Original Article

Epidemiological Profile of Repeated Self-Harm Presentations to Healthcare Services in a Brazilian Urban Centre (Vitoria, ES)

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Abstract:

Background: In Brazil, national surveillance indicates a rise in self-harm, but little is known about patterns of repeated presentations to healthcare services or changes in self-harm methods over time.

Aims: To examine sociodemographic and clinical factors associated with two or more (repeated) presentations to healthcare services for self-harm, and to explore method switching among individuals presenting to healthcare services in Vitória, Brazil.

Method: A retrospective cohort analysis was conducted using administrative data from the Brazilian Unified Health System in Vitoria City (Espírito Santo) (2012–2022). Records from the Notifiable Diseases Information System and e-SUS National Health Surveillance System were used to identify individuals with self-harm presentations. Modified Poisson Regression was employed to examine associations between recurrence repeated self-harm episodes and sociodemographic and clinical characteristics between 2018 and 2022.

Results: Among 2,152 self-harm notifications, 69% involved repeated presentations. The results revealed that female sex [RR = 1.14, 95% CI: 1.06–1.23], presence of disorder [RR = 1.41, 95% CI: 1.27–1.57], and use of sharp objects [RR = 1.22, 95% CI: 1.12–1.32] were positively associated with repetition, whereas Black [RR = 0.87, 95% CI: 0.79–0.95], multiracial ethnicity [RR = 0.92, 95% CI: 0.87–0.98], and poisoning [RR = 0.92, 95% CI: 0.85–1.00] were negatively associated. Among those with multiple episodes, half re-presented within 77 days and three-quarters within 260 days. Method switching was common: 42% changed methods between their first and second episodes, with cutting most frequently transitioning to self-poisoning.

Limitations: Findings rely on routine notification data, which vary in completeness. Some clinical information was based on collateral reports rather than diagnosis.

Conclusion: Repeated self-harm presentations often occur within short intervals, highlighting critical opportunities for early intervention. High levels of method switching underscore the need for comprehensive and person-centered assessment.

Keywords: self-harm, repetition, Brazil, Vitoria, public health data

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Conflict of Interest

The authors have no conflict of interest to declare.

Publication Ethics

The data used in this study were provided by the Municipal Health Department after approval from the Research Ethics Committee of the Federal University of Espírito Santo (Protocol No. 5.462.461) and from the Municipal Health Department itself (Protocol No. 1927205/2022).

Authorship

CRediT

- Conceptualization: AI, MDD, RCCC, TCZ (Ideas; formulation or evolution of over-arching research goals and aims).
- Data curation: RMP, VFO, TCZ Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.
- Formal analysis : RMP, VFO Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.
- Funding acquisition: AI Acquisition of the financial support for the project leading to this publication.
- Investigation: -AI, RCCC, TCZ Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.

- Methodology: -AI, MDD, RMP, VFO, KK, TCZ Development or design of methodology; creation of models.

- Project administration: - AI, TCZ Management and coordination responsibility for the re-search activity planning and execution.

- Resources: RMP, VFO - Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.

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- Writing — review & editing: KK, RMP, VFO, TCZ, AI, MDD - Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision — including pre- or post-publication stag-es.

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Research Transparency Statement

The authors are not allowed to share the study data widely due to ethical and confidentiality issues. Statistical analysis code is shared exclusively for peer-review purposes and is available as supplementary material.

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Introduction

Self-harm, defined as a behavior in which an individual inflicts harm on themselves (with or without suicidal intent), has been a central focus of suicide-prevention efforts across healthcare settings (Hawton et al., 2003, 2016). In England, a national study found rates of approximately 293 per 100,000 for males and 397 per 100,000 for females (Geulayov et al., 2016). In Ireland, recent data from the National Self-Harm Registry show rates of 167 per 100,000 for males and 217 per 100,000 for females (Joyce et al., 2024), while in Australia, recent figures indicate 63.7 per 100,000 for males and 118.1 per 100,000 for females (Australian Institute of Health and Welfare, 2025). Hospital-presenting self-harm has been consistently linked to a markedly elevated risk of subsequent suicide, particularly among individuals with repeated episodes providing 80 times higher risk than that of the general population (Griffin et al., 2023).

Across low- and middle-income countries (LMICs), healthcare-based data on self-harm remain scarce and heterogeneous, limiting cross-country comparisons and effective prevention planning (Knipe et al., 2022; Vijayakumar & Armstrong, 2019). One of the few large-scale longitudinal investigations addressing this issue is the Sri Lankan cohort study by Knipe et al. (2019), which followed over 44,000 individuals who presented to hospital for non-fatal self-harm. Within 12 months of the index presentation, 5.4% of participants re-presented with self-harm and 0.6% died by suicide. The standardised mortality ratio (SMR = 1.0, 95% CI 0.9–1.2) indicated no excess suicide risk among those who presented with self-harm however with findings suggesting that suicide prevention strategies in LMICs may need to extend beyond hospital-treated self-harm, as the risk of repetition and subsequent suicide appears lower than that observed in high-income countries (Knipe, Metcalfe, et al., 2019).

Within the middle-income countries context, recent research indicates a substantial rise in self-harm notifications, hospitalizations, and suicide rates in Brazil over the past decade. In an ecological analysis covering 2011–2022, Alves et al. (2024) reported 720,480 self-harm notifications, 104,458 hospitalizations, and 147,698 suicides nationally. Over this period, the annual notification rate of self-harm increased approximately ninefold, from 7.6 to 70.1 per 100,000 population (AAPC = 21.13%;

95% CI = 17.50–25.33), while the suicide rate rose from 5.0 to 7.3 per 100,000 (AAPC = 3.70%; 95% CI = 3.05–4.38). The study also revealed substantial inequalities where Indigenous populations in 2022, had the highest self-harm notification rate (103.7 per 10,000) and suicide rate (16.58 per 100,000), but also one of the lowest hospitalization rates (1.14 per 100,000). Complementary findings show that suicide mortality among Brazilian adolescents has increased significantly between 2000 and 2022, with a sharp rise starting in 2013 (APC: 7.7%; 95% CI: 6.2–9.3), underscoring an urgent need for targeted prevention strategies (Corassa et al., 2025).

In Brazil, information on self-harm, defined as "self-inflicted violence", is one of the reportable data outcomes collected through national information systems, primarily the Notifiable Diseases Information System (SINAN), which compiles data of diseases and health conditions from local and regional healthcare services. The e-SUS National Health Surveillance system (e-SUS VS) integrates state-level information to SINAN national data. These constitute essential sources of epidemiological information on self-harm in Brazil, and have provided evidence that a higher prevalence of self-harm is found amongst females, White populations, and those with mental disorders, such as depression, eating disorders, borderline personality disorder and alcohol use (Fonseca & Marin, 2022; Miranda et al., 2023; Paixão et al., 2021; Pinheiro et al., 2021; Santos et al., 2021; Santos et al., 2024).

