Global prevalence of psychiatric in- and out-patient treatment following hospital-presenting self-harm: a systematic review and meta-analysis

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Summary

Background Hospital-treated self-harm is common, costly, and strongly associated with suicide. Whilst effective psychosocial interventions exist, little is known about what key factors might modify the clinical decision to refer an individual to psychiatric in- and/or out-patient treatment following an episode of hospital-treated self-harm.

Methods We searched five electronic databases (CENTRAL, CDSR, MEDLINE, Embase, and PsycINFO) until 3 January 2023 for studies reporting data on either the proportion of patients and/or events that receive a referral and/or discharge to psychiatric in- and/or outpatient treatment after an episode of hospital-treated self-harm. Pooled weighted prevalence estimates were calculated using the random effects model with the Freedman-Tukey double arcsine adjustment in R, version 4.0.5. We also investigated whether several study-level and macro-level factors explained variability for these outcomes using random-effects meta-regression. The protocol of this review was pre-registered with PROSPERO (CRD42021261531).

Findings 189 publications, representing 131 unique studies, which reported data on 243,953 individual participants who had engaged in a total of 174,359 episodes of self-harm were included. Samples were drawn from 44 different countries. According to World Bank classifications, most (83.7%) samples were from high income countries. Across the age range, one-quarter of persons were referred for inpatient psychiatric care and, of these, around one-fifth received treatment. Just over one-third were referred to outpatient psychiatric care, whilst around half of those referred received at least one treatment session across the age range. Event rate estimates were generally of a lower magnitude. Subgroup analyses found that older adults (mean sample age: ≥60 years) may be less likely than young people (mean sample age: ≤25 years) and adults (mean sample age: >25 years to <60 years) to be referred for outpatient psychiatric care following self-harm. More recent studies were associated with a small increase in the proportion of presentations (events) that were referred to, and received, psychiatric outpatient treatment. No macro-level factor explained between-study heterogeneity.

Interpretation There is considerable scope for improvement in the allocation and provision of both in- and out-patient psychiatric care following hospital-presenting self-harm, particularly considering that the period after discharge from general hospitals represents the peak risk period for repeat self-harm and suicide. Given the marked between-study heterogeneity, the basis for allocation of aftercare treatment is therefore not yet known and should be further studied.

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Keywords: Self-harm; Suicide; Psychiatric; Treatment; Inpatient; Outpatient; Review

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Articles

Research in context panel

Evidence before this study

Whilst there are no guidelines or recommendations for the optimum proportion of self-harm patients that should be referred to in- or out-patient psychiatric care, clinical practice guidelines internationally recommend that aftercare should be offered to all patients after every event. Despite this, the estimates of real-world delivery of psychiatric in- and out-patient care following a hospital presentation for self-harm, and the factors that may affect this provision, are not well understood. We searched five electronic databases (CENTRAL, CDSR, MEDLINE, Embase, and PsycINFO) until 3 January 2023. All published and unpublished studies reporting data on the proportion of patients (individuals) and/or presentations (events) resulting in referral and/or discharge to psychiatric in- and/or out-patient services after an episode of general hospital-presenting self-harm were eligible for inclusion. We identified 189 publications, representing 131 unique studies, which reported data on 243,953 individual participants who had engaged in a total of 174,359 episodes of self-harm. Samples were drawn from 44 different countries. According to World Bank classifications most (83.7%) samples were from high income countries.

Added value of this study

We found that, across the age range, one-quarter of persons were referred for inpatient psychiatric care and, of these, around one-fifth received treatment. Just over one-third were referred to outpatient psychiatric care, whilst around half received at least one treatment session across the age range.

Proportions for events, rather than individual patients, were typically lower. Sub-group analyses by age suggested that a greater proportion of young people (i.e., those aged ≤ 25 years) were referred to outpatient psychiatric care, whilst a lower proportion of older adults (i.e., those aged ≥ 60 years) received these referrals. There is also some suggestion that greater proportion of presentations (events) by young people also received at least one psychiatric outpatient treatment session. No macro-level factors were significantly associated with between-study heterogeneity, including greater healthcare spending (adjusted to USD), or per capita availability of psychiatric beds and psychiatrists.

Implications of all the available evidence

There is considerable scope for improvement in the allocation and provision of both in- and out-patient psychiatric care following hospital-presenting self-harm, particularly considering that the period after discharge from general hospitals represents the peak risk period for repeat self-harm and suicide. There was marked variability in estimates between studies, as indicated by the very high levels of between-study heterogeneity, suggesting that local systems of care and context may play a greater role in determining how frequently those presenting to hospital following an episode of self-harm receive psychiatric care, and in what format (i.e., inpatient and/or outpatient). Understanding the individual and service level factors that impact universal provision of psychiatric aftercare is essential for improving the standard of care for hospital-presenting self-harm.

Introduction

Hospital-treated self-harm, which refers to intentional drug overdose, self-injury, and self-poisoning irrespective of motivation and degree of suicidal intent,[1] is a growing public health concern across a number of countries. Self-harm is relatively common. Globally, an estimated 3.9 per 100,000 young people (95% confidence interval [CI] 22.6–43.9 per 100,000) report engaging in self-harm in the previous 12 months, compared with 91.5 per 100,000 adults (95% CI 74.6–113.2 per 100,000), and 48.7 per 100,000 older adults (95% CI 39.7–59.8 per 100,000).[2] Self-harm is also often repeated, particularly in higher income countries,[3] and is strongly associated with suicide.[4] Rates of presentations to general hospitals also appear to be increasing across a number of countries, particularly in young people.[5] Self-harm also has considerable costs associated with both hospital and aftercare treatment, both in lower-to-middle income[6] and higher income[7] countries worldwide.

