

# Self-harm and violent criminality among young people who experienced trauma-related hospital admission during childhood: a Danish national cohort study



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## Summary

**Background** Development of a better understanding of subsequent pathways for individuals who experienced trauma during childhood might usefully inform clinicians and public health professionals regarding the causes of self-harm and interpersonal violence. We aimed to examine these risks during late adolescence and early adulthood among people admitted to hospital following injuries or poisonings during their childhood.

**Methods** This national cohort study included Danish people born between Jan 1, 1977, and Dec 31, 1997, and was linked to the National Patient Register and Psychiatric Central Research Register to identify all people exposed to hospital admissions for injuries or poisonings due to self-harm, interpersonal violence, or accidents before their 15th birthday. Linkage to these two registers and to the National Crime Register enabled ascertainment of self-harm and violent offending, respectively, as adverse outcomes at ages 15–35 years. Sex-specific incidence rate ratios (IRRs; relative risks) and cumulative incidence percentage values (absolute risks) were estimated. The confounding influence of parental socioeconomic status was also explored.

**Findings** 1087 672 Danish people were included in this study. The prevalence of any trauma-related hospital admission was 10% (105 753 per 1087 672; males: 64 454 [11%]; females: 44 299 [8%]) and for both sexes, accident was by far the most prevalent of the categories assessed (males: 59 011 [11%]; females: 40 756 [8%]). Similar patterns of increased risk for self-harm and violent criminality were observed in both sexes, although the IRRs were consistently and significantly larger in women (self-harm: IRR 1.94 [95% CI 1.85–2.02]; violent criminality: 2.16 [1.97–2.36]) than in men (self-harm: 1.61 [1.53–1.69]; violent criminality: 1.58 [1.53–1.63]). Confounding by parental socioeconomic status explained little of the increased risks observed. For young adult men, the highest absolute risk observed was for violent offending among individuals admitted to hospital for interpersonal violence injury during childhood (cumulative incidence 25.0% [95% CI 21.2–28.9]). For young adult women, absolute risk was highest for repeat self-harm among those admitted to hospital following self-harm during childhood (cumulative incidence 21.4% [95% CI 19.8–23.1]). More frequent trauma-related hospital admissions in childhood, and being admitted multiple times for more than one reason, conferred substantial risk increases among young people, with especially steep gradients of this nature observed among women.

**Interpretation** Trauma-related hospital admission early in life could be a useful marker for childhood distress that subsequently predicts internalised and externalised destructive behaviours among youths and young adults and might provide a timely opportunity for initiating family-oriented interventions.

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## Introduction

Trauma-related hospital admission following serious injuries and poisonings, whether self-inflicted, perpetrated by other people, or occurring accidentally, can be highly distressing experiences for children and their families. Furthermore, these episodes predict short-term and long-term increases in risk of suicide and other causes of premature death,<sup>1–4</sup> and they also absorb scarce health-care resources disproportionately.<sup>4</sup> To inform the coordinated development of multiagency initiatives to reduce adverse outcome risks among psychosocially vulnerable young people, it is therefore necessary to better understand the long-term trajectories of children

who require hospital admission following major injuries or poisonings, to help to ensure their safe progression through to healthy adult maturity. These trauma-related hospital admissions have been described as salient so-called teachable moments, providing an opportunity to deliver considered interventions that could potentially prevent future harmful behaviours.<sup>5</sup>

A paper published in 2015 reported on a large longitudinal investigation of hospital admissions for violent, drug-related or alcohol-related, self-inflicted, and accidental injury among adolescents aged 10–19 years in England.<sup>3</sup> The study indicated strong links between this exposure and risks of death and emergency readmission

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### Research in context

#### Evidence before this study

We searched for article titles published in English in MEDLINE and Embase up until Feb 24, 2017, that included the following combination of terms: “child” or “youth” or “adolesc” AND “hospitali” or “admitted” or “admission” AND “trauma” or “self-harm” or “self-inflict” or “self-injur” or “self-poison” or “suicid” or “violen” or “assault” or “accident” or “death” or “die” or “mortality”. We discovered that the existing evidence-base for this topic was limited. Previous national registry studies have examined links between history of trauma-related hospital admission and future risks of self-harm and suicide, assaultive injury, emergency readmission, and premature death. These studies have consistently shown strong associations, but several important research questions remain unanswered, including the long-term trajectories of people who experienced trauma-related hospital admissions during childhood, assessment of self-harm versus violent offending risks in the same study cohort, and cumulative risk estimation.