However, despite the availability of national notification systems, there remains limited analysis of repeated self-harm presentations within specific Brazilian urban settings. Context-specific epidemiological evidence is essential not only for enabling cross-national comparisons, but also for informing locally relevant prevention strategies, service organization, and clinical decision-making. Understanding who re-presents, the methods involved, and temporal patterns within a defined setting can support the development of targeted interventions, guide resource allocation, and shape future research priorities tailored to the needs of the population served.

Given the importance of self-harm presentation data in LMICs for enabling cross-national comparisons, and for generating contextually grounded evidence to inform prevention and service planning, the present study aims to explore (a) the demographic and clinical profile of those who have a notification of repeated self-harm; and (b) the temporal patterns and changes of means of self-harm.

We believe that uncovering these patterns will allow for a development a better understanding of the population who presents multiple times with repeated self-harm in healthcare services – a key knowledge of inform service policies and clinical practices, particularly person-centered biopsychosocial assessments that have been shown to reduce the risk of subsequent self-harm and suicide (Bergen et al., 2010; Quinlivan et al., 2021).

Method

Setting and participants

This is a retrospective cohort study that investigates patient data from the Brazilian Unified Health System (SUS) healthcare services. All information recorded by healthcare services providers are received through the Information Systems interpersonal/self-inflicted violence notification forms. Whilst most of the available evidence suggests that the overall accuracy and quality of this classification system are good (e.g., Alves et al., 2024; da Fonsêca et al., 2022; Pinheiro et al., 2025; Santos et al. 2025), some studies indicate geographic variability, with high-quality data not being found in all towns and cities across the country (e.g., Avanci et al., 2021; Girianelli et al., 2018). The study included individuals with repeated attendances for self-harm (defined as self-inflicted violence but called self-harm hereafter), between 2012 and 2022. The regression analyses were conducted using data from the full study period (2012–2022), whereas the analysis of repetition intervals was restricted to 2018–2022, when longitudinal tracking of individuals became possible in the database. Data were collected for the State of Espirito Santo capital city (Vitoria) in the southeastern region of Brazil, with an estimated population of 370,000 inhabitants.

Outcome measures

The intentional self-harm data analysed in this study cover deliberate behaviours irrespective of suicidal intent, in line with international terminology used to define self-harm presentations (Hawton, 2004). The specific self-harm methods recorded were self-poisoning, attempted hanging, use of sharp objects (cutting), other methods (such as firearms or jumping from a height), and combined methods. Sociodemographic characteristics, such as age, sex, race/ethnicity, education level, area of residence,

marital status, sexual orientation, gender identity recorded by local service providers were utilized and presented in detail in Table 1. Further information on the presence of disabilities (diagnosed disorder or disability), mental or/and behavioral disorders, method of self-harm, number of episodes and repeated presentations to healthcare services were further used (Table 1). Behavioral and mental disorders were diagnosed by healthcare professionals. Specifically, *behaviour disorder* covered: emotional disturbances (e.g., panic attacks, low mood), conduct disorders (e.g., attention-deficit symptoms, enuresis/encopresis), and impairments in social functioning (e.g., selective mutism, social withdrawal, hyperactivity); *mental disorder*: severe psychiatric conditions such as schizophrenia, bipolar disorder, obsessive-compulsive disorder, autism spectrum disorder, dementia, and alcohol or other substance dependence.

Data preparation

Given that the collected information was recorded as categorical data, imputing missing values was deemed inappropriate. Consequently, cases with missing data were omitted (listwise deletion). Entries in which the status for repeated healthcare visits, mental disorder, behavioral disorder, marital status, ethnicity, and education level were marked as "Unknown" or "Not applicable" were also excluded. Although the potential negative effects of removing these data (e.g., loss of information, reduced statistical power, etc.) are acknowledged, this methodological choice prevailed, as the distribution of data resources remained technically unchanged after the omission of these cases (see Supplementary Table 3). Due to insufficient data of self-harm cases linked to occupation, gender identity, and sexual orientation, these variables were excluded from our analyses. Additionally, the number of cases in the Indigenous ethnicity category was very small ($n < 5$). To avoid unstable estimates and potential confidentiality concerns, these observations were excluded from the analytical sample. The final dataset included 2,152 self-harm notifications, and the sequence of filters and selections is shown in Supplementary Table 1.

Statistical methods

In the current dataset (n = 2,152), there were 1,480 notifications (68.8%) between 2012 and 2022 of individuals who had repeated visits to healthcare services for self-harm in the study city. Supplementary Table 2 summarizes how the variables were measured.

Given the high prevalence of repeated self-harm in the sample (68.8%), logistic regression was deemed less appropriate due to the potential overestimation of effect sizes when outcomes are common. Therefore, modified Poisson regression (Zou, 2004) with a log link function and robust variance estimators was employed to directly estimate risk ratios (RR) and their 95% confidence intervals. This approach allows valid estimation of relative risk in cohort studies with binary outcomes and avoids the inflation associated with odds ratios in common events (Gnardellis et al., 2022).

The dependent variable was repeated self-harm presentation to healthcare services (yes/no). Independent variables included age, sex, ethnicity, marital status, disability/disorder status, method of self-harm (sharp object and poisoning), presence of mental disorder, behavioural disorder, and education level.

Robust standard errors were calculated using the sandwich estimator to account for potential variance misspecification inherent in Poisson models applied to binary data. Multicollinearity was assessed using the Generalized Variance Inflation Factor (GVIF) by Fox and Monette (1992). All VIF values were below 2, indicating no evidence of problematic multicollinearity among the covariates.

The characteristics of these individuals with repeated healthcare visits for self-harm were investigated using the following model:

$$\log(E[rep]) = \beta_0 + \beta_1 age + \beta_2 sex + \beta_3 \text{ethnicity} + \beta_4 \text{marital\_status} + \beta_5 \text{dis} + \beta_6 \text{sharp\_obj} + \beta_7 \text{poisoning} + \beta_8 \text{m\_disorder} + \beta_9 \text{b\_disorder} + \beta_{10} \text{education} + \gamma_t year$$

The interval (in days) between the first and second self-harm presentations was calculated for each individual for years 2018-2022, which was the only period during which the same individuals could be followed. The distribution of these intervals was described using quartiles and visualized through a histogram. To examine method switching between the first and second self-harm presentations, we compared the method used at each visit for individuals with repeated episodes, with

longitudinal analysis via episode-to-episode transitions graphically represented on Sankey-type diagrams (also known as Alluvial plot). The proportion of patients who changed method between presentations was calculated along with the direction and frequency of these method transitions.

Results

Sociodemographic and clinical characteristics of repeated cases of self-harm

Initial findings indicated that our sample consisted predominantly of female patients and was largely multiracial, who represented just over half of the cohort (Table 1). Educational attainment was generally low, with about one-third not having completed primary school, and most individuals were unmarried (67%). Approximately two-thirds reported a disability or disorder, and a similar proportion had repeated self-harm presentations (69%). More than half of the individuals had an official diagnosis of a mental or behavioral disorder. Regarding methods, cutting was the most frequent form of self-harm (≈71%), although self-poisoning was also widely used (≈69%).