Clinical practice guidelines across a number of higher[8–12] and lower-to-middle[13,14] income countries worldwide recommend all patients presenting to hospital following an episode of self-harm should receive a psychosocial assessment and formulation of an appropriate aftercare plan which should include, wherever possible, referral to appropriate in- and/or out-patient psychiatric treatment as indicated. Despite these recommendations, around half of those who present to hospital following an episode of self-harm do not receive any form of mental health aftercare post-discharge even within well-resourced settings.[15,16] Of those that do receive mental health aftercare, the majority are referred to outpatient psychiatric services. A smaller proportion may receive treatment in inpatient psychiatric service settings.[15,16] In lower income countries, in contrast, given that psychiatric morbidity may be less prevalent,[17] and resourcing of the formal mental health care system may be lower,[18] the treatment of self-harm may also occur in other, more diverse settings.

Several key factors might modify the clinical decision to refer self-harm patients to in- as opposed to out-patient psychiatric treatment, including: patient age,[19] gender/sex,[20] socioeconomic factors,[19] and previous history of psychiatric hospitalisation.[20] There is also some evidence

to suggest that those with a history of hospital-treated self-harm prior to the index episode may be more likely to receive inpatient psychiatric treatment,[19–22] suggesting the importance of attending to self-harm repetition status as a potential determining factor. Finally, clinical practices in different countries and underlying population rates of hospital-treated self-harm may also play a role,[23] as might macro-level factors, such as per capita spending on mental health, availability of psychiatrists, and availability of psychiatric inpatient beds.

To date, however, no studies have comprehensively reviewed the proportion of patients receiving various forms of psychiatric in- and/or out-patient treatment following an episode of self-harm, alongside the factors that may impact on these decisions with a view to providing recommendations to improve practice. We therefore undertook a comprehensive review of the international literature to determine: (1) the proportion of admissions (events) and patients (individuals) that receive a referral and/or discharge to a psychiatric inpatient hospital/ward and/or referral and/or discharge to psychiatric outpatient treatment service after an episode of hospital-treated self-harm; (2) the factors that modify the proportion of admissions (events) and patients (individuals) that receive these forms of treatment.

Method

The protocol of this review was pre-registered with PROSPERO (CRD42021261531), and followed the guidance in the updated version of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[24]

Search strategy and selection criteria

Full details on the search strategy and study selection used in this review are provided in a related review.[25] In brief, five electronic databases (the Cochrane Collaboration Depression, Anxiety, and Neurosis [CCDAN] specialized register [CENTRAL], Cochrane Database of Systematic Reviews [CDSR], MEDLINE, Embase, and PsycINFO) were searched from their respective start dates until 3 January 2023 using the search strategy outlined in the Supplementary Document, Supplementary Table SD1. Reference lists of identified studies and relevant reviews were also hand searched.

All published and unpublished studies reporting data on the proportion of patients (individuals) and/or presentations (events) resulting in referral and/or discharge to a psychiatric inpatient hospital/ward and/or referral and/or discharge to psychiatric outpatient treatment service after an episode of general hospital-presenting self-harm were eligible irrespective of study design. Studies were excluded if: (1) participants were not recruited from the emergency department of a general hospital; (2) data on the outcome(s) of interest were not reported; (3) data could not be

calculated from the information reported in the study; (4) the study sample either partially or fully overlapped with that of another study already included in the review. This latter criterion ensured data from the same sampling frame was not double counted in our pooled prevalence estimates. Lastly, due to resourcing constraints we were also unable to seek professional translation. Therefore, studies were also excluded if: (5) published in a language other than English.

Data extraction

In accordance with recommendations from the Centre for Reviews and Dissemination (CRD), records were collated, and duplicates removed. All records were then screened independently by two review authors for inclusion, firstly on title, followed by abstract. Any disagreements were resolved by the senior review author (GC). We next retrieved the full-texts of studies and pairs of review authors independently screened these full-texts, identified studies for inclusion, and recorded reasons for exclusion. Once again, any disagreements were resolved by discussion with the senior review author (GC).

We next combined multiple publications so that each study, rather than each publication, represented the unit of interest in this review. Where multiple reports of data on the same outcome were reported over the same recruitment period and in the same setting we preferentially extracted data from the study with the largest denominator (i.e., the primary study). Information from secondary studies was only included if data were reported on different outcome(s) and/or subgroups(s) from the primary study.

Two review authors independently extracted information on: (1) study information; (2) participant information; (3) methods; (4) outcomes; (5) potential modifying factors (specified *a priori*), including (where possible) mean/median sample age, sex/gender composition, socioeconomic composition, previous history of psychiatric treatment, previous history of self-harm, and (6) notes, including information on study funding and any notable conflicts of interest. Any discrepancies were resolved by a third rater (GC).

Outcome measures

The main outcomes of this review were: (1) the pooled proportion of patients and/or admissions that receive a referral and/or receive psychiatric inpatient treatment; (2) the pooled proportion of patients and/or admissions that receive a referral and/or receive psychiatric outpatient treatment. These outcomes could be ascertained in a number of ways, including from: hospital and/or medical chart review, clinician report, patient self-report, or via linkage to population administrative registers. In this review, we distinguish between referral to in- and/or out-patient treatment, which refers to any arrangement made to facilitate treatment, and receipt of in- and/or out-patient treatment, which refers either to

transfer to a psychiatric inpatient hospital/ward or attendance of at least one psychiatric outpatient treatment session (see Supplementary Document, Supplementary Table SD2 for specific definitions used in each included study).

