282 leaded by Dr. Castillo, we interviewed several SENDA professionals that allowed us to understand the data structure, and determine casuistic criteria based on the experience of everyday practice (e.g., cutpoints of reference and hierarchy of variables). Also, we cross-validated some of the time-invariant information of patients with records of the Treatment Outcomes Profile databases.

We are collecting and systematizing bibliographical material related to the research objectives through electronic databases. Yet, we need to standardize variables, label fields, and correct data integrity issues (e.g., typographical errors, automation bias, or variations in name spelling or form) to advance to the analyses and test our hypothesis.

Depending on the unit of analysis and due to the longitudinal nature of our data, we may need to discuss whether to discard overlapped events (e.g., people in treatment and incarcerated at the same time) or discordant dates (e.g., people that committed a crime after the justice process was finished).



Note. Rel.= Relationships or the combination of a victim (Vic), an offender (Imp), a judicial cause (RUC).

Annex 2 – Baseline characteristics of the cohort by Completion of the first treatment, up to date (preliminary summary)

Variables	Completion N=19278	Non-completion N=60249
Primary Substance at Admission:		
Alcohol	8522 (44.2%)	18102 (30.0%)
Cocaine hydrochloride	3279 (17.0%)	11459 (19.0%)
Marijuana	1326 (6.88%)	4046 (6.72%)
Other	516 (2.68%)	959 (1.59%)
Cocaine paste	5635 (29.2%)	25682 (42.6%)
First Substance Used:		
Alcohol	11794 (61.2%)	31241 (51.9%)
Cocaine hydrochloride	566 (2.94%)	2351 (3.90%)
Marijuana	4123 (21.4%)	17517 (29.1%)
Other	480 (2.49%)	1374 (2.28%)
Cocaine paste	631 (3.27%)	3083 (5.12%)
'Missing'	1684 (8.74%)	4683 (7.77%)
Educational Attainment:		
3-Completed primary school or less	4997 (25.9%)	17673 (29.3%)
2-Completed high school or less	10272 (53.3%)	33427 (55.5%)
1-More than high school	3927 (20.4%)	8868 (14.7%)
'Missing'	82 (0.43%)	281 (0.47%)
Psychiatric co-morbidity:		
Without psychiatric comorbidity	9252 (48.0%)	21046 (34.9%)
Diagnosis unknown (under study)	353 (1.83%)	14662 (24.3%)
With psychiatric comorbidity	9673 (50.2%)	24541 (40.7%)
Drug Dependence Diagnosis:		
FALSE	5876 (30.5%)	15710 (26.1%)
TRUE	13402 (69.5%)	44538 (73.9%)
'Missing'	0 (0.00%)	1 (0.00%)
Employment Status:		
Employed	9789 (50.8%)	28832 (47.9%)
Inactive	2364 (12.3%)	5940 (9.86%)
Looking for a job for the first time	49 (0.25%)	134 (0.22%)
No activity	986 (5.11%)	3215 (5.34%)
Not seeking for work	214 (1.11%)	590 (0.98%)
Unemployed	5876 (30.5%)	21537 (35.7%)
Tenure status of household:		
Illegal Settlement	193 (1.00%)	651 (1.08%)
Others	518 (2.69%)	1705 (2.83%)
Owner/Transferred dwellings/Pays Dividends	7726 (40.1%)	20197 (33.5%)
Renting	3283 (17.0%)	10301 (17.1%)
Stays temporarily with a relative	6674 (34.6%)	23807 (39.5%)
'Missing'	884 (4.59%)	3588 (5.96%)
Had contacts with the judiciary system:		
No	3583 (18.6%)	6207 (10.3%)
Yes	15695 (81.4%)	54042 (89.7%)

