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**Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012:
findings from the Multicentre Study of Self-Harm in England**

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Abstract

Objectives: Self-harm is a major health problem in many countries, with potential adverse outcomes including suicide and other causes of premature death. It is important to monitor national trends in this behaviour. We examined trends in non-fatal self-harm and its management in England during the 13-year period 2000-2012.

Design and setting: This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England. Information on all episodes of self-harm by individuals aged 15 years and over presenting to five general hospitals in three cities (Oxford, Manchester, and Derby) was collected through face-to-face assessment or scrutiny of emergency department electronic databases. We used negative binomial regression models to assess trends in rates of self-harm and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed).

Participants: During 2000-2012 there were 84,378 self-harm episodes (58.6% by females), involving 47,048 persons.

Results: Rates of self-harm declined in females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p < 0.0001$]. In males, rates of self-harm declined until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p < 0.0001$) and then increased (IRR 1.05; 95% CI 1.02-1.09, $p = 0.002$). Rates of self-harm were strongly correlated with suicide rates in England in males ($\rho = 0.82$, $p = 0.0006$) and females ($\rho = 0.74$, $p = 0.004$). Over 75% of self-harm episodes were due to self-poisoning, mainly with analgesics (45.7%), antidepressants (24.7%), and benzodiazepines (13.8%). A marked increase in self-injury occurred in the latter part of the study period. This was especially marked for self-cutting/stabbing and hanging/asphyxiation. Psychosocial assessment by specialist mental health staff occurred in 53.2% of episodes.

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Conclusions: Trends in rates of self-harm were similar to those for suicide in England. Self-harm may be a useful mental health indicator. Despite national guidance many patients still do not receive psychosocial assessment.

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Strengths and limitations

- This is a large study of more than 86,000 presentations to emergency departments following self-harm.
- This multicentre study includes five general hospitals in three cities of socioeconomically diverse populations in England, which provides more representative information than single centre studies.
- The study only included individuals who presented to hospital following self-harm.
- The rates of self-harm reported are based on urban populations, which are known to be higher than in rural populations.
- Some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may limit generalizability.

Introduction

Self-harm (intentional self-poisoning or self-injury, irrespective of type of motivation¹) is a public health problem in many countries. It is a major risk factor for completed suicide² and is associated with elevated all-cause mortality.³ Approximately 50% of individuals who die by suicide have a history of self-harm⁴ and in many cases there is an episode of self-harm shortly before a fatal act,⁵ particularly in frequent hospital attenders.⁶ Self-harm is also often associated with poorer psychosocial outcomes, such as depression, anxiety, substance use and educational indices,⁷ and results in considerable health services and social costs.⁸

Reliable and accurate data on self-harm are important for understanding national trends and risk factors for self-harm and for planning appropriate health services and informing potentially effective preventive measures. Systematic monitoring of self-harm in many countries, including England, has tended to be confined to single centres. However, these are limited in terms of generalizability of findings.

In the present study we examined trends in non-fatal self-harm in England using data from the Multicentre Study of Self-harm in England <http://cebmbh.warne.ox.ac.uk/csr/mcm/>, which was developed as part of the National Suicide Prevention Strategy for England.^{9 10} We previously reported on trends of self-harm during 2000-2007,¹¹ which showed declining rates of self-harm after 2003, in keeping with the national trends in suicide. Here we present data on trends during the 13-year period 2000-2012, including rates, methods of self-harm, psychiatric history, repetition, and provision of psychosocial assessment following self-harm.

Methods

Sample

This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England, as described in detail elsewhere.¹² We included all individuals who presented to five general hospital emergency departments following self-harm: Oxford (one hospital), Manchester (three hospitals), and Derby (two hospitals merged into one in mid-2009) between 1 January 2000 and 31 December 2012, who were 15 years and over.

Data collection

Information on all episodes of self-harm was collected in two ways: a) completion of assessments (of mental state, risks and needs) by the general hospital psychiatric service (and in Manchester also by emergency department staff);¹³ and b) scrutiny of emergency department electronic databases by research clerks in order to identify all other patients presenting to the hospital following self-harm, from which more limited data are extracted.

Demographic, clinical and hospital management data on each episode were collected by clinicians using pen and paper (Oxford and Manchester), or electronic (Derby and Manchester since mid-2008) forms.

Data included gender, age, date of self-harm, method of self-harm (including drugs used in self-poisoning and details of self-injury), psychiatric history (including of self-harm), whether or not psychosocial assessment was conducted and subsequent repetition of self-harm.

Information on non-assessed patients (those who had taken early discharge, refused or were not offered an assessment) was collected in Manchester from September 2002 onwards. Rates of self-harm for this centre for the earlier period were adjusted upwards by

a factor of 1.42 taking account of the 30% of non-assessed individuals identified in a review of the data collected between 1 September 2002 and 31 August 2003. Rates of assessment were similar by age and gender and the adjustment was applied across all age and gender groups.

Rates of self-harm and suicide

Rates of self-harm were calculated for defined local population areas for which centres had near to complete identification of self-harm presentations to hospital (Oxford City, City of Manchester, and Derby Unitary Area). We calculated annual person-based rates using each individual’s first episode of self-harm within each year. Mid-year population estimates were obtained from the Office for National Statistics (ONS).¹⁴ Rates were calculated per 100,000 of the local general population for each centre, for each year, age-standardised to the European population, with 95% confidence intervals (CI).

Rates of suicide in England (age standardised to the European population) were obtained from the Office for National Statistics (ONS). Suicides were “deaths given an underlying cause of intentional self-harm or injury/poisoning of undetermined intent”.¹⁵

Ethical approval

The monitoring systems in Oxford and Derby have approval from local Research Ethics Committees to collect data on self-harm for local and multicentre projects. Self-harm monitoring in Manchester is part of a clinical audit system, and has been ratified as such by the local Research Ethics Committee. All three monitoring systems are fully compliant with the Data Protection Act of 1998. All centres have approval under Section 251 of the National

Health Services (NHS) Act 2006 (formerly Section 60, Health and Social Care Act 2001) to collect patient identifiable information without patient consent.

Statistical analyses

Rates of self-harm and trends in rates were calculated separately for each centre. Trends in method of self-harm and repetition were analysed using data from 2003 to 2012 from the three centres, because these variables are to a certain extent related to assessment status e.g. fewer patients who present with self-injury receive an assessment.¹³

We used negative binomial regression models to assess trends in rates of self-harm accounting for over-dispersion in the data and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed). Likelihood Ratio (LR) tests were used to test for deviation from linearity in trends over time. Analyses were carried out using SPSS 22.0 and Stata 14.0.

Missing data

Level of missing data varied. Some variables (e.g. sociodemographic variables and method of self-harm) which could be determined from emergency department (ED) records, psychosocial or ED assessment were available for all or most individuals. Other variables (e.g. history of psychiatric treatment) could only be determined for episodes in which individuals received psychosocial assessment by mental health staff (or in some cases in Manchester by ED staff).

The role of the funding source

The Multicentre study of Self-harm in England receives financial support from the Department of Health. The Department of Health had no role in the study design, the collection, analysis and interpretation of data, the writing of the manuscript, and the decision to submit the paper for publication. The views and opinions expressed do not necessarily reflect those of the Department of Health.

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Results

During 2000-2012 there were 84,378 episodes of self-harm by people aged 15 years and over (41.4% by males, 58.6% by females and 25 episodes where sex was not known) presenting to the emergency departments in the participating centres, involving 47,048 individuals (43.1% males and 56.8% females) (Table 1). Overall, 38.4% of individuals were aged under 25 years and nearly two-thirds (62.1%) were under 35 years [mean age 32.1 (SD 14.0, range 15-97 years)].

Rates by gender

The overall age-standardized rates of self-harm were 362 (343-381) in males and 441 (420-462) in females. In males the rate appeared to decline between 2000 and 2008 and steadily increase thereafter (Figure 1a). Among females, the rate appeared to decline until 2009 and level off up until 2012 (Figure 1b).

The results of the negative binomial regression models showed a decline in rates of self-harm over the study period (2000-2012) among females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p<0.0001$]. Rates also appeared to decline among males (IRR 0.99; 95% CI 0.97-1.00, $p=0.021$) but the trend was not linear (p for likelihood ratio (LR) test for deviation from linearity (DFL)=0.007). After inspecting Figure 1 and based on our a priori assumption that the economic downturn may play a role in self-harm behaviour, we examined trends in rates by period (2000-2007 versus 2008-2012). The results showed a decline in rates until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$), followed by an increase thereafter (IRR 1.05; 95% CI 1.02-1.09, $p=0.002$).

Rates of self-harm from this study were strongly correlated with suicide rates in England in both males ($\rho=0.82$, $p=0.0006$) and females ($\rho=0.74$, $p=0.004$) (Figure 1a and b).

Rates of self-harm by centre

Rates of self-harm were similar in Manchester and Derby [males: 360 (95% CI 353-367), females: 502 (493-511); males: 357 (95% CI 346-368), females: 507 (494-520), respectively], and markedly lower in Oxford [males: 293 (95% CI 281-305), females: 397 (384-410)]. There also appeared to be differences in trends in rates of self-harm between the centres (see Figures 2a and 2b).

In males, there was a decline in rates of self-harm between 2000-2012 in Oxford (IRR 0.97; 95% CI 0.96-0.99, $p<0.0001$) and in Derby (IRR 0.98; 95% CI 0.97-1.00, $p=0.009$) but the trends were not linear (p for LR test for DFL: Oxford=0.007, Derby=0.009) while in Manchester there was no statistical evidence of a trend over the study period (IRR 0.99; 95% CI 0.97-1.01, $p=0.21$) (Figure 2a). However, in Manchester the pattern was similar to the overall trend (see above) with a decrease in rates until 2008 and increasing rates thereafter. In females, there was no evidence of a trend in rate of self-harm during 2000-2012 in Oxford (IRR 0.99; 95% CI 0.97-1.00, $p=0.05$) or Derby (IRR 1.00; 95% CI 0.99-1.01, $p=0.38$), but in Manchester rates of self-harm fell during 2000-2012 (IRR 0.97; 95% CI 0.97-0.98, $p<0.0001$).

Rates of self-harm by age group

Trends in rates of self-harm showed some differences according to gender and age group (see Figures 3a and 3b). There was no evidence of a trend in rates of self-harm in males 15-

24 or 35-54 years (IRR 0.99; 95% CI 0.99-1.00, $p=0.08$; IRR 0.99; 95% CI 0.98-1.01, $p=0.28$, respectively), but among those aged 25-34 years, rates of self-harm declined during 2000-2012 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$) though the trend was not linear ($p=0.0003$ for LR test). Rates of self-harm increased steadily and linearly in males aged 55+ (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$), an annual average increase of 2% over the study period.

Rates of self-harm fell in females younger than 55 years (15-24 years: IRR 0.98; 95% CI 0.97-0.99, $p<0.0001$; 25-34 years: IRR 0.96; 95% CI 0.96-0.97, $p<0.0001$; 35-54 years: IRR 0.99; 95% CI 0.98-1.00, $p=0.004$), although the trend was linear only in females aged 25-34 years ($p=0.76$ for LR test for DFL). There was a clear increase in rates of self-harm in older females (55+ years) (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$, p for LR test =0.81), on average a 2% annual increase.

Methods of self-harm

Using data from 2003-2012 from the three centres (67,653 episodes), 50,484 (74.6%) were due to self-poisoning alone, 14,213 (21.0%) involved self-injury alone, and the remainder 2,956 (4.4%) involved both self-poisoning and self-injury. The number of episodes involving self-injury alone steadily increased from 2007 [odds ratio (OR)=1.08, 95% CI 1.07-1.10, $p<0.0001$] (Figure 4).

Of the self-poisoning episodes ($n=53,440$), 45.6% involved analgesics (paracetamol, salicylate, both in their pure or compound form), 24.7% involved antidepressants (tricyclic, SSRIs, SNRIs, other antidepressants), 13.8% involved benzodiazepines, and 6.9% major tranquilisers or antipsychotic medication.

The vast majority of self-injury episodes involved self-cutting/stabbing (76·7%). The remainder included asphyxiation/hanging (6·0%), jumping from heights (2·8%), traffic-related (1·9%), carbon monoxide (1·0%), drowning and gunshot (0·9%), and a variety of other methods (9·3%). In terms of specific methods of self-injury, there was little change in the number of presentations to hospital following self-cutting/stabbing until 2007 (OR=1·01, 95% CI 0·99-1·03, p=0·60) but from 2007 there was an increase in the presentations to the ER involving self-cutting/stabbing (OR=1·05, 95% CI 1·04-1·07, p<·0001) (Figure 5a). There was also a marked increase in the number of episodes of hanging/asphyxiation from 2005 (OR=1·03, 95% CI 1·02-1·04, p<·0001) and an increase in jumping from heights from 2003 (OR=1·13, 95% CI 1·09-1·17, p<·0001) (Figure 5b).

Psychosocial assessment

Between 2003 and 2012, psychosocial assessment by specialist mental health staff was carried out in 35,960 (53·2%) of 67,653 episodes of self-harm, although there was considerable variation between the three centres (41·0%-69·3%). The proportion of episodes assessed fluctuated, with no evidence of a linear trend over the study period (p<·0001 for LR test for DFL). Overall, the proportion of individuals receiving psychosocial assessment was greater in 2012 relative to 2003 (OR=1·35, 95% CI 1·26-1·44, p<·0001) although there was variation between the centres. The proportion of patients receiving psychosocial assessment differed between the methods of self-harm (self-injury alone: 38·2%; self-poisoning alone: 56·6%; self-poisoning, and self-injury: 65·6%). Individuals presenting with self-injury alone were less likely to be assessed relative to patients presenting for self-poisoning alone (OR=0·47, 95% CI 0·46-0·49, p<0·001) and those

presenting after self-poisoning and self-injury (OR=0.32, 95% CI 0.30-0.35, $p<0.0001$).

Psychosocial assessment was carried out in 34.4% of the episodes of self-cutting alone.

Psychiatric history

Information was available on 39,279 episodes of self-harm, 31.3% of which were in contact with mental health services at the time of presentation (30.4% and 0.9% were receiving outpatient or inpatient treatment, respectively). The proportion of patients receiving psychiatric treatment at the time of presentation to hospital generally increased between 2003 and 2012, although there was no evidence for a linear trend ($p<0.0001$ for LR test for DFL). The proportion of individuals who reported having had previous treatment from mental health services was 62.3% (overall $n=38,490$ episodes). Information on current psychiatric treatment was missing in 3,434 (8.0%) of episodes and that about past psychiatric treatment in 4,221 (9.9%) of episodes.

Repetition of self-harm

Repetition was defined as a re-presentation to the same centre after self-harm. The proportion of individuals who repeated an episode of self-harm within one year was 21.0% (9,397/44,662) during 2003 to 2011. The proportion repeating remained relatively stable during the study period (OR=1.00, 95% 1.00-1.01, $p=0.2$).

Discussion

We examined trends in non-fatal self-harm in England during 2000-2012 using data from the Multicentre Study of Self-harm in England. We examined rates, methods of self-harm, psychiatric history, repetition of self-harm, and provision of psychosocial assessment following self-harm. Because of the rigour of the methods used in the Multicentre Study of Self-harm to collect information on self-harm, this study provides the most accurate available picture of self-harm in England.