Statistical analyses

Full details on the statistical analysis are provided in a related review.[25] Quantitative synthesis was performed using the random effects model[26] using a Restricted Maximum Likelihood Estimator (REML).[27] Accompanying 95% confidence intervals (CIs) were estimated using the Hartung-Knapp-Sidik-Jonkman adjustment.[28] We also applied the Freeman-Tukey double-arcsine adjustment. However, given that others describe misleading results in meta-analyses using the Freeman-Tukey double-arcsine adjustment and recommend use of generalised linear mixed models (GLMM) instead,[29] we also undertook sensitivity analyses using random-effects GLMM with a logit link function, assuming a normal distribution, to investigate any potential impact of transformation choice on the results.

Between-study heterogeneity was assessed using the I^2 statistic, τ^2, and accompanying 95% CIs. Using univariate random-effects meta-regression, we also explored potential reasons for heterogeneity by investigating whether any of the following potential modifying factors, determined *a priori*, were linearly associated with influencing the prevalence of any of our outcomes. These included several macro-level factors: (1) total healthcare spending adjusted to United States Dollars (USD); (2) psychiatric beds per 100,000 persons, and; (3) psychiatrists per 100,000 persons. These latter two factors were extracted from the World Health Organization Mental Health Atlas within ±5 years of the mid-point of the study recruitment period. We also included several study-level factors, such as: (4) study recruitment year; (5) proportion of females; (5) proportion of below average socioeconomic status; (6) proportion with a previous history of psychiatric treatment, and; (7) proportion with a previous history of self-harm.

Sub-group analyses were conducted to investigate whether any of our outcomes varied by age: young people (mean sample age: ≤25 years), adults (mean sample age: >25 years to <60 years), and older adults (mean sample age: ≥60 years). Differences between groups were assessed using the χ^2 test.[26] Sensitivity analyses using the leave-one-out method was used to investigate the potential influence of each individual study on the pooled estimates.[30] Finally, following previous guidance, we assessed publication bias qualitatively.[26]

Analyses were undertaken in R, version 4.0.5,[31] using the *meta*[32] and *metafor*[33] packages.

Risk of bias assessment

Full details on the method for assessing risk of bias are provided in a related review.[25] We used a tool modified for use with systematic reviews and meta-analyses of prevalence data,[34] which comprises four items affecting external validity and seven items affecting internal validity. Each item was scored as 'high', 'low', or 'unclear' risk of bias. We report a justification for our scores in an accompanying risk of bias table. Risk of bias assessments were conducted by pairs of two review authors independently, with any discrepancies resolved by consensus.

Role of the funding source

This was no specific funding for this review.

Results

A total of 11,457 records were identified by the electronic search, with three additional studies identified following hand searching the reference lists of identified studies and relevant reviews. 10,890 remained eligible for screening following the removal of duplicate records. Following a review of their titles and abstracts 10,193 records were excluded, whilst a further 480 records were excluded following a review of their full texts for the reasons as outlined in Fig. 1. A further 17 studies were excluded from this review and instead are included in a related review.[25] The inter-rater reliability between pairs of review authors was moderate (Cohen's kappa [κ] ranged from 0.61 to 0.79).

A total of 189 publications, representing 131 unique studies, were included in this review (see Supplementary Document, Supplementary Table SD2 for full reference list and methodological details of these studies). These publications included a total of 243,953 individual participants who had engaged in a total of 174,359 episodes of self-harm. The included samples were drawn from 44 different countries. According to World Bank classifications,[35] most were from higher income countries, including: the United Kingdom (UK; 50 samples), the United States of America (USA; 13 samples), Australia (13 samples), Norway (8 samples), Republic of Ireland (8 samples), Italy (6 samples), South Korea (5 samples), Switzerland (5 samples), Finland (4 samples), Japan (4 samples), Spain (4 samples), Belgium (3 samples), Denmark (3 samples), Sweden (3 samples), Taiwan (3 samples), Austria (2 samples), France (2 samples), Germany (2 samples), Hungary (2 samples), The Netherlands (2 samples), Oman (2 samples), United Arab Emirates (2 samples), and one each from Canada, Estonia, Greece, Hong Kong, Israel, New Zealand, Portugal, Qatar. A number of studies had also been conducted in upper middle-income countries, including: Turkey (10 samples), South Africa (4 samples), Brazil (2 samples), Serbia (2 samples), and one each from China, Fiji, Lebanon, Malaysia. A smaller number of studies were conducted lower-middle-income countries, including: India (2 samples), Iran (2 samples), and one each from Nepal, Nigeria, Sri Lanka, and Vietnam. Two studies had been conducted in multiple countries. Note that some studies contributed
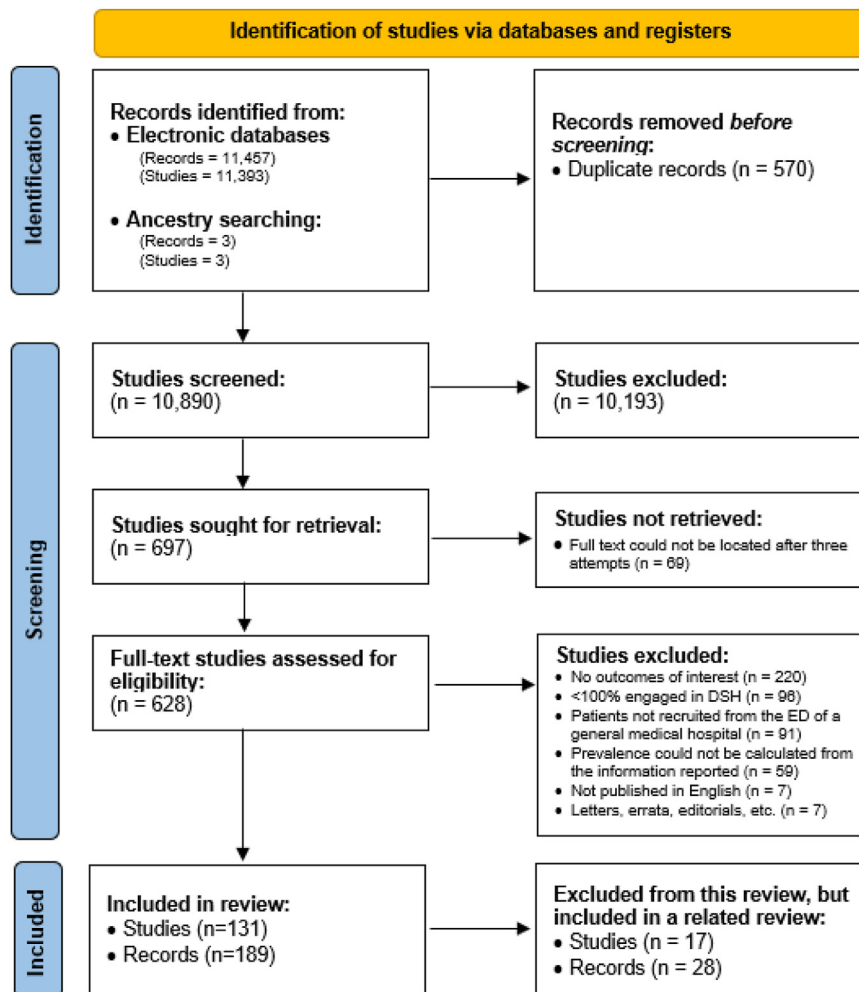
Identification of studies via databases and registers

