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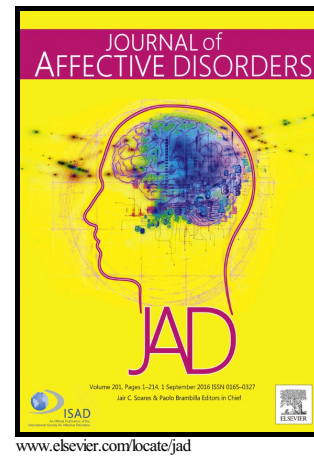
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## Author's Accepted Manuscript

Age-related differences in self-harm presentations and subsequent management of adolescents and young adults at the emergency department

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## Age-related differences in self-harm presentations and subsequent management of adolescents and young adults at the emergency department

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### Highlights

- We investigated self-harm in 12-25 year olds attending the emergency department
- A striking excess of females in younger patients had receded by young adulthood
- Physical severity of self-harm and the use of self-injury increased with age
- Repeat self-harm was more likely among the younger people in the sample
- The youngest people were more likely to receive adequate assessment and aftercare

### Abstract

#### Background

Characteristics of self-harm differ across ages, but there is little work identifying age-related differences in younger people. Young people entering adolescence face emotionally and developmentally different challenges to those entering adulthood. This study investigates how Emergency Department (ED) presentations and management of self-harm differ through adolescence and early adulthood.

#### Methods

3782 consecutive self-harm episodes involving 2559 people aged 12-25 years were identified from an existing database of Leeds ED attendances from 2004-2007. Odds ratios for each of four age bands were compared to the remaining young people.

#### Results

The female to male ratio was 6.3:1 at 12-14 years old, decreasing with successive age groups to 1.2:1 at 22-25 years old. Self-poisoning was commoner in those under 18 years old. 18-25 year olds were more likely to self-poison with prescribed medications, mixed overdoses, alcohol or recreational drugs. 18-25 year olds more often required medical treatment for the effects of the self-harm. 12-14 year olds were more often seen urgently by ED medical staff and offered high intensity mental health aftercare. Repetition of self-harm was commonest in 12-14 year olds, although multiple repetition of self-harm was commonest in 22-25 year olds.

**Limitations**

Data were not collected on whether the aftercare offered was received. The study sample included hospital attenders only.

**Conclusions**

The large excess of females over males in young people's self-harm is only true at the younger age range. Older adolescents present with more severe acts of self-harm, yet receive the lowest intensity of assessment and after care.

**Keywords:** Self-harm; Suicide; Young people

**Introduction**

Self-harm is a common problem in young people, with an estimated lifetime prevalence of 7-14% (Evans et al., 2005; Hawton and James, 2005). It is associated with increased risk of suicide (Gibb et al., 2005) and a number of adverse outcomes in young people, including low educational attainment and poor mental well-being (Mars et al., 2014). Rates and characteristics of self-harm differ with age, with younger adolescents showing more frequent use of self-poisoning than do young adults (Hawton and Harriss, 2008b). Self-harm studies typically view young people as a single group – defined for example as under 18 years or under 26 years old; little work has been done to identify age-related differences in self-harming behaviour and its management within adolescence and young adulthood. Self-harm presentations to hospital become increasingly common from age 12 onwards (Hawton et al., 2012) and, although there is no agreed definition of adolescence, the upper limit used to define adolescence and young people in self-harm studies varies between 18 and 25 years (Hawton et al., 2012). There is little evidence that there is a single effective intervention for young people who self-harm and the focus of treatment is usually on the difficulties underlying the acts of self-harm (Hawton et al., 2015b). Some key characteristics of 12-14 year olds who self-harmed have been reported (Hawton and Harriss, 2008b) as showing a higher female preponderance and higher rates of self-poisoning than in adolescents taken as a whole. Adolescence is a time of rapid social and emotional development. Young people just entering adolescence can face different challenges to the ones encountered by those entering adulthood, which might be reflected in their self-harming behaviour. The purpose of this study is to identify and describe how patterns of self-harm behaviour presenting to the emergency department (ED) vary in adolescence and early adulthood, and to determine whether immediate hospital management reflects these differences.

## METHOD

### *Participants*

Data were analysed from an existing dataset of self-harm attendances to emergency departments, collected as part of a multi-centre self-harm monitoring project in three major cities (Hawton et al., 2007). For the present study, data were from Leeds hospitals alone and were collected from the EDs of the two large teaching hospitals that cover the whole Leeds population; few people travel to hospitals in nearby towns to receive treatment.