Rates of self-harm

Trends in rates of self-harm were consistent with trends in rates of suicide in England for the equivalent period.¹⁵ This reinforces our earlier conclusion that rates of self-harm as found in this multicentre study reflect those for suicide nationally.¹¹ Since suicide is often preceded by self-harm,² it might be argued that the association is in the other direction i.e. suicide rates reflect self-harm rates. Certainly, accurate data on rates of self-harm may represent an important and sensitive mental health indicator.¹⁶

There were differences in rates of self-harm between the centres which were in keeping with differences in socioeconomic characteristics of the catchment areas.^{11 12} Thus, the average rates of self-harm between 2000 and 2012 were considerably higher in both Manchester and Derby than in Oxford. The City of Manchester is ranked lowest of all three in terms of the Index of Multiple Deprivation, followed by Derby Unitary Area and Oxford City.

Rates of self-harm generally declined during the initial part of the study period but then increased in males after 2008. This pattern is similar to that seen for suicide in England, which has been attributed to the recent economic recession.^{17 18}

Trends in rates of self-harm showed some differences according to gender and age group. There was no clear trend in rates of self-harm in males 15-24 years or 35-54 years but there was a decline in those 25-34 years. However, rates of self-harm in females aged under 55 years generally declined during 2000-2012. For both males and females there was a steady rise in rates of self-harm in those aged 55 and older, although the magnitude of the increase was relatively small.

Methods of self-harm

The vast majority of self-harm episodes were due to self-poisoning, mainly analgesics and antidepressants. The number of self-injury episodes increased over the studied period. Of the episodes involving self-injury, the majority were due to self-cutting/stabbing. The number of episodes involving this method increased markedly. We do not know if this is due to a general increase in use of this method, or because a greater proportion of people who intentionally cut themselves have presented to hospitals. However, it should be noted that there is a stronger risk of suicide following self-cutting compared to self-poisoning. We previously found a 1.8-fold increased risk of suicide following self-cutting/stabbing relative to self-harm by self-poisoning.¹⁹ Also, repetition of self-harm is more common in individuals who cut themselves.²⁰ The increase in self-cutting is also concerning given our earlier finding that the proportion of patients who receive psychosocial assessment is especially low for individuals who self-cut.²¹ The increase in other methods of self-injury, especially

hanging/asphyxiation, is also worrying. In our earlier study we found a 2.65-fold increased risk of suicide following hanging/asphyxiation relative to self-poisoning.¹⁹ Indeed, suicide by hanging has been increasing in the UK as suggested by a recent ONS report.²²

Psychosocial assessment

Despite the recommendation made by the National Institute for Health and Care Excellence (NICE) in 2004 that everyone who present to hospital following self-harm should have a comprehensive psychosocial assessment,²³ an assessment only occurred in just over half of episodes. In a survey of 32 hospitals across England, a psychosocial assessment by a mental health professional occurred in 58% of self-harm episodes (range 24% to 88%),²⁴ with no evidence of an increase in this proportion from a similar study in 2001-2002.²⁵ Hospital attendance following self-harm represents an opportunity to intervene and implement preventive measures and is associated with better outcomes.²⁶ Barriers to assessment need to be identified and overcome. This may particularly apply to self-injury, especially self-cutting.

Psychiatric history

A little over 30% of the patients were receiving some form of psychiatric care at the time of presentation. Interestingly, this figure is similar to the National Confidential Inquiry finding that 28% of suicides occurred in individuals who were in contact with the mental health services in the 12 months prior to death.²⁷

Strengths and limitations

This is a large multicentre study of more than 86,000 presentations to emergency departments of five general hospitals in three cities of different socioeconomic characteristics across England (Oxford, Manchester Derby). As such it provides more representative information than any single-centre study. It also allows for a comparison between centres of socioeconomically diverse populations. However, the study only included individuals presenting to hospital following self-harm, and it is known that many self-harm episodes do not result in hospital presentation, especially in young people.²⁸ This is relevant in particular to self-cutting which is less likely to result in hospital presentation.²⁹ The rates of self-harm we have reported are based on urban populations, which are known to be higher than in rural populations.³⁰ Furthermore, some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may have limited generalizability as there are known differences between patients who do and do not receive a psychosocial assessment following self-harm.¹³

Conclusions

There have been similar trends in rates of self-harm and suicide in England in recent years. Of note is the steady increase in self-harm observed since 2008, particularly in males, which coincided with the economic recession. Rates of self-harm also appeared to have increased in individuals aged over 54 years. Reliably collected data on self-harm may provide an important and a sensitive mental health indicator.

Our finding that only a little over half of individuals presenting to hospital after self-harm were offered psychosocial assessment and that individuals who self-injured were least likely to receive an assessment, coupled with the rise in self-injury as a method of self-harm and the link between such methods and suicide, may have important implications for the management of self-harm in hospitals. These include efforts to increase the overall rate of psychosocial assessment of patients who self-harm and, especially, to ensure that more of those who present with self-injury receive an assessment than appears to be current practice.

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Competing interests

The authors have no competing interests to disclose.

Data sharing statement

No available data.

Authors' contributions

GG and KH designed the study. All authors collected and interpreted data. GG analysed the data. GG and KH wrote the first draft of the report. All authors revised the report and approved the final version.

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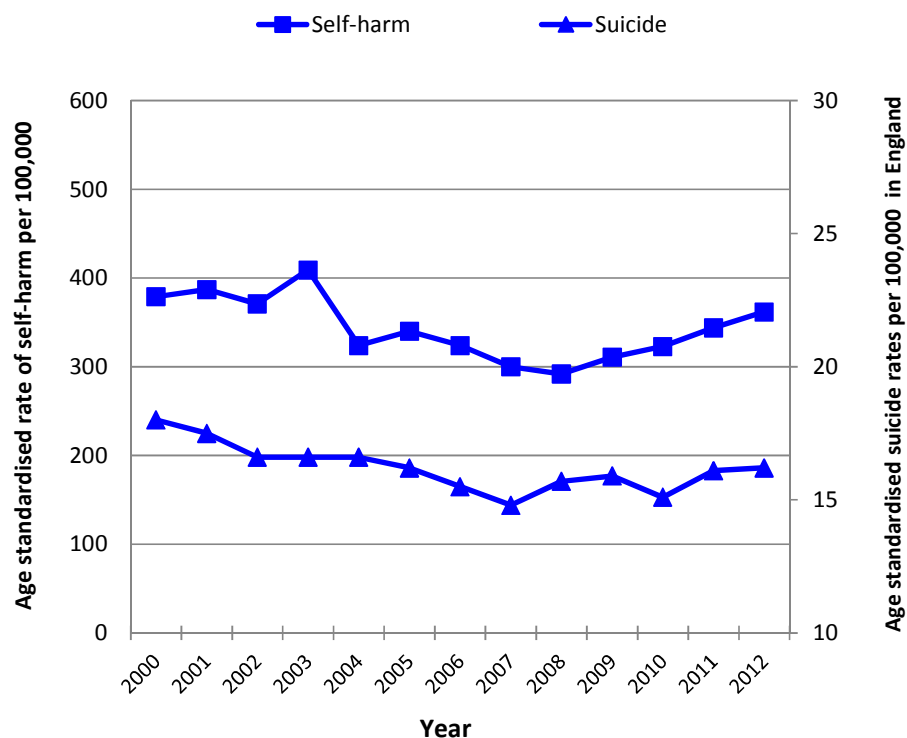
Table 1: Number of persons and episodes of self-harm among individuals aged 15+ years in 2000-2012 by, gender and age group

	n (%)		
	Males	Females	Total ^a
All episodes	34,932 (41·4)	49,421 (58·6)	84,353
Individuals	20,285 (43·1)	26,738 (56·8)	47,023
Individuals by age group			
15-24	6,482 (32·0)	11,585 (43·3)	18,067 (38·4)
25-34	5,373 (26·5)	5,790 (21·7)	11,163 (23·7)
35-54	6,906 (34·0)	7,678 (28·7)	14,584 (31·0)
55+	1,524 (7·5)	1,68 (6·3)	3,209 (6·8)

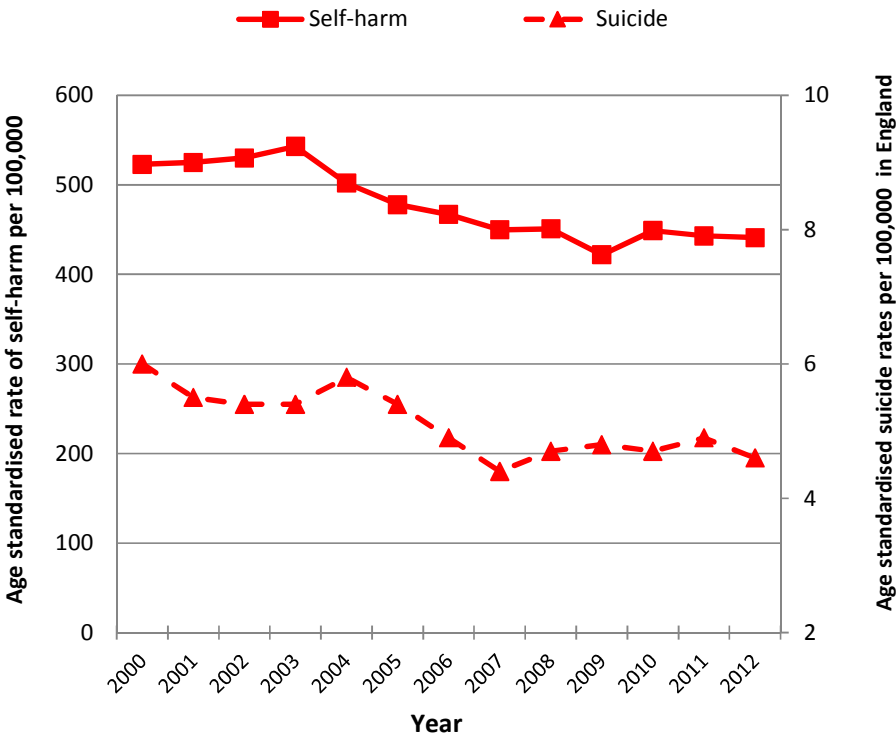
^aExcludes 25 episodes by individuals where sex was not known

Figure 1: Age standardised rates of self-harm in the three centres combined and age-standardized suicide rates in England* in persons 15+ years by gender: 2000-2012

a) Males



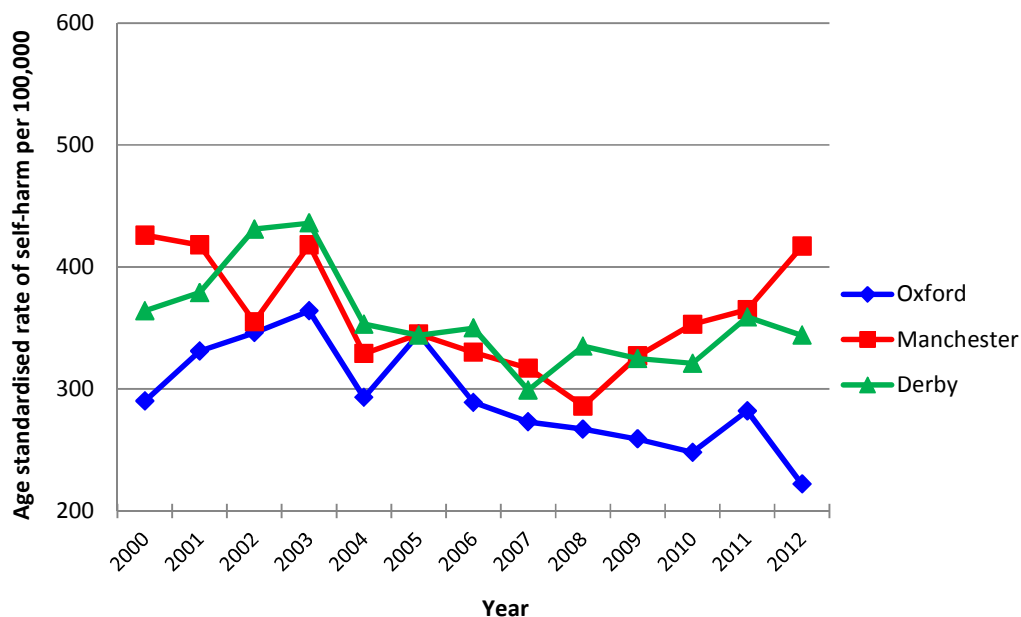
b) Females



*Source: Office for National Statistics¹⁵.

Figure 2: Age standardised rates of self-harm in individuals aged 15+ years by centre 2000-2012

a) Males



b) Females

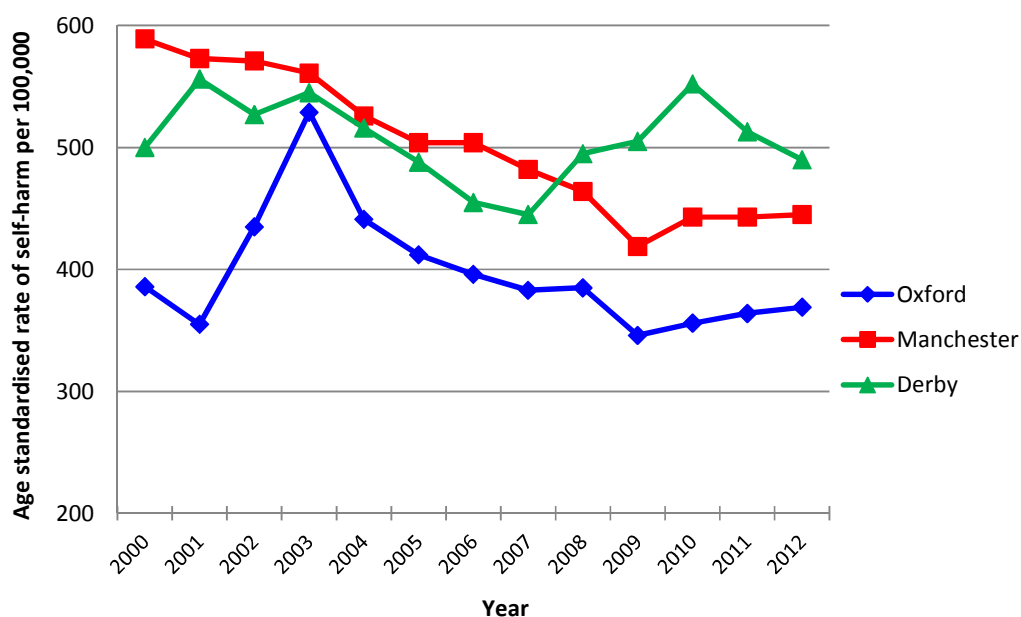


Figure 3: Rates of self-harm in individuals aged 15+ years, by age group, for the three centres combined, 2000-2012, for a) males and b) females

