The natural history of self-harm from adolescence to young adulthood: a population-based cohort study

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See Comment page 198

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Summary

Background Knowledge about the natural history of self-harm is scarce, especially during the transition from adolescence to young adulthood, a period characterised by a sharp rise in self-inflicted deaths. From a repeated measures cohort of a representative sample, we describe the course of self-harm from middle adolescence to young adulthood.

Methods A stratified, random sample of 1943 adolescents was recruited from 44 schools across the state of Victoria, Australia, between August, 1992, and January, 2008. We obtained data pertaining to self-harm from questionnaires and telephone interviews at seven waves of follow-up, commencing at mean age 15·9 years (SD 0·49) and ending at mean age 29·0 years (SD 0·59). Summary adolescent measures (waves three to six) were obtained for cannabis use, cigarette smoking, high-risk alcohol use, depression and anxiety, antisocial behaviour and parental separation or divorce.

Findings 1802 participants responded in the adolescent phase, with 149 (8%) reporting self-harm, More girls (95/947 [10%]) than boys (54/855 [6%]) reported self-harm (risk ratio 1·6, 95% CI 1·2–2·2). We recorded a substantial reduction in the frequency of self-harm during late adolescence. 122 of 1652 (7%) participants who reported self-harm during adolescence reported no further self-harm in young adulthood, with a stronger continuity in girls (13/888) than boys (1/764). During adolescence, incident self-harm was independently associated with symptoms of depression and anxiety (HR 3·7, 95% CI 2·4–5·9), antisocial behaviour (1·9, 1·1–3·4), high-risk alcohol use (2·1, 1·2–3·7), cannabis use (2·4, 1·4–4·4), and cigarette smoking (1·8, 1·0–3·1). Adolescent symptoms of depression and anxiety were clearly associated with incident self-harm in young adulthood (5·9, 2·2–16).

Interpretation Most self-harming behaviour in adolescents resolves spontaneously. The early detection and treatment of common mental disorders during adolescence might constitute an important and hitherto unrecognised component of suicide prevention in young adults.

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Introduction

Self-harm is an act with a non-fatal outcome in which an individual deliberately initiates behaviour (such as self-cutting), or ingests a toxic substance or object, with the intention of causing harm to themselves.[1] It is a global health problem[2] and is one of the strongest predictors of completed suicide.[3] Self-harm is especially common in 15–24 year old women, a group in whom rates of serious self-harm seem to be rising.[4]

Very few longitudinal studies have charted the natural history of self-harm and as far as we are aware no population-based study has rigorously examined the incidence of self-harm during the transition from late adolescence through to adulthood. This is an important period in the life course, characterised by major changes in health and a steep rise in deaths resulting from self-inflicted injuries.[5] Charting of the epidemiology of self-harm during this period might therefore provide insight into modifiable risk factors for future suicide. In this study, with a repeated measures cohort of a representative sample, we describe the course of self-harm from adolescence to young adulthood. We aimed to describe the prevalence of self-harm during adolescence and young adulthood and sought to determine psychosocial predictors of incident self-harm in both adolescence and young adulthood.

Methods

Study population

Between August, 1992, and January, 2008, we undertook a nine-wave cohort study of health in young people living in the state of Victoria, Australia. Data collection protocols were approved by the ethics in human research committee of the Royal Children's Hospital, Victoria. Informed parental consent was obtained before inclusion in the study. In the adult phase, all participants were informed of the study in writing and gave verbal consent before being interviewed.

At baseline, a representative sample of the Victorian population of school pupils aged 14–15 years (year 9) was selected. We used a two-stage cluster sampling procedure to define the study population. At stage one, 45 schools were chosen at random from a stratified frame of government, Catholic, and independent schools, with a probability proportional to the number of students aged 14–15 years in the schools in each stratum in the state.

Five schools declined participation, and each was replaced by a previously defined school from the equivalent stratum. At stage two, one intact class was selected at random from each participating school. Thus, one class entered the study in the last part of the ninth school year (wave one) and the second class 6 months later (wave two). Participants were subsequently reviewed at a further four 6-month intervals from 14 to 19 years (waves three to six) with three follow-up waves in young adulthood aged 20–21 years (wave seven), 24–25 years (wave eight), and 28–29 years (wave nine).