[Insert Table 1]

Table 2 presents the results of the modified Poisson regression analysis estimating risk ratios (RR) for repetition of self-harm. After adjustment for covariates and year fixed effects, female individuals had a 14.5% higher risk of repetition compared with males (RR = 1.14; 95% CI: 1.06–1.23; p <0.001).

[Insert Table 2]

Regarding ethnicity, Black individuals had a 13% lower risk of repetition compared with White individuals (RR = 0.87; 95% CI: 0.79–0.95; p = 0.004), while multiracial individuals had a 7.6% lower risk (RR = 0.92; 95% CI: 0.87–0.98; p = 0.008). The association for Asian individuals was not statistically significant.

The presence of a disorder was associated with a 41% higher risk of repetition (RR = 1.41; 95% CI: 1.27–1.57; p < 0.001). Self-harm involving sharp objects was associated with a 22% higher risk of repetition (RR = 1.22; 95% CI: 1.12–1.32; p < 0.001). In contrast, poisoning was associated with a 7.6%

lower risk of repetition (RR = 0.92; 95% CI: 0.85–1.00; p = 0.049). Age, marital status, mental disorder, behavioral disorder, and education level were not significantly associated with repetition in the adjusted model.

Temporal patterns and change in methods of self-harm

Among people who attended a healthcare service more than once for self-harm between 2018 and 2022, the time between episodes was usually quite short. In half of all repeat cases, the second visit happened within 77 days, just over two and a half months. Most people (75%) returned within 260 days, which is about nine months. Even so, not everyone represented quickly: nearly one in five repeat episodes (19%) were separated by more than a year.

[Insert Figure 1]

Among the individuals with a first and second presentation (n = 267), 41.9% changed their self-harm methods (Figure 2A). Nearly half of those who used cutting at the first episode (48.8%) presented with a different method at the second presentation (mostly self-poisoning). This pattern persisted when examining second repetitions (from the second to the third self-harm episode, n = 80; Figure 2B), with 50% of individuals switching methods; cutting showed a notable shift, with 54% of these individuals changing their method (again, mostly to self-poisoning). Although the number of cases decreases with higher-order repetitions (n = 28 for the fourth event [Figure 2C] and n = 14 for the fifth [Figure 2D]), the overall pattern of substantial method switching remains evident.

[Insert Figure 2]

Discussion

Our findings indicate that self-harm presentations were more common among females and multiracial individuals, with approximately one-third of the cohort having not completed primary education. More than half of the sample had a documented disability or disorder, and cutting was the most frequently used method. These characteristics were also associated with a higher likelihood of repeated self-harm. Notably, being female was associated with a 63% increased likelihood of repetition,

highlighting important sex differences in vulnerability. Additionally, our data also indicate that a substantial proportion of individuals changed their method of self-harm between presentations, with cutting showing the greatest degree of switching across episodes.

A global meta-analysis of suicidal behaviour in LMICs found that although the prevalence of diagnosed psychiatric disorders was lower than in high-income countries, more than 50% of individuals who engaged in suicidal behaviour had at least one mental disorder, and depression and alcohol-use disorders were the most frequently reported conditions (Knipe, Williams, et al., 2019). Community-based evidence further shows that suicidal ideation and attempts are common in LMIC populations and are strongly associated with mental disorders, social adversity, and exposure to stressful life events (Jordans et al., 2017). This pattern is also consistent with broader epidemiological evidence from Brazil, where females are overrepresented in non-fatal self-harm presentations, while males account for a substantially higher proportion of suicide deaths, with mortality rates nearly four times higher among men (Alves et al., 2024). This divergence suggests that males may be less likely to appear in repeat presentation samples because of the greater lethality of suicidal behaviour, potentially resulting in death at earlier attempts.

Method choice has also been shown to increase risk, a finding reinforced by more recent evidence indicating that individuals who self-harm through cutting are at increased risk of subsequent episodes (Geulayov et al., 2019; Larkin et al., 2014). Our findings that females and individuals using cutting are more likely to repeat self-harm support cross-cultural comparability of risk patterns. However, while research from high-income countries has informed the development of structured clinical guidelines and post–self-harm care pathways, healthcare systems in many LMICs remain constrained by limited resources and a lack of locally adapted clinical protocols (HSE, 2024; NICE, 2022). As a result, vulnerable populations such as those with low educational attainment, psychiatric morbidity, and repeated presentations are often not systematically identified for follow-up, potentially perpetuating cycles of repeated self-harm and missed opportunities for prevention.

Recent research highlights that both the *site* and *variability* of self-harm methods have important clinical implications. A network analysis of non-suicidal self-injury methods showed that

most individuals use multiple methods over time, with cutting occupying a central position associated with different self-harm behaviours, suggesting that method diversity may reflect increased clinical severity (Reinhardt et al., 2025). However, the method used provides only a partial picture. Effective clinical assessments must consider the individual's broader circumstances, underlying distress, and intent.

Although research has examined self-harm amongst Black people living as ethnic minorities in high-income, predominantly White countries, there is a lack of evidence on repeated self-harm among Black populations living in low- and middle-income countries (Cooper et al., 2010). A recent national study from Brazil reported significantly higher mortality from suicide and other "deaths of despair" among Black and Brown populations compared with White populations (Guimarães et al., 2024). Although in our current study Black individuals had a lower likelihood of repeated self-harm presentations compared with White individuals, they experience disproportionately higher suicide risk, (Guimarães et al., 2024). This contrast highlights an important gap between patterns of service use and death outcomes across racially diverse populations.

The high proportion of repeated presentations and the short intervals between episodes indicate that healthcare services need more consistent and coordinated responses to individuals attending healthcare services after self-harm. Strengthening early follow-up, implementing structured safety planning, and improving coordination between healthcare services could help reduce re-presentations (Hawton et al., 2022; Zortea et al., 2020). Given the high prevalence of mental disorders and disabilities in the sample, services should ensure timely access to specialist psychiatric and psychosocial support, particularly for individuals who may experience barriers to ongoing care.

Our findings indicate that half of the analysed population used a different self-harm method in subsequent episodes, consistent with international systematic evidence (Owens et al., 2015; Witt et al., 2019). These studies show that switching from self-injury (e.g., cutting) to self-poisoning is relatively common, whereas the reverse pattern is less prevalent. In Brazil (Martins Junior et al., 2016), a high proportion of hospital presentations for self-harm involve self-poisoning (around 70%), with nearly half involving medical drugs (46% of 107,763 presentations recorded between 1998 and 2014). However,

our study could not determine whether the 50% of individuals who switched from cutting to poisoning did so due to increased access to medication following their initial episode or due to treatment for mental or physical health conditions requiring prescribed drugs. Future research in Brazil should adopt longitudinal designs and incorporate information on access to means, such as prescribed medication, to better understand factors influencing transitions from self-injury to poisoning. The substantial switching of self-harm methods across episodes also highlights the importance of applying the same minimum level of assessment and support to all presentations, regardless of method or apparent severity (Owens et al., 2015).

