

# Incidence of suicide, hospital-presenting non-fatal self-harm, and community-occurring non-fatal self-harm in adolescents in England (the iceberg model of self-harm): a retrospective study



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## Summary

**Background** Little is known about the relative incidence of fatal and non-fatal self-harm in young people. We estimated the incidence of suicide, hospital-presenting non-fatal self-harm, and community-occurring non-fatal self-harm in adolescents in England.

**Methods** We used national mortality statistics (Jan 1, 2011, to Dec 31, 2013), hospital monitoring data for five hospitals derived from the Multicentre Study of Self-Harm in England (Jan 1, 2011, to Dec 31, 2013), and data from a schools survey (2015) to estimate the incidence of fatal and non-fatal self-harm per 100 000 person-years in adolescents aged 12–17 years in England. We described these incidences in terms of an iceberg model of self-harm.

**Findings** During 2011–13, 171 adolescents aged 12–17 years died by suicide in England (119 [70%] male and 133 [78%] aged 15–17 years) and 1320 adolescents presented to the study hospitals following non-fatal self-harm (1028 [78%] female and 977 [74%] aged 15–17 years). In 2015, 322 (6%) of 5506 adolescents surveyed reported self-harm in the past year in the community (250 [78%] female and 164 [51%] aged 15–17 years). In 12–14 year olds, for every boy who died by suicide, 109 attended hospital following self-harm and 3067 reported self-harm in the community, whereas for every girl who died by suicide, 1255 attended hospital for self-harm and 21995 reported self-harm in the community. In 15–17 year olds, for every male suicide, 120 males presented to hospital with self-harm and 838 self-harmed in the community; whereas for every female suicide, 919 females presented to hospital for self-harm and 6406 self-harmed in the community. Hanging or asphyxiation was the most common method of suicide (125 [73%] of 171), self-poisoning was the main reason for presenting to hospital after self-harm (849 [71%] of 1195), and self-cutting was the main method of self-harm used in the community (286 [89%] of 322).

**Interpretation** Ratios of fatal to non-fatal rates of self-harm differed between males and females and between adolescents aged 12–14 years and 15–17 years, with a particularly large number of females reporting self-harm in the community. Our findings emphasise the need for well resourced community and hospital-based mental health services for adolescents, with greater investment in school-based prevention.

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## Introduction

Suicide and non-fatal self-harm in adolescents are major public health concerns. Self-harm is common in adolescents, particularly in females and from the age of 12 years onwards,<sup>1,2</sup> and suicide is a leading cause of death in this age group.<sup>3</sup> Furthermore, self-harm is the strongest risk factor for suicide in children and adolescents.<sup>1</sup>

One report suggests that in 2014–15, 316 people aged 10–19 years died by suicide in England and Wales.<sup>4</sup> Few data are available on the incidence of non-fatal hospital-presenting self-harm in England, especially in adolescents. However, reports from the Multicentre Study of Self-harm in England (2000–07) showed that the annual incidence of hospital-presenting self-harm was 67 per 100 000 in boys and 466 per 100 000 in girls aged 10–14 years, and 302 per 100 000 in males and 1423 per

100 000 in females aged 15–18 years.<sup>5,6</sup> Data on non-fatal self-harm in adolescents in the community are also scarce. Previous studies, including two school-based surveys and a birth cohort in England including 13–18-year-old adolescents, showed that 6.9–11.0% of respondents had reported an act of self-harm in the year before the study.<sup>7–9</sup>

The incidence of self-harm in adolescents can be conceptualised in terms of an iceberg model<sup>10,11</sup> with three levels: fatal self-harm (ie, suicide), which is an overt but uncommon behaviour (the tip of the iceberg); self-harm that results in presentation to clinical services, especially general hospitals, which is also overt, but common; and self-harm that occurs in the community, which is common but largely hidden (the submerged part of the iceberg). The iceberg model is useful for clinicians, researchers, and policy makers because it

