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Polydrug Use and Co-occurring Substance Use Disorders in a Respondent Driven Sampling of Cocaine Base Paste Users in Santiago, Chile

Carla F. Olivari, BA[a], Jorge Gaete, PhD[b,c], Nicolás Rodriguez, MA[d], Esteban Pizarro, BA[d], Paloma Del Villar, MA[e], Esteban Calvo, PhD[a,f,g,h], and Alvaro Castillo-Carniglia, PhD[a,f,i]

[a]Society and Health Research Center, Universidad Mayor, Santiago, Chile; [b]Faculty of Education, Universidad de los Andes, Santiago, Chile; [c]Millennium Nucleus to Improve the Mental Health of Adolescents and Youths, Imhay, MI, USA; [d]Research Department, National Service for Prevention and Rehabilitation of Drug and Alcohol Consumption (SENDA), Santiago, Chile; [e]Centro de estudios Justicia y Sociedad, Pontificia Universidad Católica de Chile, Santiago, Chile; [f]School of Public Health, Universidad Mayor, Santiago, Chile; [g]Department of Epidemiology and Robert N. Butler Columbia Aging Center, Mailman School of Public Health, Columbia University, New York, NY, USA; [h]Laboratory on Aging and Social Epidemiology, Facultad de Humanidades, Universidad Mayor, Santiago, Chile; [i]Department of Population Health, New York University Grossman School of Medicine, New York, NY, USA

ABSTRACT

We characterized substance use patterns and co-occurring substance use disorders among active cocaine base paste (CBP) users in Santiago, Chile using data from respondent-driven sampling (RDS) in three areas of Metropolitan Santiago. Recruitment began with nine seeds, reaching 398 active CBP users (18% women; mean age 37.7 years), defined as persons consuming CBP at least twice per week in the last three months. Population proportions and uncertainty were estimated accounting for individuals' social network and homophily. The median CBP age of initiation was 21 years, and the median number of years using CBP was 7 for women and 15 for men. The median days of use in the past month was 25 days, with a median of 56 doses per week. The proportion of monthly income spent on CBP was 65%. The prevalence of substance use disorders (SUDs) were: 98% for CBP, 67% for alcohol, 60% for marijuana, and 41% for cocaine hydrochloride. Heavy polydrug use patterns and co-occurring SUDs are frequent among active CBP users in the metropolitan area of Santiago. Traditional surveillance strategies may have underestimated polysubstance use and co-occurring SUDs in active CBP users. RDS proved to be a feasible methodology that could be effectively used for substance use surveillance among hard-to-reach populations.

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Smoked cocaine; substance use disorder; surveillance; respondent-driven sampling; Chile

Introduction

Evidence over the last three decades has shown a significant increase in the prevalence of co-occurring substance use disorders (SUDs) in high-income countries from North America, Europe, and Australia (Gjersing and Bretteville-Jensen 2018; Hassan and Le Foll 2019; Quek et al. 2013; Zambon et al. 2017). Co-occurring SUDs have more detrimental health impacts, poorer treatment results, and increased risk of relapse than single-drug use disorders (Gjersing and Bretteville-Jensen 2018; Quek et al. 2013; Wang et al. 2017).

Co-occurring disorders in countries with emerging economies (e.g., Latin America), however, are less known and most of what we do know comes from traditional surveillance instruments, such as general population surveys (Hynes et al. 2019; Observatorio Chileno de Drogas 2019). In this sense, an adequate public health surveillance system is crucially important to accurately inform decisions for prevention and treatment (Hopkins, Landen, and Toe 2018).

Household surveys are useful instruments to measure national and subnational prevalence and trends of substance use and related problems, and they are one of the key surveillance tools employed by national drug agencies. These studies, however, are often ineffective in reaching subpopulations at higher risk for heavy use patterns of multiple substances and co-occurring SUDs. Most surveys intentionally exclude institutionalized (e.g., people in residential drug treatments) and homeless people due to sampling restrictions, which adds to the known issues with reporting stigmatized or illegal behaviors, such as use and abuse of drugs (Crapanzano et al. 2019; Magnani et al. 2005).