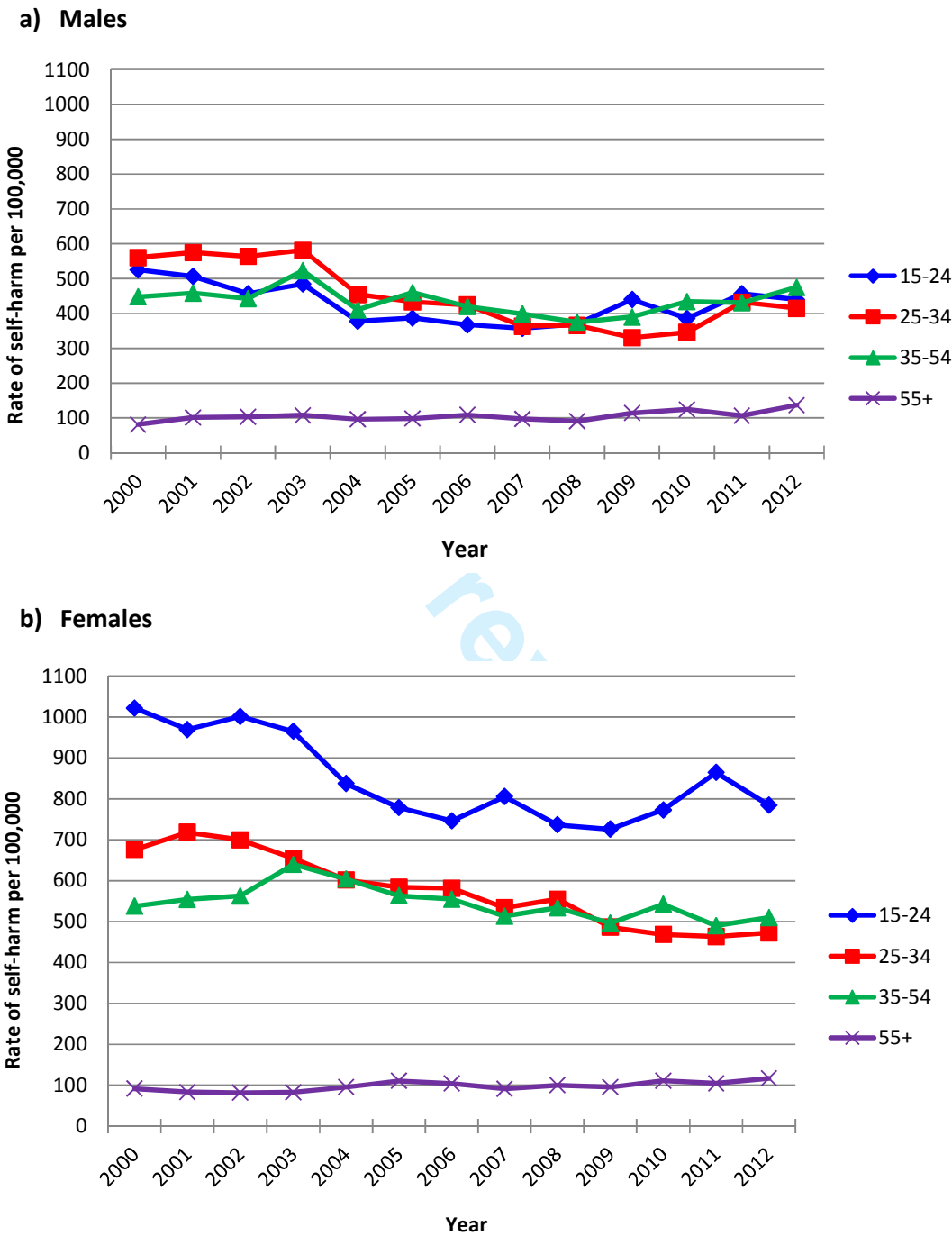
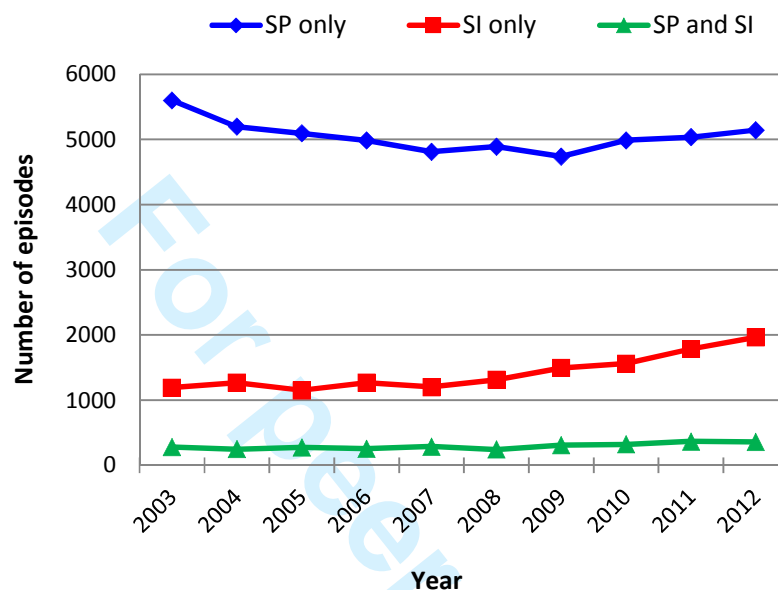


Figure 4: Trends in the number of episodes of self-poisoning (only) and self-injury (only) in individuals aged 15+ years in the three centres combined, 2003-2012



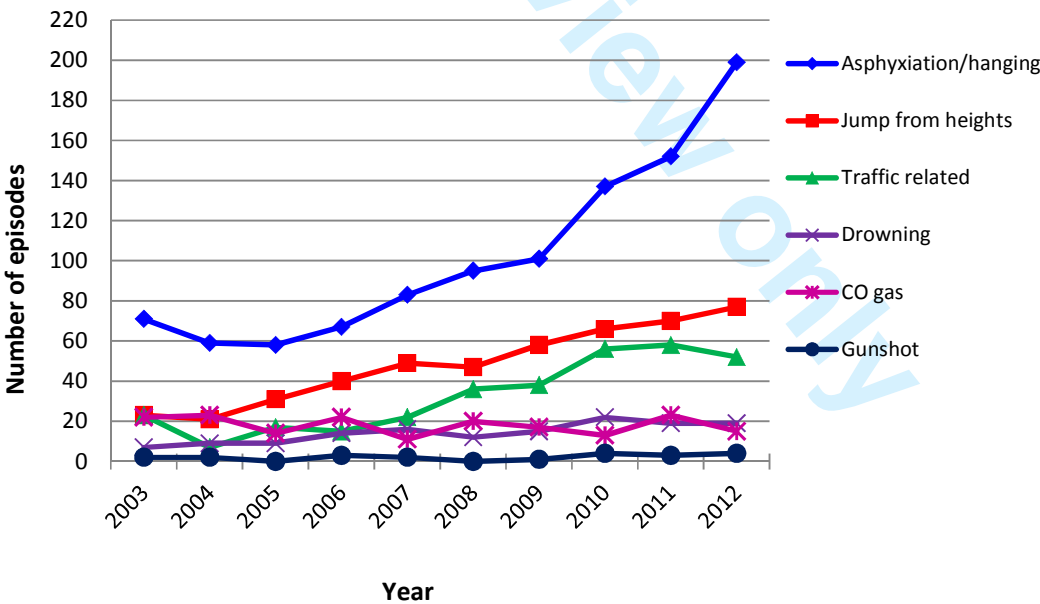
SP=self-poisoning; SI=self-injury

Figure 5: Trends in the number of episodes of self-injury in individuals aged 15+ years in the three centres combined, 2003-2012

a) Self-cutting



b) Self-injury methods other than self-cutting



STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6-9
		(b) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	N/A
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	8
		(c) Explain how missing data were addressed	8
		(d) If applicable, explain how loss to follow-up was addressed	N/A
		(e) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10, 12-14
		(b) Give reasons for non-participation at each stage	6,7, 8, 14
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10, 26
		(b) Indicate number of participants with missing data for each variable of interest	14
		(c) Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-14
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	15-17
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15-18
Generalisability	21	Discuss the generalisability (external validity) of the study results	5, 18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	8-9

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012: findings from the Multicentre Study of Self-Harm in England

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Manuscripts

**Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012:
findings from the Multicentre Study of Self-Harm in England**

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ABSTRACT

Objectives: Self-harm is a major health problem in many countries, with potential adverse outcomes including suicide and other causes of premature death. It is important to monitor national trends in this behaviour. We examined trends in non-fatal self-harm and its management in England during the 13-year period 2000-2012.

Design and setting: This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England. Information on all episodes of self-harm by individuals aged 15 years and over presenting to five general hospitals in three cities (Oxford, Manchester, and Derby) was collected through face-to-face assessment or scrutiny of emergency department electronic databases. We used negative binomial regression models to assess trends in rates of self-harm and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed).

Participants: During 2000-2012 there were 84,378 self-harm episodes (58.6% by females), involving 47,048 persons.

Results: Rates of self-harm declined in females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p < 0.0001$]. In males, rates of self-harm declined until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p < 0.0001$) and then increased (IRR 1.05; 95% CI 1.02-1.09, $p = 0.002$). Rates of self-harm were strongly correlated with suicide rates in England in males ($\rho = 0.82$, $p = 0.0006$) and females ($\rho = 0.74$, $p = 0.004$). Over 75% of self-harm episodes were due to self-poisoning, mainly with analgesics (45.7%), antidepressants (24.7%), and benzodiazepines (13.8%). A substantial increase in self-injury occurred in the latter part of the study period. This was especially marked for self-cutting/stabbing and

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hanging/asphyxiation. Psychosocial assessment by specialist mental health staff occurred in 53·2% of episodes.

Conclusions: Trends in rates of self-harm were similar to those for suicide in England. Self-harm may be a useful mental health indicator. Despite national guidance many patients still do not receive psychosocial assessment.

For peer review only

Strengths and limitations of this study

- This is a large study of more than 84,000 presentations to emergency departments following self-harm.
- This multicentre study includes five general hospitals in three cities of socioeconomically diverse populations in England, which provides more representative information than single centre studies.
- The study only included individuals who presented to hospital following self-harm.
- The rates of self-harm reported are based on urban populations, which are known to be higher than in rural populations.
- Some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may limit generalizability.

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INTRODUCTION

Self-harm (intentional self-poisoning or self-injury, irrespective of type of motivation ¹) is a public health problem in many countries. It is a major risk factor for completed suicide ² and is associated with elevated all-cause mortality.³ Approximately 50% of individuals who die by suicide have a history of self-harm ⁴ and in many cases there is an episode of self-harm shortly before a fatal act,⁵ particularly in frequent hospital attenders. ⁶ Self-harm is also often associated with poorer psychosocial outcomes, such as depression, anxiety, substance use and educational indices,⁷ and results in considerable health services and social costs. ⁸

Reliable and accurate data on self-harm are important for understanding national trends and risk factors for self-harm and for planning appropriate health services and informing potentially effective preventive measures. Systematic monitoring of self-harm in many countries, including England, has tended to be confined to single centres. However, these are limited in terms of generalizability of findings.

In the present study we examined trends in non-fatal self-harm in England using data from the Multicentre Study of Self-harm in England <http://cebmbh.warne.ox.ac.uk/csr/mcm/>, which was developed as part of the National Suicide Prevention Strategy for England.^{9 10} We previously reported on trends of self-harm during 2000-2007,¹¹ which showed declining rates of self-harm after 2003, in keeping with the national trends in suicide. Here we present data on trends during the 13-year period 2000-2012, including rates, methods of self-harm, psychiatric history, repetition, and provision of psychosocial assessment following self-harm.

METHODS

Sample

This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England, as described in detail elsewhere.¹² We included all individuals who presented to five general hospital emergency departments following self-harm: Oxford (one hospital), Manchester (three hospitals), and Derby (two hospitals merged into one in mid-2009) between 1 January 2000 and 31 December 2012, who were 15 years and over.

Socioeconomic characteristics of the centres

The three study centres include socioeconomically diverse populations. Based on the Multiple Indices of Deprivation (IMD) 2007 in England,¹³ which ranks areas according to seven domains (income, employment, health deprivation and disability, education skills and training, barriers to housing and services, crime, living environment) to derive an overall deprivation score, Manchester was ranked the fourth most deprived local authority in England, compared to Derby, which was ranked 69th and Oxford 155th.¹⁴

Data collection

Information on all episodes of self-harm was collected in two ways: a) completion of assessments (of mental state, risks and needs) by the general hospital psychiatric service (and in Manchester also by emergency department staff),¹⁵ and b) scrutiny of emergency department electronic databases by research clerks in order to identify all other patients presenting to the hospital following self-harm, from which more limited data are extracted. Demographic, clinical and hospital management data on each episode were collected by clinicians using pen and paper (Oxford and Manchester), or electronic (Derby and

Manchester since mid-2008) forms. Regular induction training of clinical staff helps maintain the quality of data collection.

Data included gender, age, date of self-harm, method of self-harm (including drugs used in self-poisoning and details of self-injury), psychiatric history (including of self-harm), whether or not psychosocial assessment was conducted and subsequent repetition of self-harm. Information on non-assessed patients (those who had taken early discharge, refused or were not offered an assessment) was collected in Manchester from September 2002 onwards. Rates of self-harm for this centre for the earlier period were adjusted upwards by a factor of 1.42 taking account of the 30% of non-assessed individuals identified in a review of the data collected between 1 September 2002 and 31 August 2003. Rates of assessment were similar by age and gender and the adjustment was applied across all age and gender groups.

Rates of self-harm and suicide

Rates of self-harm were calculated for defined local population areas for which centres had near to complete identification of self-harm presentations to hospital (Oxford City, City of Manchester, and Derby Unitary Area). We calculated annual person-based rates using each individual's first episode of self-harm within each year. Mid-year population estimates for the city catchment areas were obtained from the Office for National Statistics (ONS).¹⁶ Rates were calculated per 100,000 of the local general population for each centre, for each year, age-standardised to the European population, with 95% confidence intervals (CI).

Rates of suicide in England (age standardised to the European population) were obtained from the Office for National Statistics (ONS). Suicides were “deaths given an underlying cause of intentional self-harm or injury/poisoning of undetermined intent”.¹⁷

Ethical approval

The monitoring systems in Oxford and Derby have approval from local Research Ethics Committees to collect data on self-harm for local and multicentre projects. Self-harm monitoring in Manchester is part of a clinical audit system, and has been ratified as such by the local Research Ethics Committee. All three monitoring systems are fully compliant with the Data Protection Act of 1998. All centres have approval under Section 251 of the National Health Services (NHS) Act 2006 (formerly Section 60, Health and Social Care Act 2001) to collect patient identifiable information without patient consent.

Statistical analyses

Rates of self-harm and trends in rates were calculated separately for each centre. Trends in method of self-harm and repetition were analysed using data from 2003 to 2012 from the three centres, because these variables are to a certain extent related to assessment status e.g. fewer patients who present with self-injury receive an assessment.¹⁵

We used negative binomial regression models to assess trends in rates of self-harm accounting for over-dispersion in the data and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed). Likelihood Ratio (LR) tests were used to test for deviation from linearity in trends over time.

The correlation between rates of self-harm and suicide rates in England were examined using Spearman's Rank Correlation test. Analyses were carried out using SPSS 22.0 and Stata 14.0.

