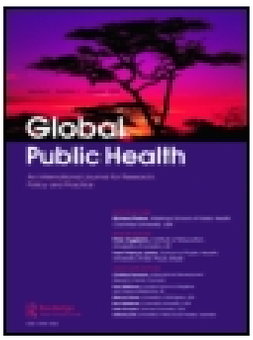

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Non-medical use of opioid analgesics in contemporary Brazil: Findings from the 2015 Brazilian National Household Survey on Substance Use

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ABSTRACT

Prior studies on substance use in Brazil have not focused on opioid misuse, previously thought to be nearly non-existent. This paper presents new findings on heroin and non-medical use of opioid analgesics. Data come from the 2015 Brazilian Household Survey on Substance Use (BHSU-3), a nationally representative survey estimating epidemiological parameters related to substance use by residents across Brazil. BHSU-3 used stratified multi-stage probability sampling across multiple geographic domains of interest, resulting in 16,273 interviews with household residents. Lifetime heroin use among Brazilians was 0.3 (95% C.I:0.2–0.4). Lifetime, past-year, and past-month non-medical use of opioid analgesics were respectively 2.9 (95%C.I.:2.3–3.4), 1.4 (95%C.I.:1.1–1.7) and 0.6 (95%C.I.:0.4–0.8). Past-year prevalence of non-medical opioid analgesics use was lower among males [Prevalence Ratio (PR): 0.54 (95% C.I.:0.36–0.78)], those aged 12–24 [0.56 (95% C.I.:0.34–0.92)], persons with monthly family incomes between R$1,501–3,000 [0.59 (95% C.I.:0.38–0.92)] or greater than R$3,000 [0.64 (95% C.I.:0.42–0.98)], and persons who were unemployed [0.65 (95% C.I.:0.46–0.92)]. Non-medical use of opioids in Brazil may be more prevalent than previously recognised. Proper measurement and evaluation of opioid misuse across Brazil and other Latin American countries is critical to understand and prevent opioid-related harms.

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Non-medical use; prescription opioids; Latin America; National survey; misuse

Introduction

In recent years, studies of the epidemiology of drug addiction and overdose in North America have focused primarily on opioids, which in 2017 took the lives of nearly 50,000 persons in the U.S. (NIDA, 2018) and 4,000 in Canada (Public Health Agency of Canada, 2018). On the other hand, studies of substance use in South America still primarily focus on powder- and crack-cocaine, which due to geopolitics (proximity to Andean countries, well-established routes and corridors for exportation of coca-cocaine to global markets), and the structure and dynamic of regional markets (e.g. high availability, low prices), has been endemic across Latin American countries (UNODC, 2018). In Brazil, specifically, cocaine is the most commonly used illicit substance after cannabis, with the prevalence of lifetime cocaine use reported as 3.1% (95% C.I.: 2.7–3.4) in the most recent representative survey of the Brazilian population (Silva et al., 2018).

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Notwithstanding, in Brazil, as well in several other countries worldwide, renewed transshipment routes have made different substances available in the global market. Despite a major ongoing economic crisis that has reduced Brazilians purchasing power along with several other unfortunate consequences (e.g. the increase of child mortality, after decades of progressive decline) (Collucci, 2018), market entanglement and globalisation of both legal and illegal merchandises seems to be an irreversible trend (UNODC, 2018). There have been scattered reports that substances besides the traditionally used illicit substances (e.g. cannabis, powder- and crack- cocaine) have been on the rise in different areas. Often, such substances affect specific segments of the population and are not available through the illicit street market. Some examples include the use of ecstasy and related substances by affluent individuals in parties and raves (Remy, Buttram, Kurtz, Surratt, & Pechansky, 2017), or the use of amphetamine-like substances by long-distance truck drivers (Malta et al., 2006).

The non-medical use of opioids other than heroin has been very seldom assessed in Brazil due to several reasons, among them the lack of attention to a drug that rarely comes up in small studies based on convenience samples originating from single behavioural health services (e.g. substance use treatment facilities) (Krawczyk, Kerrigan, & Bastos, 2016). Moreover, relatively sparse events are unlikely to be properly identified by underpowered surveys. In the 2005 Brazilian Household Survey on Drug Use, lifetime non-prescribed use of codeine-syrup was estimated at 1.9% (95% C.I. 0.5–3.2) and lifetime non-prescribed use of other opioid analgesics was estimated at 1.3% (95% C.I:0.2–2.4) (Secretaria Nacional Antidrogas (SENAD), 2005), but little attention was given to these figures. Yet, new data show that prescription opioid sales have risen dramatically across Brazil, nearly quintupling in the past six years (Krawczyk, Greene, Zorzanelli, & Bastos, 2018), leading to questions of how this rise may impact the availability of these substances and subsequent misuse. The present paper presents findings from the most recent national household survey, focusing of the non-medical use of opioid analgesics.

