27 ASPHER. *The Global Dimension of Education and Training for Public Health in the 21st Century in Europe and in the World. Charter of the Association of Schools of Public Health in the European Region (ASPHER) at the Occasion of the 6th European Public Health Conference in Brussels, Belgium, 13–16 November 2013*. Brussels: ASPHER, 2013. Available at: https://www.aspher.org/section-on-education-for-glo bal-health.html (30 June 2019, date last accessed).

28 Laaser U, Beluli F, Special Volume 2016, A Global Public Health Curriculum, 2nd edn. *SEEJPH* 2016, doi:10.4119/UNIBI/SEEJPH-2015-106.

29 ASPHER. *Working Group for Global Public Health*. Brussels: ASPHER, 2019. Available at: https://www.aspher.org/section-on-education-for-global-health.html (30 June 2019, date last accessed).

30 Agency for Public Health Education Accreditation (APHEA). Brussels: APHEA, 2019. Available at: https://www.aphea.be/ (30 June 2019, date last accessed).

31 Rodrigues R, Schulmann K, Ilinca S. Challenges to public health communication campaigns in multinational settings: a European perspective. *Eur J Public Health* 2015;25:95–96.

32 EUPHAnxt and EMSA. Skills building seminar: Public Health competencies for young professionals: a 90 minute work-out to face future challenges in public health communication. *Eur J Public Health* 2013;23:119.

33 ASPHER. *Andrija Stampar Summer Educational & Tutoring School (ASSETS)*. Brussels: ASPHER, 2019. Available at: https://www.aspher.org/download/249/ assets-2019-programme.pdf (30 June 2019, date last accessed).

34 Goodman J. The history of European public health education accreditation in perspective. *SEEJPH* 2015;3. doi:10.4119/UNIBI/SEEJPH-2015-55.

35 Otok R, Czabanowska K, Foldspang A. Public health educational comprehensiveness: the strategic rationale in establishing networks among schools of public health. *Scand J Public Health* 2017;45:720–2.

36 EHESP School of Public Health, Rennes, France together with Kraków/Poland, Sheffield/United Kingdom, Granada/Spain, Paris/France, Maastricht/Netherlands. European Public Health Master, M.Sc. Available at: https://www.europubhealth. org/ (30 June 2019, date last accessed).

37 The One Health Initiative. Apex, NC: One Health Commission, 2019. Available at: https://www.onehealthcommission.org/en/why_one_health/ (30 June 2019, date last accessed).

38 ASPHER. *Honours Committee*. Brussels: ASPHER, 2019. Available at: https://www. aspher.org/honours-committee.html (30 June 2019, date last accessed).

39 Laaser U, Schröder-Bäck P, Eliakimu E, Czabanowska K. Think-Tank for Sustainable Health & Well-being (GHW-2030). A code of ethical conduct for the public health profession. *SEEJPH* 2017;9. doi:10.4119/UNIBI/SEEJPH-2017-177.

Change in prevalence of self-harm from 2002 to 2018 among Norwegian adolescents

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Background: Self-harm is prevalent among adolescents and associated with mental health problems and negative life-events. Few studies have examined changes in its prevalence related to these factors. This study explored whether changes in prevalence of self-harm among adolescents had occurred, and to what extent changes in associated factors may have contributed. **Methods:** Two cross-sectional school-based surveys among adolescents (grades 8–10) in Norway were conducted in 2002 ($N = 5842$) and in 2017/18 ($N = 29\,063$). Past year prevalence of self-harm and identical variables on risk factors was analyzed in hierarchical logistic regression to examine whether and to what extent changes in self-harm correlates could explain periodical change in prevalence of self-harm. **Results:** An increase from 4.1% to 16.2% in self-harm prevalence was observed from 2002 to 2017/18. The increase was relatively larger among girls compared to boys and among 8th graders compared to 10th graders. Among the assessed risk factors for self-harm, depressive symptoms increased, while anti-social behavior, exposure to violent acts and drinking to intoxication decreased. The increase in depressive symptoms contributed to explain increase in self-harm. This contribution was outweighed by the decrease in other risk factors. **Conclusions:** Self-harm prevalence increased 4-fold among Norwegian adolescents over a 15-year period. While exposure to several risk factors for self-harm changed substantially in this period, these risk factors could in sum not explain any of the increase in self-harm.