From a total sample of 2032 students, 1943 (95·6%) participated at least once during the first six (adolescent) waves. School retention rates to year 9 in the year of sampling were 98%. One school did not continue beyond wave one with a loss of 13 participants (with 44 schools remaining in the study). 76 invited participants were either refused consent by their parents or were never available for interview.

In waves one to six, participants self-administered the questionnaire on laptop computers with telephone follow-up of those absent from school. The seventh to ninth waves were undertaken with computer-assisted telephone interviews. In general we used the same measures for time-varying outcomes and covariates to ensure comparability across waves. Participants were not asked about self-harm until wave three when the cohort was engaged and we judged it reasonable to ask more sensitive questions. In wave nine, 1501 participants were interviewed between May, 2006, and January, 2008, 1395 of whom completed the telephone interview, including the self-harm component; 106, who were keen to participate but had little time, completed part of the surveys without the self-harm items.

Measures

Self-harm was assessed at each wave from wave three to wave nine, with the question: "In the last [reference period] have you ever deliberately hurt yourself or done anything that you knew might have harmed you or even killed you?" The reference period was 1 year for wave three and 6 months for the other waves. Participants who responded positively to the main question were then asked to describe the nature and timing of each episode. These detailed responses were then coded into five subtypes of self-harm by good clinical practice and confirmed by the corresponding author. A dichotomous (yes/no) variable was created for each subtype: cutting or burning; self-poisoning, deliberate non-recreational risk-taking, self-battery, and other (including attempted self-drowning, hanging, intentional electrocution, and suffocation). Individuals could report more than one category of self-harm within a wave or in different waves. They were classified with "any self-harm" by wave if they were identified to have reported any of these individual categories.

Summary measures of adolescent and young adult self-harm were created by category and by any harm from waves three to six and waves seven to nine, respectively (with the response assumed to be "no occurrence" when missing). Suicide attempts were identified for all reports of self-harm at every wave from the response "Seriously trying to end my life" to the question in the Beck suicide intent inventory:[6] "When you did this, were you seriously trying to end your life—or not really?"

In the adolescent phase we identified incident self-harm in those who had reported self-harm but had not reported harming themselves in any previous wave. There were no previous waves of self-harm data collection to refer to in wave three so we used a positive response to the Beck suicide intent inventory question: "Is this the only time you have deliberately harmed yourself?" to identify incident self-harm in this wave. Incident self-harm in young adulthood was identified in those with at least one adolescent observation but no reported self-harm in this phase.

Summary adolescent measures (waves three to six) were obtained for cannabis use, cigarette smoking, high-risk alcohol use, depression and anxiety, antisocial behaviour and parental separation or divorce. Participants who reported any cannabis use in the past 6 months were identified. Participants reporting that they had smoked any cigarettes in the past month were classified as cigarette smokers. High-risk alcohol use was assessed with a beverage-specific and quantity-specific 1-week diary. High-risk alcohol use was calculated according to Australian guidelines,[7] and defined as 15 or more standard drinks (one standard drink 10 g alcohol) in the week before survey.

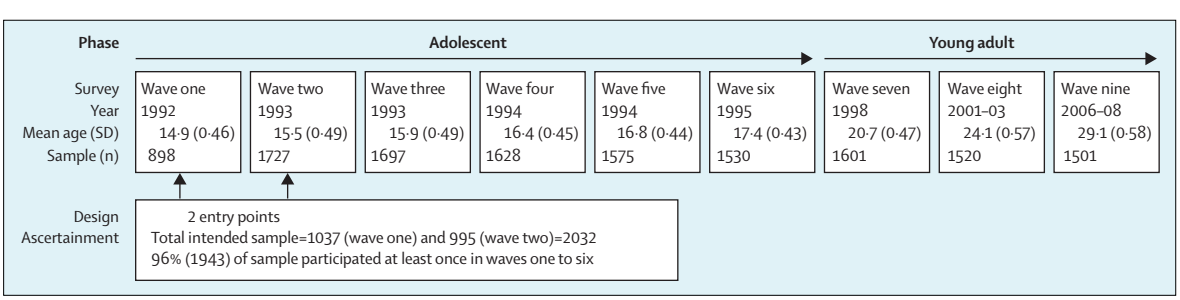

Figure 1: **Sampling of study population and ascertainment in the Victorian adolescent health cohort, 1992–2008**
Age in years.

