Adolescent self-harm and suicidal behavior and young adult outcomes in indigenous and non-indigenous peoples

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Keywords: suicidal behavior; adolescent; indigenous; epidemiology; longitudinal

ABSTRACT

The aim of this study was to examine the associations between self-harm and suicidal behavior in indigenous Sami and non-Sami adolescents and mental health and social outcomes in young adulthood. Data were obtained by linking the Norwegian Patient Registry (2008–12), the National Insurance Registry (2003–13), and the Norwegian Arctic Adolescent Health Study, a school-based survey inviting all 10th grade students in North Norway (2003–05). In total, 3,987 (68%) of all 5,877 invited participants consented to the registry linkage, of whom 9.2% were indigenous Sami. Multivariable logistic regression was used to explore the associations between self-harm only, suicidal ideation with and without self-harm, and suicide attempts in adolescence (≤16-year-old), and later mental health disorders, long-term medical, social welfare benefit receipt, or long-term unemployment in young adulthood.

Self-harm and suicidal behavior in Sami and non-Sami adolescents was associated with increased risk of later mental health disorders, long-term welfare benefit receipt, and long-term unemployment. These associations were attenuated by adolescent psychosocial problems. No major differences between the indigenous Sami participants and their non-Sami peers were found. Young suicide attempters experienced the highest risk, with adolescent suicide attempts being significantly associated with all four adult outcomes after adjustment. Self-harm and suicidal behavior in adolescence is a marker of mental health disorders and unfavorable social outcomes in young adulthood, mostly accounted for by adolescent psychosocial problems. In contrast to other indigenous peoples, no indigenous health disparities were found, indicating that the indigenous Sami adolescents were not worse off.

INTRODUCTION

Suicidal behavior and suicide, together comprising one of the three leading causes of death in youth, are significant public health problems worldwide and associated with psychosocial and mental health problems [1–4]. The debut of suicidal ideation, self-harm, and suicide attempts has its peak in adolescence [3, 5] and these occurrences outnumber completed suicides, which are relatively rare in youth [1, 3, 5–8]. Around 40–100 suicide attempts per suicide are estimated for adolescents [7, 9]. Self-harm and suicidal ideation is even more common, and many young individuals struggle with suicidal thoughts or behavior [1, 3, 6, 8, 10]. In several indigenous groups worldwide, high rates of suicidal behavior and suicides stand out as a serious public health challenge, particularly in some Arctic regions [3, 4, 11–13]. Great efforts to prevent suicides have been made [1–3], in spite of the fact that suicides are difficult to predict, even for at-risk individuals [3, 14, 15]. In a life course perspective, it is important to examine how adolescents who self-harm or experience suicidal behavior transition into adulthood and their long-term outcomes.

Indigenous youth worldwide have higher rates of suicide, suicidal behavior, and poor social outcomes than the non-indigenous population, although this varies between groups [3, 4, 11–13]. In the circumpolar regions these problems have emerged as a serious public health challenge [11, 12]. This includes highly developed countries such as Canada, the US, and Denmark, where high rates of suicide among Inuit youth occur [11, 12]. The Sami people reside in northern Scandinavia and the Russian Kola Peninsula. The majority of the Sami live in Norway, and over the last four decades a process of integration, increased ethnic revival, and self-determination has gradually replaced a history of forced assimilation and colonization [16]. Even though the indigenous Sami across the Nordic countries have an increased risk of suicide, the rates found in Sami are moderate compared to other indigenous peoples [11, 16]. The differences in suicidal behavior in Sami youth compared to their non-indigenous peers seem minor, if any [16–19]. In addition, the correlates of suicidal behavior, such as mental health disorders and traumatic life events, appear similar in both ethnic groups [20, 21]. Societal inequalities and inequities affect health in general and suicidal behavior, indigenous adolescents included [1, 3, 4, 16, 22]. Few disparities are found between the Sami and non-Sami populations in Norway with regard to socioeconomic conditions today [16, 18]. The Scandinavian focus on social equality, integration, and increased ethnic revival has been proposed as a possible reason behind better health outcomes among the Sami [16].

Longitudinal studies have shown associations between adolescent suicidal behavior and later suicidal behavior and mental health problems in young adulthood [23–29]. However, few studies have looked at different categories of suicidal behavior [23, 24] or self-harm. There can be a distinct difference in motive and intent for self-injurious behaviors. It varies between self-harm without suicidal intent to suicidal attempts. Still, all these phenomena are part of the dimensional spectrum of self-harm and suicidal behavior [1, 15]. Most of the previous studies on adolescents have focused on either suicidal ideation [25, 28] or suicide attempts [26, 27, 29]. Some of these studies have examined later adult functioning and social outcomes, showing associations with psychosocial functioning, financial difficulties, and need of social support [23, 25–27, 29]. Most of these outcomes were primarily assessed by self-reported risk scales [23, 25–27, 29], and only two studies have examined suicidal ideation and attempts in adolescence [23, 24]. Considering the lack of studies examining the adult outcomes of different levels of suicidal behavior in adolescence, we wanted to examine the risk of later mental health and social problems in four different categories of self-harm and suicidal behavior in adolescence, from self-harm without suicidal intent to suicidal attempts. The aim was to explore any difference in risk of unfavorable outcomes within the spectrum of self-injurious behaviors, while respecting the dimensional view of these behaviors.