CONTACT Alvaro Castillo-Carniglia alvacasti@gmail.com Society and Health Research Center, Universidad Mayor, Badajoz 130, room 1305, Las Condes, Santiago, Chile

Over the last decades, respondent-driven sampling (RDS), a non-traditional sampling method of chain-referral networks, has been suggested as a potential epidemiologic surveillance tool for hard-to-reach populations (Magnani et al. 2005). However, its application and usefulness has been proved mainly in studies from high-income countries and largely restricted to HIV surveillance among sex workers, injection drug users, and men who have sex with men (Johnston et al. 2016; Léon et al. 2016). Evidence on RDS as a surveillance tool for substance use and mental health disorders is very limited, particularly in social and epidemiological contexts different from those observed in developed countries.

In Latin America, the most widely available and used psychoactive drugs (after alcohol) are cannabis, cocaine hydrochloride and cocaine base paste (CBP). The latter, however, is the substance recognized as producing the most harm among users and is one of the main drugs of use among treatment patients at admission (Hynes et al. 2019; James et al., 2018). CBP is an intermediate product in the production of cocaine hydrochloride with a high addictive potential (Moraes et al. 2010). It is obtained by treating a solution of coca leaves and water with kerosene or diesel, and then adding sulfuric acid and an alkaline substance (i.e., potassium permanganate) to precipitate the cocaine base paste. CBP contains varying percentages of cocaine, and due to its volatility at high temperatures, and in regard to consumption, it is most commonly inhaled after its combustion in pipes or in cigarettes in combination with tobacco or cannabis (Moraes et al. 2010; Pascale et al. 2014).

Among the challenges of studying CBP use, the prevalence of use is relatively small (between 0.3% to 1.0% in the past year) (Pascale et al. 2014), thus studies require a very large sample size to gather a fairly large number of cases to correctly describe its epidemiology with a reasonable level of precision. In addition, these groups are often excluded or underrepresented in general population surveys (Reyes et al. 2013), which adds to a known issue in Latin America regarding the use of non-standardized instruments or single nosologic systems to measure SUDs in general population surveys, which raises questions about the validity of current estimates (Cumsille et al. 2019).

Nonetheless, available evidence from Chile, Peru, and Uruguay suggests that concurrent use of multiple substances (i.e., the use of two or more substances not necessarily in the same occasion) is frequent among CBP users (Castaño 2000; Observatorio Uruguayo de Drogas 2014; Santis et al. 2007), though quantification of detailed drug use patterns and disorders from well-designed studies is still lacking.

Using RDS for the first time as part of the Chilean surveillance drug system, we characterize polysubstance use patterns and co-occurring SUDs among active CBP users in the Metropolitan Area of Santiago, Chile. This article follows the Strengthening the Reporting of Observational Studies in Epidemiology for RDS studies (STROBE-RDS) guidelines (White et al. 2015).

Methods

We analyzed data from the study "Characterization of Regular CBP Users in Santiago" designed and funded by the Chilean National Service of Prevention and Rehabilitation of Drug and Alcohol Use and conducted by the Institute of Sociology of the Pontificia Universidad Católica de Chile (Instituto de Sociología 2014). This cross-sectional study used a RDS methodology to recruit current CBP users residing in Santiago, Chile (Heckathorn 1997). The cost of the study was approximately US $110.000, which was mainly invested in fieldworker training and payment, and participant incentives.

Prior to the survey, we qualitatively assessed the feasibility of using RDS for participant recruitment and explored key issues for survey implementation. We carried out five discussion groups in five SUD treatment centers. We also conducted six semi-structured interviews and one discussion group with CBP users and people rehabilitated from CBP use disorder. The information obtained helped us to establish appropriate survey sites and schedules, define the type and value of incentives, establish a standard protocol for the on-site urine test, and identify initial recruiters, known as "seeds," to begin the recruitment process. Seeds were recruited based on their history of use of CBP (i.e., at least one year of use), the territory they usually frequent, and a qualitative appreciation of their social skills and influence on their peers. The formative stage was performed during December 2013.

The survey stage of the study was conducted using RDS and was performed between April and July 2014. Participants were eligible if they were 18 years (age at which a person is legally considered an adult in Chile) or older, had an active CBP use (defined as the use of two or more times per week in the last three months), had a positive urine test, presented a recruitment coupon received from a prior participant, and accepted the conditions of participation in the study by signing an informed and written consent form. The study was reviewed and approved by the Institutional Review Board of the Faculty of Social Science at Pontificia Universidad Católica de Chile.