Symptoms of depression and anxiety were assessed with the revised clinical interview schedule,[8] which is a branched psychiatric interview designed to assess symptoms of depression and anxiety in non-clinical populations. Total scores were dichotomised so that scores of 12 or more delineated a mixed depression-anxiety state at a lower threshold than syndromes of major depression and anxiety disorder, but for which clinical intervention would be appropriate.[8] Antisocial behaviour was assessed with ten items from the Moffitt and Silva self-report early delinquency scale.[9] Items included antisocial behaviour relating to property damage, interpersonal conflict, and theft, but did not include alcohol-related disturbance. The reference period was 6 months. Antisocial behaviour was categorised according to whether more than one behaviour was reported more than once to distinguish participants with many antisocial behavioural problems. Parental divorce

	Male	Female	Total
Adolescent phase (waves three to six)			
Any self-harm by wave			
Three (mean age 15·9 years)	29/809 (3·6%; 2·3–4·9)	58/888 (6·5%; 4·9–8·2)	87/1697 (5·1%; 4·1–6·2)
Four (mean age 16·4 years)	19/753 (2·5%; 1·4–3·6)	28/875 (3·2%; 2·0–4·4)	47/1628 (2·9%; 2·1–3·7)
Five (mean age 16·8 years)	14/721 (1·9%; 0·9–3·0)	20/854 (2·3%; 1·3–3·4)	34/1575 (2·2%; 1·4–2·9)
Six (mean age 17·4 years)	2/682 (0·3%; 0·0–0·7)	21/848 (2·5%; 1·4–3·5)	23/1530 (1·5%; 0·9–2·1)
Any self-harm*	54/855 (6·3%; 4·7–7·9)	95/947 (10%; 8·1–12)	149/1802 (8·3%; 7·0–9·5)
Self-harm with suicidal intention*	2/855 (0·2%; 0·0–0·6)	13/947 (1·4%; 0·6–2·1)	15/1802 (0·8%; 0·4–1·3)
Number of waves of any self-harm*			
One	45/855 (5·3%; 3·8–6·8)	70/947 (7·4%; 5·7–9·1)	115/1802 (6·4%; 5·3–7·5)
More than one	9/855 (1·1%; 0·4–1·7)	25/947 (2·6%; 1·6–3·7)	34/1802 (1·9%; 1·3–2·5)
Any self-harm, by category*			
Self-battery	18/855 (2·1%; 1·1–3·1)	12/947 (1·3%; 0·6–2·0)	30/1802 (1·7%; 1·1–2·3)
Cut or burn	23/855 (2·7%; 1·6–3·8)	59/947 (6·2%; 4·7–7·8)	82/1802 (4·6%; 3·6–5·5)
Poison or overdose	5/855 (0·6%; 0·1–1·1)	29/947 (3·1%; 2·0–4·2)	34/1802 (1·9%; 1·3–2·5)