In the present study, we aimed to examine the transition into adulthood for adolescents experiencing self-harm and suicidal behaviors. Data were obtained by the linkage between a representative sample of Sami and non-Sami junior high school students linked to the Norwegian Patient Registry and the National Insurance Registry to investigate health and social outcomes in young adulthood. The main aim of the study was to examine the relationship between four different categories of self-harm and suicidal behavior in adolescence—self-harm only, suicidal ideation only, suicidal ideation and self-harm, and suicide attempts—and mental health disorders, long-term medical welfare and social welfare receipt and long-term unemployment in young adulthood. Further, we examined to what degree the adolescent self-harm and suicidal behaviors were associated with the adult outcomes, adjusting for several sociodemographic and adolescent psychosocial factors such as adverse life events, anxiety, and depressive symptoms. Secondly, we explored for differences in the outcome of suicidal behavior in indigenous Sami and non-indigenous adolescents and for males and females.

METHOD

Study design

The Norwegian Arctic Adolescent Health Study (NAAHS) [30] was conducted among 10th graders (15–16-year-olds) in nearly all junior high schools (292 out of 293) in the three northernmost counties in Norway, in 2003–05. The questionnaires were administered in classroom settings by project staff and completed during two school hours. Students who were absent completed the questionnaire at a later date. There were no specific exclusion criteria in this study.

The participants from the NAAHS were linked to the Norwegian Patient Registry (NPR) [31, 32] and the National Insurance Administration Registry [33]. The NPR is a detailed registry from 2008 that includes personal identification of specialized healthcare utilization. We used available data from specialized mental healthcare from 2008 through 2012 (participants 18–20 to 23–25 years of age) [32]. The database FD-trygd keeps records of national medical and social welfare benefits and unemployment. In Norway, citizens can receive medical benefits for work impairing illness or injury. Medical benefits include sickness benefits (up to 52 weeks for employed citizens), medical and vocational rehabilitation (called work assessment allowance (AAP) from 2010), and disability pension. We used available data from 2003–2011 for welfare benefits (6.5–8.5 years of follow-up) and from 2003–2013 (8.5–10.5 years of follow-up) for unemployment. Follow-up time started at July 1 of the corresponding year the participants responded to the NAAHS and had finished Norwegian junior high school [33].

Ethics

The students and their parents were given written information about the study in the Sami or Norwegian language, and the students provided written consent. The Norwegian Data Inspectorate and the school authorities approved the NAAHS. The Regional Medical Ethical Committee approved the NAAHS and the registry linkage. The Norwegian Institute of Public Health and Statistics Norway carried out the linkage. As data on ethnicity is not permitted to be recorded in the Norwegian registers or census, Sami health and welfare data can only be sourced from surveys. In the present study, we were approved to aggregate survey data from the NAAHS identifying Sami and non-Sami adolescents, with national health and welfare registers, which enabled us to recognize Sami and non-Sami cohorts and compare for health and social outcomes.

Sample

In total, 4,881 out of 5,877 (83%) invited students responded to the NAAHS, and 3,987 (82%) consented to a future registry linkage, resulting in a 68% sample of all 10th grade students (15–16 years of age) in Northern Norway. The registry sample consisted of 49.9% females and 9.2% indigenous Sami. The registry sample was representative of the original NAAHS sample, and the proportion of mental healthcare users in our sample was comparable to total population data [32].

Adolescent measures

Adolescent self-harm and suicidal behavior (ASSB)

The participants were asked, "Have you ever: -considered ending your own life, -attempted to take your own life, -hurt yourself on purpose?" The three questions had yes/no options. A dimensional approach to the categorization of suicidal behaviors was used [1, 34], with the intention to show the outcome of an increase in severity of motive and intent in the range of ASSB from self-harm with no suicidal intent to suicidal attempts. *Self-harm* was defined as the participants ever having *self-harmed* and *self-harmed only*, with no suicidal ideation or attempts. *Suicidal ideation* was defined as the participants reporting suicidal ideation and no suicide attempts. Suicidal ideation was further divided into *suicidal ideation and no self-harm* and *suicidal ideation and self-harm*. *Suicide attempts* were defined as the participants reporting suicide attempts. Nearly all attempters reported suicidal ideation (96.5%) and self-harm (87.9%).

The questionnaire did not include questions about the debut of suicidal ideation, but did ask about debut of suicide attempts. We consider our data reliable as the debut of suicide attempts in our sample was comparable to previous knowledge (<10 years = 0.4%, 10–12 years = 1.6%, 13–15 years = 5.9%) [5, 35]. Five possible types of suicide attempt methods were listed as options, and out of the total sample, 6.0% of the adolescents reported use of a sharp object, 2.1% pills/medication, 1.2% strangulation, 0.3% firearm and 2.1% other methods.

Psychosocial factors

Self-efficacy ($\alpha = 0.77$) was measured by a five-item version of the *General Perceived Self-Efficacy Scale* [36]. Responses were scored on a four-point Likert scale from "completely wrong" (1) to "completely right" (4). *Parental involvement* was measured by a four-item

version of the *Parental Involvement Scale* ($\alpha = 0.78$) [37, 38]. *Parental support* ($\alpha = 0.88$) was measured by five statements on family attachment, being valued and taken seriously, and receiving help when needed [37]. *Peer support* ($\alpha = 0.84$) was measured by four statements on peer attachment and support, being valued, and receiving help when needed [37]. *Parental involvement* and *parental* and *peer support* were scored on a four-point Likert scale from "completely agree" (0) to "completely disagree" (4).