The data include all self-harm attendances to the two emergency departments in Leeds between 1<sup>st</sup> October 2004 and 30<sup>th</sup> September 2007. Data were also collected for a few patients (N=22) who attended local Minor Injury Units (MIU). A hospital attendance occurred when a patient was booked into ED at the reception desk. Self-harm was defined as any non-fatal injury or poisoning reported by the patient or judged by a clinician to be self-inflicted, irrespective of whether there was an intention to die (Hawton et al., 2003b). People who died during their admission were not included. Included (although all of the following categories are rare) is self-poisoning with non-ingestible substances, and overdose of 'recreational' drugs and severe alcohol intoxication where clinical staff thought that the self-harm was intentional. Cases were identified from the ED and self-harm team records, with data then gathered from patient records held by the ED, medical wards, and the self-harm team.

In the present analysis all episodes undertaken by people aged 12-25 years who attended ED because of self-harm were identified from the existing dataset: 3782 of 11243 all-age episodes. These age boundaries were chosen because self-harm episodes leading to hospital attendance are infrequent before age 12, and 25 has been the conventional upper age limit for adolescence and young people in self-harm studies (Hawton et al., 2012). Variables recorded included demographics and patient history, features of the episode of self-harm, aspects of management, follow-up arranged for medical and mental health professionals, and non-fatal repetition of self-harm within the study period. A variety of medical and surgical interventions was used in the ED: we combined them into one "treatment" group which included simple first aid or sutures for self-injury, medical treatment with acetylcysteine or activated charcoal for self-poisoning, referral on to a specialist medical or surgical team, and treatment in the resuscitation room. As young people were offered various, and sometimes multiple, types of follow-up on discharge from hospital, we grouped the aftercare arrangements according to intensity. The category of "high intensity" is an amalgamation of inpatient admission to a psychiatric hospital and outpatient follow up with specialist mental health services, to include other secondary care services such as the crisis team and addiction services; "low intensity" is an amalgamation of the categories of: advice to self-refer to another agency, discharge to care of GP, and discharge without psychosocial assessment.

As data were collected from all self-harm attendances to the ED, repeat attendances for the same young person could be identified through hospital number and other identifiers such as name, address and date of birth. Length of follow-up from the index episode of self-harm ranged from one day (for people attending on the last day of the study) to 3 years (for those attending on the first day of the study); the average time of follow up was, consequently, 18 months. When investigating repetition by age band, a person's age band was taken to be that in which they first presented with their index episode, even if they would have crossed into an older age band on their repeat presentation. The data for patients aged 12 to 25 years were taken from a dataset containing patients of all ages. We included subsequent events for patients who had passed their 26<sup>th</sup> birthday during the follow-up period; there was no ascertainment bias consequent on the relation between age and follow up.

### ***Analysis***

Analysis was carried out using SPSS version 22. Young people were divided into four age-bands (12-14 year olds, 15-17 year olds, 18-21 year olds, 22-25 year olds). We chose the split at 17-18 years as the point at which Child and Adolescent Mental Health Services handed over the role of assessment and aftercare to adult mental health services; each division of the data (ages 12-17 and 18-25 years) was then halved in order to produce four age-bands that would allow us to look for and illustrate the development of any age-related patterns or trends. People in these age bands were compared on a number of recorded variables. The main comparisons were set out as odds ratios. For each variable, the odds of the variable for each age-band (eg 12-14 year olds) was compared with the odds of the variable for the remaining young people (in this example, 15-25 year olds). Mantel-Haenszel tests for linear association were used to identify significant trends throughout the age range under scrutiny. Odds ratios are represented in the Figures using a logarithm to base 2 scale so that a positive increment represents a doubling of the odds ratio and a negative increment represents halving of the odds ratio.

Where we deemed a confounding factor, such as gender, to be likely, we undertook a stratified analysis for the confounder by calculating the Mantel-Haenszel summary odds ratio (Daly and Bourke, 2000). The adjustment involved calculating a weighted average of the odds ratios for age group against the variable in question across the gender strata, thus adjusting for the confounding variable. The dataset was mostly complete: missing data items were excluded from the analysis of each variable and the number of missing data points reported along with the results, unless negligible (<1% of total).

### ***Ethical Approval***

Ethical approval for the data collected and ensuing analysis was granted by the Leeds West Research Ethics Committee and approval to collect data without individual patient consent was obtained from the national regulator, the then Patient Information Advisory Group (PIAG).

## RESULTS

### Patient characteristics

In total 2559 young people aged 12-25 years, median age 20 years, were included in the study. As some participants repeated self-harm, these 2559 young people accounted for 3782 ED episodes of self-harm. One of the most striking findings was that of gender distribution. The female to male ratio was 1.8:1, but this ratio differed across the age range, with females greatly over-represented in younger age groups. At 12-14 years old the female to male ratio was 6.3 (6.3:1), falling sharply to 3.5 by 15-17 years old, 1.7 by 18-21 years old and then to 1.2 by age 22-25 years old.