Risk taking	12/855 (1·4%; 0·6–2·2)	18/947 (1·9%; 1·0–2·8)	30/1802 (1·7%; 1·1–2·3)
Other	1/855 (0·1%; 0·0–0·3)	4/947 (0·4%; 0·0–0·8)	5/1802 (0·3%; 0·0–0·5)
Any self-harm excluding risk taking	44/855 (5·1%; 3·7–6·6)	90/947 (9·5%; 7·6–11)	134/1802 (7·4%; 6·2–8·6)
Young adult phase (waves seven to nine)			
Any self-harm by wave			
Seven (mean age 20·7 years)	8/735 (1·1%; 0·3–1·8)	19/866 (2·2%; 1·2–3·2)	27/1601 (1·7%; 1·1–2·3)
Eight (mean age 24·1 years)	5/696 (0·7%; 0·1–1·3)	13/824 (1·6%; 0·7–2·4)	18/1520 (1·2%; 0·6–1·7)
Nine (mean age 29·0 years)	5/631 (0·8%; 0·1–1·5)	2/764 (0·3%; 0·0–0·6)	7/1395 (0·5%; 0·1–0·9)
Any self-harm†	16/822 (1·9%; 1·0–2·9)	30/928 (3·2%; 2·1–4·4)	46/1750 (2·6%; 1·9–3·4)
Self-harm with suicidal intention†	5/822 (0·6%; 0·1–1·1)	6/928 (0·6%; 0·1–1·2)	11/1750 (0·6%; 0·3–1·0)
Number of waves of any self-harm†			
One	14/822 (1·7%; 0·8–2·6)	27/928 (2·9%; 1·8–4·0)	41/1750 (2·3%; 1·6–3·1)
More than one	2/822 (0·2%; 0·0–0·6)	3/928 (0·3%; 0·0–0·7)	5/1750 (0·3%; 0·0–0·5)
Any self-harm, by category†			
Self-battery	4/822 (0·5%; 0·0–1·0)	6/928 (0·6%; 0·1–1·2)	10/1750 (0·6%; 0·2–0·9)
Cut/burn	8/822 (1·0%; 0·3–1·6)	13/928 (1·4%; 0·6–2·2)	21/1750 (1·2%; 0·7–1·7)
Poison/overdose	5/822 (0·6%; 0·0–1·1)	8/928 (0·9%; 0·3–1·5)	13/1750 (0·7%; 0·3–1·1)
Risk taking	1/822 (0·1%; 0·0–0·4)	4/928 (0·4%; 0·0–0·9)	5/1750 (0·3%; 0·0–0·5)
Other	2/822 (0·2%; 0–0·6)	2/928 (0·2%; 0·0–0·5)	4/1750 (0·2%; 0·0–0·5)
Any self-harm excluding risk taking	15/822 (1·8%; 0·9–2·7)	26/928 (2·8%; 1·7–3·9)	41/1750 (2·3%; 1·6–3·1)
Continuity and discontinuity from adolescence (waves three to six) to young adulthood (waves seven to nine)‡			
None in either phase	703/764 (92%; 90–94)	786/888 (89%; 86–91)	1489/1652 (90%; 89–92)
Incident in young adulthood	12/764 (1·6%; 0·7–2·5)	15/888 (1·7%; 0·8–2·5)	27/1652 (1·6%; 1·0–2·2)
Remitted by young adulthood (adolescence only)	48/764 (6·3%; 4·6–8·0)	74/888 (8·3%; 6·5–10)	122/1652 (7·4%; 6·1–8·6)
Continuing in young adulthood (both phases)	1/764 (0·1%; 0·0–0·4)	13/888 (1·5%; 0·7–2·3)	14/1652 (0·8%; 0·4–1·3)