School-related stress ($\alpha = 0.66$) was measured by the following four experiences: work pressure, pressure to succeed, concentration difficulties, and difficulties understanding the teacher [37]. Responses were scored on a three-point scale from "no" (1) to "yes, often" (3). Adverse life events such as parental drug problems, bullying, and assault were measured by 12 dichotomized questions described by Eckhoff and Kvernmo [37]. *Anxiety/depression symptoms* were measured by the Hopkins Symptom Checklist 10-item version (HSCL-10) [39]. The HSCL-10 ($\alpha = 0.87$) measures symptoms in the previous week. Psychometrics has been validated among subjects aged 16–24 years [40]. The HSCL-10 was handled continuously in the multivariable analyses.

Sociodemographic factors

Parental education: Parents' highest education was obtained from Statistics Norway's education registry, registered when the participants were 15–16 years old. Parental education was categorized from "lower secondary" (≤10th grade), "upper secondary" (11^{th}–13th grade), "lower university degree" (up to 5 years) to "higher university degree" (5 years or more) [41].

Sami ethnicity was defined by a participant having one or more of the following factors: Sami parentage or Sami language competence in the family, or Sami self-labeling [42]. The majority of the Sami adolescents labeled themselves as Sami (73.7%). The Sami ethnicity group was representative of the self-labeling group.

Adult outcomes

Mental health disorders

Mental health disorders consisted of participants registered as patients in the specialized psychiatric patient registry, including use of public psychiatric healthcare and private specialists [32], and participants receiving sickness and medical rehabilitation benefits due to mental health disorders [33]. Disability pensions were not included in this group due to the low number of recipients, their young age, and because these individuals seemingly had other

difficulties. The baseline characteristics of the mental healthcare and medical benefit users have been presented in previous studies [32, 33]. In total, 20.8% (113 of 543) of the mental healthcare users were undiagnosed (n = 16 with diagnosed disorder in the National Insurance Registry) based on aggregating the two registries.

National welfare benefits and unemployment

Long-term medical benefits were defined as participants receiving three or more months of 100% sickness benefits (graded sick-leave days recalculated to 100% days) in a 12-month period (not within a calendar year) or receipt of medical rehabilitation benefits in the study period [33]. *Long-term social welfare benefits* were defined as participants receiving three or more months of benefits in a 12-month period. The cutoffs were based on previous research on work marginalization in Norway [43]. However, the social welfare cutoff was reduced to three months to increase power. We excluded 116 sickness benefit recipients and seven social welfare benefit recipients due to missing end dates for the benefit period [33].

Long-term unemployment was defined as a period of 12 months or more, as by the OECD [44], of unemployment based on registered work applicants. Part-time employed were excluded. However, participants registered as unemployed while receiving other benefits, employment measures, or other services were still included since they were without work. Therefore, we expected higher numbers compared to national unemployment rates [44]. However, quarterly comparisons were examined and 9.6% of the participants were registered as unemployed during the fourth quarter of 2013, comparable to the youth unemployment rate in Norway at 9–10% [45].

Data analysis

The adolescent psychosocial problems were significantly correlated with the ASSBs and the adult outcomes, and they were subsequently included as adjusting factors in the multivariable analyses. Chi-square tests were used for the bivariate analyses, stratified by gender and ethnicity (Table 1–2). The Mantel-Haenszel test of linear trend was used for the associations of the extent of suicidal behavior, and Yates's chi-squared tests for 2x2 tables were employed as well. Logistic regression was used for the multivariable analyses for the dichotomized adult outcomes (Table 3). The participants with no ASSB were used as the reference group to which we compared the other ASSB groups. Interactions between gender and Sami ethnicity and the ASSBs in relation to the adult outcomes were explored. In the multivariable analyses, we first adjusted for the sociodemographic factors and secondly with the addition of

adolescent psychosocial factors (Table 3). Based on a 10% outcome rate in the non-exposed group, then, the following odds ratios (OR) should be considered as small (OR = 1.46), medium (OR = 2.50), and large (OR = 4.14) effect sizes [46]. All analyses were conducted with IBM SPSS 24. The statistical significance level was set to .05. Bonferroni-adjusted significance levels for multiple comparisons ($0.05/n_{factors}$) are presented for the multivariable analysis as a conservative comparison of significance.

RESULTS

Adolescent self-harm and suicidal behavior (ASSB)

In total, 10.1% reported having self-harmed only, 13.3% reported suicidal ideation and no self-harm, 11.8% reported suicidal ideation and self-harm, and 9.0% reported suicide attempts (Table 1). All ASSBs were more common in females, except for self-harm without suicidal ideation that was more common in males. Overall, there was a non-significant trend of higher reports of self-harm, suicidal ideation and self-harm, and suicide attempts in Sami adolescents (Table 1). In gender-stratified analyses, suicide attempts were 2.48 times higher in Sami males ($\chi 2$ (1, n = 1218) = 9.25, p = .002) compared to non-Sami males, while Sami females reported 1.09 times higher rates of suicide attempts than non-Sami females ($\chi 2$ (1, n = 1,095) = 0.13, p = .71). No other statistically significant gender differences occurred between Sami and non-Sami youth.