There were also marked differences in mental health history across the age ranges, with those aged 12-14 years significantly less likely, and those aged 22-25 years significantly more likely, to report previous mental health problems (age 12-14 OR (95% CI) 0.68 (0.50 to 0.92); age 22-25 OR 1.6 (1.3 to 1.9)) (missing data n=472) or a previous history of self-harm (age 12-14 OR 0.70 (0.52 to 0.95); age 22-25 OR 1.3 (1.1 to 1.5)) (missing data n=591). By contrast at the age of 12-14 years, significantly more young people were currently involved with mental health services at the time of presentation to the ED (OR 1.4 (1.1 to 1.9)), whilst those aged 18-21 years were less likely than other age-bands to have current mental health input (OR 0.65 (0.55 to 0.77)).

### Methods of self-harm

In all age-groups self-poisoning was the commonest method used, accounting for 71% of hospital attendances overall, with 23% due to self-injury and 6% using a combination of both methods. (Table 1)

### Self-Poisoning

Although self-poisoning was common at all ages, there were age differences in proportions of young people who self-poisoned. Those aged 15-17 years old were more likely to self-poison than were those in the two oldest age groups of 18-21 and 22-25 years old (Figure 1a), even when the higher proportion of females (who are more likely to self-poison than were male peers) was taken into account (adjusted OR stratified for gender, 1.3 (1.1 to 1.6)). However, although the proportion of those who self-poison decreases with age, it should be noted that the absolute number of episodes of self-harm and self-poisoning is greater in the older age bands.

When self-poisoning, different age-groups tended to use different substances. 22-25 year olds used more prescribed medications, such as antipsychotics (OR 2.2 (1.5 to 3.1)), antidepressants (OR 1.5 (1.3 to 1.9)), opioids (OR 2.6 (2.0 to 3.6)) and sedatives (OR 2.2 (1.7 to 2.9)), with under 18 year olds more likely to take analgesics other than non-steroidal anti-inflammatories (NSAIDs) in overdose (age 12-14 OR 1.8 (1.3 to 2.5), age 15-17 OR 1.6 (1.3 to 1.9)). In those aged 22-25 years old there was greater use of recreational drugs (OR 1.7 (1.1 to 2.7)). Those aged 22-25 years old were the group most likely to take a mixed overdose with three or more medications at one time (OR 1.33 (1.09 to 1.62)). 56% of young people used alcohol either as a method of self-harm or taken alongside self-harm, with greater use in those people in the 18-21 and 22-25 year old age groups (age 18-21 OR 1.4 (1.2 to 1.7); age 22-25 OR 1.7 (1.4 to 2.0)) (missing data n=1056). These findings may represent more serious overdoses in the older age-groups, although the lethality, as perceived by either the patients or medical staff, was not recorded.

Gender differences can also be observed in the medications used in self-poisoning, although these are mostly accounted for by age, with a disproportionate number of females in the younger age groups. Even when accounting for age, however, males were more likely to

use recreational drugs as a method of self-harm (OR 3.6 (2.2 to 5.7) and use antipsychotic medication (OR 1.7 (1.2 to 2.4)). Females took more NSAIDs (OR 1.5 (1.2 to 1.80) and analgesics other than NSAIDs (OR 1.2 (1.0 to 1.4)) when the data are stratified for age.

### ***Self-Injury***

The proportion of patients who self-injured rose with age and was significantly greater in those aged 22-25 years old (OR 1.3 (1.1 to 1.5) and smaller in the two youngest age groups in the cohort (age 12-14 OR 0.71 (0.53 to 0.96), age 15-17 OR 0.74 (0.61 to 0.89)) (Figure 1a).

Where the method of self-injury was by incised wounds (cutting), in all age-groups the cuts were most commonly made at the forearm, followed by the wrist. There were some age-related differences in the location and frequency of cutting. Cuts to the forearm were more likely to be made by those aged 15-17 years old than by those of other ages (OR 1.6 (1.1 to 2.4)). Where cuts were made to the torso, these were more often by those aged 22-25 (OR 2.6 (1.4 to 4.9)). We found that those aged 18-21 were more likely to present with two or more cuts at the same ED attendance (OR 1.4 (1.1 to 1.9)). Overall, self-injury was more common in males than females when stratified for age (OR 1.3 (1.1 to 1.5)). However on examining sub-categories of self-injury and stratifying for age, females more frequently attended with incised wounds (OR 1.8 (1.3 to 2.4) and burns (OR 5.9 (1.3 to 27)), whilst males attended with more violent methods of self-injury such as stabbing (OR 3.6 (1.3 to 9.9)), hitting other objects (OR 2.6 (1.4 to 5.0)), head-banging (OR 2.3 (1.2 to 4.6)) or running in to traffic (OR 3.7 (1.2 to 11.5)).

### ***Combined methods***

Combined methods of self-harm, where self-injury and self-poisoning occur on the same occasion, were used in 6% (range across ages 4.2-6.9%) of episodes. There was no significant difference in frequency of combined methods of self-harm across the age range 12-25 years or by gender.