Missing data

Level of missing data varied. Some variables (e.g. sociodemographic variables and method of self-harm) which could be determined from emergency department (ED) records, psychosocial or ED assessment were available for all or most individuals. Other variables (e.g. history of psychiatric treatment) could only be determined for episodes in which individuals received psychosocial assessment by mental health staff (or in some cases in Manchester by ED staff). A description of the analytic sample in terms of the variables examined is presented below.

Rated of self-harm

During 2000-2012 there were 84,378 presentations due to self-harm involving 47,048 individuals aged 15 years and over to the study hospitals in the three participating centres. We excluded the data of 25 individuals whose sex was unknown, resulting in 84,535 episodes by 47,023 persons. To calculate annual person-based rates we used each individual's first episode of self-harm within each year (i.e. 63,011 episodes by 47,023 individuals). We included only those individuals residing in the local catchment area so that this analysis is based on 37,315 episodes by 26,918 individuals aged 15 years and over.

Method of self-harm and psychosocial assessment

Of the 84,353 episodes by 47,023 individuals, we included those occurring during 2003-2012
i.e. 67,653 episode by 35,507 individuals.

Psychiatric treatment

Of the 67,635 episodes by 35,507 individuals presenting to the hospitals during 2003-2012,
information on past or present psychiatric treatment was available for 42,711 episodes by
23,711 persons as they had undergone psychosocial or ED (Manchester only) assessment.

Repetition

Repetition was based on presentations occurring during 2003-2011 using only individuals'
first episode of self-harm within each year. Overall, 44,662 episodes by 31,878 persons were
included in this analysis.

The role of the funding source

The Multicentre study of Self-harm in England receives financial support from the
Department of Health. The Department of Health had no role in the study design, the
collection, analysis and interpretation of data, the writing of the manuscript, and the
decision to submit the paper for publication. The views and opinions expressed do not
necessarily reflect those of the Department of Health.

RESULTS

During 2000-2012 there were 84,378 episodes of self-harm by people aged 15 years and over (41.4% by males, 58.6% by females and 25 episodes where sex was not known) presenting to the emergency departments in the participating centres, involving 47,048 individuals (43.1% males and 56.8% females) (Table 1). Overall, 38.4% of individuals were aged under 25 years and nearly two-thirds (62.1%) were under 35 years [mean age 32.1 (SD 14.0, range 15-97 years)].

Rates by gender

The overall age-standardized rates of self-harm were 362 (343-381) in males and 441 (420-462) in females per 100,000 population. In males the rate appeared to decline between 2000 and 2008 and steadily increase thereafter (Figure 1a). Among females, the rate appeared to decline until 2009 and level off up until 2012 (Figure 1b).

The results of the negative binomial regression models showed a decline in rates of self-harm over the study period (2000-2012) among females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p<0.0001$]. Rates also appeared to decline among males (IRR 0.99; 95% CI 0.97-1.00, $p=0.021$) but the trend was not linear (p for likelihood ratio (LR) test for deviation from linearity (DFL)=0.007). After inspecting Figure 1 and based on our a priori assumption that the economic downturn might increase rates of self-harm, we examined trends in rates by period (2000-2007 versus 2008-2012) by fitting a separate regression model for each time periods.

. The results showed a decline in rates until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$), followed by an increase thereafter (IRR 1.05; 95% CI 1.02-1.09, $p=0.002$).

Rates of self-harm from this study were strongly correlated with suicide rates in England in both males ($\rho=0.82$, $p=0.0006$) and females ($\rho=0.74$, $p=0.004$) (Figure 1a and b).

Rates of self-harm by centre

Rates of self-harm were similar in Manchester and Derby [males: 360 (95% CI 353-367), females: 502 (493-511); males: 357 (95% CI 346-368), females: 507 (494-520), respectively], and markedly lower in Oxford [males: 293 (95% CI 281-305), females: 397 (384-410)]. There also appeared to be differences in trends in rates of self-harm between the centres (see Figures 2a and 2b).

In males, there was a decline in rates of self-harm between 2000-2012 in Oxford (IRR 0.97; 95% CI 0.96-0.99, $p<0.0001$) and in Derby (IRR 0.98; 95% CI 0.97-1.00, $p=0.009$) but the trends were not linear (p for LR test for DFL: Oxford=0.007, Derby=0.009) while in Manchester there was no statistical evidence of a trend over the study period (IRR 0.99; 95% CI 0.97-1.01, $p=0.21$) (Figure 2a). However, in Manchester the pattern was similar to the overall trend (see above) with a decrease in rates until 2008 and increasing rates thereafter. In females, there was no evidence of a trend in rate of self-harm during 2000-2012 in Oxford (IRR 0.99; 95% CI 0.97-1.00, $p=0.05$) or Derby (IRR 1.00; 95% CI 0.99-1.01, $p=0.38$), but in Manchester rates of self-harm fell during 2000-2012 (IRR 0.97; 95% CI 0.97-0.98, $p<0.0001$).

Rates of self-harm by age group

Trends in rates of self-harm showed some differences according to gender and age group (see Figures 3a and 3b). There was no evidence of a trend in rates of self-harm in males 15-24 or 35-54 years (IRR 0.99; 95% CI 0.99-1.00, $p=0.08$; IRR 0.99; 95% CI 0.98-1.01, $p=0.28$, respectively), but among those aged 25-34 years, rates of self-harm declined during 2000-2012 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$) though the trend was not linear ($p=0.0003$ for LR test). Rates of self-harm increased steadily and linearly in males aged 55+ (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$), an annual average increase of 2% over the study period.

Rates of self-harm fell in females younger than 55 years (15-24 years: IRR 0.98; 95% CI 0.97-0.99, $p<0.0001$; 25-34 years: IRR 0.96; 95% CI 0.96-0.97, $p<0.0001$; 35-54 years: IRR 0.99; 95% CI 0.98-1.00, $p=0.004$), although the trend was linear only in females aged 25-34 years ($p=0.76$ for LR test for DFL). There was a clear increase in rates of self-harm in older females (55+ years) (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$, p for LR test =0.81), on average a 2% annual increase.

Methods of self-harm

Using data from 2003-2012 from the three centres (67,653 episodes), 50,484 (74.6%) were due to self-poisoning alone, 14,213 (21.0%) involved self-injury alone, and the remainder 2,956 (4.4%) involved both self-poisoning and self-injury. The number of episodes involving self-injury alone steadily increased from 2007 [odds ratio (OR)=1.08, 95% CI 1.07-1.10, $p<0.0001$] (Figure 4).

Of the self-poisoning episodes ($n=53,440$), 45.6% involved analgesics (paracetamol, salicylate, both in their pure or compound form), 24.7% involved antidepressants (tricyclic,

SSRIs, SNRIs, other antidepressants), 13.8% involved benzodiazepines, and 6.9% major tranquilisers or antipsychotic medication.

The vast majority of self-injury episodes involved self-cutting/stabbing (76.7%). The remainder included asphyxiation/hanging (6.0%), jumping from heights (2.8%), traffic-related (1.9%), carbon monoxide (1.0%), drowning and gunshot (0.9%), and a variety of other methods (9.3%). In terms of specific methods of self-injury, there was little change in the number of presentations to hospital following self-cutting/stabbing until 2007 (OR=1.01, 95% CI 0.99-1.03, $p=0.60$) but from 2007 there was an increase in the presentations to the ER involving self-cutting/stabbing (OR=1.05, 95% CI 1.04-1.07, $p<.0001$) (Figure 5a). There was also a marked increase in the number of episodes of hanging/asphyxiation from 2005 (OR=1.03, 95% CI 1.02-1.04, $p<.0001$) and an increase in jumping from heights from 2003 (OR=1.13, 95% CI 1.09-1.17, $p<.0001$) (Figure 5b). The patterns seen were similar in males and females (results not shown).

Psychosocial assessment

Between 2003 and 2012, psychosocial assessment by specialist mental health staff was carried out in 35,960 (53.2%) of 67,653 episodes of self-harm, although there was considerable variation between the three centres (41.0%-69.3%). The proportion of episodes assessed fluctuated, with no evidence of a linear trend over the study period ($p<.0001$ for LR test for DFL). Overall, the proportion of individuals receiving psychosocial assessment was greater in 2012 relative to 2003 (OR=1.35, 95% CI 1.26-1.44, $p<.0001$) although there was variation between the centres. The proportion of patients receiving psychosocial assessment differed between the methods of self-harm (self-injury alone:

38.2%; self-poisoning alone: 56.6%; self-poisoning, and self-injury: 65.6%). Individuals presenting with self-injury alone were less likely to be assessed relative to patients presenting for self-poisoning alone (OR=0.47, 95% CI 0.46-0.49, $p<0.001$) and those presenting after self-poisoning and self-injury (OR=0.32, 95% CI 0.30-0.35, $p<0.0001$). Psychosocial assessment was carried out in 34.4% of the episodes of self-cutting alone.

Psychiatric history

Information was available on 39,279 episodes of self-harm, 31.3% of which were in contact with mental health services at the time of presentation (30.4% and 0.9% were receiving outpatient or inpatient treatment, respectively). The proportion of patients receiving psychiatric treatment at the time of presentation to hospital generally increased between 2003 and 2012, although there was no evidence for a linear trend ($p<0.0001$ for LR test for DFL). The proportion of individuals who reported having had previous treatment from mental health services was 62.3% (overall $n=38,490$ episodes). Information on current psychiatric treatment was missing in 3,434 (8.0%) of episodes and that about past psychiatric treatment in 4,221 (9.9%) of episodes.

Repetition of self-harm

Repetition was defined as a re-presentation to the same centre after self-harm. The proportion of individuals who repeated an episode of self-harm within one year was 21.0% (9,397/44,662) during 2003 to 2011. The proportion repeating remained relatively stable during the study period (OR=1.00, 95% 1.00-1.01, $p=0.2$).

DISCUSSION

We examined trends in non-fatal self-harm in England during 2000-2012 using data from the Multicentre Study of Self-harm in England. We examined rates, methods of self-harm, psychiatric history, repetition of self-harm, and provision of psychosocial assessment following self-harm. Because of the rigour of the methods used in the Multicentre Study of Self-harm to collect information on self-harm, this study provides the most accurate available picture of self-harm in England.

Rates of self-harm

Trends in rates of self-harm were consistent with trends in rates of suicide in England for the equivalent period.¹⁷ This reinforces our earlier conclusion that rates of self-harm as found in this multicentre study reflect those for suicide nationally.¹¹ Since suicide is often preceded by self-harm,² it might be argued that the association is in the other direction i.e. suicide rates reflect self-harm rates. Certainly, accurate data on rates of self-harm may represent an important and sensitive mental health indicator.¹⁸

There were differences in rates of self-harm between the centres which were in keeping with differences in socioeconomic characteristics of the catchment areas.^{11 12} Thus, the average rates of self-harm between 2000 and 2012 were considerably higher in both Manchester and Derby than in Oxford. The City of Manchester is ranked lowest of all three in terms of the Index of Multiple Deprivation, followed by Derby Unitary Area and Oxford City.

Rates of self-harm generally declined during the initial part of the study period but then increased in males after 2008. This pattern is likely to be related to the recent economic

recession,¹⁹ as has been found for suicide in England.^{20 21} and for suicide and self-harm in Ireland.²² The problems people face in relation to economic downturn (e.g. work, unemployment, and housing)¹⁹ present particular challenges for clinical services and prevention efforts.²³ Policies for helping such individuals include, for example, investing more in active labour market programmes such as job search assistance and subsidised employment, training frontline staff likely to be in contact with those at risk for mental health problems due to economic and employment difficulties such as staff in advice agencies and job centres and provision of adequate welfare benefits when needed.²⁴

Trends in rates of self-harm showed some differences according to gender and age group. There was no clear trend in rates of self-harm in males 15-24 years or 35-54 years but there was a decline in those 25-34 years. However, rates of self-harm in females aged under 55 years generally declined during 2000-2012. For both males and females there was a steady rise in rates of self-harm in those aged 55 and older, although the magnitude of the increase was relatively small.

Methods of self-harm

The vast majority of self-harm episodes were due to self-poisoning, mainly by ingestion of analgesics and antidepressants. Self-poisoning presents particular challenges in terms of medical management and prevention of suicide death, including optimizing medical care to minimize the risk of death after hospital admission.²⁵ The number of self-injury episodes increased over the studied period. Of the episodes involving self-injury, the majority were due to self-cutting/stabbing. In terms of gender, there were similar changes in specific methods over time. The number of episodes involving this method increased markedly. We

do not know if this is due to a general increase in use of this method, or because a greater proportion of people who intentionally cut themselves have presented to hospitals. However, it should be noted that there is a stronger risk of suicide following self-cutting compared to self-poisoning. We previously found a 1.8-fold increased risk of suicide following self-cutting/stabbing relative to self-harm by self-poisoning.²⁶ Also, repetition of self-harm is more common in individuals who cut themselves.²⁷ The increase in self-cutting is also concerning given our earlier finding that the proportion of patients who receive psychosocial assessment is especially low for individuals who self-cut.²⁸ The increase in other methods of self-injury, especially hanging/asphyxiation, is also worrying. In our earlier study we found a 2.65-fold increased risk of suicide following hanging/asphyxiation relative to self-poisoning.²⁶ Indeed, suicide by hanging has been increasing in the UK as suggested by a recent ONS report.²⁹

Psychosocial assessment

Despite the recommendation made by the National Institute for Health and Care Excellence (NICE) in 2004 that everyone who present to hospital following self-harm should have a comprehensive psychosocial assessment,³⁰ an assessment only occurred in just over half of episodes. In a survey of 32 hospitals across England, a psychosocial assessment by a mental health professional occurred in 58% of self-harm episodes (range 24% to 88%),³¹ with no evidence of an increase in this proportion from a similar study in 2001-2002.³² Hospital attendance following self-harm represents an opportunity to intervene and implement preventive measures and is associated with better outcomes.³³ Barriers to assessment need

to be identified and overcome. This may particularly apply to self-injury, especially self-cutting.

Psychiatric history

A little over 30% of the patients were receiving some form of psychiatric care at the time of presentation. Interestingly, this figure is similar to the National Confidential Inquiry finding that 28% of suicides occurred in individuals who were in contact with the mental health services in the 12 months prior to death.³⁴

Strengths and limitations

This is a large multicentre study of more than 86,000 presentations to emergency departments of five general hospitals in three cities of different socioeconomic characteristics across England (Oxford, Manchester Derby). As such it provides more representative information than any single-centre study. It also allows for a comparison between centres of socioeconomically diverse populations. However, the study only included individuals presenting to hospital following self-harm, and it is known that many self-harm episodes do not result in hospital presentation, especially in young people.³⁵ This is relevant in particular to self-cutting which is less likely to result in hospital presentation.³⁶

The rates of self-harm we have reported are based on urban populations, which are known to be higher than in rural populations.³⁷ Furthermore, some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may have limited generalizability as there are known

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3 differences between patients who do and do not receive a psychosocial assessment
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5 following self-harm.¹⁵
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10 11 **Conclusions**

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13 There have been similar trends in rates of self-harm and suicide in England in recent years.
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15 Of note is the steady increase in self-harm observed since 2008, particularly in males, which
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17 coincided with the economic recession. Rates of self-harm also appeared to have increased
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19 in individuals aged over 54 years. Reliably collected data on self-harm may provide an
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21 important and a sensitive mental health indicator.
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25 Our finding that only a little over half of individuals presenting to hospital after self-harm
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27 were offered psychosocial assessment and that individuals who self-injured were least likely
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29 to receive an assessment, coupled with the rise in self-injury as a method of self-harm and
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31 the link between such methods and suicide, may have important implications for the
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33 management of self-harm in hospitals. These include efforts to increase the overall rate of
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35 psychosocial assessment of patients who self-harm and, especially, to ensure that more of
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37 those who present with self-injury receive an assessment than appears to be current
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Competing interests

The authors have no competing interests to disclose.

