Use of health care services by people with substance use disorders in Belgium: a register-based cohort study

Luk Van Baelen (✉ luk.vanbaelen@sciensano.be)
Sciensano https://orcid.org/0000-0003-2119-7255

Els Plettinckx
Sciensano

Jérôme Antoine
Sciensano

Karín De Ridder
Sciensano

Brecht Devleesschauwer
Sciensano

Lies Gremeaux
Sciensano

Research article

Keywords: Substance Use Disorders, health care services, health care service providers, Belgium, cohort study, epidemiology

DOI: https://doi.org/10.21203/rs.3.rs-42206/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Background To describe the frequencies of health-care utilization by people with substance use disorder (SUD), more specifically contacts with the general practitioner (GP), the psychiatrist, the emergency departments (ED) and hospital admissions and to compare this frequency to the general population.

Methods Data from the national register of people who were in treatment for SUD between 2011–2014 was linked to health care data from the Belgian health insurance (N = 30,905). Four comparators were matched on age, sex and place of residence to each subject in treatment for SUD (N = 123,620). Cases were further divided in five mutually exclusive categories based on the main SUD (opiates, crack/cocaine, stimulants, cannabis and alcohol). We calculated the average number of contacts with GP, psychiatrists and ED, and hospital admissions per person over a ten year period (2008–2017), computed descriptive statistics for each of the SUD and used negative binomial regression models to compare cases and comparators.

Results Over the ten-year period, people in treatment for SUD overall had on average 60 GP contacts, 3.9 psychiatrist contacts, 7.8 visits to the ED, and 16 hospital admissions. Rate ratios, comparing cases and corresponding comparators, showed that people in treatment for SUD had on average 1.9 more contacts with a GP (95% CI 1.9-2.0), 7.4 more contacts with a psychiatrist (95% CI 7.0-7.7), 4.2 more ED visits (95% CI 4.2–4.3), and 6.4 more hospital admissions (95% CI 6.3–6.5).

Conclusion The use of health services for people with SUD is between almost two (GP) and seven times (psychiatrist) higher than for comparators. People in treatment for alcohol use disorders have a higher burden of disease than people in treatment for other SUD. The use of health services remained stable in the five years before and after the moment people with SUD entered into treatment for SUD.

Background

People with substance use disorders (SUD) are known to have poor health outcomes and increased risk of premature death. For example in Belgium, previous research found that being in treatment for SUD increased all-cause mortality risk nearly elevenfold for users of illicit drugs, and sevenfold for users of licit drugs [1]. In 2017 in Belgium, alcohol was estimated to account for 5.3% of all deaths and 6.1% of the disability-adjusted life-years (DALYs) [2]. In the same year (2017), illicit drugs were estimated to contribute to 0.25% of all deaths and to 0.81% of the DALYs. People with SUD have a higher risk of contracting cancers, cardiovascular, respiratory and liver disorders [3, 4] or infectious diseases such as tuberculosis [5], hepatitis C [6] or diseases due to the human immunodeficiency virus (HIV) [7], and they are also known to have more oral health problems [8].

Notwithstanding these high needs, people with SUD face many obstacles when in need for treatment, from prejudices about treatment adherence to stigmatizing attitudes among health professionals [9]. For example, one of the reasons for the low number of people with SUD treated for Hepatitis C Virus (HCV) is that they have always been considered by clinicians as difficult to treat because of existing social and psychological barriers and concerns about reinfection [10–12]. However, recent studies [13, 14] have shown that there is no significant difference in outcome between HCV treatment of people with SUD and the general population. These barriers not only exist in the case of infectious diseases such as hepatitis C or HIV [6, 7] but also for general health care [15], hospital care [15, 16], dental health care [8] or palliative care [17], and even for preventive measures such as contraception [18] or for access to pharmacies [15]. Although not all people who use drugs are in need for specialized treatment [19], it is known that most of them receive no specialized treatment when needed [20, 21]. As a result, many people with SUD remain untreated although needs are high and effective treatment is available.

