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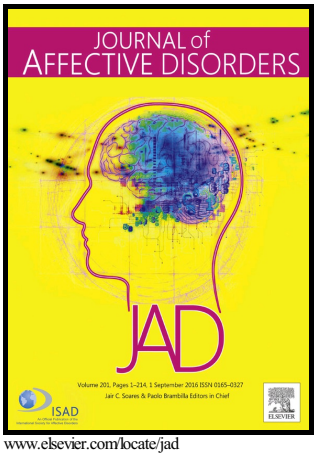


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Self-harm among the homeless population in Ireland: a national registry-based study of incidence and associated factors.

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ABSTRACT

Self-harm among the homeless population in Ireland: a national registry-based study of incidence and associated factors.

Background

Self-harm is a strong predictor of future suicide, but little is known about self-harm among the homeless population. The study aim was to estimate the incidence of self-harm among the homeless population and to assess factors associated with self-harm.

Methods

Data on self-harm presentations to 34 hospital emergency departments in Ireland were collected by the National Self-Harm Registry Ireland (NSHRI). Index presentations between 2010 and 2014 were included for the homeless and fixed residence populations. Incidence rates of self-harm were calculated using NSHRI data and census estimates. Factors associated with self-harm and repeated self-harm were analysed by multivariable-adjusted logistic regression.

Results

The age-standardised incidence rate of self-harm was 30 times higher among the homeless (5,572 presentations per 100,000) compared with those with a fixed residence (187 presentations per 100,000). Homeless people had significantly higher odds of being male (OR 1.86, 95%CI 1.56-2.23),

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presenting with self-cutting (vs. overdose, OR 2.15, 95%CI 1.74-2.66) and having psychiatric admission (vs. general admission, OR 2.43, 95%CI 1.66-3.57). Homeless people had higher odds of self-harm repetition within 12 months (vs. fixed residence, OR 1.46, 95%CI 1.21-1.77). The odds of repetition were significantly increased among homeless who engaged in self-cutting (vs. overdose, OR 1.76, 95%CI 1.17-2.65) and did not receive psychiatric review at index presentation (vs. reviewed, OR 1.54, 95%CI 1.05-2.26).

Limitations

The study only reflects self-harm presenting to hospital, and assumes no change in homelessness status after index presentation. Residual confounding may affect the results.

Conclusion

There is a disproportionate burden of self-harm among the homeless. Targeted preventive actions are warranted.

Keywords

self-harm, homeless, overdose, self-cutting, incidence, epidemiology

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Introduction

Rates of premature mortality are typically higher among the homeless population than in the general population living at a fixed residence. In high-income countries, standardised mortality ratios are commonly two to five times higher among the homeless compared to the domiciled population [Fazel et al., 2014]. Much of this difference may be attributable to higher rates of suicide and unintentional injuries among homeless people [Hwang, 2000; Feodor Nilsson et al., 2014]. Self-harm is an indicator of future suicide risk [Hawton et al., 2003; Cooper et al., 2005]. Few studies have quantified the burden of self-harm among the homeless, and the incidence rate of self-harm in the homeless population is unknown relative to those living at a fixed residence.

There have been increases in the prevalence of homelessness in Ireland in recent years, primarily due to supply shortages in housing. The homeless population includes rough sleepers, those sleeping in emergency accommodation such as hostels, and the "hidden homeless" who stay with relatives or friends, or remain in institutional care due to a lack of alternative housing. In Ireland, 5% of all hospital presentations of self-harm in 2015 were by

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residents of homeless hostels or people of no fixed abode [National Self-Harm Registry Ireland, 2017]. Although some of these are repeated presentations among the same individuals, this is disproportionately high; visibly homeless individuals comprised 0.1% of the Irish population in the 2016 census [Central Statistics Office, 2017].

The characteristics of homeless individuals who self-harm may differ from domiciled individuals, as there are inherent demographic differences between these two groups. Over half of all self-harm presentations in the general Irish population are among females [National Self-Harm Registry Ireland, 2017]. However, in a registry-based study in the UK, 80% of homeless self-harm patients were male. They were significantly more likely to be single and unemployed compared with those who lived at a fixed residence [Haw et al., 2006].

The risk of future suicide is particularly high among those with repeated self-harm [Zahl and Hawton, 2004; Christiansen and Jensen, 2007]. In England, homeless individuals were significantly more likely to present with repeated episodes of self-harm within 12 months of an index episode compared with domiciled individuals [Haw et al., 2006]. A systematic review of 129 hospital-based studies identified homelessness as an under-researched risk factor for self-harm repetition [Larkin et al., 2014a]. In Ireland, approximately 15% of all self-harm patients make at least one repeat hospital presentation for self-harm in the same calendar year, but it is unknown whether this varies by housing status [National Self-Harm Registry Ireland, 2017].

The aims of this study are to describe the crude and age-standardised incidence rates of hospital-treated self-harm among the homeless population in Ireland, and to explore factors associated with episodes of self-harm and repetition among the homeless and domiciled populations.

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Methods

The National Self-Harm Registry Ireland (NSHRI) uses the following as its definition of self-harm: ‘an act with non-fatal outcome in which an individual deliberately initiates a non-habitual behaviour, that without intervention from others will cause self-harm, or ingests a substance in excess of the prescribed or generally recognised therapeutic dosage, and which

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is aimed at realising changes that the person desires via the actual or expected physical consequences' [National Self-Harm Registry Ireland, 2017; Platt et al., 1992].