## **Treatment**

### ***Medical Treatment***

Approximately one-third of people required medical treatment in the ED for self-harm, with treatment required in 56% of cases of self-injury and 22% of self-poisoning. As shown in Figure 1b there was a clear pattern of increasing need for medical treatment in the ED with increasing age. As the figure shows, the pattern is more prominent in self-injury (Mantel-Haenszel linear-by-linear association chi squared 11.5, df=1, P=.01) than in self-poisoning (linear-by-linear chi squared 4.8, df=1, P=.03). There were no significant differences in need for medical treatment between males and females.

This age-difference in the treatment received points towards increasing severity of self-harm with age. An increase in severity with age can also be inferred from the higher incidence in the oldest age group presenting to the ED with a reduced conscious level (age 22-25 OR 1.4 (1.1 to 1.8)) (missing data n=39), as seen in Figure 1c. Despite this severity-related observation, those aged 12-14 years old were most likely to be triaged to be assessed by ED staff within 1 hour of arrival in ED (OR 3.0 (1.8 to 4.9)). Those aged 12-14 years old were also the group most likely to be admitted to general hospital (OR 2.2 (1.6 to 3.0)).

As set out above, there was a higher incidence of self-poisoning in 12-14 year-olds compared to other age bands, and people who self-poisoned were more likely to be admitted to general hospital than those who self-injured. However, when the incidence of self-poisoning was accounted for using the Mantel-Haenszel method of stratification, those aged 12-14 years old remained the most likely to be admitted to general hospital (adjusted OR 2.4



(1.6 to 3.4)). There was no significant difference in the rate of declining or refusing medical treatment amongst any of the four age-bands.

### ***Psychiatric Assessment***

Two-thirds of all 12-25 year olds presenting to the ED because of self-harm received psychosocial assessment from mental health services (missing data n=401). Assessment rates ranged from 64% in 15-17 year olds to 73% in 12-14 year olds. There was no statistically significant trend to the rate of assessment across the four age-bands (Chi-squared linear-by-linear association 0.04, p=0.8) although there was more frequent assessment in those aged 12-14 years old (OR 1.4 (1.0 to 2.0)). This youngest age-group were also more likely to be assessed by a senior clinician, such as a specialist registrar or consultant (OR 3.8 (2.0 to 7.4)).

Regardless of age, 34% of people did not receive psychological assessment before leaving hospital; for 14% of those people who were not assessed, this was due to the patient refusing psychological assessment (4% of the total people seen). Young people aged 12-14 years old were the least likely to refuse psychosocial assessment (OR 0.13 (0.02 to 0.90)), or to self-discharge prior to assessment (OR 0.36 (0.20 to 0.65)).

### ***Mental Health Aftercare***

Figure 1d shows that the two youngest age groups in the cohort received the highest intensity aftercare, particularly those aged 12-14 (age 12-14 OR 12 (5.8 to 27); age 15-17 OR 1.8 (1.5 to 2.3)) (missing data n=74). Outpatient follow up is by far the biggest contributor to this variation, as numbers of inpatient admissions represent fewer than 6% in all age-groups. The two oldest age groups, and in particular the 18-21 year old age-group, correspondingly received the lowest intensity of aftercare (age 18-21 OR 0.6 (0.5 to 0.7); age 22-25 OR 0.9 (0.7 to 1.0)). There were no gender differences in the intensity of aftercare offered.

We also examined the findings according to which of the two general hospitals the patients attended: there was no important clinical or demographic difference between the subsample of patients and no significant differences in the treatment that young people received, including medical treatment, admission to general hospital, psychiatric assessment and after-care.

### ***Repetition of Self-Harm***

One fifth (20%) of 12-25 year olds presented again to ED with a subsequent episode of self-harm during the study period (an average of 18 months of follow-up).

The Kaplan-Meier curves in Figure 2 demonstrate the occurrence of repetition at different time points in the study. The log rank test shows that repetition of self-harm was significantly more likely in those whose first episode in the study period was a result of self-injury or combined self-injury and self-poisoning (chi squared 11.14, df 2, p=0.04) Using survival statistics, Figure 2a demonstrates these method related differences in repetition: the estimate for repetition of self-harm over three years was 28%; as many as 31% of the young people who had used a self-injury method at the index episode had returned to hospital with a repeat episode of self-harm - 35% if they had combined injury and poisoning at the index episode. Figure 2b shows repetition by age group. Although the log rank test shows no significant difference between age groups, we can see that by 3 years there is greater repetition among those aged 12-14 years old. Those aged 22-25 years were, however, much more likely to repeat multiple times. Categorising the number of repeat attendances into 3 groups (1 to 3 repeat attendances; 4 to 9; and more than 10 attendances), those aged 22-25 years old were more likely to have 4 to 9 repeat attendances, and more than 10

repeat attendances, than were the other age-groups (4 to 9 repeats OR 1.8 (1.1 to 3.1); >10 repeats OR 3.9 (1.5 to 10)). Males were slightly more likely to repeat self-harm than were females, but this difference was not statistically significant after stratifying for age and method of self-harm

37% of those who presented with a repeated episode of self-harm switched the method of self-harm at their next repeat, with no significant difference in this proportion between age-groups. Those whose index episode featured a combination of self-injury and self-poisoning were much the most likely to switch method at repeat (OR 8.4 (5.1-13.9)). Over half of those who presented with self-injury alone switched method at repeat (OR 2.8 (2.2-3.6)), whilst those who self-poisoned were likely to repeat using the same method again (OR 0.20 (0.15-0.26)). Females were slightly more likely than males to switch although this difference was not significant when the method of self-harm was taken into account by stratification in the analysis.