Help-seeking normally occurs in several phases [20] and delays between the onset of SUD symptoms and the start of specialized treatment are common [22]. Several reasons could be given for these delays: resistance to acknowledge the problem (i.e. symptoms are defined as ‘normal’), lack of financial means, lack of knowledge about the availability of help, lack of trust in treatment, fear of stigmatization, etc. [19, 20, 23]. Postponing to seek and receive health care related to SUD is likely to increase the risk of developing complications [24]. Consequently, treatment can become necessary rather than desirable when occurring during an emergency or crisis situation [23]. Indeed, many studies already pointed out that people with SUD heavily rely on emergency departments and are supposedly less in contact with general health care services [25, 26]. As revealed by a recent meta-analysis, people with SUD have on average 4.8 times more episodes in emergency departments than the general population and are 7.1 times more often hospitalized [27]. However, the same review identified several gaps in the evidence such as the fact that little is known about the health seeking behavior of people with cannabis use disorders, MDMA or amphetamine use disorders, powder cocaine use disorders, as well as the lack of knowledge about the use of primary health care by people with SUD [27].

To address these gaps, the primary objective of this study is to describe the frequencies of health-care utilization by people with SUD, more specifically contacts with the general practitioner (GP), the psychiatrist, the emergency departments (ED) and hospital admissions, for people with alcohol use disorders, cannabis use disorders, disorders related to the use of stimulants other than crack/cocaine, cocaine use disorders and opiate use disorders. The second objective is to compare the frequency of health-care utilization of these people to the general population.
Methods

Data for the current study was generated through the linkage and matching of two existing Belgian national health and population registers: (1) the Belgian Treatment Demand Indicator database (TDI) with information on socio-demographic variables and substances for which treatment was sought at the start of the treatment episode for people in treatment for SUD, covering almost all specialized drug treatment centers and by around one third of the general or psychiatric hospitals [28], and (2) the InterMutualistic Agency database (IMA, [29, 30]) with data on reimbursed health care services, gathered through the seven Belgian health insurance agencies. The data that was used from this database consists of contacts with the general practitioner, the psychiatrist, ED and admissions to the hospital, and spanned a period between 1 January 2008 and 31 December 2017. The full database covers 99% of the people living in Belgium [31].

The Belgian National Identification Number (NIN) was used to link both databases. All patients registered in TDI with a NIN who started a treatment for SUD between 2011 and 2014 and who could be identified in the IMA database were considered eligible subjects for this study (n = 30,905). For those with multiple episodes the first treatment episode in TDI was selected, in line with the TDI-IMA protocol [31]. Cases were further divided in five mutually exclusive categories: people in treatment for opiate use disorders (some of which were also in treatment for other substances), people in treatment for crack/cocaine use disorders who were not in treatment for opiates, people in treatment for stimulant use disorders (mainly MDMA and amphetamines) who were not in treatment for opiates or crack/cocaine, people in treatment for cannabis use disorders with or without alcohol use disorders who were not in treatment for opiates, crack/cocaine or stimulants, and people in treatment for only alcohol use disorders.

Furthermore, there were 3,198 people in treatment for other substances, who were excluded from the analysis, which gives a total of 27,707 cases.

A group of comparators who had not been in treatment for SUD between 2011 and 2014 was selected from the general population through the IMA database [31]. Four comparators were matched on age, sex and municipality of residence to each case in treatment for SUD. Sex and age were considered to be basic matching variables. The potential confounding of municipality of residence is related to regional differences in health care regulation, health care seeking and access to specialized medical health care for SUD as well as other differences that might be present, for instance caused by socio-economic status of the patients by region.

For people with SUD as a whole as well as for each of the five patient categories and the corresponding comparators and for men and women separately, we calculated the average number of contacts with primary care physicians, psychiatrists and ED, and hospital admissions per person over the ten year period. We computed descriptive statistics for each of these groups and used negative binomial regression models to compare cases and comparators. This analysis models the log of the expected count (i.e., number of visits) as a linear function of cases versus comparators. The coefficients obtained were exponentiated to get rate ratios (with corresponding 95% confidence intervals). For the graphical representation of the average use of each outcome variable data were recalibrated towards the day people with SUD entered into treatment. Graphs represent the results of the outcome variable five years before and five years after this day. In this way, they illustrate the evolution over time per month for each category of patients and corresponding comparators.

