



BMJ Open Self-harm among in-school and street-connected adolescents in Ghana: a cross-sectional survey in the Greater Accra region

Emmanuel Nii-Boye Quarshie ^{1,2}, Farag Shuweihdi,³ Mitch Waterman,² Allan House ³

To cite: Quarshie EN-B, Shuweihdi F, Waterman M, *et al.* Self-harm among in-school and street-connected adolescents in Ghana: a cross-sectional survey in the Greater Accra region. *BMJ Open* 2021;**11**:e041609. doi:10.1136/bmjopen-2020-041609

► Prepublication history and additional materials for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-041609>).

Received 13 June 2020

Revised 30 November 2020

Accepted 13 December 2020



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Department of Psychology, University of Ghana, Accra, Ghana

²School of Psychology, University of Leeds, Leeds, UK

³Leeds Institute of Health Sciences, University of Leeds, Leeds, UK

Correspondence to

Dr Emmanuel Nii-Boye Quarshie;
enquarshie@ug.edu.gh

ABSTRACT

Objectives To identify the prevalence, methods, associations and reported reasons for self-harm among in-school and street-connected adolescents in Ghana.

Design A cross-sectional survey. We applied multi-level regression models and model-based cluster analysis to the data.

Setting Three contexts in the Greater Accra region were used: second cycle schools, facilities of charity organisations and street census enumeration areas (sleeping places of street-connected adolescents, street corners, quiet spots of restaurants, markets, train and bus stations, and lorry and car parks).

Participants A regionally representative sample of 2107 (1723 in-school and 384 street-connected) adolescents aged 13–21 years.

Outcome measures Participants responded to a structured self-report anonymous questionnaire describing their experience of self-harm and eliciting demographic information and social and personal adversities.

Results The lifetime prevalence of self-harm was 20.2% (95% CI 19.0% to 22.0%), 12-month prevalence was 16.6% (95% CI 15.0% to 18.0%) and 1-month prevalence was 3.1% (95% CI 2.0% to 4.0%). Self-injury alone accounted for 54.5% episodes and self-poisoning alone for 16.2% episodes, with more than one method used in 26% of episodes. Self-cutting (38.7%) was the most common form of self-injury, whereas alcohol (39.2%) and medications (27.7%) were the most commonly reported means of self-poisoning. The factors associated with self-harm were interpersonal: conflict with parents (adjusted OR (aOR)=1.87, 95% CI 1.24 to 2.81), physical abuse victimisation (aOR=1.69, 95% CI 1.16 to 2.47), difficulty in making and keeping friends (aOR=1.24, 95% CI 0.85 to 1.80), sexual abuse victimisation (aOR=1.21, 95% CI 0.78 to 1.87) and conflict between parents (aOR=1.07, 95% CI 0.73 to 1.56).

Conclusions Self-harm is a significant public health problem among in-school and street-connected adolescents in the Greater Accra region of Ghana. Its origins are very largely in social and familial adversity, and therefore prevention and treatment measures need to be focused in these areas.

Strengths and limitations of this study

- A larger sample of greater diversity and more heterogeneity in exposures than any previous study related to self-harm in Ghana.
- First primary study from Africa to include in-school and street-connected adolescents in an integrated way.
- We measured self-harm using a single item on the questionnaire, and its associated risks were similarly unelaborated.
- Over-representation of the school sample (81.8%) compared with the street-connected sample (18.2), is likely to have skewed the findings of the statistical modelling.
- Cross-sectional design precluded causal interpretation of findings.