## **Discussion**

Five main conclusions can be drawn from our findings. First, the high proportion of females among young people who self-harm decreases markedly with age. Second, increasing age is associated with a rise in the proportion of self-harm episodes that are characterised by self-injury and a concomitant reduction in the proportion that feature self-poisoning, although absolute numbers increased in both categories. Third, the intensity of physical care received in ED increases with age – suggesting age-related progression in physical severity. Fourth, despite the older participants in the study presenting with more medically severe acts, younger patients received quicker physical assessment and more psychosocial assessment, had fewer self-discharges, and saw more arrangements for their aftercare. Fifth, repetition of self-harm was extremely common, with its incidence inversely associated with age, and often involved a switch in the self-harm method.

### **Gender**

Among young people attending hospital because of self-harm we found what has been observed before but is not widely articulated: the predominance of females at 12-14 years old (ratio 6.3 females to males) has fallen to 3.5 by 15-17 years old and has almost disappeared (ratio 1.2) by age 22-25 years old. This reflects similar findings (Hawton and Harriss, 2008a) where the gender ratio of females to males was 8.1 in 10-14 year olds, 3.1 in 15-19-year-olds and 1.6 in 20-24-year-olds. We know little about why so many younger girls present to hospital with self-harm. A school survey (Hawton et al., 2002) described rates of self-harm in the community, self-reported by 15-16 year old pupils. It showed a 3-fold excess of self-harm in females compared to males. This gender ratio in the community is comparable with our own findings of a female to male ratio of 3.5:1 at age 15-17 years old, indicating that the predominance of females presenting to hospital with self-harm is not simply related to gender differences in help-seeking behaviours.

### **Method of harm**

Although self-poisoning was by far the commonest method of self-harm seen on hospital presentation to ED in all age-groups, this observation was most conspicuous among young people from age 12 to 17 years. After that age, from 18 to 25 years old, we found increasing likelihood of the self-harm being due to injury, usually by cutting, with a corresponding reduction in the proportion of young adults aged 18 to 25 years old who had self-poisoned. This finding is reported elsewhere in a similar pattern (Hawton et al., 2007; Hawton et al., 2015a; Hawton et al., 2003a; Hawton et al., 2003b; Nadkarni et al., 2000). We stress that this hospital-based observation is at odds with the popular notion that adolescents are especially likely to need assessment and help because they have cut themselves; self-poisoning is a major health problem among adolescents. Poisoning here involved prescribed

medication particularly among the oldest age group of 22-25 years old, while the younger two age groups of 12 to 17 years were more likely to take the kind of medicines that can readily be purchased over the counter; this relation between use of prescribed psychotropic drugs and increasing age has also been reported in study populations that included all adult ages (Hawton et al., 2007).

Although many gender differences in the method of self-harm could be accounted for by age, with an excess of females in the younger age groups, some gender differences persisted when age was taken into account. In particular, females were more likely to self-poison than were males, with females taking more analgesic medications. Perhaps most strikingly, males were much more likely to take recreational drugs in overdose. Females were more likely to injure themselves by cutting and burning, whereas males used more violent acts such as stabbing, hitting objects and running into traffic. These observations could indicate more severe acts of self-harm in males although there were no gender differences in requirement for treatment for any method of self-harm, which casts doubt on the idea of increased severity in males.

### ***Severity of harm***

Self-poisoning behaviour among young people showed features that pointed to increasing severity with age. Those aged 22-25 years old were more prone than were their younger counterparts to taking overdoses of recreational drugs and more often took alcohol at the same time as self-harming. They were also the age-group more likely to take a combination of three or more medications at once or to present with more than one cut. More unusual (and more disconcerting) incised wounds, for example to the torso, were also commoner among the young adults aged 22-25 years. The need for specific physical treatment of injuries rose sharply with increasing age and the need for targeted treatment of poisoning was also seen among the oldest age-band of 22-25 years old. Unfortunately, ED case-notes do not routinely record impressions or ratings of overall severity or perceived lethality.