Data analysis was done using SAS software version 9.3 (SAS Institute Inc., Cary, NC). The reporting of this study conforms to the STROBE guidelines [32].

Results

As shown in Table 1, almost one in three cases was in treatment for alcohol use disorders only, one in five was in treatment for cannabis or opiate use disorders, whereas 14% was in treatment for cocaine use disorders and 8.6% for stimulant use disorders.
|                                | opiates | crack/cocaine | stimulants | cannabis | alcohol |
|--------------------------------|---------|---------------|------------|----------|---------|
| Sex (N missing = 9)            | Men     | N 4502        | 3420       | 1998     | 4924    | 6207    |
|                                | % 79.1% | 80.9%         | 74.8%      | 85.3%    | 66.5%   |
|                                | Women   | N 1188        | 807        | 675      | 852     | 3125    |
|                                | % 20.9% | 19.1%         | 25.3%      | 14.8%    | 33.5%   |
| Age (N missing = 2365)         | < 20    | N 68          | 177        | 308      | 1363    | 26      |
|                                | % 1.2%  | 4.4%          | 12.3%      | 25.8%    | 0.3%    |
|                                | 20–29   | N 1568        | 1737       | 1038     | 2236    | 388     |
|                                | % 28.5% | 43.4%         | 41.4%      | 42.3%    | 4.7%    |
|                                | 30–39   | N 2153        | 1516       | 839      | 1125    | 1322    |
|                                | % 39.2% | 37.9%         | 33.4%      | 21.3%    | 16.0%   |
|                                | 40–49   | N 1380        | 480        | 260      | 435     | 2690    |
|                                | % 25.1% | 12.0%         | 10.4%      | 8.2%     | 32.6%   |
|                                | 50–59   | N 299         | 83         | 59       | 114     | 2686    |
|                                | % 5.4%  | 2.1%          | 2.4%       | 2.2%     | 32.5%   |
|                                | > 60    | N 25          | 10         | 6        | 11      | 1147    |
|                                | % 0.5%  | 0.2%          | 0.2%       | 0.2%     | 13.9%   |
| Region (N missing = 0)         | Flanders| N 3096        | 3345       | 2604     | 4785    | 6298    |
|                                | % 54.4% | 79.1%         | 97.4%      | 82.8%    | 67.5%   |
|                                | Wallonia| N 1815        | 602        | 43       | 768     | 2591    |
|                                | % 31.9% | 14.2%         | 1.6%       | 13.3%    | 27.8%   |
|                                | Brussels| N 780         | 280        | 26       | 227     | 447     |
|                                | % 13.7% | 6.6%          | 1.0%       | 3.9%     | 4.8%    |
| In treatment before (N missing = 1768) | No | N 965 | 1969 | 1215 | 3547 | 3295 |
|                                | % 19.3% | 49.1%         | 48.6%      | 63.4%    | 36.6%   |
|                                | Yes    | N 4035        | 2042       | 1283     | 2045    | 5709    |
|                                | % 80.7% | 50.9%         | 51.4%      | 36.6%    | 63.4%   |
| Type treatment setting (N missing = 0) | Inpatient | N 2341 | 1675 | 761 | 1506 | 7918 |
|                                | % 41.1% | 39.6%         | 28.5%      | 26.1%    | 84.8%   |
|                                | Outpatient | N 3350 | 2552 | 1912 | 4274 | 1418 |
|                                | % 58.9% | 60.4%         | 71.5%      | 73.9%    | 15.2%   |
| Total                          | N 5691 | 4227         | 2673       | 5780     | 9336    |
|                                | % 18.4% | 13.7%         | 8.6%       | 18.7%    | 30.2%   |

People in treatment for alcohol use disorders were older, had been in treatment for SUD before and relied mainly on inpatient services. People in treatment for disorders related to street drugs were younger and most often supported by outpatient services.

