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Physical stature and method-specific attempted suicide: cohort study of one million men

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Abstract

Adult height, a marker of early-life environment, has been sporadically associated with suicide risk. We have examined adult height and attempted suicide risk in a cohort of 1,102,293 Swedish men and, in fully-adjusted analyses, found decreasing stepwise associations between height and attempted suicides by any means and most specific means.

Keywords

Attempted suicide; Height; Cohort

1. Introduction

Although largely under genetic control, adult stature is also influenced by early life environmental factors. Short stature has been associated with lower parental (Whitley et al., 2008) and own (Davey Smith et al., 1998) socioeconomic status (SES), lower educational attainment, (Davey Smith et al., 1998) lower income, (Whitley et al., 2008) greater household overcrowding, (Whitley et al., 2008) poor nutrition, (Whitley et al., 2008) and psychological stress. (Montgomery et al., 1997) In the absence of direct measures, height is an increasingly used indicator of childhood circumstances, and has been associated with all cause mortality, cardiovascular disease and certain cancers. (Batty et al., 2009)

A much smaller literature has also identified increasing risks of completed (Allebeck and Bergh, 1992; Bjerkeset et al., 2008; Magnusson et al., 2005) and attempted suicide (Jiang et al., 1999) in shorter individuals. We have explored height-attempted suicide associations and mechanisms underlying them in a large cohort of over one million men followed up for an average 24 years. The large cohort size offers superior statistical power to previous studies and has, uniquely, enabled us to consider method-specific suicide attempts.

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Conflict of interest:

None.

2. Methods

All non-adopted men born in Sweden from 1950 to 1976 with both biological parents identified in the Multi-Generation Register were identified and linked to the Population and Housing Censuses records (1960 and 1970), and Military Service Conscription, Cause of Death, and National Hospital Discharge Registers, resulting in 1,379,531 successful matches. Height, weight and IQ measurements at ages 16-25 (mean age 18) were made at military conscription by medical personnel using standard protocols. Childhood SES was based on the highest occupation of either parent (1960/1970 census); adult SES was obtained from 1990 census records and was based on own occupation where available and household SES otherwise; marital status was extracted from the Longitudinal Database of Education, Income and Occupation (1990-2004).

Hospital admissions for attempted (non-fatal) suicide from 1969-2006 were identified from the Swedish Hospital Discharge Register, using injuries coded as intentional (International Classification of Diseases (ICD) 8/9: E950-E959; ICD 10: X60-X64) or undetermined (ICD 8/9: E980-E989; ICD 10: Y10-Y34). Our follow-up period covered three ICD revisions and we identified seven attempted suicide methods that were coded consistently between revisions: poisoning by solid or liquid; other poisoning; hanging, strangulation and suffocation; drowning; firearms and explosives; jumping or falling from a high place; and sharp object injuries (Table 1). These method-specific analyses were motivated, a priori, by observations that method preference, often determined by availability, varies with, among other factors, occupation and SES, (Kelly and Bunting, 1998) which are also associated with height. (Davey Smith et al., 1998)

Having checked that proportional hazard assumptions were not violated, Cox proportional hazards regression was used to explore attempted suicide associations with (i) quintiles of height in centimeters (cm) (174, 175-177, 178-181, 182-185, 186+) and (ii) z-scores for height (i.e. association with a standard deviation (SD=6.5cm) increase in height)). All analyses were adjusted for conscription age. Separate models controlled for childhood and adult SES (seven categories), IQ, body mass index (BMI), and marital status (four categories). Multiply-adjusted models also included conscription centre and birth year. Analyses were repeated (i) excluding men with pre-conscription hospital discharges for psychiatric illness (ICD 8/9 codes: 290-319), to examine the possibility that psychiatric illness might explain height-attempted suicide associations, and (ii) stratified by birth year, to explore the impact of improving childhood conditions leading to secular increases in height and reductions in suicide risk. Analyses are based on men with complete data for all variables.

3. Results

The original cohort consisted of 1,379,531 men of whom 1,102,293 (79.9%) had complete data on height and all covariates. Men were followed-up for an average 24 years during which 17,276 (1.6%) had at least one attempted suicide admission. The most common attempted suicide method was attempted poisoning by solid or liquid (1.3% of cohort had at least one attempt of this type), followed by sharp object injury (0.1%), other poisoning

(0.04%), hanging (0.04%), jumping (0.03%), firearms (0.02%) and drowning (0.01%). Men with attempted suicide admissions tended to have somewhat lower childhood and adult SES, lower IQ, and were less likely to be married.