### ***Assessment and aftercare***

Despite what seems to be greater physical severity of episodes amongst the young adults in the 18-21 and 22-25 year age bands, the youngest people aged 12-14 years were the ones most likely to be designated in triage as needing to be clinically assessed within one hour of arrival in the ED. In view of the pointers, above, concerning greater physical severity among older age-bands this prompt action may represent the adherence by staff to national guidelines – that under-18 year olds should be admitted to general hospital overnight for a cooling-off period prior to assessment, even when there is not a medical need for admission (NICE, 2004). This guidance is reflected in the particularly high proportion of the youngest age-band who were admitted to a general hospital bed. The youngest people, in the 12-14 year age band, were those whose psychosocial assessment was most often undertaken by a senior clinician, and it was those aged 12-14 years rather than those aged 15-17 years who were most likely to be seen by specialist CAMHS workers. Not surprisingly, those in the youngest age band of 12-14 year olds were less likely to refuse to undergo psychosocial assessment or to leave the ED without agreement of staff. Unfortunately, ED records do not consistently record whether people are accompanied or alone; we are aware of ED case-notes usually mentioning parents or other seniors when recording an account of the psychosocial assessment and care plan for the youngest people while it is not recorded so often among the young adults.

It was also clear that it was the youngest two age groups of 12-14 and 15-17 years old who were offered the highest intensity of mental health aftercare, which most frequently involved outpatient or other secondary care services. Although data were not collected concerning the receipt of arranged aftercare following discharge from ED, we do know that those aged 12-14 years old were more likely to have been involved with mental health services at their time of presentation to the ED than were the older age groups. Notably, those aged 18-21

years old, who may have recently transitioned into adult care, were the least likely to be offered high intensity after-care and may be missing out on valuable services as a result.

### ***Repetition***

One in five young people seen in the ED as a result of self-harm will return with a further episode over the next 18 months and almost one in every three will be back within three years. The oldest age group of 22-25 year olds were especially likely to have multiple repeat attendances to ED with self-harm but, despite this apparent need, this age group were offered much less intense after-care from mental health services. Among the 12-14 year olds around 40% will repeat and re-attend hospital within three years. Our data, however, do not reflect repetition in the community. It is possible that young adolescents aged 12-14 years old who self-harm are more closely monitored by concerned parents who will bring them to the ED, or perhaps they are encouraged to re-attend by virtue of having more intensive follow-up in the community - sources of support less often offered to young adults aged between 18 and 25 years old.

In line with previous studies (Lilley et al., 2008; Owens et al., 2015), fluctuation between methods of self-harm was common and repetition rates varied according to index method of self-harm; repetition was commoner amongst those who injured themselves or used a combination of methods. As with other age groups, self-harm in adolescence appears to be a fluid pattern of behaviour necessitating psychiatric assessment and treatment decisions that are based on more than just method or severity of self-harm, especially given the links between medically less serious self-injury, method-switching, and suicide (Lilley et al., 2008; McMahon et al., 2014; Owens et al., 2015).

### ***Methodological considerations***

These study data were collected comprehensively and methodically in line with the strict procedures used by three research centres in the NHS in England as part of the then Multicentre Monitoring project when Leeds was a part of that project. The inclusion of the only EDs in the city means that the whole city's population was covered, with neighbouring EDs sited in other towns and cities well away from the Leeds perimeter. The basic ED data were enhanced by hospital in-patient data and from the records of the mental health self-harm and CAMHS teams who undertake the psychosocial assessments across the city; these other sources were checked when there were missing data items from the primary ED source. The size of the city and the frequency of self-harm as a reason for hospital attendance meant that in the short period of three years our sample was not far short of 4000 episodes seen in young people, allowing the examination of fairly narrow age-bands as we tackled the question of changing age-patterns of self-harm and its care.

Less satisfactory is the absence of data on many important aspects of care, such as whether the young people were on their own or accompanied by a parent or other responsible adult when the hospital services were dealing with their assessment and treatment. This deficiency in the data is an inherent consequence of data collection from routine records in the ED. Other studies generally manage to offer more detail only when describing subsamples of people who are more thoroughly assessed – often restricted to those admitted overnight into the general hospital and thereby at the potential cost of distortion of the clinical picture when people who go directly home from the ED (often without adequate assessment) are not included in the findings.

The scrutiny of the arrangements for aftercare ended when each index episode was completed; the data were collected only from case-notes made during index admission so information was not available on whether the aftercare offered was actually received. Consequently we were unable to examine whether aftercare had an impact on repetition of self-harm. It should also be stated once again that self-harm is often a private act and in some studies up to half of young people who self-harm do not come forward to seek help,

with those who do seek help often turning to informal sources of support such as friends and family rather than health services (Biddle et al., 2004; Rowe et al., 2014). Although the present data tell us much about those young people who attended hospital, we cannot know about those who do not attend hospital or who are not identified as having self-harmed on presentation to ED. In addition, although the dataset is comprehensive, data were collected approximately 10 years ago, with implications for generalisability to the current population of young people.