Identification

Records identified from:
- Electronic databases
  (Records = 11,457)
  (Studies = 11,393)
- Ancestry searching:
  (Records = 3)
  (Studies = 3)

Records removed *before screening*:
- Duplicate records (n = 570)

Screening

Studies screened:
(n = 10,890)

Studies excluded:
(n = 10,193)

Studies sought for retrieval:
(n = 697)

Studies not retrieved:
- Full text could not be located after three attempts (n = 69)

Full-text studies assessed for eligibility:
(n = 628)

Studies excluded:
- No outcomes of interest (n = 220)
- <100% engaged in DSH (n = 98)
- Patients not recruited from the ED of a general medical hospital (n = 91)
- Prevalence could not be calculated from the information reported (n = 59)
- Not published in English (n = 7)
- Letters, errata, editorials, etc. (n = 7)

Included

Included in review:
- Studies (n=131)
- Records (n=189)

Excluded from this review, but included in a related review:
- Studies (n = 17)
- Records (n = 28)

Fig. 1: PRISMA flow diagram.

data to more than one country grouping as disaggregated data were available.

Whilst most studies included both females and males, over half (62.0%) of the sample were female in the majority of the 118 studies that reported information on gender/sex composition. Only 17 of the included studies reported information on socioeconomic level. In these studies, just under half (43.8%) of the sample were of below average/median SES. In the 76 studies that reported information on lifetime history of self-harm, 40.0% had previously engaged in self-harm prior to study recruitment. Finally, in the 53 studies reporting information on lifetime history of psychiatric treatment, around half (51.5%) had received previous treatment, however, it was not always clear whether this was on an in- and/or out-patient basis.

The weighted mean age of participants at recruitment was 32.5 ± 12.7 years. On the basis of the average sample age there were 146 studies that reported data on

adults (i.e., those aged >25 years to <60 years; weighted mean age 35.7 ± 4.9 years), 32 that reported data on young people (i.e., those aged ≤ 25 years; weighted mean age 17.2 ± 3.9 years), and 10 that reported data on older adults (i.e., those aged ≥ 60 years; weighted mean age 72.6 ± 4.6 years). Note that some studies contributed data to more than one subgroup as data were available disaggregated by age group.

Referral to inpatient psychiatric treatment

Overall, one-quarter of all persons were referred to inpatient psychiatric services following hospital-presenting self-harm (0.25, 95% CI 0.19–0.31). Around one-in-five adults (0.23, 95% CI 0.17–0.28) and just under one-third of older adults (0.31, 95% CI 0.20–0.45) were referred to inpatient psychiatric treatment. Fewer studies reported information on the proportion of young people receiving a referral to inpatient psychiatric services with the result that estimates for this age group are

mixed (0.49, 95% CI 0.00–1.00). Despite this, differences between subgroups were not significant (Fig. 2, Panel A). Heterogeneity between studies was considerable (I^2 = 99.7%; τ^2 = 0.07, 95% CI 0.05–0.10).

Only two studies, both in young people, reported data on the proportion of hospital-presenting self-harm presentations (events) referred to inpatient psychiatric services. Overall, these two studies reported that only around 5% (95% CI 0.00–1.00) of presentations by young people were referred to inpatient psychiatric services. As only one sub-group was included, it was not possible to conduct tests for subgroup differences. Between-study heterogeneity was considerable (I^2 = 86.1%), although the 95% CI around τ^2 contained zero suggesting that unexplained between-study heterogeneity was minimal (τ^2 = 0.02, 95% CI 0.00–0.14; Fig. 2, Panel B).