Table 1 presents hazard ratios (HR) and 95% confidence intervals (CI) for attempted suicide by height. There were consistent stepwise decreases in attempted suicide by any means with increasing height (p for trend < 0.001). In age-adjusted analyses, the tallest men had a 40% (37%, 43%) reduction in hazard when compared to the shortest men and a SD increase in height was associated with a 16% (15%, 18%) decrease in risk of attempted suicide. Associations were somewhat attenuated by adjustment for childhood SES (HR (95% CI) per SD increase in height: 0.86 (0.84, 0.87)), adult SES (0.85 (0.84, 0.86)), marital status (0.85 (0.84, 0.87)) and, most markedly, IQ (0.91 (0.90, 0.92)), while adjustment for BMI had no impact on height-attempted suicide associations. Consistent, modest gradients of decreasing attempted suicide with increasing height remained in multiply-adjusted models (HR (95% CI) per SD increase: 0.93 (0.91, 0.94)). Height associations with the most common attempted suicide method (poisoning by solid or liquid) were almost identical to those for all-method attempted suicides, with stepwise decreases in hazard across all five height quintiles (results not shown but available on request). Height associations with the less common methods were less marked, owing to the lower number of events, but were generally consistent with an inverse trend of decreasing hazard with increasing height. The exception to this was attempted drowning, based on 101 events, for which there was no evidence of any height association. Results from analyses excluding 8,370 (0.8%) men with psychiatric illness identified prior to conscription were almost identical to those based on the full cohort and there was no evidence of any secular trend with birth year.

4. Discussion

We examined height-attempted suicide associations in a large cohort of men and, in common with other studies, observed a step-wise, inverse association of decreasing attempted suicide in taller men which was robust to adjustment for confounding factors, including markers of SES. The main strength of our analysis is the large study size and long follow-up, which has resulted in more events than have previously been available in this context. This has allowed the exploration of a number of mechanisms that may underlie the associations and, for the first time to our knowledge, the examination of height associations with method-specific attempted suicides. However, there are also limitations to our analyses. Firstly, although we have explored the confounding/mediating effects of a number of variables, including childhood and adult SES, we cannot eliminate the possibility of residual confounding by some other unmeasured factor(s). Secondly, attempted suicides were identified from hospital discharge data and are therefore restricted to attempts severe enough to warrant hospital admission; however, as hospital treatment in Sweden is free, we have no reason to suppose that there was any systematic bias arising from this approach. Finally, results are restricted to Swedish men and are not necessarily generalisable to other countries or to women, in whom previous studies (Batty et al., 2009) suggest that stature-health associations may be weaker.

A number of mechanisms have been proposed that might explain these associations. (Batty et al., 2009) Firstly, psychological stress in childhood has been associated with smaller stature (Montgomery et al., 1997) and may also lead to mental health problems and an increased risk of suicidal behaviour later in life. (Fergusson et al., 2000) Similarly, childhood abuse is a risk factor for suicide and self-harm (Fergusson et al., 2005) and may also influence childhood growth and stature. However, the strength of height-suicide associations from the current analyses was not attenuated by exclusion of men with psychiatric illness. Secondly, taller individuals are more likely to marry, possibly because of a greater perceived attractiveness in a height-conscious society, and marriage is protective against suicide, perhaps as a result of the instant social support that it offers. In the current analyses, adjustment for marital status led to very small attenuation of associations. Thirdly, low SES in childhood is associated with shorter stature (Whitley et al., 2008) and, in addition, shorter adults tend to be more downwardly mobile (Nystrom, 1992) and have a lower SES, regardless of their childhood SES. Low SES may result in greater social and financial disadvantage and is associated with a greater risk of suicide. Adjustment for childhood and adult SES led to a very small attenuation of height-attempted suicide associations in the current analysis. Similarly, poor childhood circumstances may affect growth, not only of stature, but also of factors such as lung capacity and a recent report (Giltay et al., 2010) suggests that poor respiratory function may be associated with an increase in completed suicide independently of other factors, including height. Finally, short individuals tend to have lower intelligence and to be less well educated (Davey Smith et al., 1998) than their taller peers. It is possible that, in addition to suffering greater discrimination and victimisation, shorter individuals may have poorer problem-solving skills and be less able cognitively to find alternative coping strategies when faced with adverse circumstances. Adjustment for IQ had the greatest impact on our height-attempted suicide associations and led to some attenuation of effect. As with any observational analysis, we cannot infer any causal association. However, it is of note that, even after multiple adjustment for confounding/mediating factors from across the life-course, a consistent gradient of decreasing attempted suicide risk with increasing height remained for attempted suicide by any means and for the majority of method-specific suicide attempts.