We established four research teams in three areas of the metropolitan area of Santiago, the capital and most populous city in Chile: Huechuraba (north), Santiago (central), and Puente Alto (south-east). These areas were chosen for their geographical dispersion in Santiago, low income, and accessibility for CBP users based on the information gathered in the formative stage. Within these areas, four sites were defined to carry out the survey: a community health center in Huechuraba, a neighborhood board office in Santiago, and two community centers in Puente Alto. Each site had private bathrooms for collection and testing of urine samples.

The survey stage employed eight fieldworkers, two per site, who conducted the urine sample analyses as part of the eligibility screening. Prior to the survey, all fieldworkers underwent a training that covered field operations and procedures, questionnaire, data registration, and counseling.

Procedures

Active CBP users were recruited through RDS, a form of chain-referral sampling that allows data collection and statistical inference from hard-to-reach populations that are socially networked (Heckathorn 1997). RDS relies on the respondent themselves to recruit a fixed number of people of interest from the target population, founded on the convenience sampling of seeds or initial respondents. Each seed and recruit were provided with three recruitment coupons to use in recruiting their peers. Recruitment coupons had a unique serial number that was used to track the relationships among participants.

All participants were screened for eligibility on site. Qualifying individuals underwent consent and proceeded to perform the urine test. CBP use was primarily detected by testing for cocaine benzoylecgonine metabolite in the urine by immunoassay methods (Nickley, Pesce, and Krock 2017). A positive urine test indicates that the participant has used CBP or cocaine hydrochloride in the previous 48 to 72 hours (Moraes et al. 2010). If the urine test resulted positive, participants went on to complete a face-to-face questionnaire that inquired about social networks, socio-demographics, health, and drug use patterns. Seven people were excluded due to negative urine tests.

The questions used to measure substance use can be found in https://doi.org/10.6084/m9.figshare.16543566.v1. Mental health disorders, including SUDs, were assessed through the Mini-International Neuropsychiatric Interview (Sheehan et al. 1998), which is a brief and structured diagnostic interview that contains 16 sections and screens axis 1 DSM-IV disorders (Sheehan et al. 1998). This tool is one of the most commonly used structured psychiatric diagnostic interviews worldwide, and its validity and reliability is well-established in numerous countries (Mordal, Gundersen, and Bramness 2010).

The Spanish version of the MINI has been used as a "gold standard" in other studies in Chile and Latin America (Ignatyev et al. 2016; Terrez et al. 2011). Regarding SUDs, MINI assesses the presence of substance abuse and substance dependence, using the DSM-IV diagnostic criteria. In the analyses, the presence of either substance abuse or substance dependence was labeled as substance use disorder.

After finishing the interview, each participant received a shopping voucher of approximately US$10 for their participation. Additional shopping vouchers of approximately US$6 were given to participants for each referred acquaintance who qualified for the study. All participants were offered drug use counseling, which included a referral to treatment.

Statistical analysis

Adjusted descriptive statistical parameters (weighted proportions, weighted medians, and 95% confidence intervals) were computed using Stata 16 and its RDS and RDS_network commands developed by Schonlau and Liebau (Schonlau and Liebau 2012). These packages allowed us to estimate the average network size of a group, network homophily, network convergence, and sampling weights to compute population-level parameters.

Since RDS was designed to perform univariate analyses, a combined variable between age and sex was estimated and used as a weighting factor. This weighting factor is sensitive to network sizes and has robustness under the presence of outliers. It is computed by dividing the estimated proportions for a group equally among all sample members of that group (Schonlau and Liebau 2012). Although individuals with missing data were not excluded from the study, they were removed from the analysis of the variables associated with those missing data.

Weighted medians were estimated using the Stata command epctile, which computes weighted estimates of quantiles for subpopulations. Those estimations, however, are based on weighted factors computed from the total sample, even if subpopulation options are used (Heeringa, West, and Berglund 2017).