INTRODUCTION

There is no universally accepted definition of self-harm. This study follows the WHO's definition:

‘an act with non-fatal outcome in which an individual deliberately initiates a non-habitual behaviour, that without intervention from others will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognised therapeutic dosage, and which is aimed at realising changes that the person desires via the actual or expected physical consequences’.^{1,2}

Self-harm among adolescents has received little research attention in low-income and middle-income countries^{3–5}; much of our understanding comes from research in high-income contexts (the UK, the Oceania and North America), where self-harm is associated with many negative health outcomes including suicide.^{6,7} Recent reports of Global Burden of Disease have underscored



self-harm as an emerging non-communicable disorder with a strong link to suicide in low-income and middle-income countries, including those in Africa.⁸

Our recent systematic review found a 12-month prevalence of 16.9% for self-reported self-harm among adolescents in sub-Saharan Africa.⁵ Factors associated with self-harm were depression, hopelessness, psychiatric illness, conflict with parents, physical and emotional abuse in the family, academic failure, romantic relationship problems and lack of social support. Although adolescents generally reported diverse methods of self-harm, clinical samples of adolescents predominantly reported overdose of medication whereas adolescents in the community mostly reported self-cutting. However, the majority of the studies reviewed were conducted in South Africa: we found no study on self-harm in non-clinical adolescent samples from Ghana.⁵ The present study describes a cross-sectional self-report questionnaire survey that is novel in reporting results from in-school and street-connected adolescents in the Greater Accra region of Ghana.

Aim and research questions

We wanted to estimate the self-reported prevalence and describe some of the common sociodemographic factors and life events associated with self-harm in two non-clinical adolescent populations (in-school and street-connected adolescents: the present study adopts the definition of street-connected adolescents provided by Ghana's Department Social Welfare and collaborators: a young person who is aged between 10 and 25 years, is born on the street and lives with parent(s) on the street; migrated to the street or is an urban poor child or street mother who survives working in the street. Department of Social Welfare (DSW), Ricerca e Cooperazione, Catholic Action for Street Children, *et al.* Census on street children in the Greater Accra region, Ghana. Accra, Ghana: DSW, 2011.) in the Greater Accra region of Ghana. Our research questions were, for these populations:

1. What is the self-reported lifetime, 12-month and 1-month prevalence of self-harm?
2. What are the methods of self-harm?
3. What reasons do adolescents report for their self-harm?
4. Which sociodemographic factors and life events are associated with self-harm?
5. Are adolescents (in this study, we define adolescents as young persons aged between 10 and 25 years) who self-harm a homogenous group, in terms of certain common sociodemographic factors and negative life events?

METHODS

We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations to design, conduct and report this cross-sectional study.⁹

Design

Cross-sectional survey design involving the use of an anonymous self-report questionnaire.¹⁰

Setting

Three contexts in the Greater Accra region were used: selected second cycle schools (the system of education in Ghana is organised in three progressive levels: basic education, second cycle education and tertiary education. Basic education comprises basic schools—kindergarten, primary schools and junior high schools; second cycle education takes place in second cycle schools (i.e., senior high schools, technical and vocational schools and business schools) and tertiary education involves universities, polytechnics and training colleges. Ghana Education Act: Act 778 of Ghana, 2008. Accra, Ghana: Assembly Press; 2008), facilities of charity organisations, and selected street census enumeration areas where the survey was administered at the work and sleeping places of street-connected adolescents, on street corners, in quiet spots of restaurants, markets, train and bus stations, and in lorry and car parks.

Population and study sample

For a priori study sample size determination, the total size of the population of interest in the Greater Accra region was taken as the sum of second cycle school students (n=79 297) reported by the Ghana Education Service, and the total number of street-connected children and youth reported in the latest official census report for the Greater Accra region (n=61 482).^{11 12} We used a formula by Krejcie and Morgan to derive a sample size of 2360, plus 5% (n=118) to provide for non-response or missing data.^{13 14} This sample size (n=2478) was large enough to allow for reasonable precision in prevalence estimates and logistic regression modelling.^{15 16}

Sampling and procedure

Stratified random sampling was used to identify a school-based sample, with random sampling within facilities for the homeless and street connected adolescents. Details of sampling and questionnaire administration are provided in online supplemental eAppendix 1, eFigure 1 and eTable 1. The completion of the questionnaire lasted between 22 and 45 min. The data collection took place between May and September 2017.