Setting and sample

Since 2006, the NSHRI has complete coverage of all self-harm presentations presenting to hospital emergency departments in Ireland. The Registry includes all presentations of self-harm where the self-harm was intentionally inflicted and the patient was alive on arrival at hospital. This includes acts of varying levels of suicidal intent and different underlying motives. The NSHRI excludes accidental overdoses, alcohol overdoses alone where the intention was not to self-harm, accidental overdoses of street drugs used for recreational purposes, and patients who died on arrival at hospital.

The Registry records most individuals as living at a household residence (hereafter fixed residence). Individuals who are described in the hospital notes as being of no fixed abode, or whose address is recognised as a homeless hostel or some other form of accommodation for the homeless, are recorded as being homeless persons. Individuals are not recorded as having a fixed residence, or being homeless, if they are hospital inpatients, prison inmates, living in a nursing home, temporarily visiting the country, or residents in accommodation provided for asylum seekers or for persons with physical or intellectual disability.

Dataset

A customised data entry and electronic transfer system was used to record all NSHRI data onto laptop computers. Data registration officers (DROs) received standardised training in data collection and procedures, and worked independently of the hospitals. NSHRI data are continuously checked for consistency and accuracy, and the results of cross-checking exercises for the NSHRI indicate that there is a high level of agreement on case ascertainment between DROs across sites with kappa statistics exceeding 0.9 [Perry et al., 2012].

All presentations of self-harm to emergency departments in Ireland made by individuals who were homeless or lived at a fixed residence during the period 1 January 2007 to 31 December 2015 were included in the initial dataset. Any presentations with missing information relating to sex, age, method of self-harm, or type of residence (i.e. homeless vs. fixed residence) were excluded. Encrypted patient initials, date of birth and sex were used to create unique

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identifiers which could identify repeat episodes of self-harm within the dataset. Repeat presentations were identified where individuals with the same unique identifier re-presented to the same hospital or to another hospital during the follow-up period.

The study starting point was considered to be 1 January 2010, and the endpoint was considered to be 31 December 2014. This study period allowed a minimum 12-month follow-up period for all index acts of self-harm between 2010 and 2014. The dataset was restricted to those individuals who did not have any recorded self-harm presentation in the years 2007-2009 according to their unique identifier in order to maximise the number of true index presentations.

Ethical considerations

All records within this dataset were anonymised. Records relating to name, date of birth, area of residence, and other identifiable information were removed by the National Suicide Research Foundation (NSRF) prior to data analysis. Ethical approval was granted by the Research Ethics Committee of the Faculty of Public Health Medicine Ireland to NSRF to undertake analysis of data from the NSHRI. The NSHRI has received ethical approval from all relevant hospitals and Health Service Executive Committees. The NSRF is registered with the Data Protection Agency and complies with the Data Protection Act of 1988, and the Data Protection (Amendment) Act of 2003.

Incidence rates of self-harm

The crude incidence rate of self-harm was calculated for the homeless population, and for those living at a fixed residence, based on index presentations of self-harm within each calendar year from 2010 to 2014 inclusive.

Population estimates were only available for the homeless population from the 2011 census at the time of analysis. These estimates were therefore applied as the denominator homeless population for each year from 2010 to 2014 inclusive. The number of index presentations each year was divided by the estimated population in the following age groups as per the 2011 Census: <15 years, 15-24 years, 25-34 years, 35-44 years, 45-54 years, 55+ years. The result was then multiplied by 100,000 to get the crude incidence rate of self-harm per 100,000

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homeless population for each age group. The total crude incidence rate was calculated by dividing the total number of self-harm presentations in any calendar year by the denominator homeless population, and by multiplying the result by 100,000. For the general population, estimates were available from the Central Statistics Office (CSO) for those living at a fixed residence for each year from 2010 to 2014 inclusive. The number of index presentations each year was divided by the corresponding estimated population in each age group. The result was multiplied by 100,000 to get the crude incidence rate of self-harm per 100,000 fixed residence population per age group. The total crude incidence rate was calculated by dividing the total number of presentations each year by the overall estimated population for those living at a fixed residence, and by multiplying the result by 100,000.

The crude incidence rate of self-harm among the homeless was divided by the corresponding crude incidence rate among the fixed residence population to get the incidence rate ratio for each year.

For each age group, the crude incidence rate of self-harm was multiplied by the estimated total population using the 2013 European Standard Population. The overall age-standardised incidence rate was then calculated by summing together these estimates for the homeless population and for those living at a fixed residence respectively for each calendar year. The overall age-standardised incidence rate of self-harm among the homeless was divided by the overall age-standardised incidence rate among the fixed residence population for each calendar year to get the incidence rate ratio.

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Measurements

Exposure variables

Demographic variables in the dataset related to age, sex, and area of residence. Age was examined both as a continuous variable and as a categorical variable using the following age groups: <15 years, 15-24 years, 25-34 years, 35-44 years, 45-54 years, 55+ years. Area of residence was presented by each of the four provinces of Ireland (Munster, Leinster, Connaught, Ulster), apart from the two principal cities (Dublin – City and Greater Dublin, and Cork). Those presenting from Connaught and Ulster were combined due to small numbers.

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The hour of the day when patients presented to the emergency department was recorded as "in hours" (between 9am and 5pm) when the hospital would typically have increased staffing capacity, or "out of hours" (between 5pm and 9am) when staffing levels would be typically lower. Patients were asked whether they were brought to hospital by ambulance and this was recoded as yes/no/by other emergency service.