Methods

Study sample

Data come from the 2015 Brazilian Household Survey on Substance Use (BHSU-3), which aimed to estimate epidemiologic parameters related to substance use by residents ages 12–65 living in private or collective households in all of the national territory across Brazil. BHSU-3's specific objectives included, among others, to provide direct estimates of substance use prevalence within different timeframes (lifetime use, past year use, and past month use), as well as to assess for problematic use of alcohol, tobacco, cannabis, solvents, powder cocaine, crack cocaine, and other drugs. Data collection was conducted between May and December of 2015 by experienced interviewers who received training by local supervisors on the topic of substance use in preparation for the survey. Data was collected from 16,273 individuals interviewed in person in their households using paper questionnaires. Written consent was obtained from all selected individuals 18 years old or older, and minors under 18 years of age signed an assent form, with a parent or guardian providing written consent. This study was approved by an Ethics Review Board of FIOCRUZ (CAAE # 35283814.4.0000.5241).

Study design and sampling strategy

BHSU-3 used a stratified multi-stage probability sampling design (Cochran, 1977) and comprised multiple domains of interest such as the five Brazilian macro-regions, the set of capital cities of the 26 Brazilian states plus the Federal District, among others. The set of overlapping domains of interest required a complex stratification strategy, described in detail elsewhere (Silva et al., 2018). This stratification included sampling of municipalities with probability proportional to size (PPS) in the first stage; census enumeration areas (CEAs) sorted by average household income and sampled

with PPS based on number of private households in the second stage; and finally, households sampled using equal probability inverse sampling (Vasconcellos, Silva, & Szwarcwald, 2005) based on a list of residential addresses in each CEA. For each household, one eligible resident was sampled at random. Some municipalities of large population size were included in the sample with certainty to ensure comparability with previous surveys (Fonseca & Galduróz, 2010). Whenever this happened, the corresponding large municipality turned into a stratum for purposes of sample selection within it.

Sample size, power calculation, and capacity to assess sparse events

Determination of the sample size was guided by the study funder and by the project's budget parameters and experience with former surveys conducted by the research team. A minimum prevalence was specified, $P_{\min} = 2\%$, for which the margin of relative error of estimation should be a maximum of $dR = 30\%$, with confidence level $100 \times (1-\alpha) = 95\%$. As the study used a three and four-stage cluster sampling plan rather than simple random sampling, the research team multiplied the sample size by an estimate of the sample design effect as recommended by Silva (Silva, Pessoa, & Lila, 2002). As there were no data on sample design effect in the previous household surveys on the subject, the team decided on a sample design effect of 1.5, based on experience with similar household surveys and the types of variables the study would analyse. Thus, the number of CEAs to be sampled in any target domain to estimate prevalence's equal to or greater than 2% with 30% maximum margin of relative error would be provided by $m = 314$ CEAs, and within each track 10 eligible residents would be interviewed. This would give a total sample size of 3,140 residents per target domain. Given the requirement to provide estimates separately for each of the five Brazilian macro-regions, a total sample size of 15,700 residents was required. The overall sample size of 1,570 was then allocated to the strata, rounding sample sizes upwards to obtain integer sample sizes for each stratum. After this allocation, the resulting sample size was 16,400 residents (or households) spread across 1,640 CEAs and 351 municipalities. By conclusion of data collection, 16,273 eligible residents provided complete interviews, reaching 99.2% of the required sample size.

Measurement of prevalence of opioid use

Heroin use was assessed using three questions focused on three different timeframes with the possible responses Yes/No/NA: Ever-used; used in the last 12 months; used in the last 30 days. Since we expected a rare event for the more restricted timeframe, the past-30 days question was followed up by asking the interviewee the number of days he/she had used heroin in the last 30 days with a priori defined intervals. The same structure was used to assess non-medical use of opioid analgesics. Non-medical use was defined as using opioid analgesics not prescribed for your own use or using opioid analgesics in a way different from how the medications were prescribed. The primary examples given to participants included Tylex®, Dolantina®, Codein® and Codex®, which were the opioid analgesics most frequently mentioned by participants of the pilot study. The wording and examples for this question had been field-tested by interviewers who piloted the questionnaires in Rio de Janeiro, and were revised based on feedback that were reported back to study supervisors during the pilot phase. In addition, the researchers also included in the research manual for interviewers a comprehensive list of all opioid analgesic products as listed in the Brazilian Thesaurus of Medicines (DEF), using both brand and generic denominations included in this category.