Introduction

Self-harm affects millions of people and constitutes a major public health problem; life-time prevalence among adolescents is in the range between 10% and 20%.[1] Self-harm often starts and peaks in adolescence,[2] and is one of the most prominent predictors of suicide.[3,4] Self-harm is used in various ways and terms for non-fatal self-inflicted harm include 'Deliberate self-harm, Attempted suicide, Parasuicide and Self-injury'.[5] Here, we define self-harm broadly; any form of deliberate self-injury or self-poisoning, regardless of motivation and intention to die. Self-harm in adolescents is associated with female gender, mental health problems and negative

life-events, alcohol and drug use, problem behaviors, poor social network and poor family functioning, amongst others.[6–10] Secular trends in self-harm may thus be influenced by the extent and distribution of such time-variant factors.

In recent years, a substantial increase in depressive symptoms among teenagers is reported,[11] a trend which *per se* may have led to an increase in the prevalence of self-harm. On the other hand, other risk factors for self-harm, including adolescent substance use and problem behaviors, have decreased substantially,[11,12] and may thus have countered a possible increase in self-harm due to depressive symptoms. Moreover, the use of digital platforms and social media have changed dramatically along with the ways in which teenagers spend their leisure time, their relationship with parents, their attitudes and future perspectives seem to have changed.[13] All these changes in how adolescents live their lives may have affected the extent of self-harm.

Few studies seem to have examined trends in self-harm over time. Collishaw[11] reviewed trends in child and adolescent mental health and noted that epidemiological evidence about trends in self-harm is lacking. Administrative data may provide trend descriptions for self-harm treated in specialized health services, however, only a minor fraction—and probably the most severe cases—of those who self-harm are treated in the health services.[14,15] Thus, our main source of data about the extent, trends and characteristics of self-harm in young people stems from community-based surveys predominantly conducted in schools.

In a recent review of community-based surveys of self-harm in adolescents, spanning the period 1990–2015, Gillies et al.[1] reported that among 56 studies from various countries, the average life-time prevalence increased significantly over the 25-year period. Swannell et al.[16] systematically reviewed general population-based studies of self-harm from various countries and found an increase in average prevalence rates from 1990 to 2012. However, they[16] found that prevalence rates varied systematically with various methodological factors (e.g. response format, incentive, anonymity, mode of measurement and research focus), and when accounting for these factors, the adjusted average prevalence rate was stable over time. Notably, studies examining changes in prevalence of self-harm applying identical methodology, and hence suitable for monitoring secular trends within a single country or region, were not included in the above cited reviews. We therefore performed literature searches in Medline and Google Scholar (May 2019) and retrieved a few relevant studies published the last 10 years. These reported minuscule increases in self-harm prevalence over short periods of time.[17,18] Thus, considering the changes in risk factors for self-harm in adolescents that have occurred over the past 15–20 years, there is an urgent need to explore whether prevalence of self-harm has changed as well, and if so, identify which factors that underlie the change.

With the availability of suitable datasets from surveys among Norwegian adolescents, conducted 15 years apart, the aim of this study was to examine whether changes in prevalence of self-harm among adolescents had occurred, and if so, to explore to what extent changes in other factors related to self-harm may have contributed to the observed change.

Methods

Samples

Two sets of cross-sectional school-based surveys among adolescents in Norway (grades 8 through 13) were used. The target group and data collection methods were similar, as were many of the variables of relevance for our study purpose. Both were anonymous and provided by the Norwegian Social Science Data Services. For this study, we identified outcome and relevant risk factor variables that were identical or highly comparable in the two datasets.

The first dataset is taken from the 'Young in Norway' survey conducted in 2002. The sample was nationwide and comprised students from 73 schools, representing a broad range of municipalities regarding industry structure and urbanity.[19] The overall response rate was 92.3%. Ethical approval of the study was obtained from the Norwegian Social Science Data Services. Consent from the Ministry of Research and Education, the local school authorities and -boards were obtained. Detailed description of the design and procedures is published elsewhere.[19] To obtain comparable datasets over time, we analyzed data from eighth to 10th grade only, resulting in a net sample of 5842 respondents from 2002.