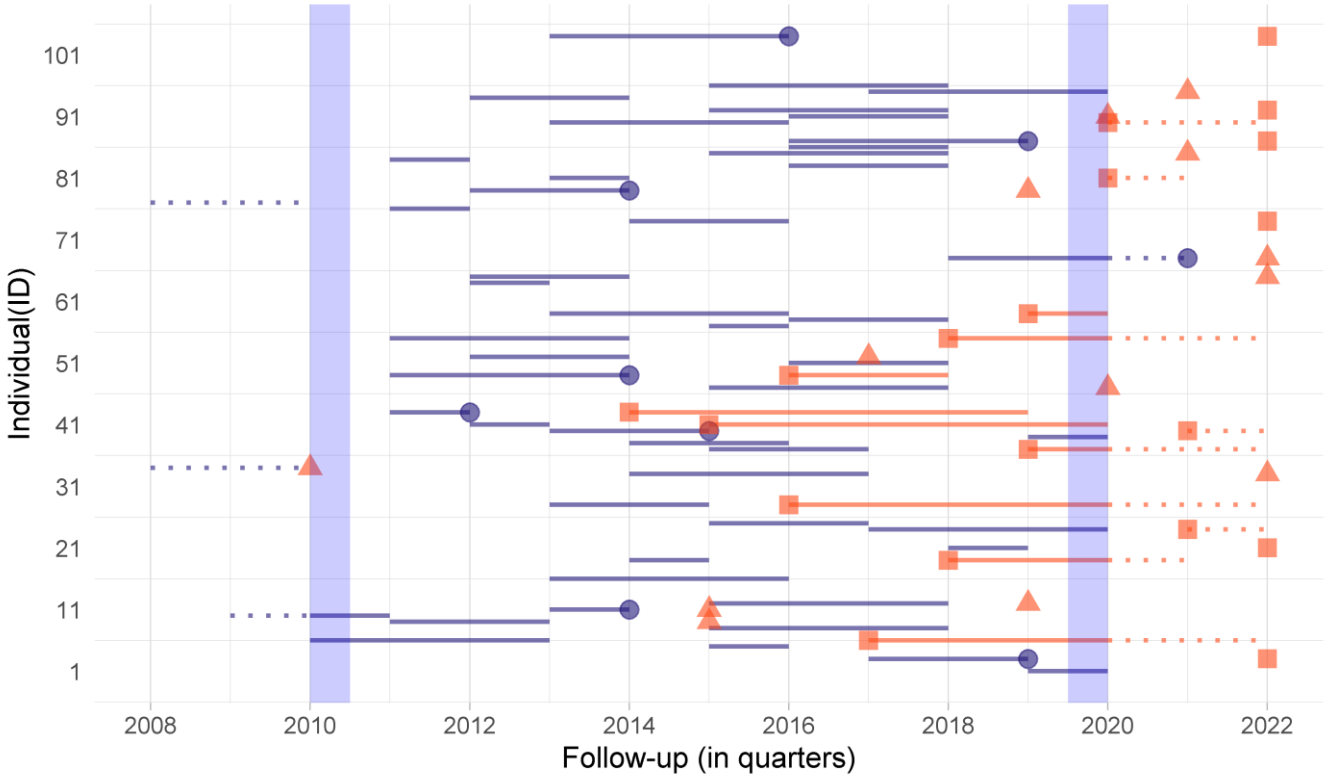
Note. Counts and percentages by column in parenthesis. Source: SENDA

Annex 3 – Link to data analysis up to date

Data and markdown with all software codes and outputs are available at:

- Step 1: Explore data environment and define variables and their properties (link)
- Step 2: Correct dates and explore birth and cohort dynamics (link)

Annex 4 – Hypothetical data structure



Note. Dot= Complete treatment;
Square= Contact w/ justice system (imputed);
Triangle= Contact w/ justice system (victim);
Blue line= Time in treatment;
Orange line= Time in conctact w/justice system;
Shared area=Follow-up window

Figure shows different potential trajectories in our retrospective cohort, including people with and without contact with the justice system. Patients' entry to the retrospective cohort starts at the time they were admitted for the first time to a SUT listed in the SENDAs yearly databases with information of treatments between 2010-2019 (independently if they had prior treatments). We considered patients that had ongoing treatments in 2010 (e.g., patient no. 11). Censoring occurred after SENDA sent us the data (November 13, 2019), after an outcome event occurred (e.g., the blue dot after 2020), or when a patient left the cohort with no other outcomes. The time in treatment (especially residentials) or a prison sentence (yet we need to know if we might be able to acknowledge this information) might be the reason why the risk of incarceration might compete with admission. As part of the research work, we will be related to this matter.