We have chosen to display some of our findings in a graphical way to show the changing pattern of clinical characteristics and treatment across the age-bands. In constructing these graphs we compared each age-band with the remaining patients in the sample. This procedure has a disadvantage in that the age-bands in the middle of the age-range are compared with people both older and younger than themselves. However, although those particular comparisons can be hard to conceptualise, comparing each band with all others is effective at showing the developing pattern; the more conventional approach of comparing each band with a reference group shows the pattern of change less well.

As with any monitoring study with a similar design, there is some contamination of the data when someone moves from one age-band into another when re-attending hospital with a further episode. This is a numerically small effect but it could be eradicated by removing such subsequent episodes from the analysis. We have not taken that step because, by doing so, we would give special status to the first episode in the study period when that index episode itself is chosen arbitrarily: for a high proportion of patients the index episode is not a lifetime first hospital attendance. In addition, including each episode in the analysis more closely represents the volume and variety of presentations to the ED, as the nature and management of self-harm may differ on subsequent attendances..

### ***Implications for Further Research and Clinical Practice***

We have shown that the substantial over-representation of females in people attending hospital with self-harm has largely disappeared by young adulthood. However, much remains to be learned about the reasons why more young females than their male peers are engaging in self-harm. It also raises the question of whether we should be considering using different, more gender-sensitive approaches to therapy.

Our study highlighted that repetition rates for self-harm are high, and yet one third of young people who present with self-harm do not receive a psychosocial assessment prior to leaving hospital. This assessment forms an essential part of their management, without which appropriate after-care to address their self-harm cannot be arranged. There is evidence that using a therapeutic approach to psychosocial assessment immediately after the act of self-harm can be beneficial in improving engagement with mental health services, although this has not been shown to reduce rates of repetition (Ougrin et al., 2013). With this in mind, we would like to stress the importance of EDs and mental health teams working together to identify these young people and assess them thoroughly. This is particularly true for young adults aged 18 years or over, in whom there is a discrepancy between the severity of self-harm, frequency of multiple repeat attendances and the provision of assessment and aftercare by both mental health and medical teams. There is a need for transition and young adult services to address this discrepancy by providing adequate after-care and support for these high risk groups of young people emerging into adulthood.

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Table 1. Episodes of self-harm according to age and method. Numbers are episodes (%).

Age band	Self-Poisoning (SP)	Self-Injury (SI)	SI and SP in same episode	Total
12-14	202 (77)	51 (19)	11 (4)	264
14-17	520 (75)	129 (19)	41 (6)	690
18-21	1052 (70)	346 (23)	104 (7)	1502

22-25	890 (67)	357 (27)	79 (6)	1326
<i>Total</i>	<i>2664 (71)</i>	<i>883 (23)</i>	<i>235 (6)</i>	<i>3782</i>

Figure 1. Odds ratios (to log-to-base-2 scale) across the age-bands, according to four aspects of the self-harm episode or its management at the hospital. Odds for each age band are compared with the odds for the remaining young people. Vertical bars are 95% confidence intervals.