Measures

Exposures

Sociodemographic variables and lifestyle factors

Participants were asked 19 questions assessing their social and demographic backgrounds and lifestyles factors, for example, age, sex (female or male), living arrangement, alcohol use, family structure and sexual orientation (see online supplemental eTable 2).

Negative life events

Participants were asked categorical questions (24 items) about negative life events and social adversities occurring

during the previous 12 months—in the family and school contexts and within other interpersonal relationships outside the family and school environment. The items were mainly adapted from the Child and Adolescent Self-harm in Europe (CASE) studies,¹⁷ and the 2012 WHO–Global School-based Student Health Survey in Ghana.¹⁸ For example, conflict with parents, parental divorce, bullying victimisation, sexual abuse victimisation, breakup and knowledge about a friend's suicide (online supplemental eTable 2 provides the list of all exposure variables and specific survey questions asked).

Outcomes

Self-harm prevalence

For lifetime self-harm prevalence, we asked participants a binary response-rated question (coded No (0) or Yes (1)): “Have you ever, actually, intentionally harmed yourself (eg, cutting, burning or poisoning yourself, or tried to harm yourself in some other way, for example, hanging, jumping from height, etc)”. Similarly, to assess 12-month self-harm prevalence, participants were asked a dichotomous response-rated question (coded No (0) or Yes (1)): “Have you, actually, intentionally harmed yourself (eg, cutting, burning or poisoning yourself, or tried to harm yourself in some other way, for example, hanging, jumping from height, etc) during the past 12 months?”

Self-harm methods

Participants responded to a checklist of 16 frequently reported methods of self-injury and self-poisoning methods adopted from various sources—the CASE studies¹⁷; the Self-Injurious Thoughts and Behaviors Interview¹⁹ and the Suicide Attempt Self-Injury Interview.²⁰ For example, medications, drugs, burning, cutting, stabbing, suffocating, jumping from a height and so on. Notably, in keeping with the principle of parsimony and for ease of readership and interpretability of results, we dichotomised reported reasons for self-harm into self-injury and self-poisoning.

Reported reasons/motivations for last episode of self-harm

As shown in the ‘Results’ section (‘Stated Reasons for last Episode of Self-Harm’), we also provided a checklist of 15 frequently reported reasons/motivations for self-harm, adopted from the CASE studies¹⁷ and the WHO/EURO Multicentre Study on Suicidal Behaviour.^{21 22} The last section of the questionnaire had one project-specific open-ended question regarding the adolescents’ opinions about what roles young people, families, friends, schools, organisations and government could play to prevent self-harm among adolescents in Ghana.

Repetition/frequency of self-harm in the previous 12 months

Participants were asked to provide their best estimate in response to the question, “During the past 12 months how many times have you, actually, intentionally harmed yourself (eg, cutting, burning or poisoning yourself, or tried to harm yourself in some other way, for example, hanging, jumping from height, etc)?”

The questionnaire was in English, the lingua franca, language of instructions in schools and official language in Ghana. The questionnaire was expert-reviewed in Ghana prior to administration to the participants.

Statistical tools and analysis procedure

Analyses were performed in SPSS V.25 and the R Statistical Package (V.4.0.0). We used the listwise deletion approach to deal with missing data,²³ since missing data were <5% of observations which implies that biases and loss of power are both likely to be inconsequential, particularly, for regression models.^{23 24} Online supplemental eTable 2 shows the list of variables included in the analysis, proportions of missing data and the coding and re-coding of variables for the analyses.

Agings 15 and 17 years were used as cut-off points to re-categorise ‘age’ into three groups: 13–15 years, 16–17 years and 18–21 years. In Ghana, persons aged 16 years or older can give sexual consent,²⁵ whereas persons aged 18 years or older are legally considered adults who can marry and qualify to vote in national elections.

In all, there were 24 negative events included in the study. Since self-harm in adolescents has been associated with the combination of multiple negative life events,^{26–28} an additional variable, ‘total negative life events’ was created by taking the sum of all individual negative life events endorsed by each participant to obtain an index of the total negative life events experienced during the past year. This was further placed into three categories: ≤5 negative events (coded 0), 6–10 negative events (coded 1) and >10 negative events (coded 2); for ease of interpretation of the results.