Methods of self-harm were recorded by DROs according to the 10th revision of the WHO's International Classification of Diseases codes for intentional injury (X60-X84) [ICD-10, 2010]. Where a combination of methods was used for self-harm, all methods were recorded. Fifteen different categories of drugs were included in the dataset. These were all included in the descriptive analysis, but only one combined variable for drug overdose was used as an exposure variable in multivariable analysis. For cases involving alcohol, the code X65 (Intentional self-poisoning by, and exposure to, alcohol) was recorded. A dichotomous variable for the involvement of alcohol was then generated.

Three variables pertained to hospital-based treatment of those presenting with self-harm: treatment for self-cutting, hospital admission, and psychiatric review. The variables for hospital admission and psychiatric review were only collected from 2013 onwards.

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Outcome variables

Three different dichotomous outcome variables were used in the analysis. These were as follows:

(1) Homelessness (vs. fixed residence) at presentation of self-harm

This allowed comparison of factors associated with all self-harm presentations based on housing status.

(2) Repetition (vs. no repetition) within 12 months of index act of self-harm

This allowed comparison of factors associated with repetition of self-harm within 12 months of an index act for all patients in the dataset. For this analysis, housing status (homelessness vs. fixed residence) was included as an exposure variable, in order to estimate its relative effect.

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(3) Repetition (vs. no repetition) of self-harm among homeless patients during the study period

This allowed comparison of factors associated with repetition of self-harm during the entire follow-up period after an index presentation, specifically among the homeless patients in the dataset.

Statistical analysis

All data analysis was undertaken in Stata 12.1 (StataCorp, College Station, TX, USA). The characteristics of homeless and fixed residence individuals were first assessed using descriptive statistics, and bivariate associations were examined using chi-squared tests. Age was the only continuous variable, and it was non-normally distributed. Comparison of age distribution across independent groups was thus examined using Wilcoxon ranksum tests. When statistical tests were applied, p values of <0.05 were taken to be statistically significant.

Univariable logistic regression was used to calculate crude measures of effect between independent exposure variables and dichotomous outcomes. Independent variables were then entered in multivariable adjusted models if $p<0.2$ on crude analysis. Multivariable logistic regression models were created to calculate adjusted measures of effect between independent exposure variables and each of the three outcome variables. Adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) were measured. Multivariable-adjusted models were restricted to two years of data (2013 and 2014) given that information on hospital admission and psychiatric review was only collected from 2013 onwards

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Results

There were 58,747 presentations of self-harm in total (index and repeat presentations) between 2010 and 2014, of which 3.9% (n=2,276) were among the homeless, 93.4% (n=54,848) were among those with a fixed residence, and 2.7% (n=1,621) were among other groups (i.e. hospital inpatients, prisoners, other/unknown). A general increase in the percentage of self-harm presentations among the homeless was observed from 2010 (2.5%; n=305) to 2014 (4.6%; n=513).

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The overall crude incidence rate of self-harm presentations among the homeless between 2010 and 2014 was 6,994 per 100,000 population, compared with 194 per 100,000 population among those living at a fixed residence (incidence rate ratio (IRR) 36:1). In 2014, the age-specific crude incidence rate was highest among 15-24 year olds for both homeless (13,193 per 100,000 population) and fixed residence groups (505 per 100,000 population). The overall age-standardised incidence rate of self-harm presentations among the homeless was 5,572 presentations per 100,000 population, compared with 187 per 100,000 population among those living at a fixed residence (IRR 30:1).

There were 45,068 presentations of self-harm among those who either lived at a fixed residence or were registered as homeless, after excluding those who had previously presented between 2007 and 2009. The mean (± standard deviation) age at presentation was 33.0 ± 14.2 years, and 52.7% of all presentations were among females. Three percent (n=1,356) of presentations were among the homeless.

Table 1 shows the variation in baseline characteristics at presentation associated hospital treatment factors for all presentations among the homeless and those living at a fixed residence. Overall, 60.8% of presentations among homeless people were in those living in Dublin City, compared with 15.5% of all presentations among those with a fixed residence (χ^2:$p<0.001$). Presentations among the homeless were more frequently due to self-cutting (26.4%) or due to highly lethal acts (i.e. attempted hanging or drowning) (11.4%) compared with the fixed residence population (16.7% and 6.8% respectively) (χ^2:$p<0.001$). Presentations among the homeless were less frequently due to drug overdose alone compared with those at a fixed residence (43.8% vs. 63.5%), but this was the most common method for self-harm in both groups. Repeat presentations of self-harm within 12 months were more frequent among the homeless (n=508; 37.5%) compared with those living at a fixed residence (n=9,234; 20.4%) (χ^2:$p<0.001$).

There was variation in the types of drugs used in overdose acts, as shown in Table 2. Minor tranquillisers and street drugs were used more frequently in overdose acts among the homeless, whereas paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), and selective serotonin reuptake inhibitors (SSRIs) were used more frequently in overdose acts among those living at a fixed residence.

During the five year period, there were 33,766 index self-harm presentations of which 2.1% (n=719) were among the homeless. The median age at index presentation was significantly

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higher among homeless individuals (median=32, range 11-77 years) compared with those living in a fixed residence (median=30, range 7-94 years) (Z= 3.9; p<0.001). Of the homeless population who had an index act of self-harm between 2010 and 2014, 19.6% (n=141) repeated within 12 months of their index act compared with 13.1% (n=4,311) of the fixed residence population (χ^2:p<0.001).