#### Added value of this study

We did a national cohort study of more than 1 million people. We identified all trauma-related hospital admissions during childhood through to the 15th birthday and examined adverse outcomes between mid-adolescence and age 35 years. We compared risks for internalised versus externalised violence, and we generated measures of sex-specific absolute risks in this population by deriving estimates of cumulative incidence values

that accounted for competing risks. Around one in seven men admitted to hospital during childhood following self-harm and one in four due to interpersonal violence will be convicted for committing a violent crime by age 35 years. About one in five women admitted to hospital after an episode of self-harm or interpersonal violence during childhood will be admitted to hospital again following self-harm between their 15th and 35th birthdays.

#### Implications of all the available evidence

The psychosocial wellbeing of individuals who experienced trauma-related hospital admission while growing up warrants careful consideration in the development of comprehensive strategies to address internalised and externalised violence in young people. National clinical guidelines for provision of psychosocial assessment target single problems such as self-harm, but they could be usefully broadened to encompass other adverse events such as hospital admission of children following episodes of interpersonal violence or serious accidents. Trauma-related hospital admission of a child might present an important opportunity to implement a family-oriented intervention in the hospital setting, with the proactive purpose of reducing future risk of harmful or self-destructive behaviours. Particularly, close monitoring and robust support are indicated for young women who were admitted to hospital as children on more than one occasion following trauma and for those who were admitted post trauma for multiple reasons during their childhood.

within 10 years of the index hospitalisation episode. Two previous investigations reporting results from large routinely collected datasets in New Zealand have examined subsequent risks of assaultive injury,<sup>6</sup> self-injury, and suicide,<sup>7</sup> without specifying an age range for experiencing trauma-related hospital admission. We examined such hospital admissions that occurred specifically during childhood, to establish the longer-term trajectories of this particularly vulnerable group of young people.

Published reports have tended to focus on a single adverse outcome, such as youth suicide,<sup>8</sup> whereas we set out to harness the potential of national Danish registers to examine the longer-term trajectories of affected children. We investigated self-harm and violent criminality as adverse outcomes because self-directed and externalised violence are associated harmful behaviours that share common causal factors. A Swedish national registry study from 2006 reported a five times increased risk of violent crime conviction among people with a history of hospital-treated self-harm, with an independent doubled risk after adjustment for psychiatric comorbidity and environmental factors.<sup>9</sup> The combined societal costs of these two related deleterious behaviours are immense,<sup>10</sup> prompting calls for concerted action to tackle them in unison.<sup>11</sup>

The aims of this national cohort study were: (1) to estimate the relative and absolute risks of self-harm and violent criminality among youths and young adults who

experienced hospital admission due to injuries and poisonings during their childhood; (2) to compare these estimates by sex and by cause of hospital admission—self-harm, interpersonal violence, or accident; (3) to assess confounding by parental socioeconomic status (SES); and (4) to evaluate effect modification by frequency of and multiple reasons for trauma-related hospital admission during childhood. We anticipated observing especially increased risks among individuals admitted to hospital as children following interpersonal violence or self-harm versus the reference category of people who had no experience of trauma-related hospital admissions during childhood. We also examined exposure to hospital admission following accidental injury or poisoning as an additional comparison. We acknowledge that a sizeable proportion of admissions following accidents might not have been anywhere near as traumatising to the affected children as those that followed internalised or externalised violence.

## Methods

### Study design and participants

Since 1968 the Civil Registration System has registered all Danish residents<sup>12</sup> by capturing date and place of birth, sex, and continuously updated vital status information. Its mandatory unique personal identification numbering system enables complete and accurate linkage to

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