Over the ten-year period 2008–2017, people in treatment for SUD overall had on average 60 GP contacts, 3.9 psychiatrist contacts, 7.8 visits to the ED, and 16 hospital admissions (Table 2).
| Contacts with GP* | Contacts with psychiatrist | Contacts with ED* | Hospital admissions |
|------------------|---------------------------|-------------------|--------------------|
| n                | mean | sd     | p-value | mean  | sd     | p-value | mean  | sd     | p-value | mean  | sd     | p-value |
| overall          | control | 123620 | 30.8 | 33.3 | < 0.001 | 0.5 | 1.2 | < 0.001 | 1.9 | 2.9 | < 0.001 | 2.5 | 9.4 | < 0.001 |
|                  | case      | 30905 | 59.9 | 68.4 | 3.9 | 10.8 | 7.8 | 11.9 | 16.0 | 30.8 |                  |
| opiates          | control | 22764 | 26.1 | 29.4 | < 0.001 | 0.6 | 4.5 | < 0.001 | 2.1 | 3.3 | < 0.001 | 2.2 | 9.7 | < 0.001 |
|                  | case      | 5691 | 68.5 | 82.7 | 3.9 | 14.1 | 7.9 | 10.8 | 10.1 | 21.4 |                  |
| cocaine/crack    | control | 16908 | 26.7 | 27.9 | < 0.001 | 0.4 | 3.7 | < 0.001 | 1.9 | 2.8 | < 0.001 | 2.1 | 10.0 | < 0.001 |
|                  | case      | 4227 | 47.0 | 49.1 | 2.7 | 7.8 | 7.0 | 8.4 | 10.6 | 23.1 |                  |
| stimulants       | control | 10692 | 29.0 | 27.5 | < 0.001 | 0.4 | 3.1 | < 0.001 | 1.8 | 2.6 | < 0.001 | 2.2 | 8.7 | < 0.001 |
|                  | case      | 2673 | 53.2 | 55.7 | 2.5 | 8.0 | 5.8 | 6.5 | 11.9 | 25.0 |                  |
| cannabis         | control | 23120 | 24.8 | 25.2 | < 0.001 | 0.4 | 2.9 | < 0.001 | 2.0 | 2.9 | < 0.001 | 1.8 | 6.7 | < 0.001 |
|                  | case      | 5780 | 39.6 | 43.1 | 2.1 | 6.5 | 5.6 | 8.3 | 8.9 | 21.9 |                  |
| alcohol          | control | 37344 | 37.9 | 39.3 | < 0.001 | 0.7 | 5.1 | < 0.001 | 1.6 | 2.7 | < 0.001 | 3.2 | 10.4 | < 0.001 |
|                  | case      | 9336 | 64.7 | 62.7 | 5.0 | 11.2 | 9.1 | 14.2 | 24.2 | 38.4 |                  |
| women            | control | 32268 | 41.6 | 40.6 | < 0.001 | 0.7 | 4.4 | < 0.001 | 1.7 | 3.0 | < 0.001 | 3.4 | 9.5 | < 0.001 |
|                  | case      | 8067 | 81.9 | 84.1 | 4.9 | 11.8 | 8.6 | 12.7 | 22.5 | 13.3 |                  |
| men              | control | 91316 | 26.9 | 29.3 | < 0.001 | 0.5 | 4.1 | < 0.001 | 1.9 | 2.9 | < 0.001 | 2.2 | 9.4 | < 0.001 |
|                  | case      | 22829 | 52.1 | 60.1 | 3.5 | 10.4 | 7.6 | 11.6 | 13.7 | 27.8 |                  |

*GP: general practitioner; ED: emergency department

Rate ratios, comparing cases and corresponding comparators, showed that people in treatment for SUD had on average 1.9 more contacts with a GP (95% CI 1.9-2.0), 7.4 more contacts with a psychiatrist (95% CI 7.0-7.7), 4.2 more ED visits (95% CI 4.2–4.3), and 6.4 more hospital admissions (95% CI 6.3–6.5) (Table 3).
between 36.6% (cannabis) and 80.7% (opiates) of the cases who had been already in treatment for SUD before, meaning that they might have

One reason for the high use of general health services might be that the data is based on the first episode in TDI between 2011 and 2014, with

level of health care use was that stable. We could not find other studies to support or contradict this finding.