Table 3 shows the factors associated with increased odds of homelessness at presentation of self-harm. On multivariable analysis, the factors associated with increased odds of homelessness included being male (vs. female), living in Dublin City (vs. Cork City), presenting with self-cutting or attempted drowning (vs. overdose alone). Those aged 35-44 years had the highest odds of homelessness (OR 3.32, 95%CI 2.08-5.31).

All index presentations of self-harm were examined to explore factors associated with repetition at 12 months (Table 4). On multivariable analysis, the odds of repetition of self-harm at 12 months were significantly higher among the homeless population compared with those living at a fixed residence (OR 1.46, 95%CI 1.21-1.77). Independent associations with self-harm repetition were also observed for those living in Dublin City (vs. Cork City) and those who engaged in self-cutting (vs. overdose).

Table 5 shows the factors associated with repetition of self-harm during the entire five-year study period among the homeless population only. On multivariable-adjusted analysis, the odds of repetition were significantly higher among homeless individuals who lived in the capital, those who engaged in self-cutting at index presentation, and those who were not reviewed by the psychiatric team in a previous presentation. There was no significant association with alcohol use after adjusting for potential confounders.

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Discussion

This study shows that the homeless population in Ireland is disproportionately affected by self-harm. The age-standardised incidence rate of self-harm presenting to hospital emergency departments between 2010 and 2014 was 30 times higher among the homeless population compared with those living at a fixed residence. Although the homeless population made up approximately 0.1% of the total population in Ireland according to the 2016 census, they

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accounted for 3.9% of all presentations of self-harm in the five year period examined in this study. Those who were homeless at presentation to hospital were significantly more likely to be male, and to present with self-cutting or highly lethal methods of self-harm compared with people living at a fixed residence. The substances used for intentional drug overdose varied between the homeless and domiciled populations. Minor tranquillisers were the most commonly used substances in all self-harm presentations, but they were significantly more likely to be used by homeless people compared with those who lived at a fixed residence. Homeless people were also significantly more likely to use street drugs in overdose, whereas those with a fixed residence were more likely to use paracetamol, NSAIDs and SSRIs. There was unequal geographical distribution of the burden of self-harm among the homeless, with urban centres most affected. Almost three quarters of self-harm presentations among the homeless were among people living in Dublin City or Cork City.

The factors associated with increased odds of self-harm repetition among all patients, regardless of housing status, included being younger in age, living in Dublin City, and engaging in self-cutting with or without overdose. Homeless people were significantly more likely to repeat an act of self-harm within 12 months of index presentation (20%) compared with those living at a fixed residence (13%). The odds of repetition of self-harm within 12 months were 46% higher among homeless people after adjusting for confounding factors.

Among the homeless population specifically, the odds of self-harm repetition were also significantly higher for those living in Dublin and for individuals who engaged in self-cutting. Those who had not received a psychiatric review at index presentation were at higher odds of repetition. There was no significant difference between homeless males and females.

The disproportionate impact of self-harm reported among the homeless population in this study was consistent with the existing literature. In Oxford, UK, 3.6% of all recorded self-harm presentations over a 14 year period were among the homeless population. Consistent with our study, the majority of homeless patients who engaged in self-harm were male [Haw et al., 2006]. In Northern Ireland, 4% of all self-harm presentations between 2012 and 2015 were reported as being among the homeless [Public Health Agency, 2016]. In 2016, the NSHRI reported that 5% of all self-harm presentations in Ireland were among the homeless, the highest proportion recorded to date in Ireland [National Self-Harm Registry Ireland, 2017]. The Census of Ireland suggests that there was a proportional increase of approximately 64% in the visibly homeless population in Ireland between 2011 (n=3,808)

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and 2016 (n=6,906), and this is likely to account for some of the observed increase in the absolute number of self-harm presentations among the homeless during this study period.

Intentional drug overdose was the most common method of self-harm among both homeless and domiciled groups in this study, and this is consistent with previous studies of the general population [Gunnell et al., 2005; Michel et al., 2000; Hawton et al., 2007] and of the homeless [Haw et al., 2006]. The current study helps to fill a gap in the existing literature on the patterns of drugs used in attempted overdose among the homeless population. The very high prevalence of use of minor tranquillisers observed, in both the homeless and fixed residence populations, is concerning given their widespread availability. Benzodiazepines are among the most commonly prescribed drugs in Ireland [Health Service Executive, 2016], and data from the National Drug-Related Deaths Index indicate that diazepam is the most common single prescription drug implicated in deaths from poisoning in Ireland [Health Research Board, 2016]. There is a need for stricter measures to reduce inappropriate access to medicines which are commonly used in overdose, particularly benzodiazepines and, to a lesser extent, SSRIs. The current study also shows that there is a need to reduce access to street drugs in order to reduce overdose attempts among the homeless in Ireland.

The higher odds of self-cutting among the homeless population compared with the domiciled population were consistent with previous studies [Haw et al., 2006; Arensman et al., 2014]. The increased odds of self-harm repetition among the homeless population who engaged in self-cutting was also observed in previous research [National Self-Harm Registry Ireland, 2017; Larkin et al., 2014b]. Although those who engage in more severe acts of self-cutting have a lower risk of repetition, if they do repeat, they tend to re-present with increasingly lethal acts of self-harm. Homeless people who present to hospital with self-cutting are thus at particularly high risk for self-harm repetition and future suicide [Cooper et al., 2005; Bergen et al., 2012].