For clinicians, the findings reinforce the need for person-centered assessments at every presentation for self-harm. The associations identified point to groups who may require closer monitoring and more sustained support. Method switching across episodes further demonstrates that clinicians should therefore explore wider contextual factors, including interpersonal difficulties, recent stressors, co-occurring disorders, and any history of previous self-harm.

The study also points to several gaps in routine data collection that limit the ability to inform clinical practice and policy. The current surveillance systems would benefit from more detailed and standardised information on psychosocial risk factors, substance use, and social vulnerability. Recording whether a psychosocial assessment was completed, and whether follow-up care was arranged would provide a clearer picture of service response. More complete documentation of ethnicity and disability or mental disorder status is also needed to identify disparities in risk and access to care.

Limitations and future directions

This study has several limitations that should be considered when interpreting the findings. First, the analysis relied on routinely collected notification data, which are subject to variability in documentation across healthcare providers and may under-represent individuals who do not attend healthcare services or whose episodes are not formally recorded. The omission of cases with missing or “Unknown” values, may have reduced sample diversity and could have excluded individuals experiencing significant social vulnerability. Important variables such as occupation, gender identity,

and sexual orientation could not be included due to insufficient data, limiting the ability to explore inequalities across these groups. Information on mental and behavioral disorders was based on collateral reports rather than clinical diagnosis, which may have introduced misclassification. The study was conducted in a single Brazilian city, and its findings may not generalize to other regions with different demographic profiles, healthcare structures, or levels of service accessibility. Finally, given that the primary focus of our work was to explore population risk estimates for repeated self-harm presentations, future studies should aim to explore temporal patterns in repeated self-harm presentations over longer study periods in order to identify changes in repetition rates and inform targeted prevention strategies.

Conclusion

This study provides new evidence on the characteristics and patterns of self-harm among individuals presenting repeatedly to healthcare services in a middle-income setting. Females, individuals with mental or behavioral disorders, and those self-cutting were more likely to re-present, and a substantial proportion of people changed their method of self-harm between episodes. These findings highlight the importance of consistent assessment, coordinated follow-up, and improved data systems to support early identification and ongoing care for individuals at heightened risk. This study contributes to a more nuanced understanding of risk patterns and underscores the need for locally informed strategies to reduce repeated presentations and improve patient outcomes.

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Table 1. Sociodemographic and clinical information of the sample (individuals who self-harmed between 2012-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).

Characteristics	Strata	Frequency (n)	Percentage (%)
Age: Age at notification	Children (under 13 years)	96	4.5
	Adolescents (13–17 years)	588	27.3
	Young Adults (18–25 years)	551	25.6
	Adults (26–59 years)	890	41.3
	Older Adults (60+ years)	27	1.3
Sex: Patient's sex	F	1688	78.4
	M	464	21.6
Ethnicity	White	697	32.4
	Black	288	13.4
	Asian	31	1.4
	Multiracial	1136	52.8
Education: Patient's education level	Incomplete primary school	669	31.1
	Complete primary school or incomplete secondary school	554	25.7
	Complete secondary school or incomplete higher education	768	35.7
	Complete higher education	161	7.5
Marital status: Marital status at notification	Never married	1448	67.3
	Married	503	23.4
	Widowed	16	0.7
	Separated	185	8.6
Disability or disorder: Reported mental disorder and/or physical disability	Yes	1432	66.5
	No	720	33.5
Repeated self-harm ED presentation	Yes	1480	68.8
	No	672	31.2
Sharp object:	Yes	628	29.2

Self-injury method - sharp object	No	1524	70.8
Poisoning: Self-injury method - poisoning	Yes	1260	58.5
	No	892	41.4
Mental disorder: The patient has a mental disorder	Yes	1243	57.8
	No	909	42.2
Behavioural disorder: The patient has a behavioural disorder	Yes	905	42.1
	No	1247	57.9
Year: Year of the notification	2012	35	1.6
	2013	35	1.6
	2014	61	2.8
	2015	39	1.8
	2016	111	5.2
	2017	213	9.9
	2018	296	13.7
	2019	438	20.3
	2020	230	10.7
	2021	416	19.3
	2022	278	12.9

Table 2. Crude and adjusted risk ratios with 95% CIs for the association between sociodemographic and clinical characteristics with self-harm repetition, using Poisson regression with robust variance

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Age	0.99	0.99–1.00	0.574	0.99	0.99–1.00	0.249
Sex						
Male (Reference)						
Female	1.14	1.05–1.23	**0.001**	1.14	1.06–1.23	**<0.001**
Ethnicity						
White (Reference)						
Black	0.83	0.75–0.92	**0.001**	0.87	0.79–0.96	**0.004**
Asian	0.79	0.58–1.07	0.134	0.83	0.63–1.11	0.216
Multiracial	0.93	0.87–0.99	**0.025**	0.92	0.87–0.98	**0.008**
Marital status						
Never married (Reference)						
Married	0.96	0.90–1.03	0.368	1.02	0.95–1.11	0.546
Widowed	0.99	0.71–1.38	0.969	1.11	0.82–1.51	0.488
Separated	1.01	0.91–1.12	0.763	1.02	0.92–1.14	0.624
Disorder						
No (Reference)						
Yes	1.46	1.36–1.58	**<0.001**	1.41	1.27–1.57	**<0.001**
Sharp object						
No (Reference)						
Yes	1.29	1.22–1.36	**<0.001**	1.22	1.12–1.32	**<0.001**
Poisoning						
No (Reference)						
Yes	0.80	0.76–0.85	**<0.001**	0.92	0.85–1.00	**0.049**
Mental disorder						
No (Reference)						
Yes	1.32	1.24–1.40	**<0.001**	1.05	0.97–1.15	0.178

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Behaviour disorder						
No (Reference)						
Yes	1.23	1.16–1.30	**<0.001**	1.00	0.95–1.07	0.812
Education						
Incomplete primary school (Reference)						
Complete primary school or incomplete secondary school	0.97	0.89–1.04	0.445	0.95	0.89–1.03	0.258
Complete secondary school or incomplete higher education	1.04	0.97–1.11	0.232	1.02	0.95–1.10	0.571
Complete higher education	0.99	0.88–1.11	0.882	0.95	0.85–1.08	0.461

Bold p values indicate significance ($p < 0.05$; $p < 0.01$; $p < 0.001$).

Figure 1. Intervals between repeated self-harm presentations (individuals who self-harmed more than once between 2018-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).