Data are n/N (%; 95% CI). *Identified in those who had a self-harm response at any of waves three to six. Categories of self-harm are not mutually exclusive. †Identified in those who had a self-harm response at any of waves seven to nine to 9. Categories of self-harm are not mutually exclusive. ‡Only participants with at least one observation in each time period.

Table 1: **Prevalence of self-harm by wave and category and summarised over adolescence and young adult phases, by sex**

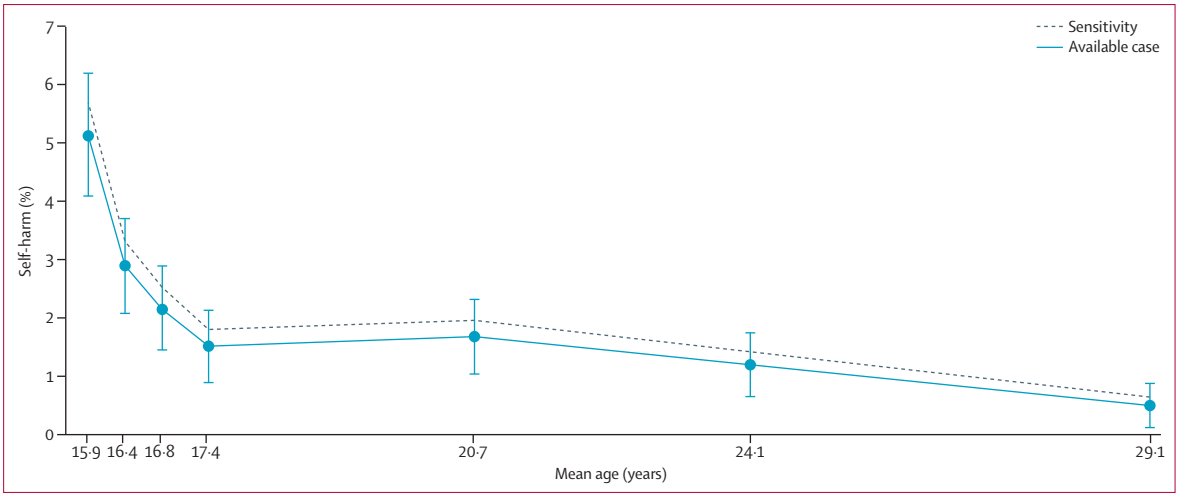

Figure 2: **Proportion of participants reporting self-harm at each follow-up wave, with 95% CIs, showing available case estimates and sensitivity estimates assuming that those missing at each wave were at twice the risk of self-harm as those responding**

or separation was identified before participant's age 18 years, reported either prospectively or retrospectively.

Statistical analysis

Our analysis is based on data provided by participants who completed the self-harm items in at least one wave from waves three to nine. The prevalence of any type of self-harm was estimated at each wave from available case data. We did a sensitivity analysis for these estimates by assuming twice the risk for self-harm in missing participants. Summary estimates of the prevalence of self-harm in adolescence (waves three to six) and young adulthood (waves seven to nine) are presented. For the participants who had responded to at least one self-harm question at every phase, estimates of continuity and discontinuity between the two phases were made. Factors associated with the incident self-harm in adolescence were assessed with discrete time survival analysis—logistic models with complementary log-log link to function estimated with robust standard errors to allow for repeated measures within individuals. Factors associated with incident young adult self-harm were initially assessed separately in unadjusted logistic regression models and then jointly in an adjusted model, first with all participants with at least one response in both adolescence and young adulthood, and second restricted to those with complete sets of data. Analysis was done in STATA version 11.

Role of the funding source

Data colection for this study was supported by the National Health and Medical Research Council, Australia, and the operational infrastructure support programme, Government of Victoria, Australia. The funders had no role in design, data collection or analysis, data interpretation, or writing of the article. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

	Unadjusted*	Adjusted†
Wave		
Three (mean age 15·9 years)	1	1
Four (mean age 16·4 years)	0·86 (0·51–1·4)	1·0 (0·61–1·7)
Five (mean age 16·8 years)	0·49 (0·26–0·91)	0·58 (0·31–1·1)
Six (mean age 17·4 years)	0·37 (0·19–0·71)	0·45 (0·23–0·86)
Background factors		
Female	1·5 (0·94–2·3)	1·5 (0·88–2·4)
Parental divorce or separation	1·8 (1·2–2·9)	1·2 (0·78–2·0)
Time varying factors in the previous wave		
Depression or anxiety (CIS≥12)	5·9 (3·8–9·0)	3·7 (2·4–5·9)
Antisocial behaviour	4·7 (2·8–7·8)	1·9 (1·1–3·4)
High-risk alcohol use	4·0 (2·4–6·7)	2·1 (1·2–3·7)
Cigarette smoking	4·9 (3·1–7·6)	2·4 (1·4–4·1)
Cannabis use	4·5 (2·9–6·8)	1·8 (1·0–3·1)

Data are HR (95% CI). n incident events=86. CIS=clinical interview schedule. *Hazard ratios from univariate discrete time survival analysis, with allowance for repeated measures within individuals. †Hazard ratios from multivariable discrete time survival analysis models adjusted for all shown measures, with allowance for repeated measures within individuals and time-varying risk of self-harm. Hosmer-Lemeshow goodness-of-fit test p=0·09.