The higher prevalence of use of street drugs among homeless people who self-harm suggests that these individuals may have problems with addiction. The risk of suicide is higher among individuals with a dual diagnosis of addiction disorder and an additional psychiatric diagnosis [Lukasiewicz et al., 2009; Buckley and Brown, 2006]. It is estimated that 10-20% of the homeless population have a dual diagnosis [Public Health Resource Unit, 2009]. Specialised services are needed to address their complex needs. In England and Wales, implementation of

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specific policies for treatment of people with dual diagnosis in mental health services was shown to reduce suicide rates in the overall population [While et al., 2012].

There is conflicting evidence around the relative importance of alcohol in self-harm presentations and repetition. In the UK, a cross-sectional study of 32,855 self-harm patients in the general population reported that self-harm repetition within 12 months was more frequent among those who misused alcohol at the time of index presentation, and that these patients had an increased risk of suicide [Ness et al., 2015]. However, in Ireland, the NSHRI has reported a lower rate of repetition among those who consumed alcohol at the time of self-harm compared with all other index presentations in the general population [National Self-Harm Registry Ireland, 2017]. The high prevalence of alcohol use at self-harm presentation in the current study is concerning nonetheless. Alcohol involvement can increase the potential seriousness and lethality of intentional overdose acts, and self-harm patients who have consumed alcohol are at increased risk of leaving hospital without being seen [National Self-Harm Registry Ireland, 2017; Griffin et al., 2017].

The higher odds of self-harm repetition among homeless people who did not receive a psychiatric review at index presentation is noteworthy. Previous studies have identified pre-existing psychiatric comorbidities as important factors associated with self-harm and suicide in this population [Feodor Nilsson et al., 2014; Haw et al., 2006; Bickley et al., 2006], and homeless people had significantly higher odds of being admitted under a psychiatric team at presentation relative to the fixed residence population in this study. Given the barriers to accessing healthcare among the homeless population, psychiatric illness is more likely to go untreated in this population, which in itself may lead to more episodes of self-harm. It is vital to engage homeless patients with psychiatric services on presentation to hospital, if warranted, as those who abscond may be at particularly high risk of repetition.

Strengths of the current study include the complete coverage of the NSHRI across all Irish emergency departments, which increases generalisability of the results to the wider population. The burden of self-harm among the homeless was quantified in greater detail than in previous studies. Few studies have reported the incidence rate of self-harm within the homeless population, and the use of age-standardised incidence rates further increased the validity of comparisons between the homeless and fixed residence populations. The large sample size increased statistical power to detect true associations between exposure variables and outcomes.

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The study is not without limitations. The incidence rates should be interpreted with caution. For those who lived at a fixed residence, updated population estimates were available from the CSO for each year, and these were thus used as denominators for this population. By contrast, the homeless population is difficult to enumerate, and there was no valid denominator available for the homeless population for each year of the study. Data from the 2011 census were used as the denominator for the homeless population every year, and this did not take in to account changes in the size of this population. The homeless population is likely to have increased between 2010 and 2014, therefore the incidence rates of self-harm among this population may have been overestimated in the current study. However, it is also likely that not all of the hidden homeless were correctly recorded in the NSHRI, particularly if their residence was recorded as 'unknown' at hospital presentation. This may have led to underestimation of the true incidence rates of self-harm among this population. As the homeless population of Ireland has continued to increase in recent years, it will be pertinent to review and update the incidence rates as new data becomes available.

The current study assumed that residence status did not change during the entire study period, and did not track those who moved in to or out of homelessness after index presentation. This is a common limitation of population-based studies of the homeless population [Nielsen et al., 2011; Hwang et al., 2009], but it may have introduced measurement error. The study did not include information relating to the length of time that individuals were homeless, and this may have affected their risk of self-harm. The NSHRI only captures self-harm which presents to hospital emergency departments. The overall burden of self-harm in the community is likely to be underestimated, as not all will present to hospital, or indeed to any healthcare provider. This may be a bigger limitation among those who live at a fixed residence compared with the homeless population, since homeless people experience multiple barriers in accessing primary care services [O'Reilly et al., 2015; Gelberg et al., 1997; Riley et al, 2003] and preferentially present to hospital emergency departments if seeking care [Elwell-Sutton et al., 2017; Chambers et al., 2013].

The multivariable-adjusted analyses were based on a reduced sample size because data for hospital admission and psychiatric review were only available for two years in the study. These were considered to be important exposure variables for repetition of self-harm, and excluding them from multivariable models may have led to confounding. A decision was taken to include all five years of data in the univariate analysis to maximise variability within the dataset and to increase statistical power. A post-hoc analysis revealed no meaningful

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differences in patterns of results when univariate analysis was restricted to the same two years as multivariable models. Residual confounding remains a possibility in this study. The NSHRI did not capture information relating to employment status, living alone, and illicit drug use, and these are potentially important predictors of self-harm repetition [Larkin et al., 2014]. Past psychiatric history is also an important potential confounder among the homeless population [Haw et al., 2016; Pluck et al., 2013] which may explain some of the observed variation in admission patterns and psychiatric review. Finally, it is unknown whether the homeless population who engaged in self-harm were driven to do so as a result of their living circumstances, or whether they had a greater tendency to self-harm at baseline compared with those living at a fixed residence. Observed associations may be mediated or confounded by factors such as underlying mental illness, substance misuse, or dual diagnosis. Longitudinal studies would provide additional insight in to the temporal nature of these associations.