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### Research in context

#### Evidence before this study

In adolescents, non-fatal self-harm is a common reason for hospital presentation and also occurs frequently in the community without coming to clinical attention. Suicide is a leading cause of death in adolescents and is often preceded by self-harm. However, little is known about the relative sizes of the populations of adolescents involved in these three levels of self-harm, despite the major implications such information could have for prevention and clinical management. We searched PubMed up to June 30, 2017, with the terms “suicide”, “self-harm”, “self-injury”, “self-poisoning”, “suicide attempt”, “attempted suicide”, “iceberg”, “relative”, “incidence”, “rates”, “adolescents”, “adolescence”, and “young”. We did not apply any language restrictions. Although several studies have addressed the incidence of each type of self-harm (suicide, hospital-presenting self-harm, and community-occurring self-harm), to our knowledge only one study has addressed the relative incidence of all three forms of self-harm. In a study published in 2014, McMahon and colleagues estimated the relative incidence of fatal and non-fatal self-harm in older adolescents (15–17 years) in Ireland and described these in terms of the three levels of an iceberg model. Their study showed that for every adolescent who died by suicide, 34 adolescents presented to the hospital for non-fatal self-harm and 555 adolescents reported self-harm in the community. The differences between incidences of fatal and non-fatal self-harm were particularly marked in females.

#### Added value of this study

We used national data on suicide, together with data on hospital-presenting self-harm from five hospitals from three research

centres and data on self-harm in the community from a large-scale schools survey to calculate the relative incidence of fatal and non-fatal self-harm in adolescents aged 12–17 years in England. Estimated rates of fatal and non-fatal self-harm show that for every adolescent suicide, there are approximately 370 adolescents who present to hospital for self-harm and 3900 adolescents who report self-harm in the community. Consistent with previous research, our results show substantially higher incidences of both hospital-presenting and community-occurring non-fatal self-harm (which mostly does not come to the attention of clinical services) in females than in males. Our findings also show substantial differences in methods of self-harm between the three levels of the iceberg model, with hanging or asphyxiation the most common method of suicide, self-poisoning the main method used in hospital-presenting self-harm, and self-cutting the most common method of self-harm in the community.

#### Implications of all the available evidence

Taken together, our results and previous findings show the extent of fatal and non-fatal self-harm in adolescents, highlighting the sizeable problem of community-occurring self-harm, especially in females, but also that most self-harm, especially in young adolescents, does not come to the attention of clinical services. These data emphasise the need for preventive measures at the community level, especially through school-based programmes, and for well developed treatment services to meet the needs of those presenting to clinical services following self-harm.

conveys the hierarchical yet dynamic nature of self-harm. Establishing the relative incidence of self-harm at these three levels is important to understand the extent of the problem and to identify the challenges for prevention and intervention.

The overall aim of this study was to describe the extent of fatal and non-fatal self-harm in adolescents in England in terms of the three levels of the iceberg model, together with the methods of self-harm predominantly used at each level of the iceberg.

## Methods

### Study design and population

For this retrospective analysis, we analysed mortality statistics, hospital monitoring data, and schools survey data for adolescents aged 12–17 years in England. Information about deaths by suicide in England was obtained from the Office for National Statistics (ONS) by year of registration, single year of age, and sex. All deaths with a coroner’s verdict of suicide (ICD-10 codes X60–X84) or undetermined intent (ICD-10 codes Y10–Y34) registered between Jan 1, 2011, and Dec 31, 2013, were included. These deaths are henceforth referred to as suicides, as per national policy.<sup>12–14</sup> Mid-year population

estimates for England were provided by ONS by sex, calendar year, and single year of age.<sup>15</sup>

Data on hospital-presenting self-harm were derived from the Multicentre Study of Self-Harm in England; in this ongoing study, data are collected on all presentations following self-harm to the emergency department in five general hospitals in Manchester (three hospitals), Derby (one hospital), and Oxford (one hospital).<sup>16,17</sup> Demographic and clinical data, including method of self-harm, are collected through completion of psychosocial assessments by liaison psychiatry services in the general hospital (also by emergency department staff in Manchester). People who present to hospital but do not receive a psychosocial assessment are identified through scrutiny of emergency department electronic databases by trained staff, who extract less complete data from case records.

Self-harm is defined as any act of intentional self-poisoning or self-injury irrespective of the degree of suicidal intent or other motivation.<sup>18</sup> In this analysis, we included the first presentation by each individual per year between Jan 1, 2011, and Dec 31, 2013. We included adolescents who resided in the catchment area of the city of Manchester, Derby unitary area, or Oxford extended area (Oxford city and an additional 64 statistical wards

For more on methods and data quality of ONS mid-year population estimates see <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/qmis/annualmidyearpopulationestimatesqmi>

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