Table 2: **Longitudinal association between background factors and time-varying exposures measured in the previous wave with incident adolescent self-harm in 1672 cohort participants who responded to the self-harm component in at least two consecutive waves in the adolescent phase (wave two in addition to waves three to six)**

Results

Figure 1 shows the flow of participants through the study. Overall, 1802 participants (88·7% of the intended sample) responded to the self-harm component at least once between waves three and six; 1750 responded to these questions between waves seven and nine. 1900 participants completed the self-harm items in at least one wave from waves three to nine. Of these participants, in the adolescent phase (waves three to six)

5% (98) did not respond to the self-harm component, 5% (102) responded once, 6% (111) responded twice, 13% (250) responded three times, and 70% (1339) responded four times. In the young adult phase (waves seven to nine) 8% (150) did not respond to the self-harm component, 11% (200) responded once, 18% (334) had responded twice, and 64% (1216) had responded three times. Overall, 967 (51%) responded to the self-harm questions at all seven waves. 1652 (87%) participants responded to these questions at least once in both the adolescent phase and young-adult phase.

Table 1 shows the prevalence of self-harm by wave of follow-up and summarised measures of self-harm for adolescence and young adult phases. Of the individuals who participated in both the adolescent and adult phases of the study, nine tenths did not report self-harm during either adolescent or young adult phases of the study, less than a tenth reported self-harm only in adolescence, about 2% reported starting self-harm in young adulthood, and less than 1% reported self-harm in both phases (table 1). Two thirds of those who self-harmed during the young adult phase were incident cases of self-harm—ie, they had not reported self-harm in the adolescent phase.

During the adolescent phase, about a tenth of participants reported self-harm at some point during follow-up, with overall more girls than boys reporting such behaviour (table 1; risk ratio [RR] 1·6, 95% CI 1·2–2·2). Adolescents who self-harmed most frequently reported cutting or burning behaviour. At each wave, the proportion of participants reporting self-harm was higher for girls than for boys (table 1) with a substantial difference emerging at wave six (RR 8·4, 95% CI 2·0–36). Less than 1% of participants reported self-harm associated with suicidal intent during the adolescent phase (table 1). During late adolescence, we recorded a substantial reduction in the proportion of participants self-harming, with a slow decline continuing during young adulthood (figure 2). We assessed the prevalence estimates obtained by including a hypothetical non-participant rate of self-harm twice that of participants, which resulted in an absolute increase in prevalence of between 0·1% and 0·4% at each wave.

Longitudinal associations between time-varying adolescent measures in the previous wave and incident self-harm during adolescence are displayed in table 2. After adjustment for the effects of all other covariates, the presence of a mixed depression-anxiety state, high-risk alcohol use, cigarette smoking, cannabis use, and antisocial behaviour all showed evidence of independent association with incident self-harm. The overall pattern of risk estimates were similar when the dataset was restricted to participants reporting only self-laceration and self-poisoning (HR 4·9, 2·6, 2·1, 1·9, and 2·4 for depression and anxiety, alcohol use, cigarette smoking, cannabis use, and antisocial behaviour, respectively).

In the young adult phase of the study, the proportion of participants reporting any self-harm fell to about 3%, with little evidence of an overall difference between sexes (RR 1·7, 95% CI 0·91–3·0). Less than 1% of participants reported engaging in self-harm associated with suicidal intent during young adulthood. By then, the prevalence of cutting or burning had diminished and no one form of self-harm predominated. Only one male continued to report self-harm from adolescence to young adulthood (table 1). By contrast, the reporting of any self-harm during the adolescent phase by girls was strongly associated with young adult self-harm (OR 9·2, 95% CI 4·2–20). Adolescent girls reporting self-harm in more than one wave of the survey were at especially high risk of self-harm as young adults, (one wave OR 5·6, 95% CI 2·1–15; more than one wave OR 20, 95% CI 7·4–56).

	Incident young adult self-harm (waves seven to nine); all available data (n=27)		Incident young adult self-harm (waves seven to nine); complete cases only (n=14)	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Background factors				
Female	1·1 (0·52–2·4)	0·66 (0·28–1·6)	1·0 (0·35–2·9)	0·60 (0·18–2·0)
Parental divorce or separation	2·0 (0·88–4·5)	1·7 (0·73–3·8)	1·4 (0·37–4·9)	1·1 (0·29–4·2)
Summary adolescent measures				
Depression or anxiety (CIS≥12)	1	1	1	1
None				
One wave	5·4 (2·1–14)	5·9 (2·2–16)	8·1 (1·9–34)	9·6 (2·2–42)
More than one wave	5·8 (2·3–15)	6·7 (2·4–18)	8·1 (2·0–33)	10 (2·4–46)
Antisocial behaviour	1·3 (0·46–3·9)	1·0 (0·31–3·3)	1·3 (0·29–6·1)	1·1 (0·19–5·9)
High-risk alcohol use	0·77 (0·26–2·2)	0·60 (0·19–1·9)	0·71 (0·16–3·2)	0·51 (0·10–2·6)
Cigarette smoking	1·1 (0·51–2·4)	0·66 (0·26–1·7)	1·0 (0·33–3·0)	0·54 (0·15–2·0)
Cannabis use	1·6 (0·72–3·5)	1·7 (0·61–4·5)	1·5 (0·50–4·5)	1·8 (0·45–7·6)