After initial univariate and bivariate analyses (see bivariate results in online supplemental eTable 3), multilevel logistic regression was used to build models examining the associations between occurrence of self-harm (binary outcome) and the exposure variables. Negative binomial regression and multilevel negative binomial regression analyses were used to assess the associations between the exposure variables and frequency of self-harm during the past 12 months.^{29 30}

Multilevel modelling with random intercept

The data in this study were nested: basically, the in-school adolescents were nested within schools, and the street-connected adolescents were nested in the street context. Thus, each of the multilevel analyses (multilevel logistic regression and multilevel negative binomial regression) focused on two levels—the context (school/street) and individual level factors. The strength of multilevel analysis lies in accounting for data nested within clusters,³¹ thereby reducing the likelihood of overstating statistically significant results, as SEs of regression coefficients are not underestimated.^{31 32} Negative binomial analyses were deemed appropriate because the outcome variable (frequency of self-harm) was overdispersed, with inflated zeros—higher than the mean of the counts within the distribution.^{29 33} Over 80% of the participants in the

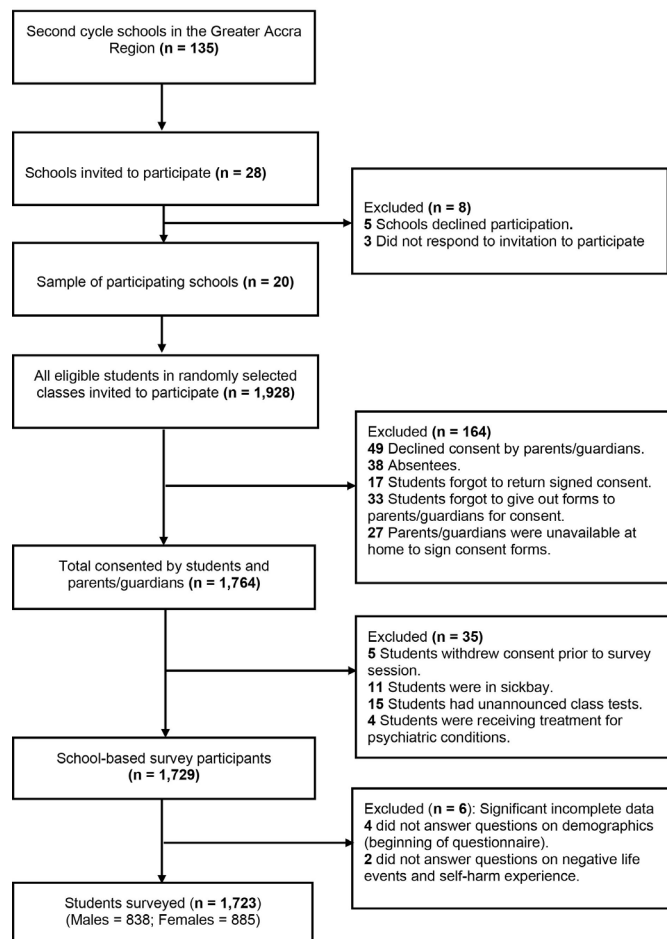


Figure 1 Summary of participant recruitment process for school-based questionnaire survey.

overall sample of this study reported no self-harm during the past 12 months, a situation which satisfies the key assumption of negative binomial regression.^{29 33} Statistical significance in the regression models was determined using the $p < 0.05$ threshold; we cautiously chose this criterion in order to avoid reporting multiple possible but rather weak associations when the interpretation of the results is based on CIs.^{34 35}