The findings from this study indicate the need for enhanced efforts to prevent self-harm among the homeless population in Ireland. A suite of actions will be required to achieve this, including improved provision of primary care and mental health services for the homeless; increased availability of evidence-based psychosocial interventions for this group (e.g. cognitive behavioural therapy, dialectical behavioural therapy); enhanced training for healthcare and community-based professionals treating the homeless population; changes to policy across health, housing and other sectors, to prevent homelessness and enhance access to appropriate care; and population-level interventions to prevent inappropriate drug prescribing, and to reduce excessive use of alcohol and illicit drugs.

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Conclusions

Homeless people suffer a disproportionate burden of self-harm. The age-standardised incidence rate of self-harm was 30 times higher among the homeless population in Ireland compared with those living at a fixed residence between 2010 and 2014. Homeless people are significantly more likely to present with self-cutting or attempted drowning. Intentional drug overdose is the most common method of self-harm among both the homeless and fixed residence populations.

Risk of repetition of self-harm within a year of index presentation is higher among the homeless population compared with those who live at a fixed residence. Within the homeless

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population, the factors associated with repetition include living in an urban centre, engaging in self-cutting, and not receiving a psychiatric review at index presentation.

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Contributors

PB and EA designed the study. EG and PC prepared the anonymised dataset on behalf of NSRF. PB undertook all data analysis and drafted the manuscript. EG, PC, MTOM, and EA provided critical input on the draft manuscript.

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Conflict of Interest

None.

Author contributions:.

PB and EA designed the study. EG and PC prepared the anonymised dataset on behalf of NSRF. PB undertook all data analysis and drafted the manuscript. EG, PC, MTOM, and EA provided critical input on the draft manuscript. All authors approved the final manuscript.

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Table 1. Baseline characteristics at presentation to hospital emergency departments, among homeless and domiciled individuals with index or repeat self-harm acts in Ireland, 2010-2014.

	Fixed residence (%) **N= 43,712**	**Homeless (%)** **N= 1,356**	**χ^2:p**
Sex			
Female	53.3	33.8	

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Male	46.7	66.2	<0.001
Age group (years)			
<15	3.1	0.6	
15-24	33.0	28.5	
25-34	22.9	30.3	
35-44	18.6	22.4	
45-54	13.9	13.4	
55+	8.5	4.8	<0.001
Presentation Time			
In hours (9am-5pm)	29.1	28.6	
Out of hours (5pm-9am)	70.9	71.4	0.706
Brought in by ambulance			
Yes	52.5	57.3	
No	41.0	34.3	
Other emergency service	2.5	4.0	
Unknown	3.9	4.4	<0.001
Area of residence			
Dublin City	15.5	60.8	
Rest of Dublin	15.7	6.8	
Leinster	25.7	5.9	
Cork City	4.9	13.0	
Munster	23.0	9.9	
Connaught	9.8	3.5	
Ulster	5.4	0.2	<0.001
Method			
Drug overdose	63.5	43.8	
Self-cutting	16.7	26.4	
Overdose & self-cutting	4.2	5.8	
Attempted hanging	4.6	5.6	
Attempted drowning	2.2	5.8	
Other	8.9	12.6	<0.001
Alcohol involvement			
Yes	37.6	37.8	
No	62.4	62.2	0.88
Admission†	***n=17,212***	***n=627***	
General admission	24.1	10.2	
Psychiatric admission	8.2	11.8	
Refused admission	0.8	0.6	
Left before admission	10.2	16.6	
Not admitted	54.1	54.7	
Left without being seen	2.7	6.1	<0.001
Psychiatric review/assessment†	***n=17,212***	***n=627***	
Yes	62.4	56.1	
No	25.4	30.5	
Refused	1.9	1.9	0.014
Treatment for self-cutting	***n=9,677***	***n=467***	
Steristrips	31.8	30.6	
Sutures	30.6	34.3	
Referral to Plastic Surgery	19.1	17.8	
No treatment	3.9	3.6	
Unknown	14.7	13.7	0.58

†Data on admission and psychiatric review/assessment collected from 2013 onwards

Data in this table excludes people who presented with self-harm between 2007 and 2009.

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Table 2. Drugs used in overdose for self-harm presentations to hospital emergency departments, among homeless and domiciled individuals with index or repeat self-harm acts in Ireland, 2010-2014.

	Fixed residence (%) N= 30,693	Homeless (%) N= 721	χ^2:p
Salicylates	2.2	0.8	0.013
Salicylate compounds	0.9	0.6	0.282
Paracetamol	22.0	15.5	<0.001
Paracetamol compounds	8.9	3.6	<0.001
NSAIDs	13.7	5.0	<0.001
Opiates	5.3	8.9	<0.001
Opiate compounds	7.7	3.1	<0.001
Minor tranquillisers	38.6	47.2	<0.001
Major tranquillisers	8.1	9.6	0.164
SSRIs	13.4	5.3	<0.001
TCAs	2.0	0.7	0.011
Other mood stabilisers	7.3	5.1	0.024
Barbiturates	5.9	5.3	0.484
Street drugs	5.7	18.6	<0.001
Other medical drugs	26.1	22.5	0.03

NSAID, Non-steroidal anti-inflammatory drug; SSRI, Selective serotonin reuptake inhibitor; TCA, tri-cyclic antidepressant

Table 3. Factors associated with homelessness at index or repeat self-harm presentation compared with having a fixed residence, Ireland, 2010-2014 (n=45,068).