Survey weighting, post-stratification and calibration, and statistical analysis

Design weights were calculated as reciprocals of each participant's sample inclusion probability and adjusted to compensate for differential non-response by sex, age group, macro-regions and household size. Lifetime, past year and past month prevalence of heroin and non-medical opioid analgesic

use with 95% confidence intervals were calculated for the entire sample. Past year prevalence of non-medical use of opioid analgesics was then estimated based on sex, age, ethnicity/race, education, family income, employment status, and religion, and prevalence ratios were calculated with respective 95% confidence intervals to detect groups that were at higher risk of non-medical opioid analgesic use. Contingency tables and pertinent statistics were used, taking in full consideration the underlying complex structure of the database.

All analyses incorporated survey weights as well as calibration of the sample to account for the survey design and the differential loss/enrolment of interviewees. Survey weighting and analysis was performed using 'tidyverse'(Wickham, 2017), 'survey' (Lumley & Lumley, 2018) and 'srvyr' (Ellis & Lumley, 2018) libraries of the R statistical software.

Results

The main findings respecting the reported prevalence and 95% confidence intervals (CI) for heroin and non-medical use of opioid analgesics are depicted in Table 1. Prevalence of lifetime heroin use was found to be low (0.3% (95% C.I.: 0.2–0.4)), with past year use being an extremely rare event (Prevalence: 0.0 (0.0–0.2)). Due to the very low figures for heroin use and the fact that the prevalence for those who have ever used was below the 2% threshold defined a priori as the minimum point prevalence (and respective confidence intervals) that could be assessed by the statistical power of the sample, no further information about heroin was presented about past-30 day use or number of days of use.

Non-medical use of opioid analgesics, on the other hand, was reported much more frequently, with a reported lifetime prevalence of 2.9 (95%CI: 2.3–3.4) past-year prevalence of 1.4 (95%CI: 1.1–1.7) and past 30 day prevalence of 0.6 (95% CI:0.4–0.8). The majority of participants who reported past-30 day use of opioid analgesics reported doing so for 1–2 days in the past month (35.3%) or 3–5 days in past month (26.5%).

Table 2 summarises past year prevalence of non-medical opioid analgesic use and prevalence ratios (PR) based on select sociodemographic characteristics. Sociodemographic factors associated with lower prevalence of non-medical opioid analgesic use were being male (PR: 0.54 (95% CI:0.36–0.78)), being in the youngest age group of 10–24 (0.56 (95%CI:0.34–0.92)) compared to ages 45–65, having a monthly family income of R$1,501–3,000 (0.59 (95% C.I.:0.38–0.92)) or greater

Table 1. Estimated number of non-medical opioid users, point prevalence and respective 95% confidence intervals (Brazil, 2015).

Reported use	Users (N)[a]	Prevalence (%)	95% Confidence Interval
Heroin			
Ever used	459,798	0.3	0.2–0.4
Past 12 months	82,238	0.0	0.0–0.1
Past 30 days	–	–	–
Opioid analgesic (non-medical use)			
Ever used	4,417,961	2.9	2.3–3.4
Past 12 months	2,152,258	1.4	1.1–1.7
Past 30 days	901,977	0.6	0.4–0.8
Days of opioid analgesic use among those reporting any past 30 day use			
–2 days	317,143	35.2	25.2–45.1
3–5 days	238,963	26.5	15.6–37.4
6–9 days	156,225	17.3	7.8–26.8
10–19 days	43,853	4.9	0.6–9.2
20–29 days	19,480	2.2	0.0–5.7
Everyday	59,822	6.6	1.4–11.9
Don't know	66,491	7.4	0.0–15.4

[a]N corresponds to number of estimated Brazilians after weighting and calibrating the sample based on the official figures for the Brazilian population of this age group of approximately 153 million persons, according to estimates by the Brazilian Institute of Geography and Statistics (IBGE) in 2015.

Table 2. Sociodemographic characteristics and prevalence among respondents reporting non-medical use of opioid analgesics in the past year before interview (Brazil, 2015).