Interestingly, as shown by the graphs, there is little difference in the number of contacts with the specific health service providers over time within each category of SUD. Indeed, the use of health services remains quite stable in the five years before and after the moment people with SUD entered into treatment. Of course, this does not provide insights in individual variation over time, but it remains interesting to see that this level of health care use was that stable. We could not find other studies to support or contradict this finding.

One reason for the high use of general health services might be that the data is based on the first episode in TDI between 2011 and 2014, with

compared to people with disorders related to stimulants and crack/cocaine.

Table 3
Rate ratios (RR) (with standard error (SE) and 95% confidence interval (CI)) of use of health provider/service for people in treatment for substance use disorders between 2011 and 2014 versus comparators in Belgium, overall, by substance and by sex (2008–2017)

| Contacts with GP* | Contacts with psychiatrist | Contacts with ED* | Hospital admissions |
|------------------|---------------------------|-------------------|--------------------|
| RR   | SE   | 95% CI | RR | SE   | 95% CI | RR | SE   | 95% CI | RR | SE   | 95% CI |
| Overall | 1.9 | 0.01 | 1.9–2.0 | 7.4 | 0.17 | 7.0–7.7 | 4.2 | 0.03 | 4.2–4.3 | 6.4 | 0.06 | 6.3–6.5 |
| Opiates | 2.6 | 0.04 | 2.5–2.7 | 6.7 | 0.40 | 5.9–7.5 | 3.7 | 0.06 | 3.5–3.8 | 4.6 | 0.10 | 4.4–4.8 |
| Cocaine | 1.8 | 0.03 | 1.7–1.8 | 6.5 | 0.40 | 5.7–7.4 | 3.6 | 0.07 | 3.5–3.8 | 5.0 | 0.12 | 4.8–5.3 |
| Stimulants | 1.8 | 0.03 | 1.8–1.9 | 7.0 | 0.61 | 5.9–8.3 | 3.3 | 0.08 | 3.1–3.5 | 5.3 | 0.16 | 5.0–5.6 |
| Cannabis | 1.6 | 0.02 | 1.6–1.6 | 5.6 | 0.30 | 4.9–6.3 | 2.8 | 0.05 | 2.7–2.8 | 4.9 | 0.10 | 4.7–5.1 |
| Alcohol | 1.7 | 0.02 | 1.7–1.7 | 7.7 | 0.30 | 7.1–8.3 | 5.7 | 0.05 | 5.6–5.9 | 7.6 | 0.11 | 7.3–7.8 |
| Women (vs men) | 1.6 | 0.02 | 1.5–1.6 | 1.4 | 0.04 | 1.3–1.5 | 1.1 | 0.02 | 1.1–1.2 | 1.7 | 0.03 | 1.6–1.7 |

*GP: general practitioner; ED: emergency department

Rate ratios per SUD category ranged for GP contacts between 1.6 (cannabis, 95%CI 1.6–1.6) and 2.6 (opiates, 95%CI 2.5–2.7), for psychiatrist contacts between 5.6 (cannabis, 95%CI 4.9–6.3) and 7.7 (alcohol, 95%CI 7.1–8.3), for contacts with ED between 2.8 (cannabis, 95%CI 2.7–2.8) and 5.7 (alcohol, 95%CI 5.6–5.9), and for hospital admissions between 4.6 (opiates, 95%CI 4.4–4.8) and 7.6 (alcohol, 95%CI 7.3–7.8).

Women with SUD were using health care services more than men, with rate ratios ranging between 1.1 (ED, 95%CI 1.1–1.1) and 1.7 (hospital admissions, 95% CI 1.6–1.7).

Discussion
The results of this study confirm the high burden of disease for people with SUD. Our results for ED and hospitalizations episodes are in line with the results of previous studies [27]. At the same time, our study gives a better understanding of the number of contacts with general practitioners by people with SUD. People in treatment for SUD have between 1.6 and 1.9 times more contacts with a GP than their comparators, except for people in treatment for opiate use disorders who have on average 2.6 times more contacts with their GP than their respective comparators. The reason for this higher frequency might be that many of them are on substitution treatment for which they have to consult a GP. For all other considered health service providers, people with alcohol use disorders had more frequent contacts than people with disorders related to street drugs and the comparators. This last observation is in contrast to findings from a previous study where people with alcohol use disorders were found to use less health care services than the general population [33].