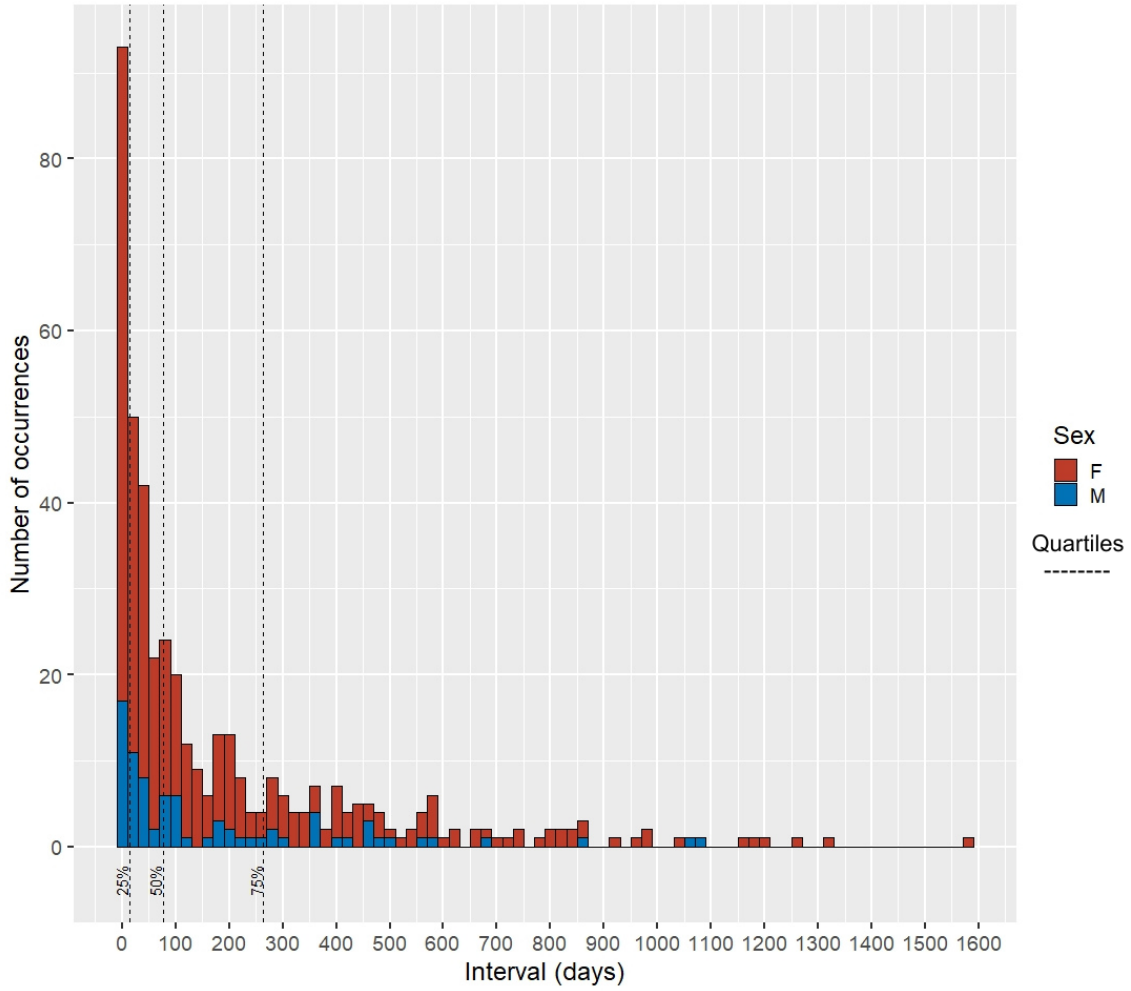
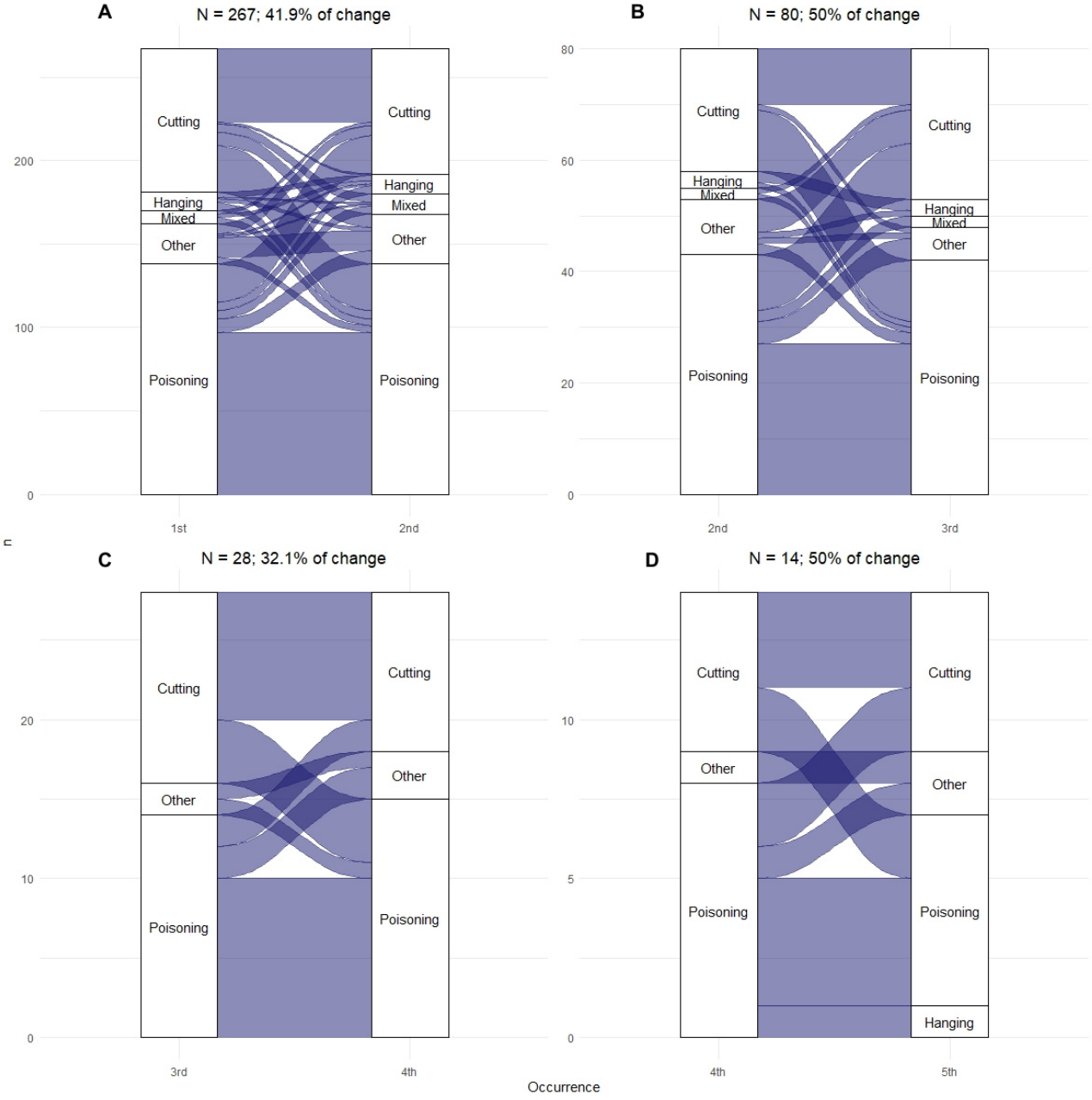


Figure 2. Method switching across repeated self-harm presentations (individuals who self-harmed more than once between 2018-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).