Receipt of inpatient psychiatric treatment
Across the age range around one-in-five persons were admitted for inpatient psychiatric treatment following hospital-presenting self-harm (0.22, 95% CI 0.18–0.28). Around one-in-five adults (0.23, 95% CI 0.18–0.28) and young people (0.23, 95% CI 0.08–0.42), compared with

16% (95% CI 0.05–0.31) of older people received psychiatric inpatient treatment. Despite this, differences between subgroups were not significant (Fig. 3, Panel A). Heterogeneity between studies was considerable (I^2 = 99.5%) and, as the 95% CI around τ^2 did not contain zero, some between-study heterogeneity remained unexplained (τ^2 = 0.07, 0.05–0.10).

With regards to presentations (events), one-in-ten presentations were admitted for inpatient psychiatric treatment across the age range (0.10, 95% CI 0.07–0.15). One-in-ten presentations by adults (0.10, 95% CI 0.06–0.14) and by young people (0.12, 95% CI 0.02–0.28) were admitted for inpatient psychiatric treatment. No study in older adults reported data on this outcome. Differences between subgroups were not significant (Fig. 3, Panel B). Heterogeneity between studies was considerable (I^2 = 99.6%), although the 95% CI for τ^2 was close to zero suggesting that between-study heterogeneity may have been minimal (τ^2 = 0.03, 95% CI 0.02–0.05).

Referral to outpatient psychiatric treatment
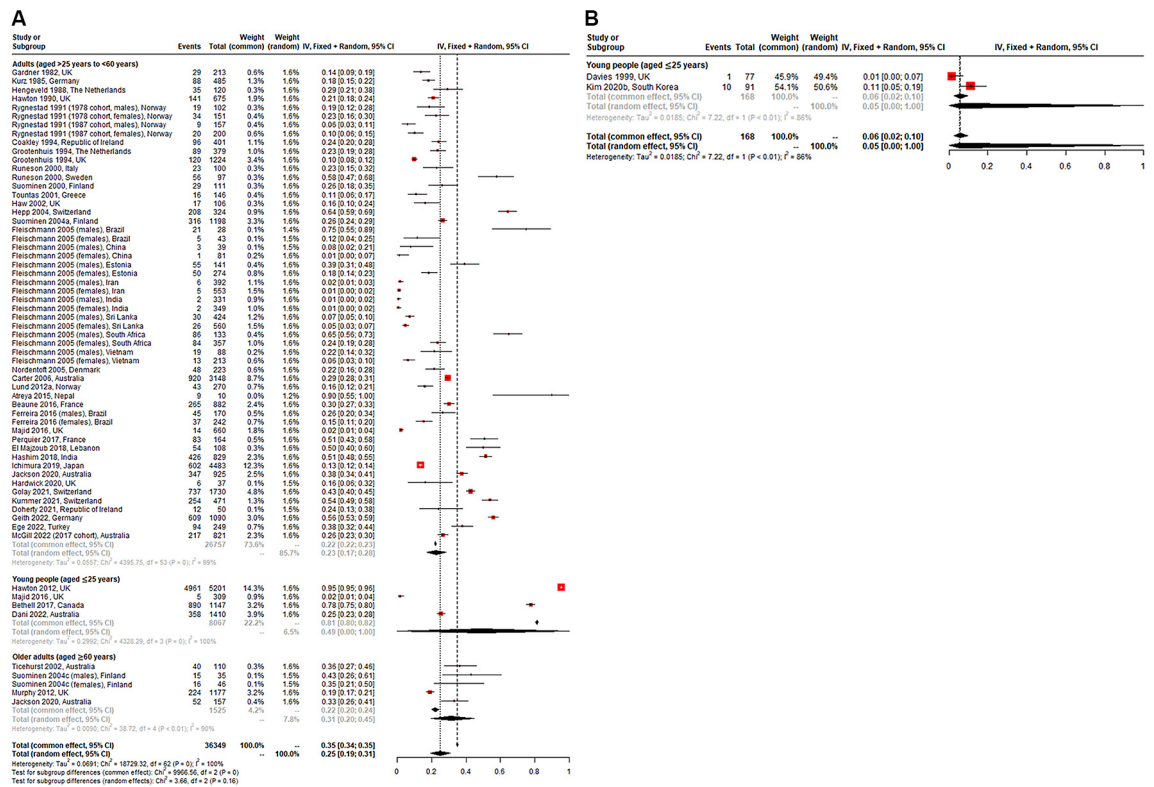Overall, across the age range just over one-third of persons were referred to psychiatric outpatient

Fig. 2: Mixed effects pooled estimates of the proportion of persons (individuals) (Panel A) and presentations (events) (Panel B) referred to inpatient psychiatric treatment following a hospital presentation for self-harm.

Fig. 3: Mixed effects pooled estimates of the proportion of persons (individuals) (Panel A) and presentations (events) (Panel B) receiving inpatient psychiatric treatment following a hospital presentation for self-harm.

services following hospital-presenting self-harm (0.39, 95% CI 0.33–0.46). Just over one-third of adults (0.37, 95% CI 0.30–0.45), and around one-quarter of older adults (0.27, 95% CI 0.12–0.45) received these referrals. In contrast, around half of all young people were referred to psychiatric outpatient services following a hospital presentation for self-harm (0.54, 95% CI 0.36–0.72). As a result, the test for subgroup differences was significant for this outcome ($\chi^2 = 9.75$, df = 2, $p = 0.0076$; Fig. 4, Panel A). Once again, heterogeneity between studies was considerable ($I^2 = 99.3\%$) and, as the 95% CI for τ^2 did not contain zero, some between-study heterogeneity remained ($\tau^2 = 0.07$; 95% CI 0.05–0.11).