To determine whether the participants could be differentiated based on profiles of sociodemographic variables, negative events and self-harm, cluster analysis was used. Clustering helped to identify distinct profiles to which participants might belong, hence we may be able to develop appropriate interventions for each cluster. Model-based (in model-based clustering, it is assumed that the dataset of interest contains various clusters with different distributions) and non-model-based clustering algorithms, where each cluster is described by a density function, were used to explore various cluster solutions from very few simple two-cluster solutions to a more complex six-cluster arrangements, describing further the associations between exposures and self-harm.³⁶ Model-based and non-model-based clustering algorithms are represented through a finite mixture of probability distributions to estimate parameters for each cluster using the

expectation-maximisation (EM) algorithm.³⁷ Then each observation is assigned to the corresponding cluster using the maximum a posteriori probability. This approach is applied till no further reduction in Akaike Information Criterion (AIC) is achieved. Variables possessing clustering information (showing different relative distribution between clusters) were used in the detection of the group structure.

RESULTS

Demographic and background characteristics of participants

In all, 2424 adolescents were invited to participate in the survey (see figures 1–2), with 2107 completed questionnaires included in the final analyses, representing an overall response rate of 87%. Of the 2107 participants, 82% ($n=1723$) were adolescents in school and 18% ($n=384$) were street-connected adolescents. The majority of the street-connected adolescents (53%) had been in the street situation for >1 year.

It was not one of the aims of our study to compare in-school and street-connected adolescents, but rather to include both in our sample as a way of reducing bias. Differences between the two groups illustrate the likelihood of such bias, and are shown in online supplemental eTable 3.

Table 1 presents the demographic and background characteristics of the study participants. More street-connected

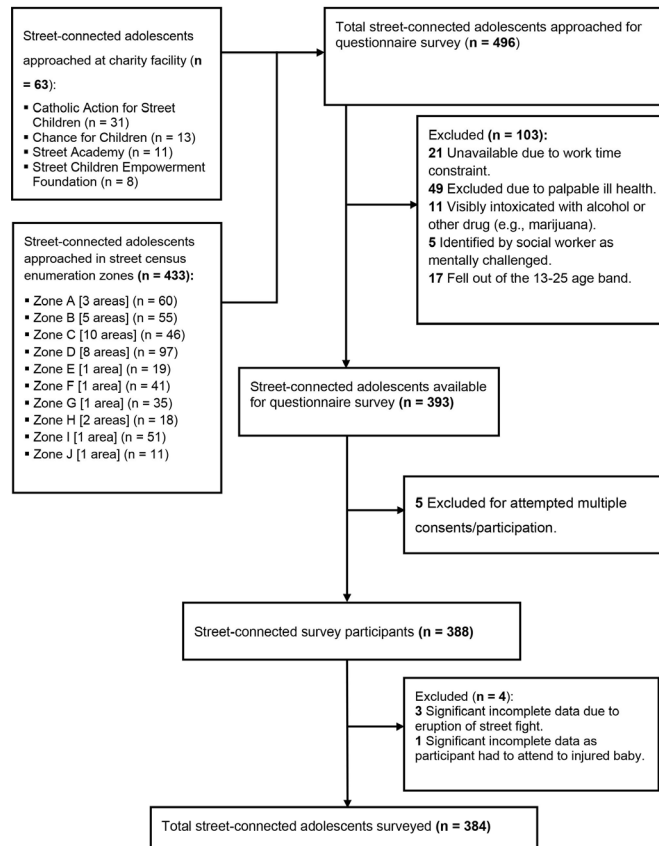


Figure 2 Summary of participant recruitment process for street-connected questionnaire survey.