	Crude OR	95% CI	p	Adj. OR	95% CI
Sex					
Female	1	ref		1	ref
Male	2.24	(2.00, 2.51)	<0.001	1.86	(1.56, 2.23)
Age group (years)					
55+	1	ref		1	ref
45-54	1.72	(1.29, 2.28)		1.99	(1.20, 3.29)
35-44	2.13	(1.63, 2.80)		3.32	(2.08, 5.31)
25-34	2.35	(1.80, 3.06)		2.63	(1.65, 4.19)
15-24	1.54	(1.18, 2.00)		2.28	(1.43, 3.63)
<15	0.34	(0.16, 0.71)	<0.001	0.95	(0.37, 2.41)
Area of residence					
Cork City	1	ref		1	ref
Dublin City	1.49	(1.26, 1.77)		2.14	(1.45, 3.15)
Rest of Dublin	0.16	(0.13, 0.21)		0.19	(0.11, 0.31)
Leinster	0.09	(0.07, 0.11)		0.14	(0.09, 0.23)
Munster	0.16	(0.13, 0.21)		0.20	(0.13, 0.31)
Connaught & Ulster	0.14	(0.10, 0.19)	<0.001	0.10	(0.06, 0.18)
Method					
Drug overdose	1	ref		1	ref
Self-cutting	2.30	(2.01, 2.62)		2.15	(1.74, 2.66)
Overdose & self-cutting	2.00	(1.57, 2.54)		1.71	(1.16, 2.53)
Attempted hanging	1.76	(1.38, 2.25)		1.32	(0.90, 1.92)
Attempted drowning	3.92	(3.07, 5.00)		4.16	(2.80, 6.17)
Other	2.05	(1.72, 2.44)	<0.001	1.51	(1.13, 2.00)
Alcohol involvement					

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No	1	ref		-	-
Yes	1.01	(0.90, 1.13)	0.88	-	-
Presentation Time					
In hours (9am-5pm)	1	ref		-	-
Out of hours (5pm-9am)	1.02	(0.91, 1.15)	0.706	-	-
Brought in by ambulance					
No	1	ref		1	ref
Yes	1.30	(1.16, 1.47)		1.29	(1.07, 1.55)
Other emergency service	1.88	(1.41, 2.51)	<0.001	1.63	(1.00, 2.66)
Admission*					
General admission	1	ref		1	ref
Psychiatric admission	3.41	(2.43, 4.80)		2.43	(1.66, 3.57)
Refused admission	1.78	(0.64, 4.97)		0.96	(0.33, 2.81)
Left before admission	3.85	(2.81, 5.28)		1.81	(1.26, 2.59)
Not admitted	2.38	(1.82, 3.12)		1.52	(1.14, 2.04)
Left without being seen	5.30	(3.51, 8.00)	<0.001	1.87	(1.15, 3.06)
Psychiatric review/assessment*					
Yes	1	ref		1	ref
No	1.33	(1.11, 1.60)		1.19	(0.94, 1.51)
Refused	1.13	(0.63, 2.04)	0.016	0.99	(0.52, 1.91)

*Data for these variables were available for 2013 and 2014 only.
† A category listed at the top of each variable was used as a reference (ref) in logistic regression models for the homeless vs. fixed residence population; of 45,068 self-harm presentations, 3.0% were among the homeless.

Table 4. Factors associated with repetition of self-harm within 12 months of index presentation of self-harm, Ireland, 2010-2014 (n=33,766).

	Crude OR	95% CI	p	Adj. OR	95% CI
Sex					
Female	1	ref		-	-
Male	1.04	(0.97, 1.10)	0.27	-	-
Age group (years)					
55+	1	ref		1	ref
45-54	1.45	(1.25, 1.68)		1.44	(1.24, 1.67)
35-44	1.40	(1.22, 1.61)		1.37	(1.19, 1.58)
25-34	1.41	(1.23, 1.62)		1.35	(1.18, 1.55)
15-24	1.45	(1.27, 1.65)		1.37	(1.20, 1.57)
<15	1.74	(1.43, 2.12)	<0.001	1.58	(1.30, 1.94)
Housing status					
Fixed residence	1	ref		1	ref
Homeless	1.63	(1.35, 1.96)	<0.001	1.46	(1.21, 1.77)
Area of residence					
Cork City	1	ref		1	ref
Dublin City	1.33	(1.13, 1.56)		1.33	(1.13, 1.56)
Rest of Dublin	1.10	(0.94, 1.30)		1.15	(0.98, 1.36)
Leinster	0.97	(0.83, 1.13)		1.03	(0.88, 1.21)
Munster	1.01	(0.86, 1.18)		1.06	(0.90, 1.24)
Connaught & Ulster	1.00	(0.85, 1.18)	<0.001	1.06	(0.89, 1.25)
Method					
Drug overdose	1	ref		1	ref
Self-cutting	1.41	(1.30, 1.54)		1.36	(1.25, 1.48)