Overall, people with SUD had a higher use of primary care than acute health care, which is in line with findings from the few number of studies who reported on this [34, 35]. Compared to the comparators, the differences in use of health services between people in treatment for disorders related to cannabis, stimulants and crack/cocaine are minimal for contacts with the GP, and not significant for hospitalizations and contacts with psychiatrists. Only people in treatment for cannabis use disorders have significantly less contacts with the ED than the comparators compared to people with disorders related to stimulants and crack/cocaine.

Interestingly, as shown by the graphs, there is little difference in the number of contacts with the specific health service providers over time within each category of SUD. Indeed, the use of health services remains quite stable in the five years before and after the moment people with SUD entered into treatment. Of course, this does not provide insights in individual variation over time, but it remains interesting to see that this level of health care use was that stable. We could not find other studies to support or contradict this finding.

One reason for the high use of general health services might be that the data is based on the first episode in TDI between 2011 and 2014, with between 36.6% (cannabis) and 80.7% (opiates) of the cases who had been already in treatment for SUD before, meaning that they might have
had already serious substance use related and general health care problems before the day on which they were registered in TDI.

The current study has several strengths and limitations, some of which have already been mentioned in previous articles [1, 6, 31]. Outreach services and harm reduction initiatives are not covered by TDI, nor are GPs who are considered to play a major role in detecting and managing SUD directly [28]. This means that people with SUD who are only treated by GPs are not included in the database. However, for all people registered in TDI, data about their consultations to GPs are registered in IMA.

The use of register data for a vast and diversified group of people in treatment for SUD allows a better understanding of the number of contacts with health care service providers. However, the relatively limited evolution over time, and the fact that almost 60% of the cases had been in specialized treatment for SUD before, supports the idea that the development of SUD is a long-term process. Further research should thus take a longer time period into consideration to describe earlier phases in the use of general health care services leading to specialized treatment of SUD.

**Conclusion**

Our study gives a better understanding of the high burden of disease for people with SUD. People with SUD go almost twice as often to the GP as comparators and more than seven times more often to the psychiatrist. They are also more than six times more frequently admitted to the hospital than comparators. People in treatment for alcohol use disorders make significantly more use of health services and health service providers than people in treatment for disorders related to street drugs. The use of health services remains quite stable in the five years before and after the moment people with SUD entered into treatment for their SUD.

**Abbreviations**

TDI: Treatment Demand Indicator; IMA: InterMutualistisch Agentschap; SUD: substance use disorder; GP: general practitioner; ED: the emergency departments; CI: confidence interval; DALY: disability-adjusted life-years; HIV: human immunodeficiency virus; HCV: Hepatitis C Virus; MDMA: 3,4-Methylenedioxyamphetamine; NIN: National Identification Number

**Declarations**

**Ethics approval and consent to participate**

The project was approved by the Belgian Privacy Commission (SCSZG/15/033). IMA adheres to the Program Law of 24/12/2002, articles 278 – 281. The Belgian TDI protocol adheres to the European protocol and the Belgian privacy legislation, as described by Antoine et al. [28].

**Consent for publication**

Not applicable.

**Availability of data and materials**

The full dataset of this study is not available due to restricted access to the IMA database.

**Competing Interests**

The authors declare that they do not have any conflicts of interest to disclose.

**Funding**

This study received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**Authors’ Contributions**

LVB was responsible for conceptualization, analysis, methodology and writing the original draft, EP was responsible for validation and reviewing the manuscript, JA was responsible for the TDI data collection, KDR was responsible for conceptualization, methodology, validation and reviewing the manuscript, BDV was involved in the conceptualization, the formal analysis and reviewing the manuscript, LG was involved in the project administration and the critical revision of the manuscript. All authors read and approved the final manuscript.

**Acknowledgements**

None.
References

1. Van Baelen L, Antoine J, De Ridder K, et al. All-cause mortality rate of people in treatment for substance use disorders in Belgium: A register-based cohort study. Journal of Substance Use. 2019;24:481–6. doi:10.1080/14659891.2019.1604841.