With regards to admissions (events), one-third of presentations resulted in referral to outpatient psychiatric services across the age range (0.33, 95% CI 0.23–0.43). Just under one-third of presentations by adults (0.29, 95% CI 0.20–0.38) resulted in referral to outpatient psychiatric services, compared to almost one-half of presentations by young people (0.43, 95% CI

0.13–0.77). Despite this, differences between subgroups were not significant (Fig. 4, Panel B). Between-study heterogeneity was considerable ($I^2 = 99.7\%$) and, as the 95% CI for τ^2 did not contain zero, some between-study heterogeneity remained unexplained ($\tau^2 = 0.05$, 95% CI 0.03–0.12).

Receipt of outpatient psychiatric treatment
Overall, almost half of those referred for outpatient psychiatric services following a hospital presentation for self-harm attended at least one session across the age range (0.42, 95% CI 0.33–0.51): almost two-in-five adults (0.40, 95% CI 0.29–0.51) compared to just over half of young people (0.56, 95% CI 0.29–0.81), and almost half of older people (0.43, 95% CI 0.28–0.59). Despite these differences, the test for subgroup differences was not significant (Fig. 5, Panel A). Once again, heterogeneity between studies was considerable ($I^2 = 99.5\%$) and, as the 95% CI for τ^2 did not contain zero, some between-study heterogeneity remained unexplained ($\tau^2 = 0.07$, 95% CI 0.04–0.12).

Fig. 4: Mixed effects pooled estimates of the proportion of persons (individuals) (Panel A) and presentations (events) (Panel B) referred for outpatient psychiatric treatment following a hospital presentation for self-harm.

Fig. 5: Mixed effects pooled estimates of the proportion of persons (individuals) (Panel A) and presentations (events) (Panel B) receiving outpatient psychiatric treatment following a hospital presentation for self-harm.

With regards to presentations (events) half of all presentations received at least one session of psychiatric outpatient treatment across the age range (0.51, 95% CI 0.32–0.70). This was similar to the result for adults (0.44, 95% CI 0.24–0.64). There was some suggestion that a greater proportion of young people attended at least one session of psychiatric outpatient treatment (0.87, 95% CI 0.64–0.99); however, this result was based on only one study reporting data for two different cohorts and should be interpreted with caution. One study reported data on the proportion of older adults who engaged with outpatient treatment, finding that one-third of the older adults referred received outpatient treatment in this study (0.33, 95% CI 0.32–0.35). Again, this result should be interpreted with caution. The test for subgroup differences was significant ($\chi^2 = 642.09$, df = 2, $p = 0.0001$; Fig. 5, Panel B). Heterogeneity between studies was considerable ($I^2 = 99.4\%$) and, as the 95% CI for τ^2 did not contain zero, some between-study heterogeneity cannot be ruled out ($\tau^2 = 0.09$, 95% CI 0.05–0.29).

Sensitivity analyses
Transformation choice (i.e., Freedman-Tukey versus GLMM) did not materially affect the results. Influence analyses did not indicate that any one study was associated with excessive influence for any of the outcomes included in this review. There was also no evidence of publication bias on visual inspection of the funnel plots. As a consequence, meta-regression was performed to investigate other potential sources of between-study heterogeneity.

Meta-regression analyses
Several study-level factors were associated with between-study heterogeneity (Tables 1 and 2). Each one-unit increase in study recruitment year was associated with, on average, a 1% increase in the proportion of presentations (events) resulting in referral to outpatient treatment services, and a 1.5% increase in the proportion of presentations (events) receiving at least one session of psychiatric outpatient treatment. A greater proportion of females in the sample was associated with a decrease in the proportion of patients (individuals) receiving psychiatric inpatient treatment and an increase in the proportion referred to psychiatric outpatient treatment. This factor was also associated with a 2.0% increase in the proportion of presentations (events) receiving in at least one session of psychiatric outpatient treatment. Finally, a greater proportion of those with a lifetime history of self-harm prior to the index episode was associated with a decrease in the proportion of patients (individuals) referred to psychiatric inpatient treatment, but an increase in both the proportion of patients (individuals) and presentations (events) referred to psychiatric outpatient treatment. No macro-level factor was significantly associated with between-study heterogeneity.

Risk of bias
Risk of bias, as assessed using a tool modified for use with systematic reviews and meta-analyses of prevalence data,[34] was unclear or high for all included studies with potential biases most apparent for the domains of representativeness, generalizability, and acceptability of case ascertainment (see Supplementary Document, Supplementary Fig. SD1 and Table SD3).