The second dataset comprises a series of cross-sectional school surveys conducted in 54 municipalities across Norway in 2017 and 2018. These surveys are part of a quality assured and standardized system designed to conduct local surveys of adolescents in Norway, 'Young Data'.[20] The purpose is to monitor living conditions, including mental health among the adolescents in a local context. Ethical approval of the study was obtained from the Norwegian Social Science Data Services. Detailed description of the surveys is provided elsewhere.[20] The overall response rate in secondary school is 82%, and our sample of students participating in the 2017 and 2018 surveys comprised a total of 29 063 respondents in grades 8 through 10. In sum, the two datasets include responses from 34 905 students in secondary school.

Variables
Self-harm

In the 2002 survey, the students were asked, 'Have you ever intentionally taken an overdose with pills or in any other way tried to harm yourself?' Response categories were 'Yes, less than 1 year ago', 'Yes, more than 1 year ago' and 'No, never'. The variable was re-coded into a dichotomous variable, reflecting past 12 months self-harm, to match the variable in the 2017/18 surveys. Here, the question was asked under the subheading 'Self-harm': 'Have you tried to harm yourself in the past 12 months?' with the response categories 'Yes' and 'No'.

Socio-demographics

Gender and school grade (proxy for age) were included. Urban–rural dwelling was based on information about the municipality to which the school belonged and categorized into the following: big city (i.e. >100 000 inhabitants); medium sized city (50 000–100 000 inhabitants); small city (15 000–50 000 inhabitants); town (5000–15 000 residents); and village/countryside (<5000 inhabitants). Perceived family economy was assessed by the item: 'How is the economic situation in your family over the past two years?' and five response categories included 'Very good all the time', 'Mainly good', 'Neither good nor poor', 'Mainly poor' and 'Very poor all the time'.

Anti-social behavior

Four items regarding frequency of anti-social behavior were retrieved from National Youth Longitudinal Study (NYLS).[21] They were vandalism; not paying for tickets; school truancy; and spending the night away from home without your parents knowing where you were. The reference period was the last year. Response categories were: 'Never', 'once', '2–5 times', '6–10 times' and '11 times or more'. These variables were re-coded into semi-continuous measures (taking the values 0, 1, 4, 8 and 15, respectively), and added into a sum-score, ranging from 0 to 60.

Alcohol intoxication frequency

Alcohol intoxication frequency was also retrieved from the NYLS scale[21] and had identical response categories. As alcohol intoxication may trigger self-harm, its role in self-harm differs from that of the other anti-social items included, and hence was treated separately.

The question was how often in the past year they had drunk so much that they felt clearly intoxicated.

Romantic relationship

The students were asked whether they had a girl/boyfriend with response categories: 'Yes, I have now', 'No, but I had previously' and 'No, I never had one'. In the analysis, the two negative responses were collapsed together.

Depressive symptoms

Depressive symptoms were assessed by six items from 'The Hopkins Symptom Checklist'[22] and the 'Depressive Mood Inventory'.[23] These items were 'felt that everything was a struggle', 'sleeping problems', 'depressed mood', 'hopelessness', 'felt stiff or tense' and 'worried too much about things'. The last week was the reference period. Four response options ranged from 'Not bothered at all' (1) to 'Very much bothered' (4). A mean score (range 1 through 4) of the six items was used in the analysis.

Exposure to violence

The students were asked whether they, during the past 12 months, had been exposed to 'violent threats (that made you scared)' and 'been hit, without visible injury'. Four frequency response categories applied to both questions and were 'Never', 'Once', '2–5 times' and '6 times or more'. These were re-coded into semi-continuous variables and added into a sum-score ranging from 0 to 16.

Strategy of analysis and statistical analyses

Change in prevalence of self-reported self-harm over the observation period was first described for all students and for demographic strata (by gender, school grade and urban/rural dwelling) and differences were tested using Pearson's chi-squared test. Self-harm correlates were identified among the potential candidates, and—due to high statistical power—we applied an indicator of magnitude of association rather than level of statistical significance as criterion for significant association in bivariate analyses. Thus, only variables producing at least 20% variation in self-harm prevalence were included as correlates in the further analyses.