Mental health disorders and welfare benefits in young adulthood

A higher proportion of females were registered with adult mental health disorders, long-term medical welfare benefit receipt, and long-term unemployment (Table 1). No difference in adult mental health disorders occurred between Sami and non-Sami, while significantly more Sami participants had received either long-term medical or social welfare benefits. Sami females were registered with less long-term unemployment than non-Sami females, while Sami males had more long-term unemployment than non-Sami males. Of the long-term unemployed, 32.4% had received long-term social welfare benefits, 36.3% had received long-term medical welfare benefits, and 25.2% of the participants had received both long-term medical and social welfare benefits.

Associations with adult mental health disorders and welfare benefits

Increased suicidal intent in the dimensional range of ASSB was associated with a significantly higher proportion of participants registered with later mental health disorders (Table 2). Sami participants reporting adolescent suicidal ideation only were the exception, with lower rates compared to the participants reporting no ASSB. Overall, there was an increase in both long-term welfare benefits and long-term unemployment in young adults reporting ASSB, except for those reporting suicidal ideation only. The rates were highest for the participants reporting suicide attempts, where 35.9% had mental health disorders, and 56.2% had either received long-term welfare benefits or been long-term unemployed in young adulthood (Table 2).

The relationship between the different ASSBs and later mental health disorders did not differ between Sami and non-Sami (Table 2). Adolescent females who reported having made a suicidal attempt had significantly more adult mental health disorders compared to males (38.8% vs. 24.6%) and had received significantly more long-term medical welfare benefits than males (30.4% vs. 14.5%). Males who reported having made a suicidal attempt had received more long-term social welfare, however not significantly ($p = .11$). The Sami adolescents reporting self-harm only received significantly more long-term medical benefits with a similar trend for the other adult difficulties. For the other ASSBs, however, there were mainly minor and non-significant ethnic differences (Table 2).

Table 3 shows the unadjusted and adjusted odds ratios in the multivariate analyses for the different ASSBs, with the participants reporting no ASSB as a reference group. All categories of ASSB were associated with later mental health disorders, except for the participants reporting self-harm only when adjusted for sociodemographic and adolescent psychosocial factors. In the fully adjusted model, adolescent suicide attempts were the only factor associated with all the adult outcomes. The adolescent suicidal thought and self-harm group was significantly associated with both long-term social and medical welfare benefits and long-term unemployment when adjusted for sociodemographic factors, while participants reporting adolescent self-harm only had significantly more long-term social welfare benefit receipt and long-term unemployment (Table 3). No interactions were significant for either ASSB and gender or ethnic group. The interaction term with self-harm only by Sami ethnicity was nearly significant ($p = .055$) for long-term medical welfare benefits, as could be deduced by the findings in Table 2.

DISCUSSION

This study provides evidence that Sami and non-Sami adolescents experiencing self-harm or suicidal behavior are at increased risk of later mental health disorders, as well as worse long-term functioning in young adulthood. Adolescent sociodemographic and psychosocial problems attenuated the relationships found between ASSB and the adult outcomes. Young suicide attempters had the highest risk for unfavorable mental health and social outcomes, and this was the only ASSB significantly associated with all four adult outcomes when adjusted for sociodemographic and psychosocial factors. No major differences occurred between the indigenous Sami participants and their non-indigenous peers.

Similar to previous studies, we found ASSB to be common and more prevalent in females [1–3], while we found self-harm without suicidal ideation to be more common in males. The high reports in this study might reflect the lower intent and lethality of suicidal behaviors in youth [47], compared to adults. Our findings are supported by previous studies that have shown comparable high self-reports of ASSB [6, 10, 27], compared to lower proportions reported from interview settings [23, 24]. Our overall finding that ASSB was associated with increased rates of mental health disorders and unfavorable social outcomes in young adulthood was comparable to previous longitudinal studies on adolescent suicidal behavior [23–29].

The large sample size in this study allowed us to differentiate ASSB into four dimensional categories. Alongside the overall conclusions, previous studies differentiating suicidal behavior show some different results, compared to our findings, that may be influenced by methodological differences. Both Copeland et al. [23] and Fergusson et al. [24] found little difference in successful transition into adulthood between suicidal ideation and suicide attempts in their adjusted analyses, while our findings showed a significant increased risk in the participants reporting suicide attempts compared to the other ASSBs of less suicidal intent, as self-harm without suicidal ideation. However, the unadjusted findings presented by Fergusson et al. [24] showed a similar increase in adult mental health disorders from adolescent suicidal ideation to attempts, comparable to our findings. Thus, the differences may have been influenced by a difference in statistical power. In contrast to the findings of Copeland et al. [23], the adolescents reporting suicidal ideation only were no more troubled with long-term welfare or unemployment than those with no reports of suicidal behavior. This could be due to methodological differences and suicidal ideation being a more common phenomenon in this sample. Participants reporting both suicidal ideation and self-harm were at increased risk of unfavorable functional outcomes in young adulthood.