Data are OR (95% CI). CIS=clinical interview schedule. *Odds ratios from univariate logistic regression models. †Odds ratios from multivariable logistic regression models adjusted for all shown variables.

Table 3: **Adolescent measures associated with incident young adult self-harm in cohort participants with no reports of self-harm in adolescence and at least one observation in both adolescent and young adult phases (N=1507) and restricted to participants with complete data for all seven waves of data (N=880)**

Table 3 shows associations between adolescent variables and incident young adult self-harm. After adjustment for the effects of all other covariates, only the presence of a mixed depression-anxiety state during adolescence was clearly associated with incident self-harm in young adulthood, with much the same risk evident in those identified with this state in one and more than one adolescent wave. Neither high-risk alcohol use nor cigarette smoking during adolescence seemed to be associated with incident self-harm in young adulthood, with the confidence intervals tending to suggest negative rather than positive associations. Similar results were seen when the analysis was restricted to those participants with observations in all seven waves and when the definition of self-harm was restricted to the reporting of self-laceration and self-poisoning (estimates not reported here).

Discussion

In this representative cohort of young Australians, over 8% (149 of 1802) of the sample reported self-harm from age 14 to 19 years. The prevalence of self-harm when cohort members were about age 15 years is in line with values reported in previous surveys of school pupils of a similar age from developed countries.[10,11] Injury to the skin through cutting and burning was the commonest method of self-harm during adolescence, although by young adulthood no one form of self-harm predominated. A substantial reduction in reported self-harm occurred as adolescents got older, although part of the drop from wave three to wave four can be explained by the change in reference period from 12 to 6 months. Middle-to-late adolescence is a period of difficulties in emotional control and risk-taking becomes prominent, perhaps related to underlying biological changes.[12] Risks for self-harm increase substantially across pubertal stage, a process that seems to be independent of age.[13] Furthermore, striking concurrent changes in brain development arise that might lead to a developmental imbalance in emotional control that resolves with the eventual maturation of the prefrontal cortex.[14]

Incident self-harm during adolescence was independently associated with the presence of depression and anxiety, antisocial behaviour, high-risk alcohol use, cannabis use, and cigarette smoking. Harmful use of alcohol has been previously identified as a risk factor for future self-harm in clinical populations.[15] As a result, WHO has recommended that population-wide policies to reduce harmful use of alcohol should be developed as a component of comprehensive self-harm prevention strategies.[16] Others have reported an association between antisocial behaviour and self-harm[17] although the relation between cigarette smoking and self-harm is less clear. A plausible explanation for the associations between anxiety and depression and later self-harm is that young people who self-harm might rely on the behaviour to alleviate underlying distress. An affect-regulation model of self-harm has empirical support, with a review of the topic showing that negative affect precedes most self-injury and that decreased negative affect and relief are present after self-injury.[18]

Incident self-harm during young adulthood was independently associated with symptoms of anxiety and depression occurring during adolescence. Cross-sectional surveys of young people have consistently found an association between mental distress and self-harm, and depression and anxiety predict later suicide attempts in young people.[19] Knowledge about the natural history of self-harm is largely based on longitudinal studies of clinical populations and because most young people who self-harm do not seek treatment,[20] the generalisability of findings from these studies is uncertain. The few population-based longitudinal studies examining self-harm in young people have been characterised by small samples,[21–25] short duration of follow-up,[26] a focus on select groups, such as males,[27] or admitted patients,[28] or have limited their coverage to 11–19 year olds (panel).[17,29]