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Supplementary Table 1. Descriptive process of sample selection from the original dataset (n = 13,533) to the final analytical sample (n = 2,155).

Step	Filter description	Justification	Observations
0	Original dataset	-	13533
1	Filtering for self-harm behaviours	Only self-harm occurrences are selected.	4152
2	Selecting independent variables of interest	Research questions guided this selection.	4152
3	Omitting cases where self-harm as completed as "Ignored"	Only binary values (yes/no) were deemed as valid.	3473
4	Omitting cases with missing values in any variable	The type of statistical technique conducted requires a dataset with complete cases. Furthermore, this procedure does not significantly alter data distribution.	3399
5	Removing "Ignored" and "Not applicable" in m_disorder and b_disorder	Cleaning data is necessary and this choice does not significantly alter data distribution.	2990
6	Removing "Ignored" status in marital_status, ethnicity and education.	Cleaning data is necessary and this choice does not significantly alter data distribution.	2152

Supplementary Table 2. Variables measurement level

$\widehat{\beta}$	Variables	Description
β_1	age (Control)	Continuous: age at notification
β_2	sex (Control)	*Dummy*: Female (F); Male (M)
β_3	ethnicity (Control)	*Categorical*: White (1); Black (2); Asian (3); Multiracial (4); Indigenous (5)
β_4	marital_status (Control)	Categorical: (1) Never Married; (2) Married; (3) Widowed; (4) Separated
β_5	dis (Control)	*Dummy*: (1) if the patient has some kind of disorder/disability; (0) otherwise
β_6	shrp_obj (Control)	*Dummy*: (1) use of sharp objects as means of self-directed aggression ; (0) otherwise
β_7	poisoning (Control)	*Dummy*: (1) use of poisoning as means of self-directed aggression; (0) otherwise
β_8	m_disorder (Control)	*Dummy*: (1) having a diagnosis of a mental disorder; (0) otherwise
β_9	b_disorder (Control)	*Dummy*: (1) having a diagnosis of a behaviour disorder; (0) otherwise
β_{10}	education (Control)	Categorical ordinal: (0) incomplete primary school; (1) complete primary school or incomplete secondary school; (2) complete secondary school or incomplete higher education; (3) complete higher education
	rep (DV)	*Dummy*: (1) repeated emergency department presentation for self-harm; (0) otherwise

Supplementary Table 3. Distribution of key demographic and clinical characteristics across successive filtering steps

Variable	(1) Original (N = 3473)	(2) Without missing values (N = 3399)	(3) Removing "Unknown" and "Not applicable" from m_disorder and b_disorder + (1) + (2) (N = 2990)	(4) Removing "Unknown" from marital_status, ethnicity2 and education2 + removing Indigenous + (1) + (2) + (3) (N = 2152)	Overall (N = 12014)
Age at notification					
Mean (SD)	27.4 (13.2)	27.4 (13.2)	27.3 (13.2)	26.4 (12.4)	27.2 (13.1)
Median [Min, Max]	24.0 [4.00, 99.0]	24.0 [4.00, 99.0]	24.0 [4.00, 90.0]	23.0 [9.00, 88.0]	24.0 [4.00, 99.0]
Sex					
F	2683 (77.3%)	2626 (77.3%)	2317 (77.5%)	1688 (78.4%)	9314 (77.5%)
M	790 (22.7%)	773 (22.7%)	673 (22.5%)	464 (21.6%)	2700 (22.5%)
Ethnicity					
White	1080 (31.1%)	1064 (31.3%)	945 (31.6%)	697 (32.4%)	3786 (31.5%)
Black	454 (13.1%)	440 (12.9%)	391 (13.1%)	288 (13.4%)	1573 (13.1%)
Asian	45 (1.3%)	43 (1.3%)	39 (1.3%)	31 (1.4%)	158 (1.3%)
Multiracial	1795 (51.7%)	1758 (51.7%)	1556 (52.0%)	1136 (52.8%)	6245 (52.0%)
Indigenous	4 (0.1%)	4 (0.1%)	3 (0.1%)	0 (0%)	11 (0.1%)
Unknown	93 (2.7%)	90 (2.6%)	56 (1.9%)	0 (0%)	239 (2.0%)
Missing	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)	2 (0.0%)
Marital status					
Never married	2078 (59.8%)	2045 (60.2%)	1840 (61.5%)	1448 (67.3%)	7411 (61.7%)
Married	800 (23.0%)	790 (23.2%)	688 (23.0%)	503 (23.4%)	2781 (23.1%)
Widowed	35 (1.0%)	33 (1.0%)	28 (0.9%)	16 (0.7%)	112 (0.9%)
Separated	296 (8.5%)	292 (8.6%)	256 (8.6%)	185 (8.6%)	1029 (8.6%)
Not applicable	102 (2.9%)	90 (2.6%)	66 (2.2%)	0 (0%)	258 (2.1%)
Unknown	150 (4.3%)	149 (4.4%)	112 (3.7%)	0 (0%)	411 (3.4%)
Missing	12 (0.3%)	0 (0%)	0 (0%)	0 (0%)	12 (0.1%)
Year					
2012	63 (1.8%)	61 (1.8%)	50 (1.7%)	35 (1.6%)	209 (1.7%)
2013	70 (2.0%)	70 (2.1%)	64 (2.1%)	35 (1.6%)	239 (2.0%)
2014	149 (4.3%)	148 (4.4%)	97 (3.2%)	61 (2.8%)	455 (3.8%)