To our knowledge, there have been no previous studies showing the longitudinal outcome of ASSB in an indigenous population compared to their non-indigenous peers. In contrast to previous findings [18, 48], Sami males reported significantly more suicide attempts than their non-Sami male peers. Still, there were no major differences in terms of the adult outcomes between the indigenous Sami adolescents reporting ASSB and their non-Sami peers. While not directly comparable, this stands in great contrast to previous studies showing poor social outcomes and high suicide rates for indigenous people in general worldwide [3, 4, 11, 13]. Interestingly, Sami adolescents reporting self-harm only seemed to be worse off in all the adult outcomes, but this was a non-significant trend. The lack of major differences between Sami youth and their non-indigenous peers, compared to other indigenous people, might be results of several societal factors, such as the improved dedicated health services for Sami and increased cultural revitalization in the last decades [16], but also a national welfare system offering a good level of health-related services and social security for all inhabitants, the Sami included.

Comparable to previous studies [23, 24, 26–28], the predictive risk associated with ASSB was largely attributable to adolescent psychosocial problems. However, the adolescents reporting having made a suicidal attempt had a significant increased risk of all the adult outcomes, even adjusted for adolescent psychosocial factors, supporting the significant findings found in two previous studies focused on suicide attempts [26, 27]. The significant increased risk of later mental health disorders, medical and social welfare receipt and unemployment highlights the dimensional aspect of the increased risk of unfavorable outcomes associated with the increased lethality in the ASSBs. This gives clinicians useful insight into the subsequent risk associated with the different behaviors in adolescence, from non-suicidal self-harm to suicidal attempts, alongside the knowledge of mental health disorders and their outcomes. We still emphasize that we view self-harm and suicidal behavior as an important indicator of underlying struggle and not the direct cause of the outcomes in this study [26], as indicated by the attenuated results. It is also important to note that two-thirds of adolescents reporting suicide attempts had no indication of later mental health disorders, indicating that for many this may be part of transitory adolescent struggles. The risk of adult social difficulties, however, was greater, with 56.2% having received one of the long-term welfare benefits or having been long-term unemployed.

The main strength of this study is that it shows the transition of ASSB into adulthood by linking a large and representative multiethnic population study to two national registries of high quality, resulting in a follow-up period up to 10 years. The large sample gave us the

opportunity to provide representable proportions for the adult outcome, and we were able to differentiate self-harm and suicidal behavior on four different levels. In general, the Norwegian welfare system offers good accessibility to healthcare and welfare for all inhabitants. Although healthcare accessibility may vary in rural areas, the use of healthcare and welfare registries in combination offers excellent research measures for health and social outcomes.

The NPR registry had few logical errors, while the National Insurance Registry was missing some medical rehabilitation (12%) and sickness benefit (21%) diagnoses [33]. The missing sickness benefit end dates may have led to an underestimation of this outcome. However, the National Insurance Registry was beneficial in supplying measures from primary healthcare, for example, participants receiving sick leave due to mental health problems by their general practitioner without seeking specialist treatment. The national welfare system would also minimalize any financial reasons for not seeking treatment. The long-term unemployment rates were high, but were based on any long-term unemployment, including employment measures and other services administered through the Norwegian Labor and Welfare Administration (NAV), during the entire study period of up to 11.5 years. In comparison, the OECD reported a 2.5% long-term unemployment incidence rate for youth in Norway (2008) [49].

The population study relied on self-reports with the risk of information bias. However, questions about suicidal behavior are of a serious nature and should thus be less influenced by recall bias. Some of the psychosocial scales used in this study are not frequently used outside the Norwegian Youth Studies [30]. The HSCL-10 is well validated, but measures only anxiety/depression symptoms in the previous week. A lack of diagnostic data from the adolescent study made it difficult to explore for high-risk individuals within the examined relationships.

Mental health problems are complex, and inclusion of several factors that potentially mediate or confound each other in a model can lead to underestimation of some relationships. Including adjustments for several adolescent psychosocial problems might be an over-adjustment of the associations between ASSB and the adult difficulties. The fully adjusted findings in this study might, therefore, be more representative for a clinical patient group of struggling adolescents.

The findings from this study show that self-harm and suicidal behavior are common phenomenon in adolescence and the majority with these experiences are coping well in young adulthood. However, ASSB is clearly a marker of mental health disorders and unfavorable

social outcomes in young adulthood, mostly accounted for by adolescent psychosocial problems. The significant rates of suicidal behavior are unlikely to change and pose a major challenge for health and welfare systems worldwide. Adolescence stands out as a natural target for interventions to reduce the risk of poor outcomes in adulthood. Young suicide attempters experience the highest risk and are those most in need of interventions and follow-up. In strong contrast to the general reports of high rates of suicidal behavior and poor outcomes in worldwide, the circumpolar region in particular, the indigenous Sami youth in Norway do not seem to be worse off than their non-Sami peers. Although no direct causal link can be established, this might be a result of decades of increased focus on ethnic revival and self-determination for the Sami people, and a well-functioning welfare system ensuring stable social and economic conditions. Our findings do not counteract the fact that research on suicidal behavior and prevention should be culturally sensitive in detecting possible cultural and ethnic specific predictors of suicidal behavior.