Table 1 Demographic and background characteristics of participants

Characteristic	Overall n=2107 n (%)	Adolescent groups		Sex		Age groups (mean=16.81 years; SD=1.33)		
		In-school n=1723 n (%)	Street-connected n=384 n (%)	Male n=1034 n (%)	Female n=1073 n (%)	13– 15n=312 n (%)	16– 17n=1210 n (%)	18– 21n=585 n (%)
Adolescent groups								
In-school	1723 (81.8)	1723 (100)	–	838 (81.0)	885 (82.5)	186 (59.6)	1060 (87.6)	477 (81.5)
Street-connected	384 (18.2)	–	348 (100)	196 (19.0)	188 (17.5)	126 (40.4)	150 (12.4)	108 (18.5)
Sex								
Male	1034 (49.1)	838 (48.6)	196 (51.0)	1034 (100)	–	164 (52.6)	576 (47.6)	294 (50.3)
Female	1073 (50.9)	885 (51.4)	188 (49.0)	–	1073 (100)	148 (47.4)	634 (52.4)	291 (49.7)
Age groups (years)								
13–15	312 (14.8)	186 (10.8)	126 (32.8)	164 (15.9)	148 (13.8)	312 (100)	–	–
16–17	1210 (57.4)	1060 (61.5)	150 (39.1)	576 (55.7)	634 (59.1)	–	1210 (100)	–
18–21	585 (27.8)	477 (27.7)	108 (28.1)	294 (28.4)	291 (27.1)	–	–	585 (100)
Mean age	16.81	16.91	16.36	16.79	16.83	14.71	16.55	18.48
SD	1.33	1.22	1.67	1.38	1.28	0.59	0.49	0.64
Sexual orientation								
Heterosexual	2030 (96.5)	1672 (97.2)	358 (93.2)	1004 (97.2)	1026 (95.8)	305 (97.8)	1174 (97.0)	551 (94.7)
Non-heterosexual	74 (3.5)	48 (2.8)	26 (6.8)	29 (2.8)	45 (4.2)	7 (2.2)	36 (3.0)	31 (5.3)
In romantic relationship								
No	1317 (62.5)	1078 (62.6)	239 (62.2)	699 (67.6)	618 (57.6)	248 (79.5)	784 (64.8)	285 (48.7)
Yes	790 (37.5)	645 (37.4)	145 (37.8)	335 (32.4)	455 (42.4)	64 (20.5)	426 (35.2)	300 (51.3)
Religious group								
Christian	1811 (86.9)	1578 (91.9)	233 (63.7)	904 (88.6)	907 (85.3)	254 (83.0)	1055 (87.9)	502 (87.0)
Muslim	272 (13.1)	139 (8.1)	133 (36.3)	116 (11.4)	156 (14.7)	52 (17.0)	145 (12.1)	75 (13.0)
Employment status								
Unemployed	1708 (81.2)	1656 (96.1)	52 (13.6)	825 (79.9)	883 (82.4)	208 (66.7)	1051 (87.0)	449 (76.9)
Employed	396 (18.8)	67 (3.9)	329 (86.4)	208 (20.1)	188 (17.6)	104 (33.3)	157 (13.0)	135 (23.1)
Family structure								
Father has one wife	1448 (68.8)	1283 (74.5)	165 (43.0)	718 (69.5)	730 (68.0)	228 (73.1)	860 (71.1)	360 (61.5)
Father has more than one wife	658 (31.2)	439 (25.5)	219 (57.0)	315 (30.5)	343 (32.0)	84 (26.9)	349 (28.9)	225 (38.5)
Sibling size								
0–4	1472 (69.9)	1295 (75.2)	177 (46.1)	725 (70.1)	747 (69.6)	226 (72.4)	892 (73.7)	354 (60.5)
>4	635 (30.1)	428 (24.8)	207 (53.9)	309 (29.9)	326 (30.4)	86 (27.6)	318 (26.3)	231 (39.5)
Living arrangement								
Live with one or both parents	1419 (67.3)	1332 (77.3)	87 (22.7)	700 (67.7)	719 (67.0)	214 (68.6)	876 (72.4)	329 (56.2)
Live with other relative	414 (19.6)	297 (17.2)	117 (30.5)	199 (19.2)	215 (20.0)	55 (17.6)	219 (18.1)	140 (23.9)
Live alone or with other person	274 (13.0)	94 (5.5)	180 (46.9)	135 (13.1)	139 (13.0)	43 (13.8)	115 (9.5)	116 (19.8)
Street life age (street-connected only)								
6 months–1 year	181 (47.1)	–	181 (47.1)	87 (44.4)	94 (50.0)	66 (52.4)	68 (45.3)	47 (43.5)
>1 year	203 (52.9)	–	203 (52.9)	109 (55.6)	94 (50.0)	60 (47.6)	82 (54.7)	61 (56.5)
Still have contact with family (street-connected only)								
No	81 (21.1)	–	81 (21.1)	43 (21.9)	38 (20.2)	17 (13.5)	35 (23.3)	29 (26.9)
Yes	303 (78.9)	–	303 (78.9)	153 (78.1)	150 (79.8)	109 (86.5)	115 (76.7)	79 (73.1)