Results

Figure 1 illustrates the recruitment network characteristics, number of recruitment waves and total number of recruits for each seed. Over a period of 11 weeks, 416

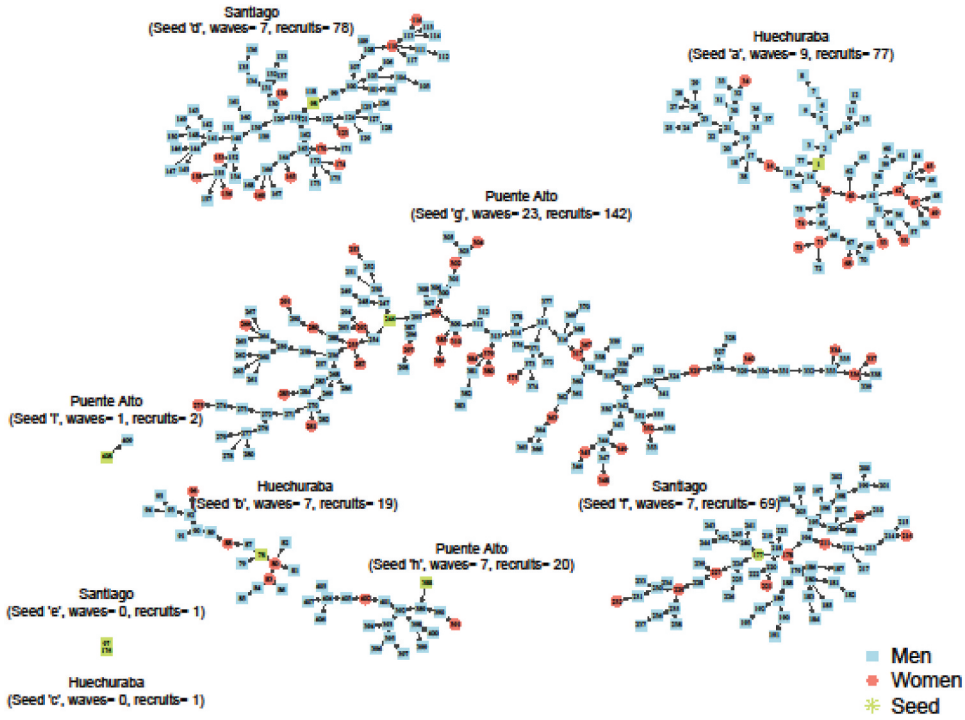

Figure 1. Recruitment networks from survey sites in Santiago city.
Note. Seeds 'c', 'e' and 'i' were removed from the final sample as they did not generate any recruitment wave.

individuals were originally recruited, 14 of which were ineligible. Among the ineligible participants, seven tested negative for CBP in the urine test and the other seven did not answer the questionnaire according to standard quality criteria (e.g., incomplete or inconsistent responses). Of the nine seeds originally recruited, three did not recruit any participants, so they were excluded from the analysis. From the active seeds, one was a woman and five were men. The total sample size under analysis was 398 participants, of which 18% were women; after weighting, the population proportion of women was 13%. The average network size of men and women was 17.2 and 25.0, respectively, and homophily was fairly close to zero (−0.3 for men and 0.1 for women), meaning that contacts within the social network were not necessarily similar in age or sex. The median number of waves by seed was seven, and the average network size was 67.5. The most productive seed was from Puente Alto (southern Santiago), yielding 23 waves and 142 recruits.

Table 1 shows crude sample characteristics and adjusted parameters for the population of CBP users in Santiago. Eighty-two percent of respondents were men, and the mean age was 37.7 (95%CI 36.4, 38.5) years. Almost half of participants had less than ten years of education, and one fifth completed secondary education. Median total income was US$ 318, and the income for men was more than double that of women. One in two participants reported working on their own, and one in three reported to have received drugs as compensation after work.

Table 2 shows adjusted values for CBP use patterns, cost and spending. The initiation age of CBP use occurred around age 21, and was somewhat later in women (23 years of age) than men (20 years of age). The median number of years using CBP resulted in seven years for women and 15 years for men. In the last month, there were no differences in the number of days of CBP use between women and men (median 25 days), though the number of weekly doses consumed was 1.3 times higher in women than men, with a median number of 56 doses (8 per day) in the whole sample. The median cost of a CBP dose reported was US$1.40.

The proportion of total income spent in CBP was 65% for men. For women, this proportion exceeds the total declared income by 60%. When including marijuana and cocaine hydrochloride, the proportion of total income spent on drugs was 75% for men and 190% for women (and 83% for men and women together).

All participants indicated that the primary form of PBC use was smoked or inhaled when heated, and 65% responded that the most frequent place of PBC

Table 1. Characteristics of the study sample.