Discussion
We included 189 publications, representing 131 unique studies, in this review. These samples reported data on outcomes for 243,953 individual participants and 179,359 episodes of self-harm. Overall, one-quarter of patients (individuals) presenting to hospital following self-harm were referred for inpatient psychiatric care

Covariate	Referral to psychiatric inpatient treatment				Receipt of psychiatric inpatient treatment				Referral to psychiatric outpatient treatment				Receipt of psychiatric outpatient treatment			
	β	LCI	UCI	p	β	LCI	UCI	p	β	LCI	UCI	p	β	LCI	UCI	p
Macro-level covariates																
Total healthcare spending, adjusted to USD (per $1000)	2.83	−0.32	5.97	0.078	0.94	−2.40	4.30	0.580	−1.07	−4.96	2.81	0.588	6.18	1.76	10.59	0.006
Psychiatric beds, per 1000 persons	−0.06	−0.19	0.07	0.390	−0.01	−0.11	0.11	0.962	−0.00	−0.11	0.11	0.975	0.03	−0.17	0.23	0.781
Psychiatrists, per 100,000 persons	−0.03	−0.98	0.91	0.947	−0.09	−1.01	0.83	0.848	0.34	−0.52	1.20	0.443	0.75	−0.30	1.81	0.163
Study level covariates																
Study recruitment year	0.45	−0.17	1.07	0.157	0.28	−0.27	0.84	0.311	0.21	−0.36	0.77	0.474	0.73	−0.06	1.52	0.071
Percent sample, female	−0.06	−0.27	0.15	0.568	−0.41	−0.72	−0.09	0.013	0.31	0.01	0.62	0.046	0.41	−0.08	0.89	0.103
Percent sample, below average SES	0.37	−0.98	1.71	0.592	0.68	−0.67	2.03	0.324	1.40	−0.56	3.35	0.161	0.47	−0.96	1.01	0.520
Percent, sample, lifetime history of self-harm	−0.53	−0.99	−0.06	0.028	−0.20	−0.60	0.20	0.318	−0.37	−0.81	0.07	0.100	0.44	0.04	0.85	0.030
Percent sample, lifetime history of psychiatric treatment	−0.70	−1.50	0.11	0.089	0.13	−0.23	0.49	0.481	0.12	−0.25	0.49	0.538	0.01	−0.61	0.81	0.787

Note: Coefficients transformed to represent per percent change in prevalence. Dashes indicate covariates and subgroups with insufficient observations. LCI: lower confidence interval; SES: socio-economic status; UCI: upper confidence interval; USD: United States Dollar.

Table 1: Univariate random-effects meta-regression effects for macro- and study-level covariates on prevalence estimates for patients (individuals).

Covariate	Referral to psychiatric inpatient treatment				Receipt of psychiatric inpatient treatment				Referral to psychiatric outpatient treatment				Receipt of psychiatric outpatient treatment			
	β	LCI	UCI	p	β	LCI	UCI	p	β	LCI	UCI	p	β	LCI	UCI	p
Macro-level covariates																
Total healthcare spending, adjusted to USD (per $1000)	–	–	–	–	1.41	–1.53	4.36	0.346	–0.90	–6.66	4.85	0.758	–1.97	–6.79	2.85	0.422
Psychiatric beds, per 1000 persons	–	–	–	–	0.13	–0.10	0.35	0.266	–0.38	–0.91	0.16	0.165	0.35	–0.43	1.14	0.381
Psychiatrists, per 100,000 persons	–	–	–	–	0.14	–0.81	1.08	0.780	–0.48	–1.64	0.68	0.419	0.33	–1.07	1.73	0.647
Study level covariates																
Study recruitment year	–	–	–	–	0.28	–0.21	0.78	0.262	1.00	0.33	1.67	0.003	1.47	0.66	2.27	0.004
Percent sample, female	–	–	–	–	0.04	–0.27	0.35	0.790	0.07	–1.09	1.24	0.901	1.96	0.01	3.90	0.048
Percent sample, below average SES	–	–	–	–	–	–	–	–	–	–	–	–	–2.43	–7.73	2.86	0.368
Percent, sample, lifetime history of self-harm	–	–	–	–	0.23	–0.17	0.63	0.264	0.80	0.31	1.30	0.002	1.04	–0.07	2.14	0.066
Percent sample, lifetime history of psychiatric treatment	–	–	–	–	0.22	–0.15	0.59	0.247	–0.11	–0.52	0.29	0.581	0.48	–0.76	1.74	0.447

Note: Coefficients transformed to represent per percent change in prevalence. Dashes indicate covariates and subgroups with insufficient observations. LCI: lower 95% confidence interval; SES: socioeconomic status; UCI: upper 95% confidence interval; USD: United States Dollar.

Table 2: Univariate random-effects meta-regression effects for macro- and study-level covariates on prevalence estimates for presentations (events).

across the age range. Of those referred, around one-fifth received inpatient treatment. For outpatient psychiatric care, around one-third were referred, whilst around half of those referred received at least one treatment session. Subgroup analyses found that older adults (mean sample age: ≥60 years) may be less likely than young people (mean sample age: ≤25 years) and adults (mean sample age: >25 years to <60 years) to be referred for outpatient psychiatric care following self-harm.

For presentations (events), rather than individual patients, only 5% of presentations by young people resulted in referral to inpatient psychiatric care, whilst no studies reported data for adults or older adults. Of those referred, one-in-ten presentations received psychiatric inpatient treatment across the age range. For outpatient psychiatric treatment, one-third of presentations resulted in referral to services. Of these referrals, half received at least one treatment session. There was some suggestion that a greater proportion of young people attended at least one session of psychiatric outpatient treatment; however, this result was based on only one study reporting data for two different cohorts. Older adults were far less likely to receive at least one psychiatric outpatient treatment session, however, again this result is based on only one study and must be interpreted with caution.