2. GBD 2017 Risk Factor Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392:1923–94. doi:10.1016/S0140-6736(18)32225-6.

3. Degenhardt L, Larney S, Randall D, et al. Causes of death in a cohort treated for opioid dependence between 1985 and 2005. Addiction. 2014. https://onlinelibrary.wiley.com/doi/abs/10.1111/add.12337.

4. Degenhardt L, Bucello C, Mathers B, et al. Mortality among regular or dependent users of heroin and other opioids: a systematic review and meta-analysis of cohort studies. Addiction. 2011;106:32–51. doi:10.1111/j.1360-0443.2010.03140.x.

5. Millet J-P, Moreno A, Fina L, et al. Factors that influence current tuberculosis epidemiology. Eur Spine J. 2013;22 Suppl 4:539–48. doi:10.1007/s00586-012-2334-8.

6. Van Baelen L, Antoine J, De Ridder K, et al. Diagnostic hepatitis C testing of people in treatment for substance use disorders in Belgium between 2011 and 2014: a cross-sectional study. Acta Gastroenterol Belg. 2019;82:35–42.

7. Kamaruizada N, Altice FL. Challenges in managing HIV in people who use drugs. Curr Opin Infect Dis. 2015;28:10–6. doi:10.1097/QCO.000000000000125.

8. Sheridan J, Aggleton M, Carson T. Dental health and access to dental treatment: a comparison of drug users and non-drug users attending community pharmacies. Br Dent J. 2001;191:453–7. doi:10.1038/sj.bdj.4801206.

9. van Boekel LC, Brouwers EPM, van Weeghel J, et al. Stigma among health professionals towards patients with substance use disorders and its consequences for healthcare delivery: Systematic review. Drug Alcohol Depend. 2013;131:23–35.

10. Foster GR. Injecting drug users with chronic hepatitis C: should they be offered antiviral therapy? Addiction. 2008;103:1412–3.

11. Higgs P, Sacks-Davis R, Gold J, et al. Barriers to receiving hepatitis C treatment for people who inject drugs: Myths and evidence. Hepatitis Monthly. 2011;11:513–8.

12. Martin NK, Vickerman P, Miners A, et al. Cost-effectiveness of hepatitis C virus antiviral treatment for injection drug user populations. Hepatology. 2012;55:49–57.

13. Bielen R, Moreno C, Van Vlierberghen H, et al. Belgian experience with direct acting antivirals in people who inject drugs. Drug Alcohol Depend. 2017;177:214–20.

14. Robaeys G, Christensen S, Lucidarme D, et al. Chronic Hepatitis C Treatment in Patients with Drug Injection History: Findings of the INTEGRATE Prospective, Observational Study. Infectious Diseases Therapy. 2017;6:265–75.

15. Neale J, Tompkins C, Sheard L. Barriers to accessing generic health and social care services: a qualitative study of injecting drug users. Health Soc Care Community. 2008;16:147–54. doi:10.1111/j.1360-0443.2007.00739.x.

16. Chan Carusone S, Guta A, Robinson S, et al. “Maybe if I stop the drugs, then maybe they’d care?”—hospital care experiences of people who use drugs. Harm Reduction Journal. 2019;16:147. doi:10.1186/s12954-019-0285-7.

17. Hudson BF, Flemming K, Shulman C, et al. Challenges to access and provision of palliative care for people who are homeless: a systematic review of qualitative research. BMC Palliative Care. 2016;15:96. doi:10.1186/s12904-016-0168-6.

18. Olsen A, Banwell C, Madden A. Contraception, punishment and women who use drugs. BMC Women's Health. 2014;14:5. doi:10.1186/1472-6874-14-5.

19. Digiusto E, Treloar C. Equity of access to treatment, and barriers to treatment for illicit drug use in Australia. Addiction. 2007;102:958–69. doi:10.1111/j.1360-0443.2007.01842.x.

20. Mojtahabi R, Olfson M, Mechanic D. Perceived need and help-seeking in adults with mood, anxiety, or substance use disorders. Arch Gen Psychiatry. 2002;59:77–84. doi:10.1001/archpsyc.59.1.77.