Next, we explored whether the identified self-harm correlates changed over the observation period. Differences were tested, using Pearson's chi-squared test for categorical variables and *F*-test for continuous variables.

In order to examine whether and to what extent changes in self-harm correlates could explain change in the prevalence of self-harm over the observation period, we regressed self-harm on a dichotomous-period variable in a hierarchical manner. First, the period variable was estimated in a model, only adjusting for demographic sample difference (Model A); i.e. the two datasets differed with regard to distribution of urban–rural dwelling. In the subsequent models (Models B and C), the period effect was estimated after adjustment for correlates to self-harm that had changed significantly over the observation period. Difference in the parameter estimate for the period before and after adjustment for these correlates, indicates the extent to which these self-harm correlates contribute to the overall change in prevalence of self-harm, and the difference was tested by *T*-test:

$$T = (b1 - b2 / \text{square root of } [\text{ SE } b1 \text{ squared} + \text{SE } b2 \text{ squared }])$$

These analyses were conducted for the overall sample of students and for demographic strata of students that is stratified by gender, school grade and urban/rural dwelling.

The proportion of change in self-harm prevalence over the observation period explained by changes in self-harm correlates was calculated as the difference between parameter estimate (regression coefficient) for period in Models A and B divided by the parameter estimate for period in Model A.

Results

Overall, the percentage of adolescents reporting self-harm in the past year almost quadrupled; from 4.1% in 2002 to 16.2% in 2017/18, most prominently among girls.

Sample characteristics of the two datasets are presented in table 1, and no large differences in the two samples regarding socio-demographics were found.

The following variables filled the criterion for self-harm correlate and were included in the further analyses: gender, age (i.e. school grade), urban/rural dwelling, depressive symptoms, exposure to violent threats and acts, alcohol intoxication and anti-social behavior. Cross-tabulations of past year self-harm and demographic variables showed that girls and students in 10th grade more often reported self-harm, as compared to boys and students in lower grades, respectively. Prevalence of self-harm increased with increasing:—score on depressive symptoms;—frequency of exposure violent threats and acts;—frequency of drinking to intoxication; and anti-social behavior score. Prevalence of self-harm differed somewhat across categories of residential area, but there was no clear trend in the association with regard to degree of urban dwelling. Self-harm was more often reported by those who were in a romantic relationship and among those who perceived their family economy as poor.

Whether the distribution of these correlates to self-harm had changed over the observation period, was explored in further analyses. We found that the depressive symptoms score increased, and hence was a likely candidate for explaining some of the increase in self-harm. On the other hand, anti-social behavior, exposure to violent acts and drinking to intoxication decreased during the observation period—and the proportion of adolescents being in a romantic relationship or perceiving their family economy as poor, also decreased (table 2).

Next, we explored the change in self-harm both overall and in demographic strata, and we explored whether or to what extent the changes in self-harm correlates could explain the increase in self-harm prevalence. Change in self-harm was estimated in logistic regression models, adjusting first for demographic sample differences only (Model A) and subsequently also for depressive symptoms (Model B), and finally for all other self-harm covariates (Model C). In Model A, the parameter estimate [presented as odds ratio (OR)] for period change in self-harm was almost five for all students (OR = 4.97), and it was statistically significantly higher for girls than for boys, higher among younger (eighth grade) than older (10th grade) adolescents and higher among those living in rural compared to urban areas (table 3). As expected, the OR for period change was markedly reduced when adjusting for depressive symptoms; from 4.97 in Model A to 3.68 in Model B. The difference between these two estimates corresponds to 17% of the increase in self-harm prevalence from 2002 to 2017/18 being explained by the concurrent

Table 1 Sample characteristics of the two datasets from 2002 and from 2017/18

N	2002 5842 (%)	2017/18 29 063 (%)
Gender		
Boys	50.0	49.3
Girls	50.0	50.7
Grade		
8th grade	33.7	33.8
9th grade	32.7	33.3
10th grade	33.7	32.8
Urban–rural dwelling		
Big city	18.5	15.6
Medium large city	8.2	31.6
Small city	18.1	28.2
Large village	17.6	17.9
Small village or county-side	36.3	6.7