***Panel:* Research in context**

Systematic review

We searched Medline (1948 to June, 2011), Embase (1974 to May, 2011), PsycINFO (1806 to June, 2011), and Google Scholar (to June, 2011), with the following search terms: "self-harm", "deliberate self-harm", "self-injury", "self-mutilation", "non-suicidal self-injury" in combination with "general population", "community", "adolescence", "young people", "longitudinal study" and "prospective cohort study". Reference lists of review articles were hand searched. Two of the authors independently scanned titles from identified studies, read relevant abstracts, and then retrieved and read all potentially relevant studies. The criteria for the selection of relevant articles were longitudinal studies, written in English, of community-dwelling young people, in which the main outcome was self-harm. We did not include articles in which the primary outcome was suicidal ideation or suicide attempt. 11 relevant articles were identified. Previous studies were limited by small samples, short or single follow-ups, a focus on select groups, or limited coverage to the teenage years. We were unable to identify any multi-wave longitudinal studies of the course of self-harm from adolescence to young adulthood.

Interpretation

A substantial reduction in the frequency of self-harm occurred during late adolescence and continued into young adulthood. Females showed greater continuity in self-harm between adolescence and young adulthood than males. Incident young adult self-harm was predicted by adolescent symptoms of anxiety and depression present during adolescence. Most adolescent self-harming resolved spontaneously. However, young people who self-harm commonly had associated mental health problems that might not resolve without treatment. These associated mental disorders should be a primary focus of early intervention.

As far as we are aware, only one other longitudinal study has examined the course of self-harm from adolescence to young adulthood in a general population sample of young people[30] and by contrast with our study, it had a substantially higher attrition rate, did not track one age cohort, and included only one wave of follow-up over a much shorter period of time.

Our representative sample, high rates of participation, and seven waves of follow-up over a period spanning from middle adolescence to the late 20s are strengths of this study. However, our findings need to be considered in view of some limitations. We used a broad definition of self-harm that encompassed behaviours with and without suicidal intention. We deliberately adopted this approach because a substantial overlap exists between suicidal and non-suicidal self-harm and behavioural intention with respect to suicide is changeable.[31]

Our definition of self-harm included deliberate non-recreational risk-taking, which was categorised as self-harm only if the respondent gave clear evidence that the act was done in the knowledge that serious injury might occur. It therefore did not include behaviours related to excessive drug use, unprotected sex, or dangerous driving. Moreover, when we excluded this category, the findings from our multivariate analyses did not substantially change. We relied exclusively on self-reported self-harm, without checking these reports against other sources, such as hospital records. However, self-report might be more likely to present an accurate picture of self-harm than independent measures, because most individuals who self-harm do not present for medical care.[32]

Although the study had high response rates throughout, only 51% (967) of participants completed every wave, potentially leading to some misspecification of frequencies and associations. Additionally, the study had limited power to detect predictive relations with incident self-harm in young adulthood and might therefore have missed important associations with adolescent exposures. Finally, missing data might have affected our estimation of self-harm prevalence and the prediction of young adult self-harm from adolescent measures. Sensitivity analyses exploring the potential effects of missing data suggested that these data were not substantial, but they do not exclude the possibility of biases due in particular to differential attrition.

Our findings suggest that most adolescent self-harming behaviour resolves spontaneously. However, young people who self-harm often have mental health problems that might not resolve without treatment, as evident in the strong relation detected between adolescent anxiety and depression and an increased risk of self-harm in young adulthood. Our findings suggest that the treatment of such problems might have additional benefits in terms of reducing the suffering and disability associated with self-harm in later years. Moreover, because of the association between self-harm and suicide, we suggest that the treatment of common mental disorders during adolescence could constitute an important and hitherto unrecognised component of suicide prevention in young adults.

Contributors

GCP and PM had the idea for the study and developed the analysis plan with CC, HR, and JBC. Data were analysed by CC and HR. PM led the writing of the paper and CC, HR, GCP, JBC, CO, RB contributed to the writing of the paper.

Conflicts of interest

PM runs a National Health Service clinical service for people who self-harm and has been a member of the National Institute for Health and Clinical Excellence guideline development group on Self-harm: longer-term management. GCP, CC, HR, JCB, CO, and RB declare that they have no conflicts of interest.

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