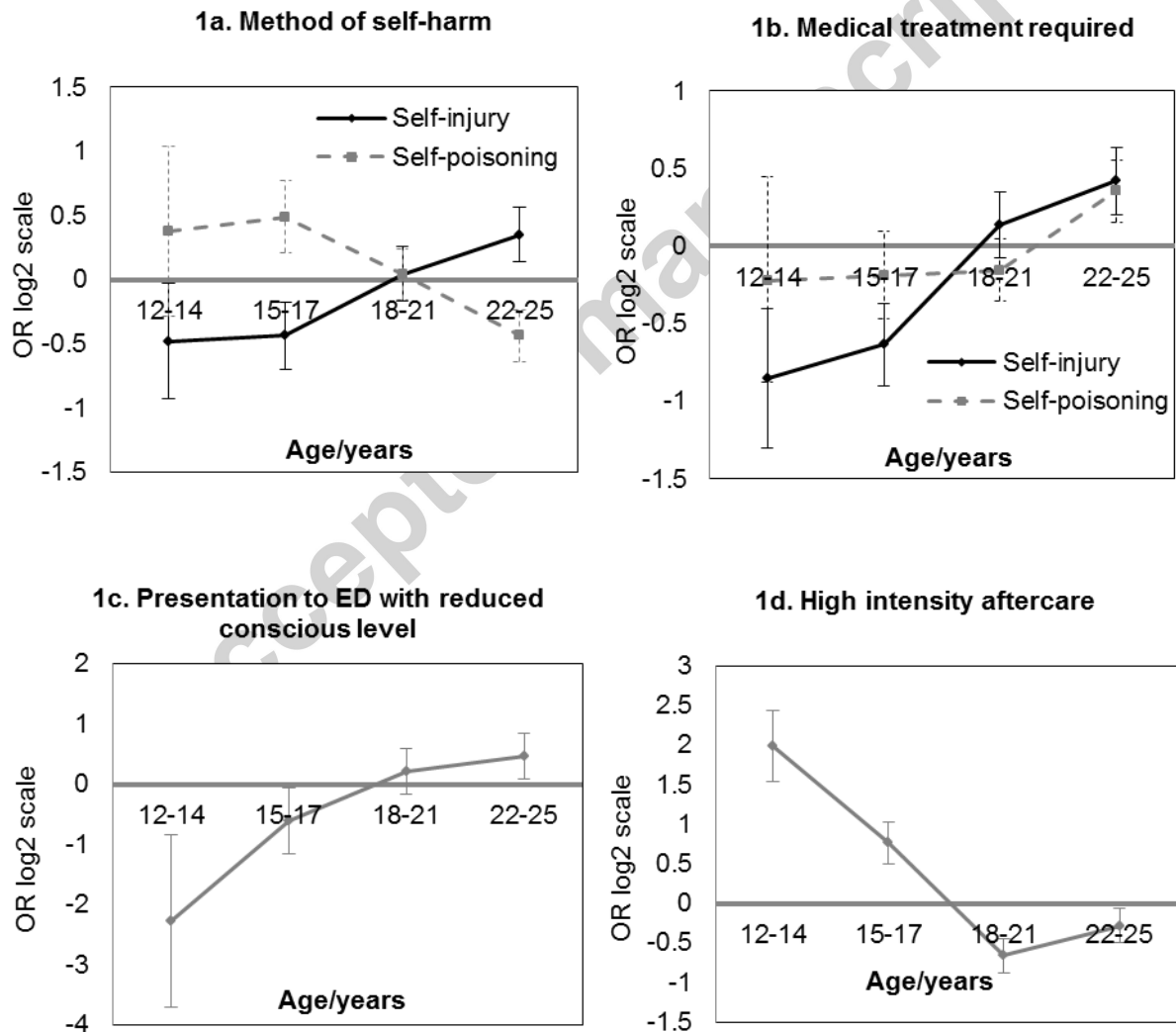
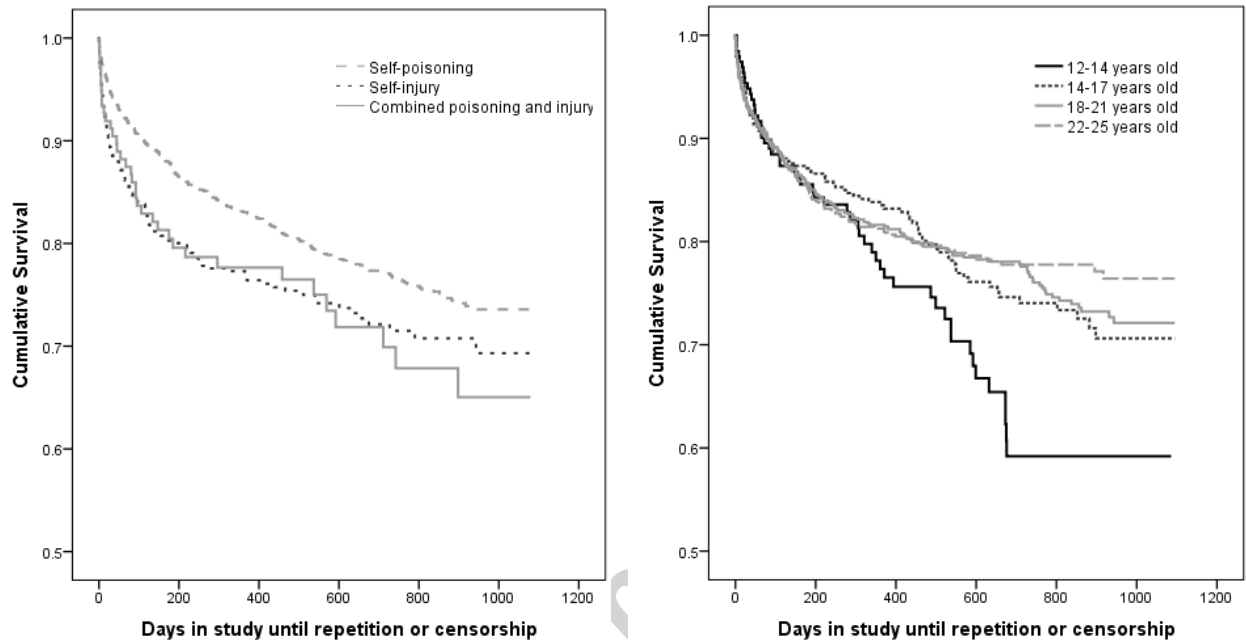




Figure 2. Kaplan Meier curves for time in study until repetition of ED attendance due to self-harm, according to (a) method of self-harm at index episode and (b) age-band



### Highlights

- We investigated self-harm in 12-25 year olds attending the emergency department
- A striking excess of females in younger patients had receded by young adulthood
- Physical severity of self-harm and the use of self-injury increased with age
- Repeat self-harm was more likely among the younger people in the sample
- The youngest people were more likely to receive adequate assessment and aftercare