21. Priester MA, Browne T, Iachini A, et al. Treatment Access Barriers and Disparities Among Individuals with Co-Occurring Mental Health and Substance Use Disorders: An Integrative Literature Review. J Subst Abuse Treat. 2016;2015/10/31:47–59.

22. Kessler RC, Aguilar-Gaxiola S, Berglund PA. Patterns and predictors of treatment seeking after onset of a substance use disorder. Arch Gen Psychiatry. 2001;58:1065–71. doi:10.1001/archpsyc.58.11.1065.

23. Morrissin A, Elliott L, Gruer L. Injecting-related harm and treatment-seeking behaviour among injecting drug users. Addiction. 2006;92:1349–52. doi:10.1111/j.1360-0443.1997.tb02853.x.

24. Onyeka IN, Beynon CM, Ronkainen K, et al. Hospitalization in a Cohort Seeking Treatment for Illicit Drug Use in Finland. J Subst Abuse Treat. 2015;53:64–70.
25. Bahorik AL, Satre DD, Kline-Simon AH, et al. Alcohol, marijuana, and opioid use disorders: 5-Year patterns and characteristics of emergency department encounters. Subst Abus. 2018;39:59–68. doi:10.1080/08897077.2017.1356789.

26. Sanjuan PM, Rice SL, Witkiewitz K, et al. Alcohol, tobacco, and drug use among emergency department patients. Drug Alcohol Depend. 2014;138:32–8. doi:10.1016/j.drugalcdep.2014.01.025.

27. Lever D, Freer J, King E, et al. Frequency of health-care utilization by adults who use illicit drugs: a systematic review and meta-analysis. *Addiction* Published Online First: 9 November. 2019. doi:10.1111/add.14892.

28. Antoine J, De Ridder K, Plettinckx E, et al. Treatment for substance use disorders: the Belgian Treatment Demand Indicator registration protocol. Archives of Public Health. 2016;74:27.

29. IMA. IMA Population Database. Published Online First. 4 October 2017. _http://www.aim-ima.be/Data-Populatie-53_ (accessed 17 Jun 2020).

30. IMA. IMA Health Service Database. Published Online First: 4 October 2017. _http://www.aim-ima.be/_ (accessed 17 Jun 2020).

31. Van Baelen L, De Ridder K, Antoine J, et al. Longitudinal pharmacoepidemiological and health services research for substance users in treatment: protocol of the Belgian TDI-IMA linkage. Arch Public Health 2018;76. doi:10.1186/s13690-017-0249-x.

32. Vandebroucke JP, von Elm E, Altman DG, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and Elaboration. PLoS Medicine. 2007;4:e297.

33. Zarkin GA, Bray JW, Babor TF, et al. Alcohol Drinking Patterns and Health Care Utilization in a Managed Care Organization. *Health Serv Res.* 2004;39:553–70. doi:10.1111/j.1475-6773.2004.00244.x.

34. Darke S, Marel C, Ross J, et al. Health Service Utilization Among Heroin Users: 11-Year Follow-up of the Australian Treatment Outcome Study Cohort. *Addictive Disorders Their Treatment.* 2015;14:159–66. doi:10.1097/ADT.0000000000000069.

35. Lintzeris N, Rivas C, Monds LA, et al. Substance use, health status and service utilisation of older clients attending specialist drug and alcohol services. *Drug Alcohol Rev.* 2016;35:223–31. doi:10.1111/dar.12266.

**Figures**

**Figure 1**

Monthly proportion of people in treatment for substance use disorders between 2011 and 2014 and comparators in contact with general practitioner in the five years before and after the day of start treatment, by substance in Belgium (2008-2017).
Figure 2

Monthly proportion of people in treatment for substance use disorders between 2011 and 2014 and comparators in contact with a psychiatrist in the five years before and after the day of start treatment, by substance in Belgium (2008-2017).

Figure 3

Monthly proportion of people in treatment for substance use disorders between 2011 and 2014 and comparators in contact with emergency department in the five years before and after the day of start treatment, by substance in Belgium (2008-2017).
Figure 4

Monthly proportion of people in treatment for substance used disorders between 2011 and 2014 and comparators with hospital admissions in the five years before and after the day of start treatment, by substance in Belgium (2008-2017).