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Overdose & self-cutting	1.42	(1.22, 1.65)		1.37	(1.17, 1.59)
Attempted hanging	0.83	(0.70, 0.98)		0.80	(0.68, 0.94)
Attempted drowning	0.84	(0.67, 1.07)		0.83	(0.66, 1.06)
Other	1.15	(1.03, 1.29)	<0.001	1.13	(1.01, 1.26)
Presentation Time					
In hours (9am-5pm)	1	ref		-	-
Out of hours (5pm-9am)	1.03	(0.96, 1.11)	0.38	-	-
Brought in by ambulance					
No	1	ref		-	-
Yes	0.97	(0.91, 1.03)		-	-
Other emergency service	0.94	(0.76, 1.16)	0.56	-	-
Admission*					
General admission	1	ref		-	-
Psychiatric admission	1.19	(0.96, 1.49)		-	-
Refused admission	0.86	(0.46, 1.62)		-	-
Left before admission	1.18	(0.97, 1.45)		-	-
Not admitted	1.05	(0.92, 1.20)		-	-
Left without being seen	1.22	(0.87, 1.72)	0.37	-	-
Psychiatric review/assessment*					
Yes	1	ref		-	-
No	1.09	(0.96, 1.23)		-	-
Refused	1.02	(0.67, 1.56)	0.71	-	-
Alcohol involvement					
No	1	ref		1	ref
Yes	0.94	(0.88, 1.00)	0.054	0.96	(0.89, 1.02)

*Data for these variables were available for 2013 and 2014 only.

† A category listed at the top of each variable was used as a reference (ref) in logistic regression models for those who repeated within 12 months vs. no repetition; of 33,766 index presentations between 2010 and 2014, 2.1% were among the homeless.

Table 5. Factors associated with repetition of self-harm during the entire study period among the homeless population, Ireland, 2010-2014 (n=1,356).

	Crude OR	95%CI	p	Adj. OR	95%CI
Sex					
Female	1	ref		-	-
Male	0.88	(0.70, 1.10)	0.26	-	-
Age group (years)					
55+	1	ref		1	ref
45-54	4.05	(1.82, 9.02)		2.67	(0.78, 9.11)
35-44	4.54	(2.09, 9.87)		3.28	(1.02, 10.58)
25-34	3.60	(1.67, 7.76)		2.68	(0.83, 8.64)
15-24	6.00	(2.79, 12.93)		4.31	(1.34, 13.90)
<15	1.02	(0.11, 9.39)	<0.001	0.72	(0.06, 8.50)
Area of residence					
Cork City	1	ref		1	ref
Dublin City	1.75	(1.22, 2.50)		2.28	(1.09, 4.77)
Rest of Dublin	2.55	(1.51, 4.32)		3.38	(1.22, 9.38)
Leinster	1.60	(0.91, 2.80)		1.33	(0.51, 3.49)
Munster	1.22	(0.74, 1.99)		1.88	(0.72, 4.88)
Connaught & Ulster	1.37	(0.70, 2.69)	0.004	2.42	(0.72, 8.16)

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Method					
Drug overdose	1	ref		1	ref
Self-cutting	2.02	(1.54, 2.64)		1.76	(1.17, 2.65)
Overdose & self-cutting	1.51	(0.93, 2.44)		0.74	(0.33, 1.65)
Attempted hanging	0.74	(0.43, 1.26)		0.65	(0.30, 1.42)
Attempted drowning	1.13	(0.69, 1.85)		0.80	(0.37, 1.72)
Other	1.00	(0.70, 1.44)	<0.001	0.97	(0.56, 1.69)
Presentation Time					
In hours (9am-5pm)	1	ref		1	ref
Out of hours (5pm-9am)	1.36	(1.06, 1.74)	0.016	1.34	(0.90, 1.99)
Brought in by ambulance					
No	1	ref		-	-
Yes	1.18	(0.93, 1.49)		-	-
Other emergency service	1.12	(0.64, 1.98)	0.51	-	-
Admission*					
General admission	1	ref		-	-
Psychiatric admission	1.50	(0.74, 3.03)		-	-
Refused admission	0.73	(0.07, 7.49)		-	-
Left before admission	1.75	(0.91, 3.36)		-	-
Not admitted	1.65	(0.93, 2.92)		-	-
Left without being seen	3.03	(1.31, 6.96)	0.27	-	-
Psychiatric review/assessment*					
Yes	1	ref		1	ref
No	1.69	(1.19, 2.42)		1.54	(1.05, 2.26)
Refused	0.49	(0.13, 1.85)	<0.001	0.37	(0.09, 1.48)
Alcohol involvement					
No	1	ref		1	ref
Yes	0.74	(0.59, 0.93)	0.01	0.74	(0.51, 1.07)

*Data for these variables were available for 2013 and 2014 only.

† A category listed at the top of each variable was used as a reference (ref) in logistic regression models for the homeless people who had a repeat presentation of self-harm during 2010-2014; of 1,356 self-harm presentations, 37.5% were repeat presentations

Highlights

- The age-standardised incidence rate of self-harm was 30 times higher among the homeless population compared with people living at a fixed residence in Ireland during the period 2010-2014.
- Homeless people had significantly higher odds of being male, presenting to hospital with self-cutting, and having a psychiatric admission on presentation with self-harm, compared with those living at a fixed residence.
- Homeless people had significantly higher odds of repetition of self-harm within 12 months of an index presentation compared with people who lived at a fixed residence.

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- Among the homeless population who engage in self-harm, the odds of repetition were significantly higher among those who presented with self-cutting, and those who did not have a psychiatric review at index presentation.

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