2015	169 (4.9%)	166 (4.9%)	77 (2.6%)	39 (1.8%)	451 (3.8%)
2016	223 (6.4%)	219 (6.4%)	157 (5.3%)	111 (5.2%)	710 (5.9%)
2017	333 (9.6%)	326 (9.6%)	290 (9.7%)	213 (9.9%)	1162 (9.7%)
2018	439 (12.6%)	432 (12.7%)	376 (12.6%)	296 (13.8%)	1543 (12.8%)
2019	627 (18.1%)	615 (18.1%)	584 (19.5%)	438 (20.4%)	2264 (18.8%)
2020	387 (11.1%)	358 (10.5%)	327 (10.9%)	230 (10.7%)	1302 (10.8%)
2021	599 (17.2%)	597 (17.6%)	573 (19.2%)	416 (19.3%)	2185 (18.2%)
2022	414 (11.9%)	407 (12.0%)	395 (13.2%)	278 (12.9%)	1494 (12.4%)
Repetition					
Yes	2322 (66.9%)	2274 (66.9%)	2039 (68.2%)	1480 (68.8%)	8115 (67.5%)
No	1151 (33.1%)	1125 (33.1%)	951 (31.8%)	672 (31.2%)	3899 (32.5%)
Disorder					
Yes	2221 (64.0%)	2189 (64.4%)	2041 (68.3%)	1432 (66.5%)	7883 (65.6%)
No	982 (28.3%)	949 (27.9%)	949 (31.7%)	720 (33.5%)	3600 (30.0%)
Unknown	266 (7.7%)	261 (7.7%)	0 (0%)	0 (0%)	527 (4.4%)
Missing	4 (0.1%)	0 (0%)	0 (0%)	0 (0%)	4 (0.0%)
Sharp object					
Yes	917 (26.4%)	898 (26.4%)	822 (27.5%)	628 (29.2%)	3265 (27.2%)
No	2550 (73.4%)	2496 (73.4%)	2164 (72.4%)	1524 (70.8%)	8734 (72.7%)
Unknown	5 (0.1%)	5 (0.1%)	4 (0.1%)	0 (0%)	14 (0.1%)
Missing	1 (0.0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.0%)
Poisoning					
Yes	2117 (61.0%)	2074 (61.0%)	1786 (59.7%)	1260 (58.6%)	7237 (60.2%)
No	1351 (38.9%)	1322 (38.9%)	1201 (40.2%)	892 (41.4%)	4766 (39.7%)
Unknown	3 (0.1%)	3 (0.1%)	3 (0.1%)	0 (0%)	9 (0.1%)
Missing	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)	2 (0.0%)
Mental disorder					

Yes	1853 (53.4%)	1825 (53.7%)	1765 (59.0%)	1243 (57.8%)	6686 (55.7%)
No	1240 (35.7%)	1230 (36.2%)	1225 (41.0%)	909 (42.2%)	4604 (38.3%)
Unknown	352 (10.1%)	344 (10.1%)	0 (0%)	0 (0%)	696 (5.8%)
Missing	28 (0.8%)	0 (0%)	0 (0%)	0 (0%)	28 (0.2%)
Behavior disorder					
Yes	1307 (37.6%)	1289 (37.9%)	1257 (42.0%)	905 (42.1%)	4758 (39.6%)
No	1755 (50.5%)	1735 (51.0%)	1733 (58.0%)	1247 (57.9%)	6470 (53.9%)
Unknown	382 (11.0%)	375 (11.0%)	0 (0%)	0 (0%)	757 (6.3%)
Missing	29 (0.8%)	0 (0%)	0 (0%)	0 (0%)	29 (0.2%)
Education					
Incomplete primary school	851 (24.5%)	841 (24.7%)	728 (24.3%)	669 (31.1%)	3089 (25.7%)
Complete primary school or incomplete secondary school	665 (19.1%)	658 (19.4%)	581 (19.4%)	554 (25.7%)	2458 (20.5%)
Complete secondary school or incomplete higher education	908 (26.1%)	898 (26.4%)	798 (26.7%)	768 (35.7%)	3372 (28.1%)
Complete higher education	196 (5.6%)	194 (5.7%)	175 (5.9%)	161 (7.5%)	726 (6.0%)
Unknown	816 (23.5%)	798 (23.5%)	701 (23.4%)	0 (0%)	2315 (19.3%)
Not applicable	10 (0.3%)	10 (0.3%)	7 (0.2%)	0 (0%)	27 (0.2%)
Missing	27 (0.8%)	0 (0%)	0 (0%)	0 (0%)	27 (0.2%)

Table 2. Crude and adjusted risk ratios with 95% CIs for the association between sociodemographic and clinical characteristics with self-harm repetition, using Poisson regression with robust variance

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Age	0.99	0.99–1.00	0.574	0.99	0.99–1.00	0.249
Sex						
Male (Reference)						
Female	1.14	1.05–1.23	**0.001**	1.14	1.06–1.23	**<0.001**
Ethnicity						
White (Reference)						
Black	0.83	0.75–0.92	**0.001**	0.87	0.79–0.96	**0.004**
Asian	0.79	0.58–1.07	0.134	0.83	0.63–1.11	0.216
Multiracial	0.93	0.87–0.99	**0.025**	0.92	0.87–0.98	**0.008**
Marital status						
Never married (Reference)						
Married	0.96	0.90–1.03	0.368	1.02	0.95–1.11	0.546
Widowed	0.99	0.71–1.38	0.969	1.11	0.82–1.51	0.488
Separated	1.01	0.91–1.12	0.763	1.02	0.92–1.14	0.624
Disorder						
No (Reference)						
Yes	1.46	1.36–1.58	**<0.001**	1.41	1.27–1.57	**<0.001**
Sharp object						
No (Reference)						
Yes	1.29	1.22–1.36	**<0.001**	1.22	1.12–1.32	**<0.001**
Poisoning						
No (Reference)						
Yes	0.80	0.76–0.85	**<0.001**	0.92	0.85–1.00	**0.049**
Mental disorder						
No (Reference)						
Yes	1.32	1.24–1.40	**<0.001**	1.05	0.97–1.15	0.178

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Behaviour disorder						
No (Reference)						
Yes	1.23	1.16–1.30	**<0.001**	1.00	0.95–1.07	0.812
Education						
Incomplete primary school (Reference)						
Complete primary school or incomplete secondary school	0.97	0.89–1.04	0.445	0.95	0.89–1.03	0.258
Complete secondary school or incomplete higher education	1.04	0.97–1.11	0.232	1.02	0.95–1.10	0.571
Complete higher education	0.99	0.88–1.11	0.882	0.95	0.85–1.08	0.461

Bold p values indicate significance.

Table 1. Sociodemographic and clinical information of the sample (individuals who self-harmed between 2012-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).

Characteristics	Strata	Frequency (n)	Percentage (%)
Age: Age at notification	Children (under 13 years)	96	4.5
	Adolescents (13–17 years)	588	27.3
	Young Adults (18–25 years)	551	25.6
	Adults (26–59 years)	890	41.3
	Older Adults (60+ years)	27	1.3
Sex: Patient's sex	F	1688	78.4
	M	464	21.6
Ethnicity	White	697	32.4
	Black	288	13.4
	Asian	31	1.4
	Multiracial	1136	52.8
Education: Patient's education level	Incomplete primary school	669	31.1
	Complete primary school or incomplete secondary school	554	25.7
	Complete secondary school or incomplete higher education	768	35.7
	Complete higher education	161	7.5
Marital status: Marital status at notification	Never married	1448	67.3
	Married	503	23.4
	Widowed	16	0.7
	Separated	185	8.6
Disability or disorder: Reported mental disorder and/or physical disability	Yes	1432	66.5
	No	720	33.5
Repeated self-harm ED presentation	Yes	1480	68.8
	No	672	31.2
Sharp object: Self-injury method - sharp object	Yes	628	29.2
	No	1524	70.8