	Total		Women		Men	
	N (%)[b]	(%)[c]	N (%)[b]	(%)[c]	N (%)[b]	(%)[c]
Sex	398 (100)	(100)	72 (18)	(14.5)	326 (82)	(85.5)
Age						
18– 30	86 (22)	(26)	20 (28)	(38)	66 (20)	(24)
31– 38	124 (31)	(29)	26 (36)	(32)	98 (30)	(28)
39– 44	97 (24)	(20)	14 (19)	(17)	83 (25)	(20)
45– 65	91 (23)	(26)	12 (17)	(13)	79 (24)	(28)
Education						
Primary school or less	183 (46)	(42)	45 (63)	(60)	138 (42)	(40)
High school incompleted	101 (25)	(27)	12 (17)	(22)	89 (27)	(22)
High school completed	77 (19)	(20)	9 (12.5)	(10)	68 (21)	(23)
Tertiary	26 (7)	(8)	4 (5.5)	(7.0)	22 (7.0)	(7.0)
Missing	11 (3)	(2.8)	2 (2.8)	(1.0)	9 (3.0)	(3.0)
Marital Status						
Never married	285 (72)	(71)	48 (67)	(60)	237 (73)	(73)
Married	99 (24)	(26)	22 (31)	(39)	77 (24)	(24)
Divorced	9 (2.2)	(1.9)	0 (0.0)	(0.0)	9 (2.8)	(2.2)
Widowed	4 (1.0)	(1.0)	2 (2.8)	(1.0)	2 (0.61)	(1.0)
Missing	1 (0.25)	(0.1)	0 (0.0)	(0.0)	1 (0.31)	(0.0)
Cohabiting in the last year						
With relatives	242 (60)	(62)	53 (75)	(83)	189 (58)	(58)
With acquaintances or friends	83 (21)	(19)	7 (10)	(5.8)	76 (23)	(21)
Alone	72 (18)	(20)	11 (15)	(11)	61 (19)	(21)
Missing	1 (0.25)	(0.1)	0 (0.0)	(0.0)	1 (0.23)	(0.0)
Employment						
Self-employed	232 (59)	(56)	43 (62)	(56)	189 (59)	(57)
Employed	121(31)	(34)	11 (16)	(20)	110 (34)	(36)
Unemployed	8 (2.0)	(2)	5 (7.2)	(7.0)	3 (0.9)	(1.0)
Missing	30 (7.7)	(7.8)	10 (15)	(18)	20 (6.2)	(6.1)
Unconventional Income						
Unconventional legal income (i.e., begging or peddling on the street)	178 (45)	(43)	36 (50)	(60)	142 (44)	(42)
Unconventional illegal income (drug traffic, stealing or sex trade)	158 (40)	(35)	26 (36)	(36)	132 (41)	(34)
Housing conditions						
Living on the streets	50 (27)	(27)	13 (39)	(45)	37 (24)	(23)
nonpaying tenant (parents' home, with friends, solidarity shelter, relatives' home)	76 (41)	(39)	9 (27)	(28)	67 (44)	(40)
Institution	11 (6.0)	(3.0)	2 (6)	(5.0)	9 (5.9)	(2.7)
Owned or rented housing	23 (12)	(21)	4 (12)	(10)	19 (13)	(23)
Other	25 (14)	(11)	5 (15)	(11)	20 (13)	(11)
Total Income in US$. Median (IQR)	346	318 (192–697)	155 (150–640)	161 (128–552)	379	364 (198–708)

[a]Due to rounding rules, percentages may not add to 100 in all variables. [b] Unweighted; [c] Weighted. [d] Insecure housing was defined as having lived in the street within the last 12 months. IQR = Interquartile Range.

use was in public places, such as streets, vacant lots or city parks. More than half of the men reported using PBC mainly alone, while women indicated to use mainly with their spouse or partner.

The prevalence of concurrent and simultaneous use of multiple substances proved to be high. Alcohol, marijuana, and cocaine hydrochloride were the three substances with the highest past month prevalence (Table 3). The median cost of a marijuana cigarette was US $1.40 and US$7 for a gram of cocaine hydrochloride. For these three substances, the prevalence was higher in men than women. Regarding the simultaneous use of CBP with other drugs, around three-quarters of participants reported using alcohol or marijuana in the same consumption.