Data sharing statement

No available data.

Authors' contributions

GG and KH designed the study. All authors collected and interpreted data. GG analysed the data. GG and KH wrote the first draft of the report. All authors revised the report and approved the final version.

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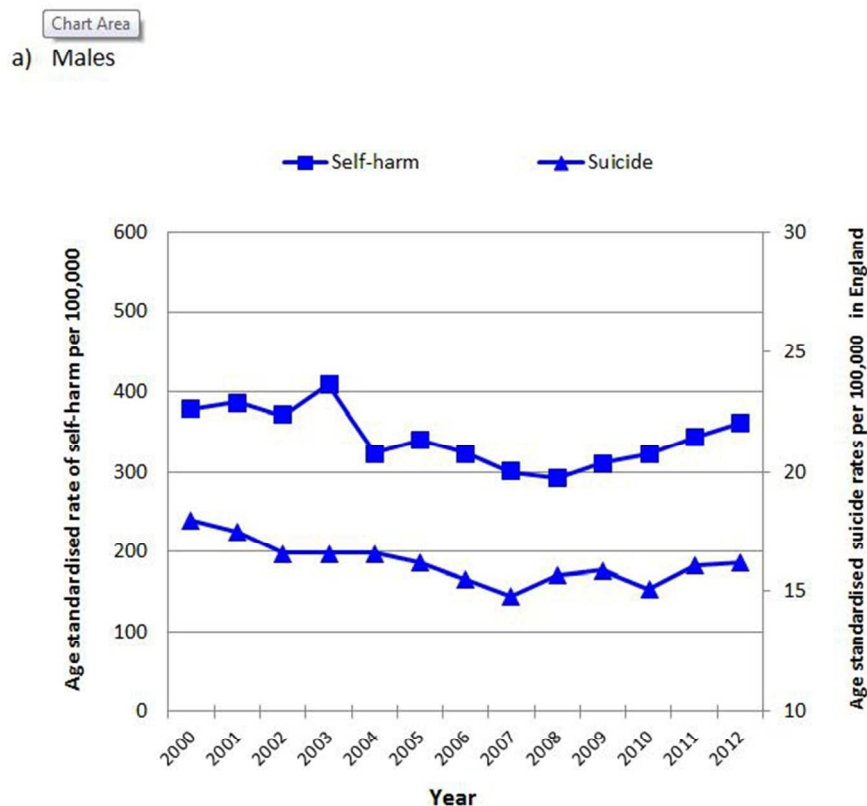
For peer review only

Table 1: Number of persons and episodes of self-harm among individuals aged 15+ years in 2000-2012 by, gender and age group

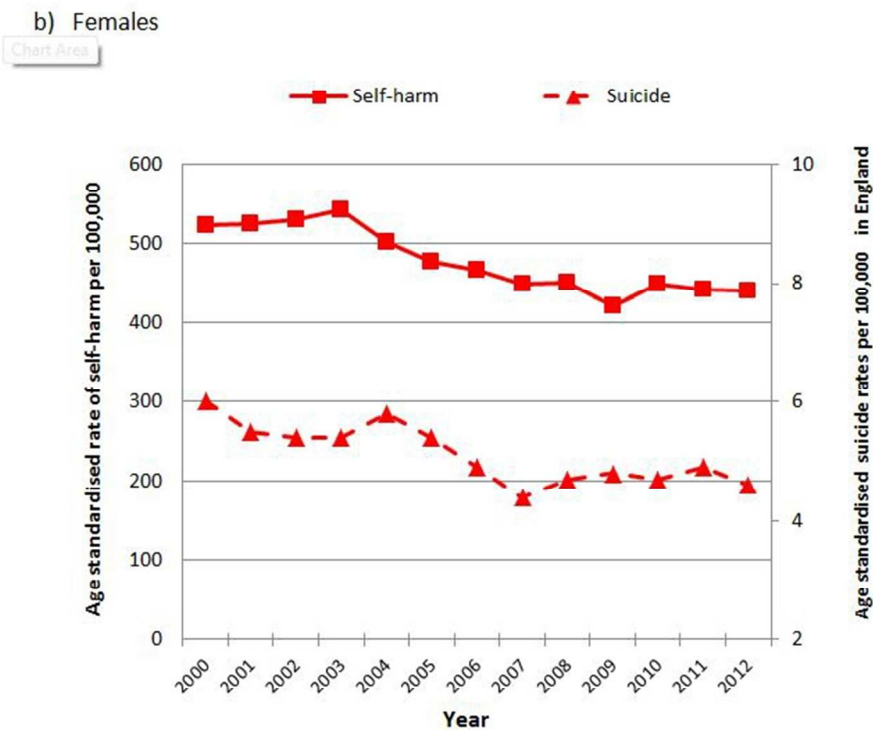
	n (%)		
	Males	Females	Total ^a
All episodes	34,932 (41·4)	49,421 (58·6)	84,353
Individuals	20,285 (43·1)	26,738 (56·8)	47,023
Individuals by age group			
15-24	6,482 (32·0)	11,585 (43·3)	18,067 (38·4)
25-34	5,373 (26·5)	5,790 (21·7)	11,163 (23·7)
35-54	6,906 (34·0)	7,678 (28·7)	14,584 (31·0)
55+	1,524 (7·5)	1,685 (6·3)	3,209 (6·8)

^aExcludes 25 episodes by individuals where sex was not known

Figure 1: Age standardised rates of self-harm in the three centres combined and age-standardized suicide rates in England* in persons 15+ years by gender: 2000-2012



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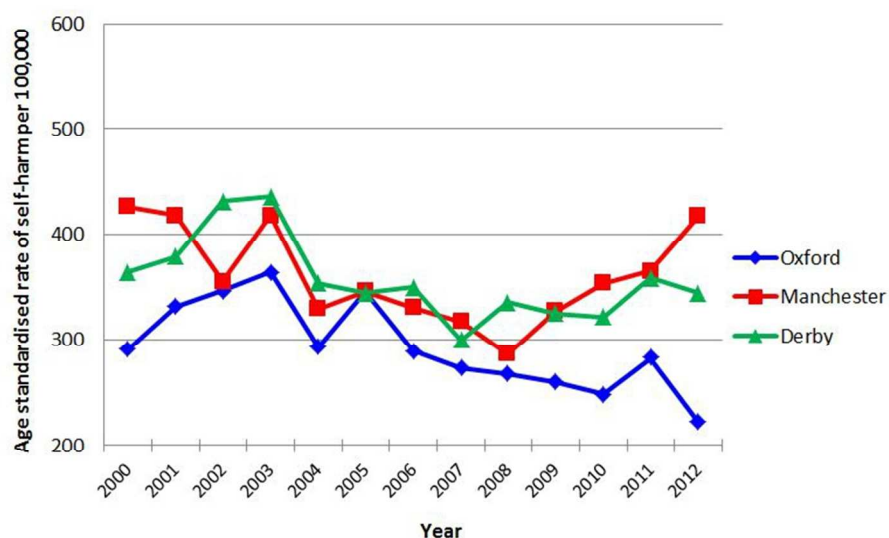


*Source: Office for National Statistics¹⁵.

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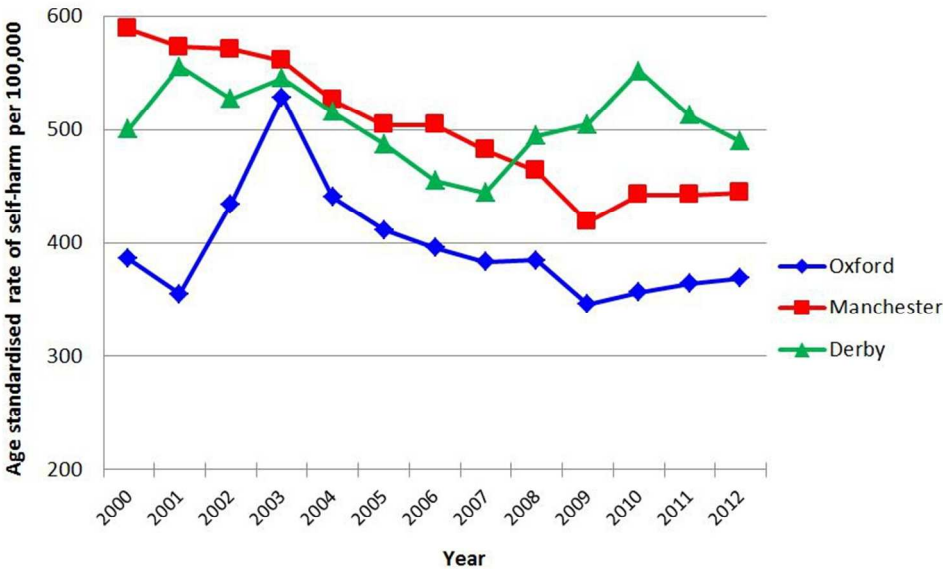
Figure 2: Age standardised rates of self-harm in individuals aged 15+ years by centre 2000-2012

a) Males



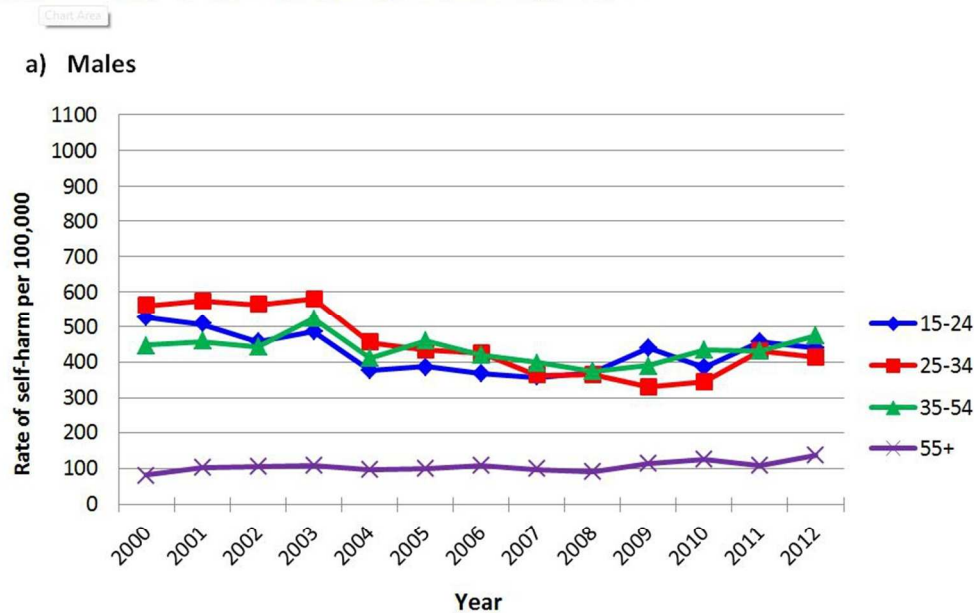
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b) Females

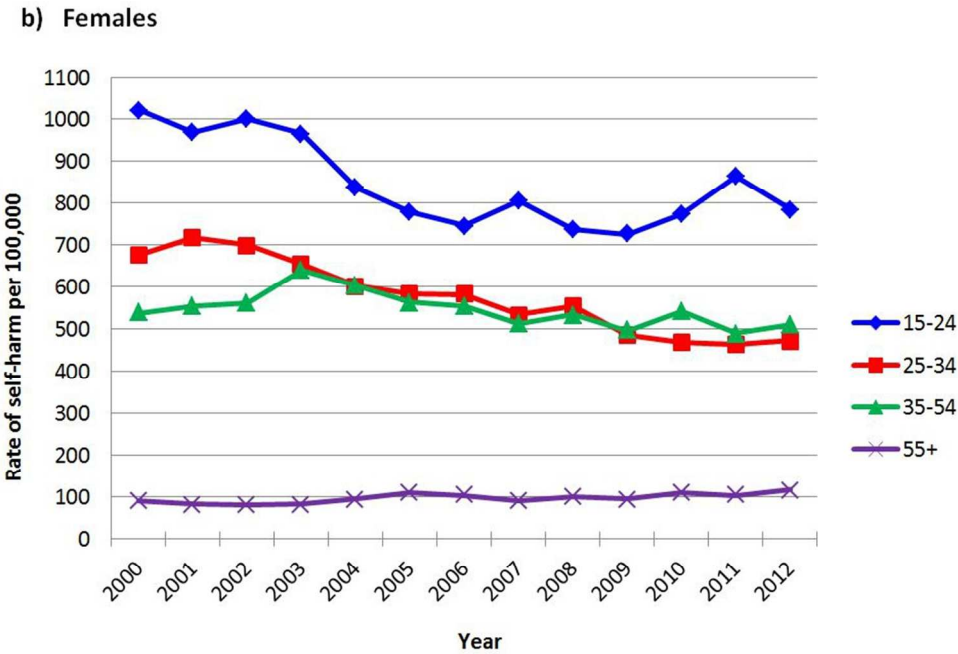


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Figure 3: Rates of self-harm in individuals aged 15+ years, by age group, for the three centres combined, 2000-2012, for a) males and b) females

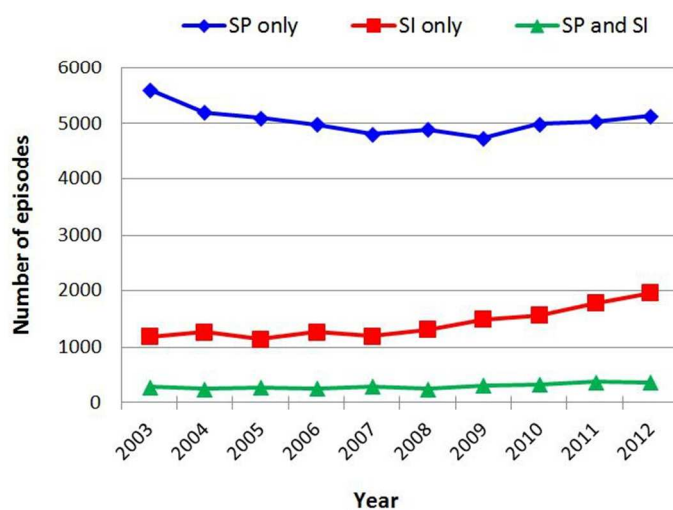


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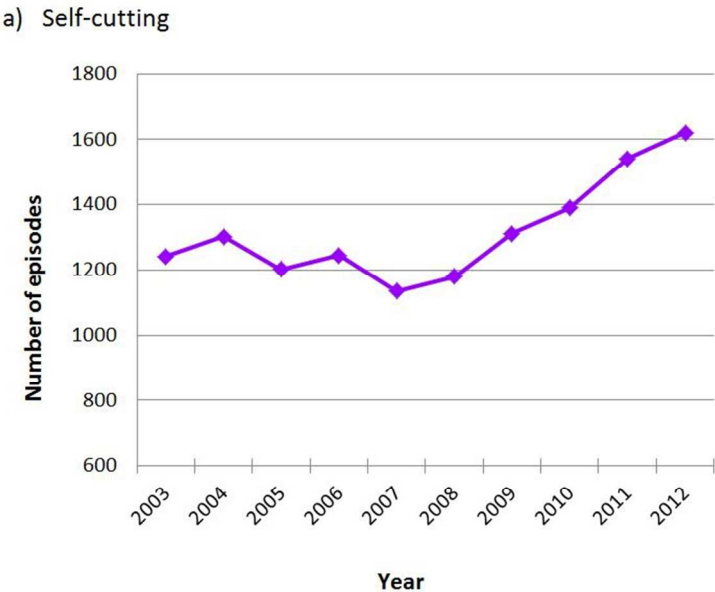
Figure 4: Trends in the number of episodes of self-poisoning (only) and self-injury (only) in individuals aged 15+ years in the three centres combined, 2003-2012