Table 2 Change in self-harm and self-harm correlates from 2002 to 2017/18

	2002	2017/18	Relative change	*P*
Self-harm last year	4.1%	16.2%	295.1%	<0.001
Among boys	2.9%	9.7%	330.8%	<0.001
Among girls	5.2%	22.4%	508.7%	<0.001
Among 8th graders	2.3%	14.0%	335.0%	<0.001
Among 9th graders	4.0%	17.4%	335.0%	<0.001
Among 10th graders	5.6%	16.8%	200.0%	<0.001
Among urban dwelling students	4.6%	15.1%	228.3%	<0.001
Among rural dwelling students	3.8%	17.0%	347.4%	<0.001
Depressive symptoms *M* (SD)	1.74 (0.65)	1.97 (0.91)	13.2%	<0.001
Anti-social behavior *M* (SD)	4.23 (8.17)	2.56 (5.67)	−39.5%	<0.001
Alcohol intoxication frequency *M* (SD)	2.34 (4.47)	0.61 (2.24)	−73.9%	<0.001
Girlfriend or boyfriend % (SD)	15.0% (35.7)	10.6% (30.8)	−29.3%	<0.001
Perceived family economy *M* (SD)	0.94 (0.91)	1.22 (0.88)	29.8%	<0.001
Exposure to violent threats *M* (SD)	0.32 (1.13)	0.32 (1.19)	0.0%	0.939
Exposure to violent acts *M* (SD)	0.74 (1.88)	0.56 (1.66)	−24.3%	<0.001

Table 3 Logistic regression models of change in self-harm from 2002 to 2017/18 adjusted for correlates

	Model A[a] OR (95% CI)	Model B[b] OR (95% CI)
All	4.97 (4.16–5.53)	3.68 (3.17–4.27)
Gender		
Boys	3.61 (2.83–4.61)	3.57 (2.77–4.59)
Girls	5.63 (4.71–6.72)	3.64 (3.02–4.38)
Grade		
8th	7.23 (5.26–9.94)	6.74 (4.82–9.43)
10th	3.61 (2.92–4.47)	2.45 (1.96–3.07)
Dwelling		
Urban	3.43 (2.54–4.63)	2.88 (2.10–3.96)
Rural	5.96 (4.58–7.76)	4.14 (3.56–4.82)

a: Adjusted for dwelling.
b: Adjusted for dwelling and depressive symptoms.

Table 4 Logistic regression models of change in self-harm from 2002 to 2017/18 adjusted for all correlates

	Model C OR (95% CI)
All	6.06 (5.13–7.15)
Gender	
Boys	5.72 (4.33–7.55)
Girls	6.82 (5.49–8.46)
Grade	
8th	12.97 (8.70–19.34)
10th	4.21 (3.28–5.41)
Dwelling	
Urban	5.01 (3.49–7.18)
Rural	9.68 (6.81–13.76)

increase in depressive symptoms. Notably, after adjustment for depressive symptoms, change in self-harm did not differ statistically significantly between girls and boys over the study period, whereas differences in change between younger and older students and those in urban and rural areas, remained statistically significant.

When also adjusting for correlates that decreased over time (Model C), the parameter estimate for period became, as expected, larger than in Model B, and even larger than that in Model A (table 4). Having adjusted for all self-harm correlates, the relative increase in self-harm did not differ by gender (*P* > 0.05), but it remained statistically significantly higher among younger as compared to older students and higher among those in rural as compared to urban areas (table 4).

Discussion

This study was among the first to assess whether self-harm had changed over a 15-year period, and how prevalence was affected by associated factors. A substantial increase in last year prevalence was observed. The level of depressive symptoms also increased markedly, and could explain some of the increase in self-harm. Other risk factors, including exposure to violence, alcohol intoxication and anti-social behavior, changed in the opposite direction. When taking these changes into account, the increase in self-harm was even more substantial, leaving a dramatic change unaccounted for by available data in this study.