The age of initiation for secondary substances, including alcohol, marijuana, and cocaine, varied between 15 and 25 years of age, without differences between women and men (Table 3). Substances with the earliest age of initiation were alcohol and marijuana. Regarding the frequency of alcohol use, it was 1.3 times higher in women than men (Table 3).

Overall, 98% of respondents met DSM-IV criteria for CBP use disorder, 68% alcohol use disorder, 60% marijuana use disorder, and 41% cocaine hydrochloride use

Table 2. Patterns of cocaine base paste use.

	Weighted Median (IQR)		
	Total	Women	Men
Age of initiation	21 (16–30)	23 (15–30)	20 (16–30)
Years using CBP	15 (10–21)	7 (4–16)	15 (9–21)
Days of use in the past month	25 (15–30)	24 (15–30)	25 (15–30)
Doses in the past week	56 (26–108)	66 (27–159)	51 (26–105)
US$ spent on CBP in the past week [b]	58 (29–120)	78 (3–191)	56 (29–108)
US$ spent on CBP in the past month [b]	207 (62–514)	267 (66–818)	200 (62–462)
Proportion of monthly income spent on CBP[a]	0.65 (0.32–0.73)	1.6 (0.52–1.7)	0.55 (0.31–0.65)
Simultaneous use of CBP with other drugs (% and 95%CI)	56(47–66)	64(47–78)	57 (45–64)
Received CBP as retribution (% and 95%CI)	36 (29–44)	29.6 (17.4–45.6)	37.1 (28.9–46.1)
Cost of one CBP dose in US$	1.40 (1.40–1.40)	1.40 (1.40–1.40)	1.40 (1.40–1.40)

[a]Calculated with Weighted Median values. [b] (US$1 = CL$783 on 11–13-2019). IQR = Interquartile Range. CBP = Cocaine base paste. 95%CI = 95% Confidence Interval.

Table 3. Secondary substance use patterns.

	Group	Marijuana	Alcohol	Cocaine Hydrochloride
Past month adjusted prevalence (95% CI)	Women	35 (22–51)	76 (58–88)	23 (14–37)
	Men	57 (47–66)	88 (82–92)	41 (32–51)
	Total	53 (44–62)	86 (80–90)	38 (30–48)
Age of use initiation. Weighted Median (IQR)	Women	15 (13–18)	15 (13–20)	21 (15–25)
	Men	15 (13–17)	15 (12–17)	20 (16–25)
	Total	15 (13–17)	15 (13–17)	20 (16–25)
Days of use in the last month. Weighted Median (IQR)	Women	8 (2–27)	20 (6–30)	3 (1–5)
	Men	10 (4–25)	15 (5–30)	3 (1–6)
	Total	10 (4–25)	15 (5–30)	3 (1–6)
Doses used in the last week[a]	Women	4 (2–17)	5 (3–5)	0.5 (0–1)
Weighted median (IQR)	Men	6 (2–14)	4 (2–5)	1 (0–1)
	Total	6 (2–14)	5 (2–5)	1 (0–4)

[a]Number of marijuana cigarettes, number of alcohol drinks, and grams of cocaine hydrochloride per week, respectively. 95%CI = 95% Confidence Interval. IQR = Interquartile Range.

disorder (Figure 2). Sixty-seven percent presented two or more concurrent SUD, with no significant differences between men and women. In the last twelve months, two in three participants declared the need for treatment to reduce or stop drug use. Fifteen percent of them attended a treatment service in the past year.

Discussion

In this study, we characterized polydrug use patterns and co-occurring SUDs among current CBP users in the metropolitan area of Santiago, Chile. Leveraging chain-referral networks through RDS, we reached