SP=self-poisoning; SI=self-injury

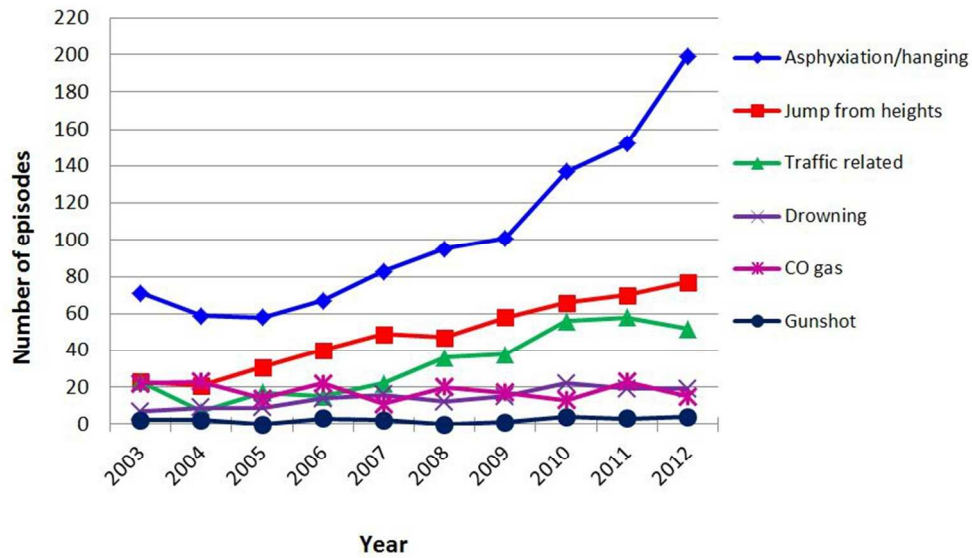
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Figure 5: Trends in the number of episodes of self-injury in individuals aged 15+ years in the three centres combined, 2003-2012



254x189mm (96 x 96 DPI)

b) Self-injury methods other than self-cutting



245x157mm (96 x 96 DPI)

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-10
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6-10
		(b) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	N/A
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8-9
		(b) Describe any methods used to examine subgroups and interactions	8-9
		(c) Explain how missing data were addressed	8-9
		(d) If applicable, explain how loss to follow-up was addressed	N/A
		(e) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9-10, 13-15
		(b) Give reasons for non-participation at each stage	6,7, 9-10, 15
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11, 26
		(b) Indicate number of participants with missing data for each variable of interest	9-10, 15
		(c) Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-15
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11-15
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-20
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	5, 19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012: findings from the Multicentre Study of Self-Harm in England

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Keywords:	EPIDEMIOLOGY, Suicide & self-harm < PSYCHIATRY, PUBLIC HEALTH

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**Epidemiology and trends in non-fatal self-harm in three centres in England, 2000–2012:
findings from the Multicentre Study of Self-Harm in England**

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ABSTRACT

Objectives: Self-harm is a major health problem in many countries, with potential adverse outcomes including suicide and other causes of premature death. It is important to monitor national trends in this behaviour. We examined trends in non-fatal self-harm and its management in England during the 13-year period 2000-2012.

Design and setting: This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England. Information on all episodes of self-harm by individuals aged 15 years and over presenting to five general hospitals in three cities (Oxford, Manchester, and Derby) was collected through face-to-face assessment or scrutiny of emergency department electronic databases. We used negative binomial regression models to assess trends in rates of self-harm and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed).

Participants: During 2000-2012 there were 84,378 self-harm episodes (58.6% by females), involving 47,048 persons.

Results: Rates of self-harm declined in females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p<0.0001$]. In males, rates of self-harm declined until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$) and then increased (IRR 1.05; 95% CI 1.02-1.09, $p=0.002$). Rates of self-harm were strongly correlated with suicide rates in England in males ($\rho=0.82$, $p=0.0006$) and females ($\rho=0.74$, $p=0.004$). Over 75% of self-harm episodes were due to self-poisoning, mainly with analgesics (45.7%), antidepressants (24.7%), and benzodiazepines (13.8%). A substantial increase in self-injury occurred in the latter part of the study period. This was especially marked for self-cutting/stabbing and

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hanging/asphyxiation. Psychosocial assessment by specialist mental health staff occurred in 53·2% of episodes.

Conclusions: Trends in rates of self-harm and suicide may be closely related and therefore self-harm can be a useful mental health indicator. Despite national guidance many patients still do not receive psychosocial assessment, especially those who self-injure.

For peer review only

Strengths and limitations of this study

- This is a large study of more than 84,000 presentations to emergency departments following self-harm.
- This multicentre study includes five general hospitals in three cities of socioeconomically diverse populations in England, which provides more representative information than single centre studies.
- The study only included individuals who presented to hospital following self-harm.
- The rates of self-harm reported are based on urban populations, which are known to be higher than in rural populations.
- Some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may limit generalizability.

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INTRODUCTION

Self-harm (intentional self-poisoning or self-injury, irrespective of type of motivation¹) is a public health problem in many countries. It is a major risk factor for completed suicide² and is associated with elevated all-cause mortality.³ Approximately 50% of individuals who die by suicide have a history of self-harm⁴ and in many cases there is an episode of self-harm shortly before a fatal act,⁵ particularly in frequent hospital attenders.⁶ Self-harm is also often associated with poorer psychosocial outcomes, such as depression, anxiety, substance use and educational indices,⁷ and results in considerable health services and social costs.⁸

Reliable and accurate data on self-harm are important for understanding national trends and risk factors for self-harm and for planning appropriate health services and informing potentially effective preventive measures. Systematic monitoring of self-harm in many countries, including England, has tended to be confined to single centres. However, these are limited in terms of generalizability of findings.

In the present study we examined trends in non-fatal self-harm in England using data from the Multicentre Study of Self-harm in England <http://cebmbh.warne.ox.ac.uk/csr/mcm/>, which was developed as part of the National Suicide Prevention Strategy for England.^{9 10} We previously reported on trends of self-harm during 2000-2007,¹¹ which showed declining rates of self-harm after 2003, in keeping with the national trends in suicide. Here we present data on trends during the 13-year period 2000-2012, including rates, methods of self-harm, psychiatric history, repetition, and provision of psychosocial assessment following self-harm.

METHODS

Sample

This observational study was undertaken in the three centres of the Multicentre Study of Self-harm in England, as described in detail elsewhere.¹² We included all individuals who presented to five general hospital emergency departments following self-harm: Oxford (one hospital), Manchester (three hospitals), and Derby (two hospitals merged into one in mid-2009) between 1 January 2000 and 31 December 2012, who were 15 years and over.

Socioeconomic characteristics of the centres

The three study centres include socioeconomically diverse populations. Based on the Multiple Indices of Deprivation (IMD) 2007 in England,¹³ which ranks areas according to seven domains (income, employment, health deprivation and disability, education skills and training, barriers to housing and services, crime, living environment) to derive an overall deprivation score, Manchester was ranked the fourth most deprived local authority in England, compared to Derby, which was ranked 69th and Oxford 155th.¹⁴

Data collection

Information on all episodes of self-harm was collected in two ways: a) completion of assessments (of mental state, risks and needs) by the general hospital psychiatric service (and in Manchester also by emergency department staff),¹⁵ and b) scrutiny of emergency department electronic databases by research clerks in order to identify all other patients presenting to the hospital following self-harm, from which more limited data are extracted. Demographic, clinical and hospital management data on each episode were collected by clinicians using pen and paper (Oxford and Manchester), or electronic (Derby and

Manchester since mid-2008) forms. Regular induction training of clinical staff helps maintain the quality of data collection.

Data included gender, age, date of self-harm, method of self-harm (including drugs used in self-poisoning and details of self-injury), psychiatric history (including of self-harm), whether or not psychosocial assessment was conducted and subsequent repetition of self-harm. Information on non-assessed patients (those who had taken early discharge, refused or were not offered an assessment) was collected in Manchester from September 2002 onwards. Rates of self-harm for this centre for the earlier period were adjusted upwards by a factor of 1.42 taking account of the 30% of non-assessed individuals identified in a review of the data collected between 1 September 2002 and 31 August 2003. Rates of assessment were similar by age and gender and the adjustment was applied across all age and gender groups.

Rates of self-harm and suicide

Rates of self-harm were calculated for defined local population areas for which centres had near to complete identification of self-harm presentations to hospital (Oxford City, City of Manchester, and Derby Unitary Area). We calculated annual person-based rates using each individual's first episode of self-harm within each year. Mid-year population estimates for the city catchment areas were obtained from the Office for National Statistics (ONS).¹⁶ Rates were calculated per 100,000 of the local general population for each centre, for each year, age-standardised to the European population, with 95% confidence intervals (CI).

Rates of suicide in England (age standardised to the European population) were obtained from the Office for National Statistics (ONS). Suicides were “deaths given an underlying cause of intentional self-harm or injury/poisoning of undetermined intent”.¹⁷

Ethical approval

The monitoring systems in Oxford and Derby have approval from local Research Ethics Committees to collect data on self-harm for local and multicentre projects. Self-harm monitoring in Manchester is part of a clinical audit system, and has been ratified as such by the local Research Ethics Committee. All three monitoring systems are fully compliant with the Data Protection Act of 1998. All centres have approval under Section 251 of the National Health Services (NHS) Act 2006 (formerly Section 60, Health and Social Care Act 2001) to collect patient identifiable information without patient consent.

Statistical analyses

Rates of self-harm and trends in rates were calculated separately for each centre. Trends in method of self-harm and repetition were analysed using data from 2003 to 2012 from the three centres, because these variables are to a certain extent related to assessment status e.g. fewer patients who present with self-injury receive an assessment.¹⁵

We used negative binomial regression models to assess trends in rates of self-harm accounting for over-dispersion in the data and logistic regression models for binary outcomes (e.g. assessed vs. non-assessed). Likelihood Ratio (LR) tests were used to test for deviation from linearity in trends over time.

The correlation between rates of self-harm and suicide rates in England were examined using Spearman's Rank Correlation test. Analyses were carried out using SPSS 22.0 and Stata 14.0.

Missing data

Level of missing data varied. Some variables (e.g. sociodemographic variables and method of self-harm) which could be determined from emergency department (ED) records, psychosocial or ED assessment were available for all or most individuals. Other variables (e.g. history of psychiatric treatment) could only be determined for episodes in which individuals received psychosocial assessment by mental health staff (or in some cases in Manchester by ED staff). A description of the analytic sample in terms of the variables examined is presented below.

Rated of self-harm

During 2000-2012 there were 84,378 presentations due to self-harm involving 47,048 individuals aged 15 years and over to the study hospitals in the three participating centres. We excluded the data of 25 individuals whose sex was unknown, resulting in 84,535 episodes by 47,023 persons. To calculate annual person-based rates we used each individual's first episode of self-harm within each year (i.e. 63,011 episodes by 47,023 individuals). We included only those individuals residing in the local catchment area so that this analysis is based on 37,315 episodes by 26,918 individuals aged 15 years and over.

Method of self-harm and psychosocial assessment

Of the 84,353 episodes by 47,023 individuals, we included those occurring during 2003-2012
i.e. 67,653 episode by 35,507 individuals.

Psychiatric treatment

Of the 67,635 episodes by 35,507 individuals presenting to the hospitals during 2003-2012,
information on past or present psychiatric treatment was available for 42,711 episodes by
23,711 persons as they had undergone psychosocial or ED (Manchester only) assessment.

Repetition

Repetition was based on presentations occurring during 2003-2011 using only individuals'
first episode of self-harm within each year. Overall, 44,662 episodes by 31,878 persons were
included in this analysis.

The role of the funding source

The Multicentre study of Self-harm in England receives financial support from the
Department of Health. The Department of Health had no role in the study design, the
collection, analysis and interpretation of data, the writing of the manuscript, and the
decision to submit the paper for publication. The views and opinions expressed do not
necessarily reflect those of the Department of Health.

RESULTS

During 2000-2012 there were 84,378 episodes of self-harm by people aged 15 years and over (41.4% by males, 58.6% by females and 25 episodes where sex was not known) presenting to the emergency departments in the participating centres, involving 47,048 individuals (43.1% males and 56.8% females) (Table 1). Overall, 38.4% of individuals were aged under 25 years and nearly two-thirds (62.1%) were under 35 years [mean age 32.1 (SD 14.0, range 15-97 years)].

Rates by gender

The overall age-standardized rates of self-harm were 362 (343-381) in males and 441 (420-462) in females per 100,000 population. In males the rate appeared to decline between 2000 and 2008 and steadily increase thereafter (Figure 1a). Among females, the rate appeared to decline until 2009 and level off up until 2012 (Figure 1b).

The results of the negative binomial regression models showed a decline in rates of self-harm over the study period (2000-2012) among females [incidence rate ratio (IRR) 0.98; 95% confidence interval (CI) 0.97-0.99, $p<0.0001$]. Rates also appeared to decline among males (IRR 0.99; 95% CI 0.97-1.00, $p=0.021$) but the trend was not linear (p for likelihood ratio (LR) test for deviation from linearity (DFL)=0.007). After inspecting Figure 1 and based on our a priori assumption that the economic downturn might increase rates of self-harm, we examined trends in rates by period (2000-2007 versus 2008-2012) by fitting a separate regression model for each time periods.

. The results showed a decline in rates until 2008 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$), followed by an increase thereafter (IRR 1.05; 95% CI 1.02-1.09, $p=0.002$).

Rates of self-harm from this study were strongly correlated with suicide rates in England in both males ($\rho=0.82$, $p=0.0006$) and females ($\rho=0.74$, $p=0.004$) (Figure 1a and b).

Rates of self-harm by centre

Rates of self-harm were similar in Manchester and Derby [males: 360 (95% CI 353-367), females: 502 (493-511); males: 357 (95% CI 346-368), females: 507 (494-520), respectively], and markedly lower in Oxford [males: 293 (95% CI 281-305), females: 397 (384-410)]. There also appeared to be differences in trends in rates of self-harm between the centres (see Figures 2a and 2b).