Author contributions

CE contributed to the concept and design of the study, the acquisition of registry data, analysis and interpretation of data, and drafting and revising the manuscript. CE had full access to the data in this study and takes responsibility for the integrity of the data and the accuracy of the data analysis. MTS contributed to the analysis and interpretation of data, drafting, critical review, and revision of the manuscript. SK contributed to the concept and design of the study, acquisition of data, analysis and interpretation of data, critical review, and revision of the manuscript.

Acknowledgements

Data from the Norwegian Patient Register (NPR) have been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Norwegian Patient Register is intended or should be inferred.

Funding

This work was funded by the Sami Norwegian National Advisory Unit on Mental Health and Substance Use (SANKS). UiT The Arctic University of Norway, the Centre for Sami Health Research, and the Norwegian Institute of Public Health funded the NAAHS study. The

registry linkage was funded by the University Hospital of North Norway and Nordland Hospital. The authors would like to thank all the participants of the NAAHS study.

Conflict of interest

CE has received research support from the Sami Norwegian National Advisory Unit on Mental Health and Substance Use (SANKS). MTS and SK report no financial or potential conflicts of interest.

Ethics

The students and their parents were given written information about the study, and the students provided written consent. The Norwegian Data Inspectorate and the school authorities approved the NAAHS. The Regional Medical Ethical Committee approved the NAAHS and the registry linkage. The Norwegian Institute of Public Health and Statistics Norway carried out the linkage.

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Table 1 Descriptive statistics for adolescent self-harm and suicidal behavior (ASSB) and adult outcomes, by ethnicity and gender

	Sami (%)				Non-Sami (%)				
Factors (%)	Females n=184	Males n=170	Total n=354	Gender diff. (χ2)	Females n=1634	Males n=1587	Total n=3221	Gender diff.(χ2)	Ethnic diff. (χ2)
ASSB:	54.9	38.8	47.2	$8.52^{p=.004}$	53.7	34.0	44.0	$126.91^{p<.001}$	$1.18^{p=.28}$
Self-harm	37.4	26.7	32.2	$4.09^{p=.043}$	36.8	22.6	29.8	$77.44^{p<.001}$	$0.79^{p=.37}$
Self-harm only	4.9	9.4	7.1	$2.11^{p=.15}$	7.7	13.2	10.4	$24.98^{p<.001}$	$3.58^{p=.059}$
Suicidal ideation	34.8	21.2	28.2	$7.41^{p=.006}$	32.1	17.5	24.9	$90.98^{p<.001}$	$1.70^{p=.193}$
no self-harm	15.2	11.2	13.3	$0.93^{p=.34}$	15.9	10.9	13.4	$16.73^{p<.001}$	$0.01^{p=.99}$
and self-harm	19.6	10.0	15.0	$5.62^{p=.018}$	16.2	6.6	11.5	$72.38^{p<.001}$	$3.36^{p=.066}$
Suicidal attempts	15.2	8.2	11.8	$3.55^{p=.059}$	13.9	3.3	8.6	$113.67^{p<.001}$	$3.59^{p=.058}$
Adult outcomes[a]:									
Mental health disorders:	17.6	12.4	15.1	$1.60^{p=.21}$	18.9	11.8	15.4	$31.09^{p<.001}$	$0.01^{p=.94}$
Mental healthcare users	12.8	11.2	12.1	$0.10^{p=.76}$	16.1	10.8	13.5	$19.06^{p<.001}$	$0.46^{p=.50}$
Sickness benefits	7.0	2.8	4.9	$2.51^{p=.11}$	5.9	2.8	4.3	$18.76^{p<.001}$	$0.16^{p=.69}$
Medical rehabilitation	2.7	0.6	1.6	$1.40^{p=.24}$	1.2	1.0	1.1	$0.02^{p=.88}$	$0.45^{p=.50}$
Long-term welfare benefits:	23.5	24.7	24.1	$0.02^{p=.89}$	21.5	16.9	19.2	$10.96^{p=.001}$	$4.69^{p=.030}$
Medical benefits	17.6	10.1	14.0	$3.70^{p=.054}$	14.0	8.0	11.0	$29.77^{p<.001}$	$2.66^{p=.10}$
Social welfare benefits	11.2	16.9	14.0	$1.96^{p=.16}$	10.5	11.3	10.9	$0.40^{p=.53}$	$2.85^{p=.090}$
Long-term unemployment	17.6	21.3	19.5	$0.58^{p=.45}$	22.1	16.6	19.4	$15.71^{p<.001}$	$0.01^{p=.99}$

Note: Statistical analyses: Chi-square test (χ2). [a]Accumulated data from the Norwegian Patient Registry (2008–12) and the National Insurance Registry for the entire study period (2003–2013). Long-term benefits defined as three or more months of sickness or social welfare benefits in a 12-month period or medical rehabilitation benefits. Long-term unemployment defined as $\geq$12-months.