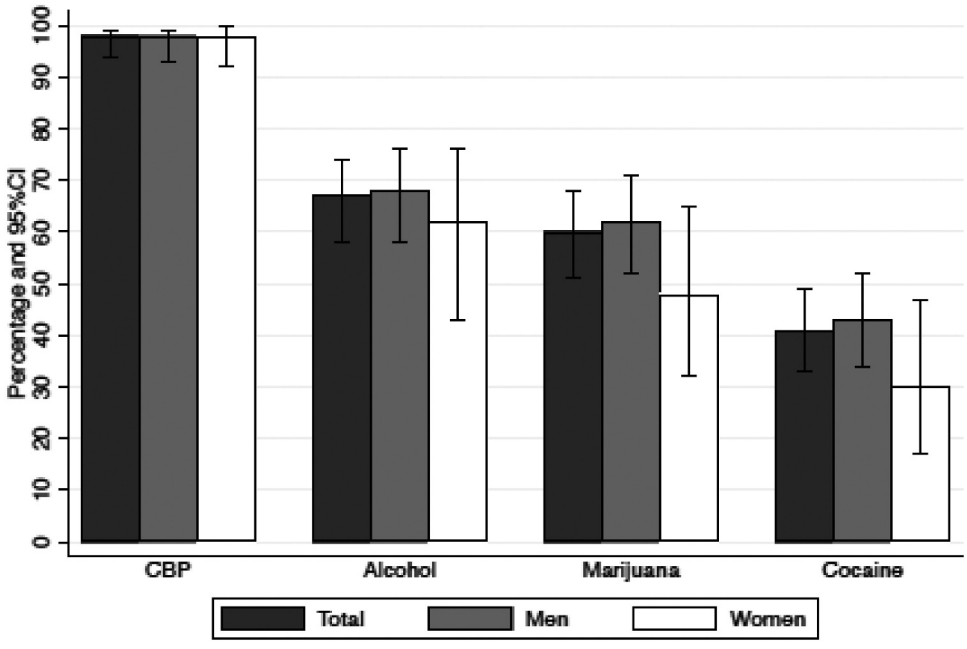

Figure 2. Prevalence of substance use disorders among current cocaine base paste users.
Note. CBP = Cocaine Base Paste. 95%CI = 95% Confidence Interval

a sizable number of active CBP users, something that traditional surveillance instruments typically fail to do as they only cover the civilian, noninstitutionalized population reached at their households (Observatorio Chileno de Drogas 2019; Smith et al. 2011).

We found that most CBP users were young adults, single men, with low levels of education and income. Our findings are consistent with previous studies documenting that groups with these characteristics exhibit a high risk of heavy consumption of multiple substances (Hassan and Le Foll 2019; John et al. 2018; Santis et al. 2007), which may lead to co-occurring SUDs. We found that women and men that regularly use CBP as a primary drug also consume several other substances. Drugs like alcohol, marijuana, and cocaine powder are most frequently used concurrently and simultaneously with CBP. This pattern of polydrug use is consistent with findings from two previous studies conducted in CBP users in Uruguay and Chile (Observatorio Uruguayo de Drogas 2014; Santis et al. 2007). In Uruguay, a RDS study showed that about 80% of CBP users were single men, and mostly all of them were polydrug users (Observatorio Uruguayo de Drogas 2014).

Ninety-one percent of CBP users in that study reported concurrent use with alcohol and 84% with marijuana (Observatorio Uruguayo de Drogas 2014). Likewise, previous evidence from Chile indicates that 63% of active CBP users had alcohol dependence and 87% presented dependence from two or more substances (Santis et al. 2007). In regard to the number of years using CBP, women had been using it for almost half of the time reported by men. If we consider that women's CBP use initiation occurs only slightly later in life compared to their male counterparts (23 years vs 20 years respectively), women's shorter drug careers may be related to the well-documented "telescoping phenomenon," which refers to the faster SUD progression observed in women relative to men (Greenfield et al. 2013; McHugh et al. 2018). In spite of fewer years of drug use, the accelerated SUD progression is usually associated with more severe health-related problems, such as liver cirrhosis, breast cancer, hypertension, anemia and gastrointestinal disorders (Greenfield et al. 2013; Hernandez-Avila, Rounsaville, and Kranzler 2004).

In the 13th Chilean National Study on Drug Use (Observatorio Chileno de Drogas 2019), the prevalence of CBP use disorder among past year users was 64,4%, however the number of cases reporting CBP use in the past year was 93 cases, of which 60 were problematic users. Such a small number of cases precludes reliable generalizations or population inferences. In our study, almost all participants presented CBP use disorder, and we collected in-depth information on patterns of use and social context, which give us a better picture of the nuances of this problem in Chile, such as those reported in this paper.