In males, there was a decline in rates of self-harm between 2000-2012 in Oxford (IRR 0.97; 95% CI 0.96-0.99, $p<0.0001$) and in Derby (IRR 0.98; 95% CI 0.97-1.00, $p=0.009$) but the trends were not linear (p for LR test for DFL: Oxford=0.007, Derby=0.009) while in Manchester there was no statistical evidence of a trend over the study period (IRR 0.99; 95% CI 0.97-1.01, $p=0.21$) (Figure 2a). However, in Manchester the pattern was similar to the overall trend (see above) with a decrease in rates until 2008 and increasing rates thereafter. In females, there was no evidence of a trend in rate of self-harm during 2000-2012 in Oxford (IRR 0.99; 95% CI 0.97-1.00, $p=0.05$) or Derby (IRR 1.00; 95% CI 0.99-1.01, $p=0.38$), but in Manchester rates of self-harm fell during 2000-2012 (IRR 0.97; 95% CI 0.97-0.98, $p<0.0001$).

Rates of self-harm by age group

Trends in rates of self-harm showed some differences according to gender and age group (see Figures 3a and 3b). There was no evidence of a trend in rates of self-harm in males 15-24 or 35-54 years (IRR 0.99; 95% CI 0.99-1.00, $p=0.08$; IRR 0.99; 95% CI 0.98-1.01, $p=0.28$, respectively), but among those aged 25-34 years, rates of self-harm declined during 2000-2012 (IRR 0.96; 95% CI 0.95-0.98, $p<0.0001$) though the trend was not linear ($p=0.0003$ for LR test). Rates of self-harm increased steadily and linearly in males aged 55+ (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$), an annual average increase of 2% over the study period.

Rates of self-harm fell in females younger than 55 years (15-24 years: IRR 0.98; 95% CI 0.97-0.99, $p<0.0001$; 25-34 years: IRR 0.96; 95% CI 0.96-0.97, $p<0.0001$; 35-54 years: IRR 0.99; 95% CI 0.98-1.00, $p=0.004$), although the trend was linear only in females aged 25-34 years ($p=0.76$ for LR test for DFL). There was a clear increase in rates of self-harm in older females (55+ years) (IRR 1.02; 95% CI 1.01-1.04, $p=0.003$, p for LR test =0.81), on average a 2% annual increase.

Methods of self-harm

Using data from 2003-2012 from the three centres (67,653 episodes), 50,484 (74.6%) were due to self-poisoning alone, 14,213 (21.0%) involved self-injury alone, and the remainder 2,956 (4.4%) involved both self-poisoning and self-injury. The number of episodes involving self-injury alone steadily increased from 2007 [odds ratio (OR)=1.08, 95% CI 1.07-1.10, $p<0.0001$] (Figure 4).

Of the self-poisoning episodes ($n=53,440$), 45.6% involved analgesics (paracetamol, salicylate, both in their pure or compound form), 24.7% involved antidepressants (tricyclic,

SSRIs, SNRIs, other antidepressants), 13.8% involved benzodiazepines, and 6.9% major tranquilisers or antipsychotic medication.

The vast majority of self-injury episodes involved self-cutting/stabbing (76.7%). The remainder included asphyxiation/hanging (6.0%), jumping from heights (2.8%), traffic-related (1.9%), carbon monoxide (1.0%), drowning and gunshot (0.9%), and a variety of other methods (9.3%). In terms of specific methods of self-injury, there was little change in the number of presentations to hospital following self-cutting/stabbing until 2007 (OR=1.01, 95% CI 0.99-1.03, $p=0.60$) but from 2007 there was an increase in the presentations to the ER involving self-cutting/stabbing (OR=1.05, 95% CI 1.04-1.07, $p<.0001$) (Figure 5a). There was also a marked increase in the number of episodes of hanging/asphyxiation from 2005 (OR=1.03, 95% CI 1.02-1.04, $p<.0001$) and an increase in jumping from heights from 2003 (OR=1.13, 95% CI 1.09-1.17, $p<.0001$) (Figure 5b). The patterns seen were similar in males and females (results not shown).

Psychosocial assessment

Between 2003 and 2012, psychosocial assessment by specialist mental health staff was carried out in 35,960 (53.2%) of 67,653 episodes of self-harm, although there was considerable variation between the three centres (41.0%-69.3%). The proportion of episodes assessed fluctuated, with no evidence of a linear trend over the study period ($p<.0001$ for LR test for DFL). Overall, the proportion of individuals receiving psychosocial assessment was greater in 2012 relative to 2003 (OR=1.35, 95% CI 1.26-1.44, $p<.0001$) although there was variation between the centres. The proportion of patients receiving psychosocial assessment differed between the methods of self-harm (self-injury alone:

38.2%; self-poisoning alone: 56.6%; self-poisoning, and self-injury: 65.6%). Individuals presenting with self-injury alone were less likely to be assessed relative to patients presenting for self-poisoning alone (OR=0.47, 95% CI 0.46-0.49, $p<0.001$) and those presenting after self-poisoning and self-injury (OR=0.32, 95% CI 0.30-0.35, $p<0.0001$). Psychosocial assessment was carried out in 34.4% of the episodes of self-cutting alone.

Psychiatric history

Information was available on 39,279 episodes of self-harm, 31.3% of which were in contact with mental health services at the time of presentation (30.4% and 0.9% were receiving outpatient or inpatient treatment, respectively). The proportion of patients receiving psychiatric treatment at the time of presentation to hospital generally increased between 2003 and 2012, although there was no evidence for a linear trend ($p<0.0001$ for LR test for DFL). The proportion of individuals who reported having had previous treatment from mental health services was 62.3% (overall $n=38,490$ episodes). Information on current psychiatric treatment was missing in 3,434 (8.0%) of episodes and that about past psychiatric treatment in 4,221 (9.9%) of episodes.

Repetition of self-harm

Repetition was defined as a re-presentation to the same centre after self-harm. The proportion of individuals who repeated an episode of self-harm within one year was 21.0% (9,397/44,662) during 2003 to 2011. The proportion repeating remained relatively stable during the study period (OR=1.00, 95% 1.00-1.01, $p=0.2$).

DISCUSSION

We examined trends in non-fatal self-harm in England during 2000-2012 using data from the Multicentre Study of Self-harm in England. We examined rates, methods of self-harm, psychiatric history, repetition of self-harm, and provision of psychosocial assessment following self-harm. Because of the rigour of the methods used in the Multicentre Study of Self-harm to collect information on self-harm, this study provides the most accurate available picture of self-harm in England.

Rates of self-harm

Trends in rates of self-harm were consistent with trends in rates of suicide in England for the equivalent period.¹⁷ This reinforces our earlier conclusion that rates of self-harm as found in this multicentre study reflect those for suicide nationally.¹¹ Since suicide is often preceded by self-harm,² it might be argued that the association is in the other direction i.e. suicide rates reflect self-harm rates. Certainly, accurate data on rates of self-harm may represent an important and sensitive mental health indicator.¹⁸

There were differences in rates of self-harm between the centres which were in keeping with differences in socioeconomic characteristics of the catchment areas.^{11 12} Thus, the average rates of self-harm between 2000 and 2012 were considerably higher in both Manchester and Derby than in Oxford. The City of Manchester is ranked lowest of all three in terms of the Index of Multiple Deprivation, followed by Derby Unitary Area and Oxford City.

Rates of self-harm generally declined during the initial part of the study period but then increased in males after 2008. This pattern is likely to be related to the recent economic

recession,¹⁹ as has been found for suicide in England.^{20 21} and for suicide and self-harm in Ireland.²² The problems people face in relation to economic downturn (e.g. work, unemployment, and housing)¹⁹ present particular challenges for clinical services and prevention efforts.²³ Policies for helping such individuals include, for example, investing more in active labour market programmes such as job search assistance and subsidised employment, training frontline staff likely to be in contact with those at risk for mental health problems due to economic and employment difficulties such as staff in advice agencies and job centres and provision of adequate welfare benefits when needed.²⁴

Trends in rates of self-harm showed some differences according to gender and age group. There was no clear trend in rates of self-harm in males 15-24 years or 35-54 years but there was a decline in those 25-34 years. However, rates of self-harm in females aged under 55 years generally declined during 2000-2012. For both males and females there was a steady rise in rates of self-harm in those aged 55 and older, although the magnitude of the increase was relatively small.

Methods of self-harm

The vast majority of self-harm episodes were due to self-poisoning, mainly by ingestion of analgesics and antidepressants. Self-poisoning presents particular challenges in terms of medical management and prevention of suicide death, including optimizing medical care to minimize the risk of death after hospital admission.²⁵ The number of self-injury episodes increased over the studied period. Of the episodes involving self-injury, the majority were due to self-cutting/stabbing. In terms of gender, there were similar changes in specific methods over time. The number of episodes involving this method increased markedly. We

do not know if this is due to a general increase in use of this method, or because a greater proportion of people who intentionally cut themselves have presented to hospitals. However, it should be noted that there is a stronger risk of suicide following self-cutting compared to self-poisoning. We previously found a 1.8-fold increased risk of suicide following self-cutting/stabbing relative to self-harm by self-poisoning.²⁶ Also, repetition of self-harm is more common in individuals who cut themselves.²⁷ The increase in self-cutting is also concerning given our earlier finding that the proportion of patients who receive psychosocial assessment is especially low for individuals who self-cut.²⁸ The increase in other methods of self-injury, especially hanging/asphyxiation, is also worrying. In our earlier study we found a 2.65-fold increased risk of suicide following hanging/asphyxiation relative to self-poisoning.²⁶ Indeed, suicide by hanging has been increasing in the UK as suggested by a recent ONS report.²⁹

Psychosocial assessment

Despite the recommendation made by the National Institute for Health and Care Excellence (NICE) in 2004 that everyone who present to hospital following self-harm should have a comprehensive psychosocial assessment,³⁰ an assessment only occurred in just over half of episodes. In a survey of 32 hospitals across England, a psychosocial assessment by a mental health professional occurred in 58% of self-harm episodes (range 24% to 88%),³¹ with no evidence of an increase in this proportion from a similar study in 2001-2002.³² Hospital attendance following self-harm represents an opportunity to intervene and implement preventive measures and is associated with better outcomes.³³ Barriers to assessment need

to be identified and overcome. This may particularly apply to self-injury, especially self-cutting.

Psychiatric history

A little over 30% of the patients were receiving some form of psychiatric care at the time of presentation. Interestingly, this figure is similar to the National Confidential Inquiry finding that 28% of suicides occurred in individuals who were in contact with the mental health services in the 12 months prior to death.³⁴

Strengths and limitations

This is a large multicentre study of more than 84,000 presentations to emergency departments of five general hospitals in three cities of different socioeconomic characteristics across England (Oxford, Manchester Derby). As such it provides more representative information than any single-centre study. It also allows for a comparison between centres of socioeconomically diverse populations. However, the study only included individuals presenting to hospital following self-harm, and it is known that many self-harm episodes do not result in hospital presentation, especially in young people.³⁵ This is relevant in particular to self-cutting which is less likely to result in hospital presentation.³⁶

The rates of self-harm we have reported are based on urban populations, which are known to be higher than in rural populations.³⁷ Furthermore, some of the data reported were based on information available only for those assessed (i.e. approximately 53% of all episodes of self-harm), which may have limited generalizability as there are known

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3 differences between patients who do and do not receive a psychosocial assessment
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10 **Conclusions**

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12 There have been similar trends in rates of self-harm and suicide in England in recent years.
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14 Of note is the steady increase in self-harm observed since 2008, particularly in males, which
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16 coincided with the economic recession. Rates of self-harm also appeared to have increased
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18 in individuals aged over 54 years. Reliably collected data on self-harm may provide an
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20 important and a sensitive mental health indicator.
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26 Our finding that only a little over half of individuals presenting to hospital after self-harm
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28 were offered psychosocial assessment and that individuals who self-injured were least likely
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30 to receive an assessment, coupled with the rise in self-injury as a method of self-harm and
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32 the link between such methods and suicide, may have important implications for the
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34 management of self-harm in hospitals. These include efforts to increase the overall rate of
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36 psychosocial assessment of patients who self-harm and, especially, to ensure that more of
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38 those who present with self-injury receive an assessment than appears to be current
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Competing interests

The authors have no competing interests to disclose.

Data sharing statement

No available data.

Authors' contributions

GG and KH designed the study. All authors collected and interpreted data. GG analysed the data. GG and KH wrote the first draft of the report. All authors revised the report and approved the final version.

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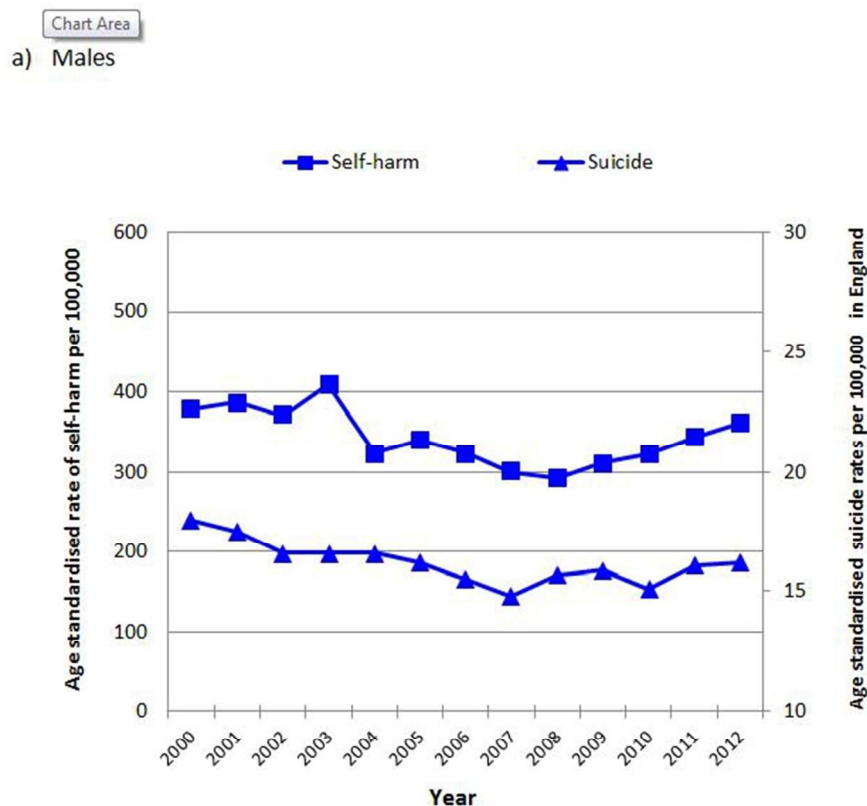
For peer review only

Table 1: Number of persons and episodes of self-harm among individuals aged 15+ years in 2000-2012 by, gender and age group