Sociodemographic characteristic		Past-year users	Total population	Prevalence	Prevalence ratio[c]
Sex	Male	724,269	74,179,205	0.98	**0.54 (0.36–0.78)**
	Female	1,427,989	78,915,961	1.81	1
Age group	12–24	352,204	42,603,244	0.83	**0.56 (0.34–0.92)**
	25–44	1,088,863	62,046,208	1.75	1.20 (0.85–1.68)
	45–65	711,191	48,445,715	1.47	1
Ethnicity/Race[a]	White	893,370	67,777,519	1.32	1
	Black	278,540	15,497,481	1.80	1.37 (0.77–2.45)
	Mixed race	923,598	68,083,270	1.36	1.03 (0.71–1.49)
	Other	56,749	1,736,896	3.27	2.53 (1.00–6.41)
Education	No formal education	294,799	15,398,271	1.91	1
	Primary-School	786,680	47,631,405	1.65	0.86 (0.52–1.42)
	High-School	401,196	34,785,075	1.15	0.60 (0.34–1.05)
	College or more	669,582	55,280,414	1.21	0.63 (0.37–1.07)
Monthly family income[b]	R$0–750.00	540,862	26,657,801	2.03	1
	R$751.00–1,500.00	609,102	46,205,824	1.32	0.65 (0.33–1.29)
	R$1,501.00–3,000.00	691,586	56,966,528	1.21	**0.59 (0.38–0.92)**
	R$3,000.00 +	310,708	23,265,014	1.34	**0.64 (0.42–0.98)**
Employment	Regular employment	966,679	58,620,894	1.65	1
	Intermittent/informal	439,253	25,000,873	1.76	1.07 (0.71–1.59)
	Unemployed	746,326	69,473,400	1.07	**0.65 (0.46–0.92)**
Religion	None	177,720	13,174,180	1.35	1
	Catholic	1,433,596	91,242,525	1.57	0.85 (0.47–1.55)
	Evangelic	461,425	42,892,302	1.08	0.68 (0.44–1.06)
	Other	79,516	5,786,158	1.37	0.87 (0.46–1.67)
Overall totals		2,152,258	153,095,66	1.41	

[a]As defined by categories used by the Brazilian Census.
[b]The average exchange rate for US$ dollars/Brazilian R$ for the period when the survey was carried out was roughly R$3.3 per US $1.0.
[c]Bold signals significant prevalence ratio at the $p < 0.05$ level.

than R$3,000 (0.64 (95% C.I.:0.42–0.98)) (compared to the lowest income group of up to R$750+), and being unemployed (0.65 (95%CI:0.46–0.92)). There were no differences in prevalence of use among persons of different ethnic/racial groups, different education levels, or different religions.

Discussion

Given its large scale, the BSHU-3 had greater statistical power than former epidemiologic studies on substance use in Brazil. This enabled the survey to capture relatively rare events (Fosgate, 2009) such as the use of non-prescribed opioid analgesics, giving them the chance to emerge as a so-far neglected public health issue in Brazil. Figures for heroin use were below the threshold defined by the sample size calculation as point prevalence that could be defined with the necessary precision. The calculations of confidence intervals that include zero speak in favour of an actual sparse event, especially for more recent use. This may be explained by the unavailability of heroin as a street-drug, as has been found by a former survey on open drug scenes where the use of multiple substances was assessed, and in which heroin was absent in over 1,500 drug scenes all over the country (Coutinho et al., 2019).

This study identified a higher than expected prevalence of nonmedical use of opioid analgesics among a substantial fraction of the population within a representative sample of the general population. This emerged as an unexpected finding given the historical assumption that non-medical use of opioids was not a problem of interest in Brazil. Indeed, the lifetime (2.9%) and past-year (1.4%) prevalence found in this survey were comparable to estimates of cocaine use (Silva et al., 2018) and are not far from U.S. estimates of non-medical use of opioids reported in 2001–2002, which were respectively 4.7% and 1.8% (Huang et al., 2006). This is concerning given the rapid growth in opioid analgesic use that has occurred in the U.S over the past decade (Saha et al., 2016) and the opioid

analgesic and heroin/fentanyl overdose epidemics that have followed to become a leading cause of death (Rudd, 2016). Especially alarming is this high prevalence coupled with the recent findings that reveal a dramatic increase in sales of medically prescribed opioids in pharmacies all over Brazil in recent years (Krawczyk et al., 2018).