Taken together, our results suggest that repeat episodes of self-harm may be less likely to result in referral and/or receipt of inpatient psychiatric treatment, as evidenced by the lower pooled prevalence estimates for presentations (events) as compared with individuals (patients) for these outcomes. For outpatient psychiatric treatment, in contrast, there is some evidence to suggest the reverse may be true as a greater proportion of presentations (events), particularly those by adults and by young people, received at least one treatment session. A

proportion of those who initially received psychiatric inpatient treatment may subsequently also receive outpatient treatment following their discharge from hospital.[15,16] It is also important to note that the primary studies included in these analyses were largely independent of one another. It would therefore not be valid to conclude that virtually all patients referred were admitted, although that may be the case in some clinical settings globally. We also did not have any data that distinguished involuntary from voluntary inpatient care, which is an important clinical and personal consideration.

The reasons for the clinical decision to refer (or admit) self-harm patients to inpatient care are not clearly established but are likely complex and include individual demographic,[19,20,36] social,[19] specific diagnostic factors,[19,20] previous history of suicidal behaviours,[19–22] and previous treatment history.[20] Patient acceptance of certain forms of treatment may be low, particularly in the case of psychiatric inpatient treatment. Stigma may also play a role. Finally, both direct and indirect patient costs may also influence patient acceptance of certain forms of aftercare.[37] At the service-level, this decision may also involve legal responsibilities under relevant Mental Health Acts. Service availability may also influence the provision of aftercare services in any one setting.[38]

There was marked variability in estimates between studies, as indicated by the very high levels of between-study heterogeneity. Whilst there is some evidence that the proportion of females and those with a lifetime history of self-harm prior to the index episode may affect these estimates, effects were small. More recent studies were associated with a small increase in the proportion of presentations (events) that were referred to, and received, psychiatric outpatient treatment suggesting that the lower than recommended treatment allocation noted in this review has not changed significantly over

time, and is not greatly influenced by patient gender, socio-economic level, or previous history of self-harm or psychiatric treatment. Other macro-level factors that could be expected to have improved over time were also not associated with between-study heterogeneity in this review, including total healthcare spending, per capita availability of psychiatric beds, and per capita availability of psychiatrists. This suggests that local systems of care and context may play a greater role in determining how frequently those presenting to hospital following an episode of self-harm receive psychiatric care, and in what format (i.e., in- and/or out-patient). It may also be that the national estimates of these macro-level availability metrics may not be appropriate to the original studies which are often conducted in centres specialising in the care of self-harm patients. It is also important to acknowledge that there are important differences in resourcing of the formal mental health care system between countries, even those within the same income category.[39] Further, although we applied the Hartung-Knapp-Sidik-Jonkman adjustment[28] to account for potential inaccurate estimation of between-study variability, some of our analyses included fewer than five independent studies. Results of these should therefore be interpreted with caution.

Risk of bias was rated as unclear or high for all included studies and, as such, future, more robust studies may change our confidence in the estimates obtained. Few studies provided data to indicate whether the catchment area was comparable to the national population on important prognostic factors and therefore, whether prevalence estimates derived from these studies are valid. Greater information on the size of the population would also have enabled population weights to be incorporated in our analyses, thereby improving the validity of our pooled estimates. With regards to generalizability, a number of studies excluded participants either on the basis of self-harm method used, ethnicity, physical and/or psychiatric co-morbidities. Finally, with regards to acceptability of case ascertainment, a number of studies identified self-harm presentations from International Classification of Disease (ICD) versions 9 or 10 codes alone. However, previous work has demonstrated that the sensitivity of ICD codes in identifying self-harm is low,[40] and supplementation using textual fields is recommended to improve the enumeration of self-harm where intent is ambiguous.[41–43]

This is the only review to date to comprehensively synthesise global data on the prevalence of different forms of psychiatric treatment following hospital-presenting self-harm. We undertook a comprehensive search of the global literature and, as far as we are aware, have identified all studies meeting our inclusion criteria that had been completed and published up to the end of our search period. We also investigated the impact of various macro-level factors indicative of mental health care system resourcing to determine whether these factors influence the likelihood of psychiatric aftercare following hospital-presenting self-harm. We do

acknowledge, however, that the majority (83.7%) of the included samples were drawn from higher income countries worldwide, particularly English-speaking countries such as the UK, the USA, and Australia, which likely share a number of similarities in the structure and resourcing of their mental health systems. In low and low-to-middle income countries, in contrast, resourcing of the formal mental health care system may be lower, with the consequence that availability of inpatient psychiatric beds, psychiatrists, and mental health clinicians may be limited.[18] Aftercare for self-harm patients may therefore occur more frequently outside of the formal mental health care system in these countires,[18] and would not be captured by our estimates. Notwithstanding this, our estimates fall well short of recommendations in clinical practice guidelines internationally that, where possible, aftercare should be offered to self-harm patients after each event.[8–14]

Clinical practice guidelines internationally recommend that aftercare should be offered to all self-harm patients after every event. In contrast, this review found that, across the age range, one-quarter of persons were referred for inpatient psychiatric care and, of these, around one-fifth received this form of treatment. Just over one-third were referred to outpatient psychiatric care, whilst around half received at least one treatment session across the age range. Event rate estimates were, generally, of a lower magnitude than estimates for individual patients. There was marked variability in estimates between studies; however, no macro-level factor indicative of resourcing of the healthcare system, including total healthcare spending adjusted to USD, psychiatric beds or psychiatrists per 100,000 persons explained this apparent heterogeneity. There has also been little improvement in these effects over time. Given that the period following discharge from hospital represents the peak risk period for repeat self-harm and suicide, there is considerable scope for improvement in the allocation and provision of both in- and out-patient psychiatric care following hospital-presenting self-harm.

Appendix A. Supplementary data
Supplementary data related to this article can be found at https://doi.org/10.1016/j.eclinm.2023.102295.

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