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Table 1Hazard ratio^a (95% confidence Interval) for the relation of adult height with attempted suicide^b

	N suicide / no suicide	Age adjusted	Multiple adjustment ^c
All attempted suicides			
1 (lowest quintile)	5,134 / 254,081	1.00	1.00
2	3,116 / 180,072	0.87 (0.83, 0.91)	0.97 (0.93, 1.01)
3	4,077 / 263,025	0.79 (0.76, 0.82)	0.92 (0.89, 0.96)
4	2,897 / 209,439	0.71 (0.68, 0.74)	0.88 (0.84, 0.92)
5	2,052 / 178,400	0.60 (0.57, 0.63)	0.78 (0.74, 0.82)
<i>d</i>		<0.001	<0.001
Per SD ^e increase	17,276 / 1,085,017	0.84 (0.82, 0.85)	0.93 (0.91, 0.94)
<i>P</i>		<0.001	<0.001
Method specific attempted suicides^f			
<i>Attempted poisoning (solid or liquid)</i>			
Per SD ^e increase	13,705 / 1,088,588	0.83 (0.82, 0.84)	0.92 (0.91, 0.94)
<i>P</i>		<0.001	<0.001
<i>Attempted sharp object injury</i>			
Per SD ^e increase	1,603 / 1,100,690	0.85 (0.81, 0.89)	0.94 (0.90, 0.99)
<i>P</i>		<0.001	0.02
<i>Other attempted poisoning</i>			
Per SD ^e increase	443 / 1,101,850	0.81 (0.74, 0.89)	0.89 (0.81, 0.98)
<i>P</i>		<0.001	0.02
<i>Attempted hanging</i>			
Per SD ^e increase	383 / 1,101,910	0.81 (0.74, 0.90)	0.88 (0.80, 0.98)
<i>P</i>		<0.001	0.02
<i>Attempted jumping</i>			
Per SD ^e increase	348 / 1,101,945	0.84 (0.76, 0.94)	0.91 (0.82, 1.01)
<i>P</i>		0.002	0.07
<i>Attempted firearms injury</i>			
Per SD ^e increase	205 / 1,102,088	0.84 (0.73, 0.96)	0.92 (0.80, 1.05)
<i>P</i>		0.01	0.21
<i>Attempted drowning</i>			
Per SD ^e increase	101 / 1,102,192	0.94 (0.77, 1.14)	1.01 (0.83, 1.23)
<i>P</i>		0.51	0.94

^a Analyses were based on the first hospital admission after conscription for attempted suicide by the method of interest. Follow-up began on the date of conscription, when height was measured, and ended on the earliest of: date of attempted suicide, death, emigration, or 31 December 2006.

^b Includes undetermined injuries

^c Adjusted for age, conscription centre, year of birth, childhood SES, adult SES, marital status, IQ and educational attainment

^d P for trend

^e SD = 6.5cm

^fICD codes: poisoning by solid or liquid (including drugs) ICD8/9: E950, E980; ICD10: X60-X65, X68-X69, Y10-Y15, Y18-Y19; other poisoning (including domestic gas and vehicle exhaust) ICD8/9: E951-E952, E981-E982; ICD10: X66-X67, Y16-Y17; hanging, strangulation and suffocation ICD8/9: E953, E983; ICD10: X70, Y20; drowning ICD8/9: E954, E984; ICD10: X71, Y21; firearms and explosives ICD8/9: E955, E985; ICD10: X72-X75, Y22-Y25; jumping or falling from a high place ICD8/9: E957, E987; ICD10: X80, Y30; and sharp object injuries ICD8/9: E956, E986; ICD10: X78, Y28