Table 2 The proportion of adolescents with mental health disorders, long-term welfare benefit receipt, and unemployment in young adulthood by self-harm and different categories of suicidal behavior in adolescence (ASSB), by gender and ethnicity

	Adult mental health disorders (%)						
ASSB (%)	Total sample n=629	Females n=386	Males n=243	Gender diff. ($\chi2$)	Sami n=55	Non-Sami n=504	Ethnic diff. ($\chi2$)
No ASSB (n=2135)	10.2	11.8	9.0	$4.02^{p=.045}$	10.7	10.0	$0.03^{p=.86}$
Self-harm only (n=388)	14.4	17.9	12.3	$1.86^{p=.17}$	20.0	13.1	$0.44^{p=.51}$
Suicidal ideation only (n= 508)	17.3	18.0	16.3	$0.16^{p=.69}$	10.6	18.1	$1.15^{p=.28}$
Suicidal ideation and self-harm (n=453)	23.6	24.5	21.6	$0.27^{p=.60}$	24.5	23.8	$0.01^{p=.99}$
Suicidal attempts (n=345)	35.9	38.8	24.6	$4.19^{p=.041}$	26.2	37.1	$1.46^{p=.23}$
Suicidal behavior diff. ($\chi2$)	$169.37^{p<.001}$	$95.44^{p<.001}$	$36.64^{p<.001}$		$8.66^{p=.003}$	$155.14^{p<.001}$	
	Adult long-term medical welfare benefits (%)						
	Total sample n=463	Females n=295	Males n=169	Gender diff. ($\chi2$)	Sami n=51	Non-Sami n=360	Ethnic diff. ($\chi2$)
No ASSB	8.8	10.4	7.5	$5.05^{p=.025}$	10.2	8.5	$0.38^{p=.54}$
Self-harm only	11.3	17.2	7.8	$7.11^{p=.008}$	28.0	10.1	$5.68^{p=.017}$
Suicidal ideation only	10.6	13.1	6.9	$4.33^{p=.037}$	10.6	9.7	$0.01^{p=.99}$
Suicidal ideation and self-harm	13.9	14.4	12.7	$0.11^{p=.74}$	17.0	13.5	$0.22^{p=.64}$
Suicidal attempts	27.2	30.4	14.5	$6.30^{p=.012}$	23.8	26.8	$0.05^{p=.83}$
Suicidal behavior diff. ($\chi2$)	$74.08^{p<.001}$	$44.77^{p<.001}$	$5.00^{p=.025}$		$4.53^{p=.033}$	$59.19^{p<.001}$	
	Adult long-term social welfare benefits (%)						
	Total sample n=456	Females n=228	Males n=228	Gender diff. ($\chi2$)	Sami n=51	Non-Sami n=357	Ethnic diff. ($\chi2$)
No ASSB	8.3	7.0	9.3	$3.44^{p=.064}$	12.3	7.8	$4.06^{p=.044}$
Self-harm only	13.1	15.9	11.5	$1.14^{p=.29}$	24.0	12.2	$1.89^{p=.17}$
Suicidal ideation only	7.1	5.6	9.4	$2.11^{p=.15}$	8.5	6.9	$0.01^{p=.92}$
Suicidal ideation and self-harm	14.6	12.9	18.7	$2.11^{p=.15}$	13.2	15.1	$0.03^{p=.87}$
Suicidal attempts	27.8	25.7	36.2	$2.53^{p=.11}$	23.8	27.9	$0.13^{p=.72}$
Suicidal behavior diff. ($\chi2$)	$79.07^{p<.001}$	$52.04^{p<.001}$	$34.47^{p<.001}$		$1.48^{p=.22}$	$76.73^{p<.001}$	
	Adult long-term unemployment (%)						
	Total sample n=786	Females n=438	Males n=348	Gender diff. ($\chi2$)	Sami n=71	Non-Sami n=635	Ethnic diff. ($\chi2$)
No ASSB	16.0	17.1	15.2	$1.16^{p=.28}$	15.5	16.0	$0.01^{p=.94}$
Self-harm only	20.9	26.2	17.7	$3.48^{p=.062}$	24.0	20.9	$0.01^{p=.91}$
Suicidal ideation only	16.7	17.0	16.3	$0.01^{p=.91}$	14.9	16.4	$0.01^{p=.95}$
Suicidal ideation and self-harm,	22.7	21.9	24.6	$0.25^{p=.62}$	24.5	23.0	$0.01^{p=.94}$
Suicidal attempts	36.8	38.8	29.0	$1.87^{p=.17}$	33.3	37.1	$0.10^{p=.76}$
Suicidal behavior diff. ($\chi2$)	$61.93^{p<.001}$	$37.70^{p<.001}$	$12.21^{p<.001}$		$6.26^{p=.012}$	$51.94^{p<.001}$	
	Any adult long-term welfare benefit or unemployment (%)						
	Total sample n=1136	Females n=633	Males n=503	Gender diff. ($\chi2$)	Sami n=107	Non-Sami n=914	Ethnic diff. ($\chi2$)
No ASSB	23.3	24.2	22.6	$0.61^{p=.44}$	25.1	22.8	$0.38^{p=.54}$
Self-harm only	30.4	37.9	25.9	$5.63^{p=.018}$	48.0	29.6	$2.90^{p=.089}$
Suicidal ideation only	23.4	24.6	21.7	$0.43^{p=.51}$	17.0	23.1	$0.59^{p=.44}$
Suicidal ideation and self-harm,	33.1	32.6	34.3	$0.06^{p=.81}$	35.8	33.5	$0.04^{p=.86}$
Suicidal attempts	56.2	57.6	50.7	$0.80^{p=.37}$	45.2	56.8	$1.53^{p=.22}$
Suicidal behavior diff. ($\chi2$)	$113.31^{p<.001}$	$73.51^{p<.001}$	$21.93^{p<.001}$		$4.93^{p=.026}$	$101.13^{p<.001}$	

Note: Statistical analyses: Chi-square test ($\chi2$). Accumulated data from the Norwegian Patient Registry (2008–12) and the National Insurance Registry for the entire study period (2003–2013). Long-term benefits defined as three or more months of sickness or social welfare benefits in a 12-month period or medical rehabilitation benefits. Long-term unemployment defined as $\geq$12-months. The exact N for each adult outcome by the different suicidal behavior groups can be derived by using the proportions presented in Table 1.