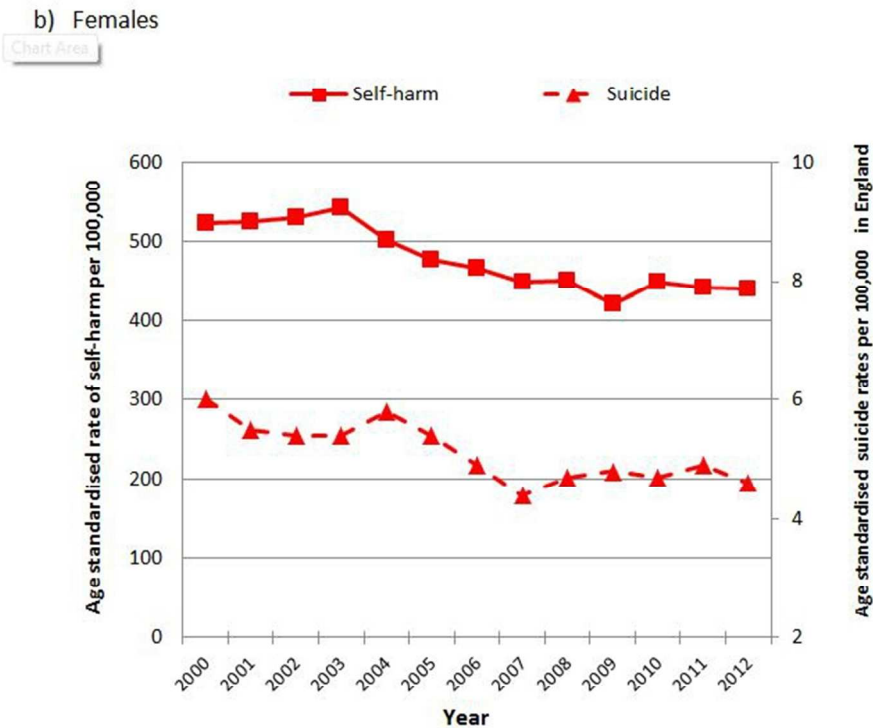
	n (%)		
	Males	Females	Total ^a
All episodes	34,932 (41·4)	49,421 (58·6)	84,353
Individuals	20,285 (43·1)	26,738 (56·8)	47,023
Individuals by age group			
15-24	6,482 (32·0)	11,585 (43·3)	18,067 (38·4)
25-34	5,373 (26·5)	5,790 (21·7)	11,163 (23·7)
35-54	6,906 (34·0)	7,678 (28·7)	14,584 (31·0)
55+	1,524 (7·5)	1,685 (6·3)	3,209 (6·8)

^aExcludes 25 episodes by individuals where sex was not known

Figure 1: Age standardised rates of self-harm in the three centres combined and age-standardized suicide rates in England* in persons 15+ years by gender: 2000-2012



187x183mm (96 x 96 DPI)

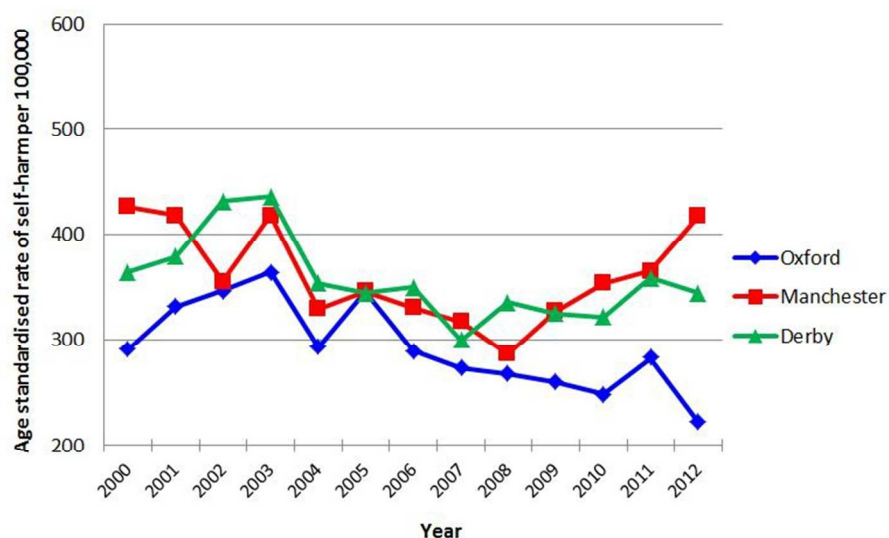


*Source: Office for National Statistics¹⁵.

190x170mm (96 x 96 DPI)

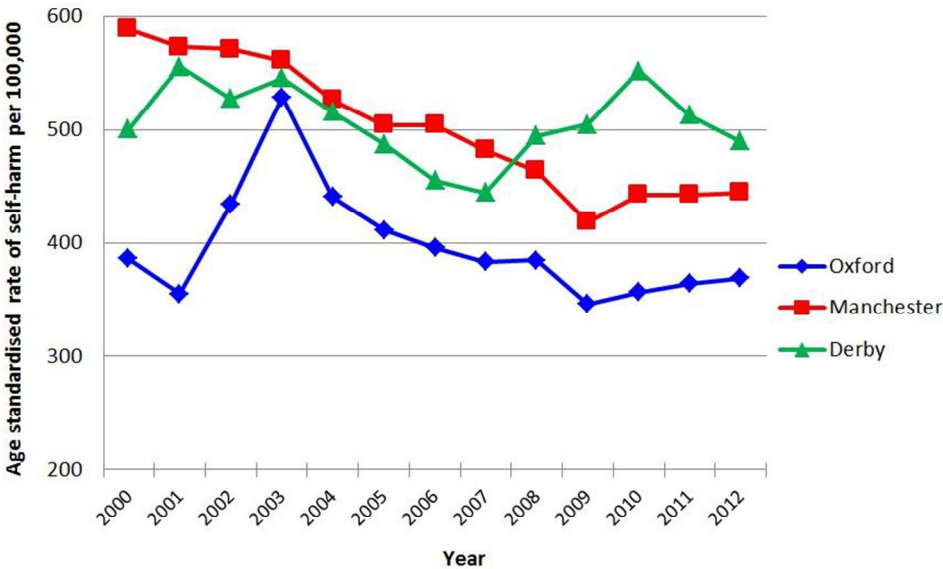
Figure 2: Age standardised rates of self-harm in individuals aged 15+ years by centre 2000-2012

a) Males



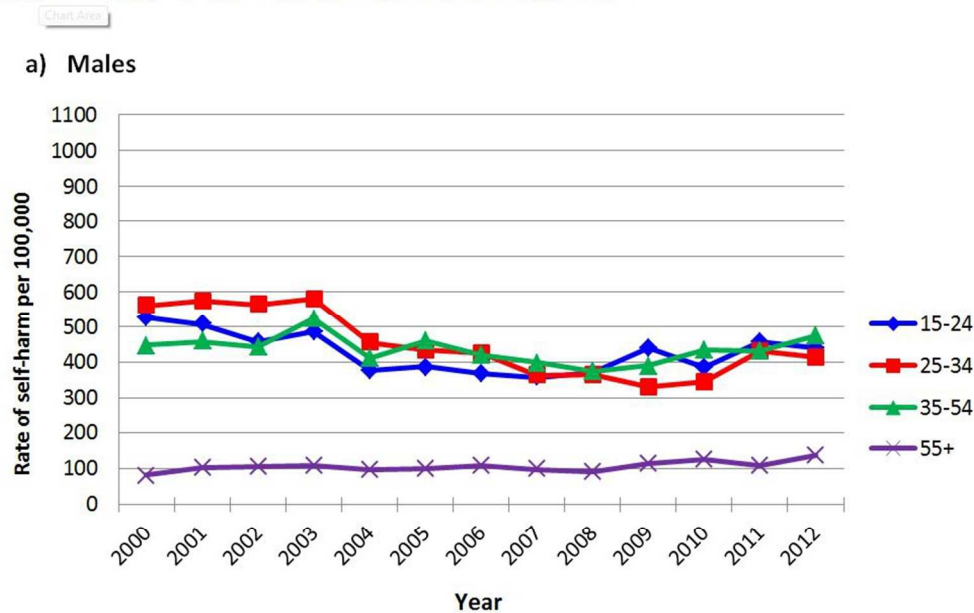
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b) Females

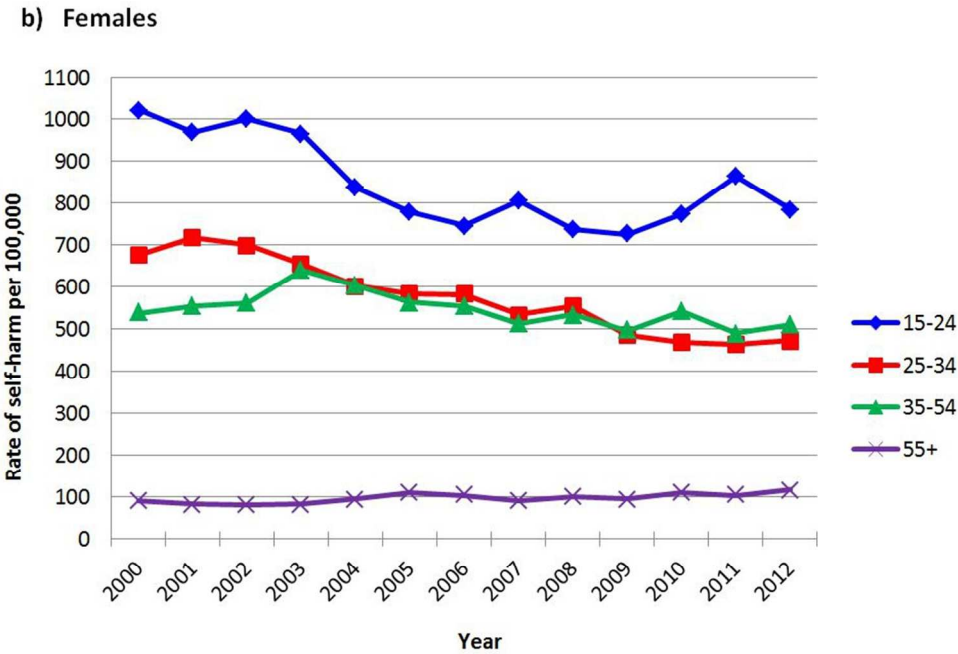


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Figure 3: Rates of self-harm in individuals aged 15+ years, by age group, for the three centres combined, 2000-2012, for a) males and b) females

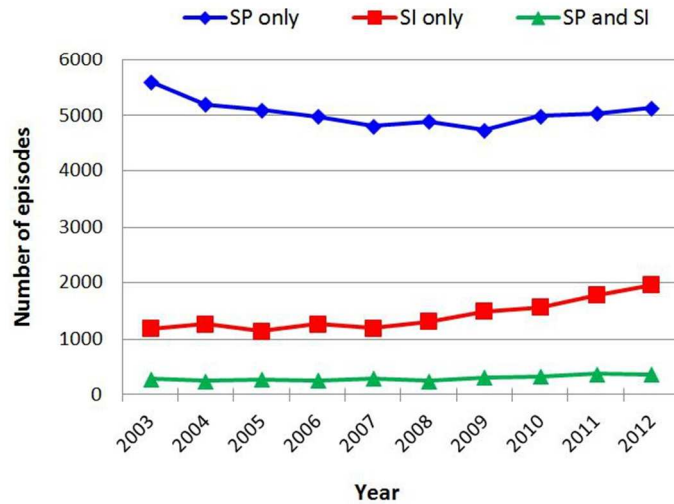


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258x170mm (96 x 96 DPI)

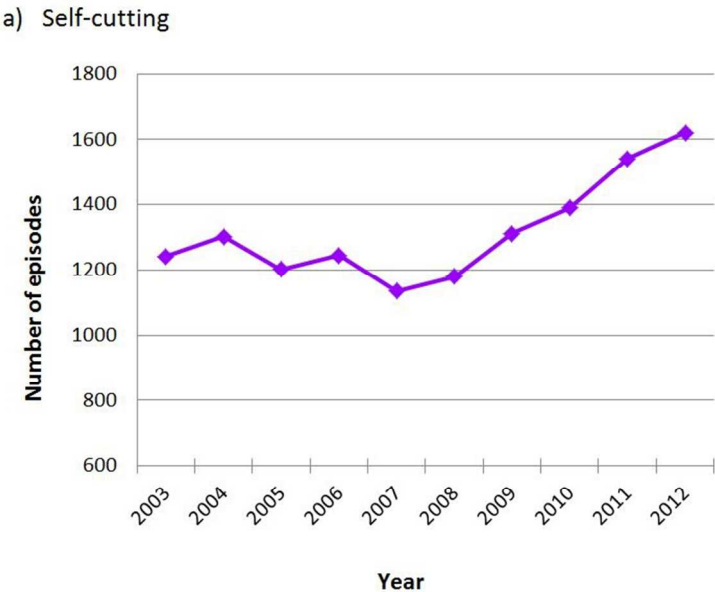
Figure 4: Trends in the number of episodes of self-poisoning (only) and self-injury (only) in individuals aged 15+ years in the three centres combined, 2003-2012



SP=self-poisoning; SI=self-injury

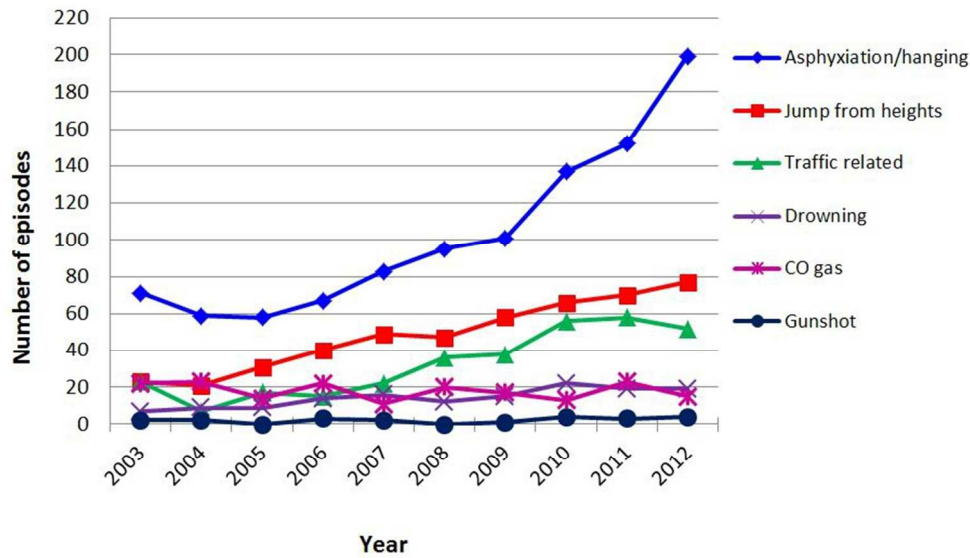
263x190mm (96 x 96 DPI)

Figure 5: Trends in the number of episodes of self-injury in individuals aged 15+ years in the three centres combined, 2003-2012



254x189mm (96 x 96 DPI)

b) Self-injury methods other than self-cutting



245x157mm (96 x 96 DPI)

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-10
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6-10
		(b) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	N/A
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8-9
		(b) Describe any methods used to examine subgroups and interactions	8-9
		(c) Explain how missing data were addressed	8-9
		(d) If applicable, explain how loss to follow-up was addressed	N/A
		(e) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9-10, 13-15
		(b) Give reasons for non-participation at each stage	6,7, 9-10, 15
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11, 26
		(b) Indicate number of participants with missing data for each variable of interest	9-10, 15
		(c) Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-15
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11-15
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-20
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	5, 19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.