Interestingly, females were more likely to report past-year non-medical use opioid analgesics compared to males, which differs from U.S. trends where nonmedical opioid analgesic use rates are higher among men (Saha et al., 2016). This may reflect a general trend in greater psychotropic medicine use among women that has been reported in Brazil (Estancial Fernandes, de Azevedo, Goldbaum, & Barros, 2018). Another potential explanation for the higher prevalence among women during the study period was the emergence of Chikungunya virus at the time, whose chronic stage is often accompanied by severe pain, especially among women (Souza et al., 2018) and yet may be under- detected and treated by the healthcare system (Bagno et al., 2019). The complex interrelationship of an ongoing Chikungunya epidemic, which dates back to 2013 (Souza et al., 2019) with the medical and non-medical use of opioids remain to be fully discerned.

Past year non-medical opioid analgesic use was also found to be less prevalent among youth (10–24), suggesting possible greater use and accessibility to psychotropic medications among older age groups, which has also been previously reported in Brazil (Blay, Fillenbaum, Pitta, & Peluso, 2014). Lastly, prevalence was lower among persons in higher-income groups but also among those who were unemployed, indicating a need to better understand how opioid analgesic use may relate to distinct socioeconomic conditions. More research is needed to better explore the differences identified in order to target surveillance and intervention efforts to groups that may be at highest risk for opioid-related problems.

The non-medical use of opioids has so far remained a semi-hidden issue amid the focus of so-called major drug problems, as perceived by the government, the media and the public. The heavy focus on curbing cocaine use (especially crack cocaine, described as being used in epidemic dimensions) (Volcov & Vasconcellos, 2013), along with a long chain of national debates and controversy surrounding the legality of cannabis (Angelo, 2018), has largely obfuscated all other issues in the field of drug policy in contemporary Brazil. The current data reveal a more complex picture to be further explored by future research. Some critical next steps for research in this area include looking into prescribing patterns of opioids in public and private hospitals and outpatient settings, and studying how opioids are used both during medical supervision as well as in the period following care. A clearer focus on motivations for prescribed and non-medical opioid use in Brazil (such as for self-treatment for Chikungunya) and of sources of medications will help shed important information that could inform the development of proper public health policies and interventions to prevent negative consequences related to opioid use.

Limitations

The current study has a few limitations. For one, as prevalence of heroin was very low, we could not detect meaningful measures for past 30-day use or numbers of days used. Therefore, research into the relatively rare availability and use of heroin use in Brazil may have to rely on convenience samples that may not be generalisable to the rest of the Brazilian population. Second, given opioid analgesics were not expected to be a common substance that came up in this survey, there were no further instruments that accompanied the questionnaire in relation to the nature or patterns of opioid analgesic use. We therefore could not distinguish whether reported use was in response to self-medication for pain or for recreational use. We were also not able to ask about the source of such non-prescribed medications, including an assessment of homemade synthetic opioids and the role of internet-driven sales of opioids, for which no data currently exist. Lastly, despite multiple training sessions by the research team, study interviewers and participants may have been less familiar with the concept of non-medical use of opioid analgesics than that of other drug use, which may have led to some reporting biases for these substances.

Conclusion

Despite limitations, this study was the first to our knowledge to reliably measure prevalence rates of heroin and non-medical opioid analgesic use in a representative national sample in Latin America. The complex survey design allowed for the detection of relatively sparse events that have recently not been found in previous surveys or studies with smaller samples. Although the consumption of heroin appears to remain negligible, other opioids appear to be on the rise in contemporary Brazil, both through legal and illegal means. Given the relatively easy shift that has been known to occur from opioid analgesics to stronger, illicit opioids when made available (Compton, Jones, & Baldwin, 2016), it is important that the nonmedical use of opioid analgesics and potential growing demand for an illicit opioid market not be overlooked. It is therefore essential to discern whether current figures reflect an emerging major public health issue, and in response, to ensure that evidence-based policies be effectively implemented that may help curb further spread and untoward consequences.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Data availability statement

Microdata were provided as a CD-Rom to the funder (SENAD-MInistério da Justiça), containing de-identified primary data, as well as a column of respective weights and post-stratification calibration adjustments. Together with the CD-Rom, a tutorial on how to use the R survey library was provided as part of the final report submitted to the funder. Both the microdata and the acompanying tutorials are available from the funder under request. As soon as the authors get the clearance from the federal government, all microdata will be available for download from the Researchers' institution repository (https://www.arca.fiocruz.br/) at no cost.

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