The high proportion of adolescents reporting past year self-harm in the 2017–18 surveys, corresponds well to those reported in a recent study among adult students (19.6%) in Norway[24] but was higher than those reported in earlier meta-analyses among adolescents.[8,16] Recent studies on trends in self-harm amongst adolescents in the general population are few, if any, but studies using data from hospitals, registries or poison information centers have reported increasing trends in self-harm.[25–27]

The observed change in associated factors is consistent with recent studies based on data from representative cross-sectional studies conducted at various time points. Observations include stabilized or increased scores on depressive symptoms and decreasing trends in alcohol use, anti-social behavior and exposure to violence.[11,13,28–30] The observed decline in alcohol use among adolescents also found in other studies[12] may be part of broader life-style changes in adolescence, including decrease in aggressive behaviors.[30]

A substantial increase in self-harm could not be accounted for by changes in well-known correlates. Hence, the role of other, unobserved explanatory factors should be considered in this context. Notably, over the past 20 years, the life-style and living conditions for adolescents in several countries have changed markedly. These changes include the technological development of digital media and the ways in which people spend their leisure time and interact.[31] Such changes may well have impacted risks for self-harm, yet it remains to be examined empirically.

Methodological explanations could also affect the observed increase. The slight difference in measurement may possibly account for some of the observed increase, however, it seems unlikely that this would differ across gender, age and area of dwelling to the extent as observed. It is also possible that the content validity; the ways in which the respondents understand the concept of self-harm has changed over time, and that reliability of self-reports of self-harm has changed, for instance if willingness to report self-harm has increased.[26]

The large datasets with nationwide samples increase statistical power and generalizability to adolescents living in Norway. The large timespan between the two time points increases the likelihood of observing substantial changes in self-harm and its risk factors over

time. Some limitations exist. First, slightly different questions regarding self-harm in the two datasets may have impacted the observed increase. Also the change from 'pen and paper' to online questionnaires may have hampered comparability over time, although previous studies have shown that such change in data collection method does not affect data content or data quality.[32]

In conclusion, a substantial increase in self-harm was observed, and the driving forces behind should be further explored. As self-harm is associated with considerable risk of future suicide, the observation is a strong call for monitoring future suicide rates among young adults. On the other hand, self-harm reported in surveys also comprises experimentation and sub-clinical behavior, and we need to distinguish this from behaviors that warrants treatment. Anyhow, evidence-based universal school-based public health prevention programs exist,[33] and should be considered. The Youth Aware of Mental Health Program has showed to prevent suicidal behavior,[34] and may also be used to prevent self-harm, but replications and cost-effectiveness evaluations are needed.

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Conflicts of interest: None declared.

Key points

- Self-harm among adolescents has increased substantially.
- An increase in depressive symptoms could explain some of the increase in self-harm.
- Exposure to other established risk factors decreased, and in sum, the observed risk factors could not explain the substantial increase in self-harm.
- There is an urgent need to better understand why young people self-harm to a much higher extent now as compared to 15 years ago.

References

1 Gillies D, Christou MA, Dixon AC, et al. Prevalence and characteristics of self-harm in adolescents: meta-analyses of community-based studies 1990-2015. *J Am Acad Child Adolesc Psychiatry* 2018;57:733–41.

2 Nock MK, Green JG, Hwang I, et al. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. *JAMA Psychiatry* 2013;70:300–10.

3 Groholt B, Ekeberg Ø, Haldorsen T. Adolescent suicide attempters: what predicts future suicidal acts? *Suicide Life Threat Behav* 2006;36:638–50.

4 Hawton K, Bergen H, Cooper J, et al. Suicide following self-harm: findings from the multicentre study of self-harm in England, 2000-2012. *J Affect Disord* 2015;175:147–51.

5 Skegg K. Self-harm. *Lancet* 2005;366:1471–83.

6 Evans E, Hawton K, Rodham K. Factors associated with suicidal phenomena in adolescents: a systematic review of population-based studies. *Clin Psychol Rev* 2004;24:957–79.

7 Mars B, Heron J, Crane C, et al. Clinical and social outcomes of adolescent self-harm: population based birth cohort study. *BMJ* 2014;349:g5954.

8 Muehlenkamp J, Claes L, Havertape L, Plener PL. International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child Adolesc Psychiatry Ment Health* 2012;6:6–10.

9 Nixon MK, Cloutier MD, Jansson SM. Nonsuicidal self-harm in youth: a population-based survey. *CMAJ* 2007;178:306–12.

10 Nock MK. Self-injury. *Annu Rev Clin Psychol* 2010;6:339–63.

11 Collishaw S. Annual research review: secular trends in child and adolescent mental health. *J Child Psychol Psychiatry* 2015;56:370–93.