Poisoning: Self-injury method - poisoning	Yes	1260	58.5
	No	892	41.4
Mental disorder: The patient has a mental disorder	Yes	1243	57.8
	No	909	42.2
Behavioural disorder: The patient has a behavioural disorder	Yes	905	42.1
	No	1247	57.9
Year: Year of the notification	2012	35	1.6
	2013	35	1.6
	2014	61	2.8
	2015	39	1.8
	2016	111	5.2
	2017	213	9.9
	2018	296	13.7
	2019	438	20.3
	2020	230	10.7
	2021	416	19.3
	2022	278	12.9

Table 2. Crude and adjusted risk ratios with 95% CIs for the association between sociodemographic and clinical characteristics with self-harm repetition, using Poisson regression with robust variance

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Age	0.99	0.99–1.00	0.574	0.99	0.99–1.00	0.249
Sex						
Male (Reference)						
Female	1.14	1.05–1.23	**0.001**	1.14	1.06–1.23	**<0.001**
Ethnicity						
White (Reference)						
Black	0.83	0.75–0.92	**0.001**	0.87	0.79–0.96	**0.004**
Asian	0.79	0.58–1.07	0.134	0.83	0.63–1.11	0.216
Multiracial	0.93	0.87–0.99	**0.025**	0.92	0.87–0.98	**0.008**
Marital status						
Never married (Reference)						
Married	0.96	0.90–1.03	0.368	1.02	0.95–1.11	0.546
Widowed	0.99	0.71–1.38	0.969	1.11	0.82–1.51	0.488
Separated	1.01	0.91–1.12	0.763	1.02	0.92–1.14	0.624
Disorder						
No (Reference)						
Yes	1.46	1.36–1.58	**<0.001**	1.41	1.27–1.57	**<0.001**
Sharp object						
No (Reference)						
Yes	1.29	1.22–1.36	**<0.001**	1.22	1.12–1.32	**<0.001**
Poisoning						
No (Reference)						
Yes	0.80	0.76–0.85	**<0.001**	0.92	0.85–1.00	**0.049**
Mental disorder						
No (Reference)						
Yes	1.32	1.24–1.40	**<0.001**	1.05	0.97–1.15	0.178

Variable	Crude RR	95% CI	p-value	Adjusted RR	95% CI	p-value
Behaviour disorder						
No (Reference)						
Yes	1.23	1.16–1.30	**<0.001**	1.00	0.95–1.07	0.812
Education						
Incomplete primary school (Reference)						
Complete primary school or incomplete secondary school	0.97	0.89–1.04	0.445	0.95	0.89–1.03	0.258
Complete secondary school or incomplete higher education	1.04	0.97–1.11	0.232	1.02	0.95–1.10	0.571
Complete higher education	0.99	0.88–1.11	0.882	0.95	0.85–1.08	0.461

Bold p values indicate significance ($p < 0.05$; $p < 0.01$; $p < 0.001$).

Figure 1. Intervals between repeated self-harm presentations (individuals who self-harmed more than once between 2018-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).

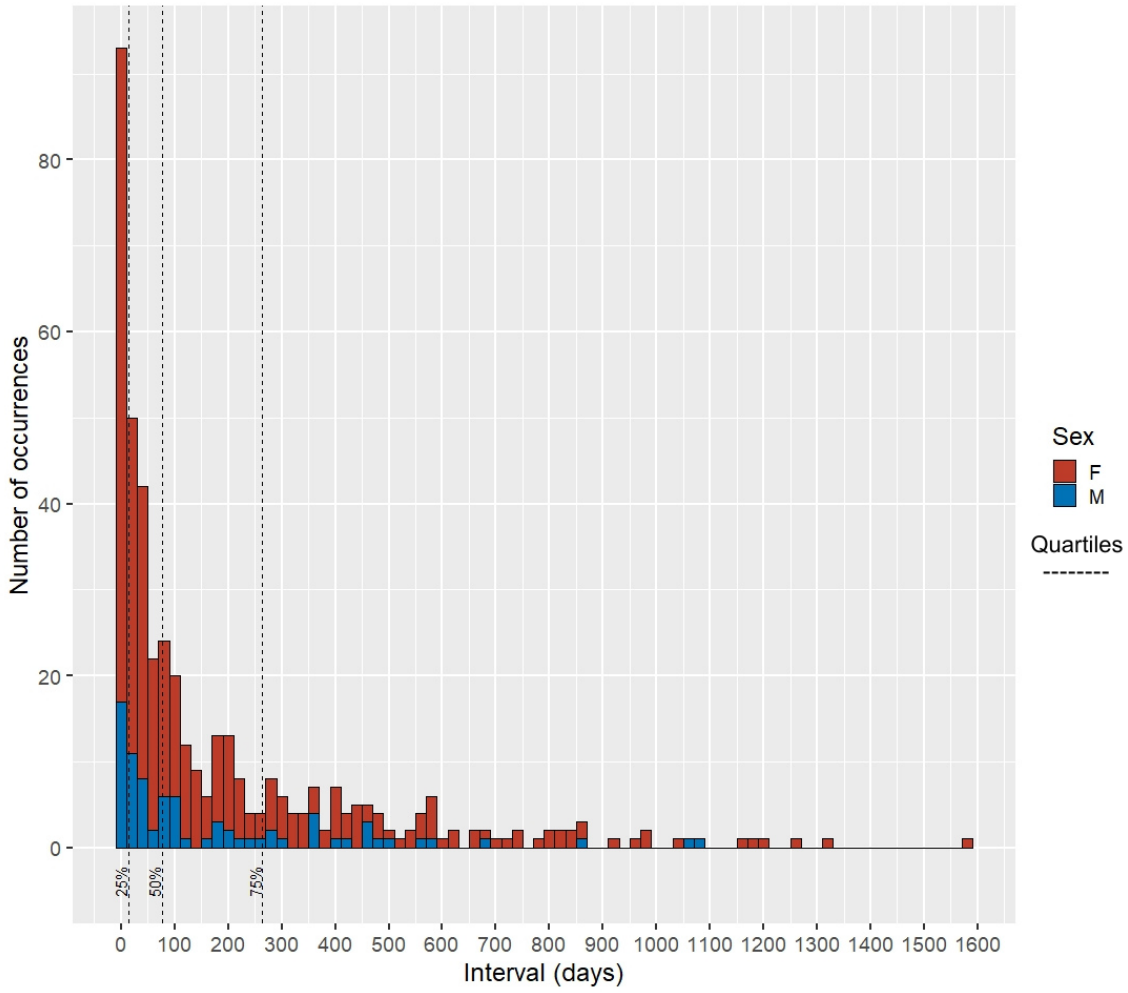

Figure 2. Method switching across repeated self-harm presentations (individuals who self-harmed more than once between 2018-2022 for the city of Vitoria, State of Espirito Santo. Brazilian Unified Health System).