Multiple substance use patterns of CBP in Chile is similar to that described among crack or smokable cocaine users in other countries (da Cunha, Araujo, and Bizarro 2015; Gossop, Manning, and Ridge 2006; Santos Cruz et al. 2013; Usdan et al. 2001). For example a study in Brazil, in which they often use the term crack to refer to CBP, though they are not distinguishable by toxicology or composition, showed that crack cocaine users had a high prevalence of co-occurring SUDs, with alcohol, marijuana, and cocaine hydrochloride most frequently consumed concurrently with crack. This study also documented that, as with CBP, crack cocaine use initiation occurs in early adulthood (da Cunha, Araujo, and Bizarro 2015). Another study in the United Kingdom found that, compared to cocaine hydrochloride users, crack cocaine users reported a higher frequency of monthly drug use (mean of 8.5 and 21.5 days, respectively) and a remarkably higher prevalence of polydrug use (Gossop, Manning, and Ridge 2006). Additional drugs most often used by crack cocaine users were alcohol, marijuana, cocaine hydrochloride, heroin, and benzodiazepines (Gossop, Manning, and Ridge 2006).

Our results showed that CBP consumption is mostly a solitary activity that occurs in public places, except among women, who report consuming mainly with their partners. The CBP use, as a shared practice in women, is reported in another study that indicates that drug use is conditioned or regulated by the use of their sexual partner, especially at the beginning of drug use (Observatorio Uruguayo de Drogas 2019).

CBP use is territorially concentrated in urban areas with high levels of poverty and social marginality (Observatorio Uruguayo de Drogas 2014). Due to low education and precarious employment, CBP users do not benefit much from social protection systems. We found that CBP users obtain their income mostly from informal and self-employed jobs, which are on average below the Chilean minimum wage (~US$417) and slightly above the poverty line (~US$218). This situation seems to be particularly critical among women. The large proportion of income spent in CBP is consistent with the proportion of participants in insecure housing conditions and living with relatives/friends and institutions presumably without paying rent. In fact, Table 2 shows that among women, the monthly expense in CBP exceeds their total income by 60%, which may be related with illegal or stigmatizing ways of generating their

income and obtaining CBP, as well as a more frequent use with friends and partners compared to men. The latter is likely related to the amount of CBP used by women and the estimate of CBP spending, even if they were not directly involved in the purchase.

Qualitative data from previous studies show that CBP users are embedded in disadvantaged social backgrounds and that they often have life trajectories marked by negative events and a persistent feeling of abandonment, which is usually more detrimental in the case of women due to gender inequalities (Becker and Koob 2016; Instituto de Sociología 2014; Observatorio Uruguayo de Drogas 2014). Overall, CBP users tend to concentrate on multiple health and social disadvantages, including a high prevalence of psychiatric comorbidities and co-occurring SUDs, which hamper the effectiveness of many treatment and social integration strategies (Pascale et al. 2014).

Our study has limitations. Active CBP users may have been under the effect of substances during the interview. We tackled this difficulty through clinical assessment of the mental status and state of consciousness made by trained psychologists who performed the interview. In cases where the participant presented evident signs of altered consciousness, the interview was postponed for a few hours, until the participant's mental status cleared. Another limitation is that the urine test used in the screening stage to confirm CBP use was not able to discriminate between use of CBP or cocaine hydrochloride. However, given that 98% of participants met criteria for CBP use disorder and that their socioeconomic status was fairly low, it is very unlikely that positive tests were due to the exclusive use of cocaine hydrochloride, which is 5 to 10 times more expensive than CBP. Finally, our study was limited to the population of 18+ years of age in Santiago, thus we are not necessarily capturing the whole spectrum of CBP users. People who started using at young ages could not be represented, for example, because they stop using CBP before turning 18, they have an increased likelihood of being institutionalized, or they have died.

According to 2018 data from Chilean state-funded SUD treatment programs, the highest treatment demand came from individuals with alcohol use disorder (37%), followed by CBP users, with the latter accounting for 36% of the total treatment demand (Servicio Nacional para la Prevención y Rehabilitación del Consumo de Drogas y Alcohol 2018). That is, CBP users place a disproportionately high burden on the health care system relative to their prevalence among the general population (Observatorio Chileno de Drogas 2017). The evidence presented here provides a starting point and a model for implementing non-traditional sampling methods as part of public health surveillance systems for substance use and SUD among hidden populations. In-depth data from these high-risk groups are essential to inform evidence-based interventions to effectively address polydrug use and co-occurring disorders.

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ORCID

Alvaro Castillo-Carniglia PhD http://orcid.org/0000-0002-3016-890X

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