12 Pape H, Rossow I, Brunborg GS. Adolescents drink less: how, who and why? A review of the recent research literature. *Drug Alcohol Rev* 2018;37:S98–114.

13 Twenge JM, Joiner TE, Rogers ML, Martin GN. Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. *Clin Psychol Sci* 2018;6:3–17.

14 Geulayov G, Kapur N, Turnbull P, et al. Epidemiology and trends in non-fatal self-harm in three centres in England, 2000-2012: findings from the Multicentre Study of Self-harm in England. *BMJ Open* 2016;6:e010538.

15 Groholt B, Ekeberg O, Wichstrom L, Haldorsen T. Young suicide attempters: a comparison between a clinical and an epidemiological sample. *J Am Acad Child Adolesc Psychiatry* 2000;39:868–75.

16 Swannell SV, Martin GE, Page A, et al. Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. *Suicide Life Threat Behav* 2014;44:273–303.

17 Rossow I, Wichstrom L. Receipt of help after deliberate self-harm among adolescents: changes over an eight-year period. *Psychiatr Serv* 2010;61:783–7.

18 Fleming TM, Clark T, Denny S, et al. Stability and change in the mental health of New Zealand secondary school students 2007–2012: results from the national adolescent health surveys. *Aust N Z J Psychiatry* 2014;48:472–80.

19 Rossow I, Bø AK. *Metoderapport for Datainnsamlingen Til Ung i Norge 2002*. Oslo: Norsk Institutt for forskning om oppvekst, velferd og aldring, 2003.

20 NOVA. Ungdata. Available at: www.ungdata.no (1 August 2019, date last accessed).

21 Windle M. A longitudinal study of antisocial behaviors in early adolescence as predictors of late adolescent substance use: gender and ethnic group differences. *J Abnorm Psychol* 1990;99:86–91.

22 Derogatis LR, Lipman RS, Rickels K, et al. The Hopkins Symptom Checklist (HSCL): a self-report symptom inventory. *Syst Res* 1974;19:1–15.

23 Kandel DB, Davies M. Epidemiology of depressive mood in adolescents: an empirical study. *Arch Gen Psychiatry* 1982;39:1205–12.

24 Sivertsen B, Hysing M, Knapstad M, et al. Suicide attempts and non-suicidal self-harm among university students: prevalence study. *BJPsych Open* 2019;5:e26.

25 Cairns R, Karanges EA, Wong A, et al. Trends in self-poisoning and psychotropic drug use in people aged 5-19 years: a population-based retrospective cohort study in Australia. *BMJ Open* 2019;9:e026001.

26 Morgan C, Webb RT, Carr MJ, et al. Incidence, clinical management, and mortality risk following self harm among children and adolescents: cohort study in primary care. *BMJ* 2017;359:j4351.

27 Griffin E, McMahon E, McNicholas F, et al. Increasing rates of self-harm among children, adolescents and young adults: a 10-year national registry study 2007–2016. *Soc Psychiatry Psychiatr Epidemiol* 2018;53:663–71.

28 Pedersen W, von Soest T. Adolescent alcohol use and binge drinking: an 18-year trend study of prevalence and correlates. *Alcohol Alcohol* 2015;50:219–25.

29 von Soest T, Wichstrøm L. Secular trends in depressive symptoms among Norwegian adolescents from 1992 to 2010. *J Abnorm Child Psychol* 2014;42:403–15.

30 Frøyland LR, von Soest T. Trends in the perpetration of physical aggression among Norwegian adolescents 2007–2015. *J Youth Adolesc* 2018;47:1938–51.

31 Bucksch J, Sigmundova D, Hamrik Z, et al. International trends in adolescent screen-time behaviors from 2002 to 2010. *J Adolesc Health* 2016;58:417–25.

32 Denscombe M. Web-based questionnaires and the mode effect: an evaluation based on completion rates and data contents of near-identical questionnaires delivered in different modes. *SSCR* 2006;24:246–54.

33 Brent DA, Brown CH. Effectiveness of school-based suicide prevention programmes. *Lancet* 2015;385:1489–91.

34 Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: the SEYLE cluster-randomised, controlled trial. *Lancet* 2015;385:1536–44.