Table 3 Self-harm and suicidal behavior in adolescence (ASSB) as predictors of later mental health disorders, welfare benefit receipt, and unemployment in young adulthood

		Adult mental health disorders - OR (95% CI)		
ASSB	n	Unadjusted	Adj. sociodemo[a]	Adj. psychosocial[b]
No ASSB	2135	1.0	1.0	1.0
Self-harm only	388	1.49 (1.09–2.05)$^{p=.013}$	1.46 (1.04–2.05)$^{p=.027}$	0.93 (0.61–1.39)$^{p=.70}$
Suicidal ideation only	508	1.85 (1.42–2.42)$^{p<.001}$	1.83 (1.38–2.42)$^{p<.001}$	1.46 (1.06–2.03)$^{p=.022}$
Suicidal ideation and self-harm	453	2.73 (2.11–3.54)$^{p<.001}$	2.65 (2.00–3.49)$^{p<.001}$	1.78 (1.25–2.53)$^{p=.001}$
Suicidal attempts	345	4.96 (3.82–6.44)$^{p<.001}$	4.51 (3.39–6.01)$^{p<.001}$	2.64 (1.79–3.91)$^{p<.001}$
		Adult long-term medical welfare benefits - OR (95% CI)		
No ASSB	2135	1.0	1.0	1.0
Self-harm only	388	1.33 (0.94–1.89)$^{p=.11}$	1.39 (0.96–1.99)$^{p=.078}$	1.21 (0.81–1.82)$^{p=.35}$
Suicidal ideation only	508	1.24 (0.90–1.71)$^{p=.19}$	1.07 (0.76–1.50)$^{p=.72}$	0.92 (0.63–1.36)$^{p=.69}$
Suicidal ideation and self-harm	453	1.68 (1.24–2.28)$^{p=.001}$	1.56 (1.13–2.16)$^{p=.008}$	1.28 (0.84–1.95)$^{p=.25}$
Suicidal attempts	345	3.90 (2.95–5.16)$^{p<.001}$	3.21 (2.36–4.36)$^{p<.001}$	2.60 (1.70–3.97)$^{p<.001}$
		Adult long-term social welfare benefits - OR (95% CI)		
No ASSB	2135	1.0	1.0	1.0
Self-harm only	388	1.66 (1.19–2.32)$^{p=.003}$	1.73 (1.22–2.45)$^{p=.002}$	1.31 (0.87–1.96)$^{p=.20}$
Suicidal ideation only	508	0.84 (0.58–1.22)$^{p=.35}$	0.80 (0.64–1.40)$^{p=.80}$	0.76 (0.48–1.19)$^{p=.23}$
Suicidal ideation and self-harm	453	1.88 (1.39–2.54)$^{p<.001}$	2.30 (1.66–3.19)$^{p<.001}$	1.34 (0.87–2.06)$^{p=.19}$
Suicidal attempts	345	4.24 (3.20–5.61)$^{p<.001}$	5.07 (3.68–7.00)$^{p<.001}$	3.74 (2.38–5.87)$^{p<.001}$
		Adult long-term unemployment - OR (95% CI)		
No ASSB	2135	1.0	1.0	1.0
Self-harm only	388	1.38 (1.06–1.81)$^{p=.019}$	1.43 (1.08–1.90)$^{p=.012}$	1.20 (0.87–1.65)$^{p=.27}$
Suicidal ideation only	508	1.05 (0.81–1.37)$^{p=.70}$	1.01 (0.77–1.33)$^{p=.96}$	0.90 (0.65–1.22)$^{p=.47}$
Suicidal ideation and self-harm	453	1.54 (1.20–1.98)$^{p=.001}$	1.56 (1.20–2.04)$^{p=.001}$	1.18 (0.84–1.64)$^{p=.35}$
Suicidal attempts	345	3.05 (2.39–3.91)$^{p<.001}$	2.86 (2.18–3.74)$^{p<.001}$	2.06 (1.42–2.99)$^{p<.001}$

Note: Statistical analyses: Logistic regression (OR). Reference group = no adolescent self-harm and suicidal behavior. Accumulated data from the Norwegian Patient Registry (2008–12) and the National Insurance Registry for the entire study period (2003–2013). Long-term benefits defined as three or more months of sickness or social welfare benefits in a 12-month period or medical rehabilitation benefits. Long-term unemployment defined as ≥12-months. [a]Adjusted for sociodemographic factors: gender, Sami ethnicity, parental education. [b]Adjusted for sociodemographic and adolescent psychosocial factors: self-efficacy, parental involvement and support, peer support, school-related stress and adverse life events and anxiety/depression symptoms. See methods section for description of these factors. Bonferroni-adjusted significance level 0.005 for the fully adjusted models.