Continued

Table 1 Continued

Characteristic	Overall n=2107 n (%)	Adolescent groups		Sex		Age groups (mean=16.81 years; SD=1.33)		
		In-school n=1723 n (%)	Street-connected n=384 n (%)	Male n=1034 n (%)	Female n=1073 n (%)	13– 15 n=312 n (%)	16– 17 n=1210 n (%)	18– 21 n=585 n (%)
Primary caretaker								
One or both parents	1544 (73.3)	1447 (84.0)	97 (25.3)	768 (74.3)	776 (72.3)	232 (74.4)	966 (79.8)	346 (59.1)
Other relative	251 (11.9)	180 (10.4)	71 (18.5)	111 (10.7)	140 (13.0)	39 (12.5)	121 (10.0)	91 (15.6)
Myself or other person	312 (14.8)	96 (5.6)	216 (56.3)	155 (15.0)	157 (14.6)	41 (13.1)	123 (10.2)	148 (25.3)
Primary caretaker's employment status								
Unemployed	178 (8.9)	125 (7.3)	53 (18.3)	81 (8.2)	97 (9.5)	24 (8.0)	76 (6.5)	78 (14.3)
Employed	1833 (91.1)	1597 (92.7)	236 (81.7)	906 (91.8)	927 (90.5)	275 (92.0)	1090 (93.5)	468 (85.7)
Educational background (street-connected only)								
No formal education	35 (9.1)	–	35 (9.1)	12 (6.1)	23 (12.2)	9 (7.1)	15 (10.0)	11 (10.2)
Primary or junior high school	349 (90.9)	–	349 (90.9)	184 (93.9)	165 (87.8)	117 (92.9)	135 (90.0)	97 (89.8)
Still in school (street-connected only)								
No	335 (15.9)	–	335 (87.2)	167 (85.2)	168 (89.4)	100 (79.4)	136 (90.7)	99 (91.7)
Yes	49 (12.8)	–	49 (12.8)	29 (14.8)	20 (10.6)	26 (20.6)	14 (9.3)	9 (8.3)
School residential status								
Boarding	376 (21.2)	376 (21.8)	0	227 (26.2)	149 (16.5)	66 (31.1)	269 (25.0)	41 (8.4)
Day student	1396 (78.8)	1347 (78.2)	49 (100)	640 (73.8)	756 (83.5)	146 (68.9)	805 (75.0)	445 (91.6)
Weekly cigarettes smoked								
Never/Stopped	2051 (97.3)	1713 (99.4)	338 (88.0)	998 (96.5)	1053 (98.1)	300 (96.2)	1188 (98.2)	563 (96.2)
One or more cigarettes	56 (2.7)	10 (0.6)	46 (12.0)	36 (3.5)	20 (1.9)	12 (3.8)	22 (1.8)	22 (3.8)
Weekly alcoholic drinks								
Never drink	1741 (82.6)	1493 (86.7)	248 (64.6)	819 (79.2)	922 (85.9)	265 (84.9)	1033 (85.4)	443 (75.7)
One or more drinks	366 (17.4)	230 (13.3)	136 (35.4)	215 (20.8)	151 (14.1)	47 (15.1)	177 (14.6)	142 (24.3)
Drugs used in the past year								
Never take illicit drugs	1993 (94.6)	1677 (97.4)	316 (82.3)	964 (93.2)	1029 (96.0)	293 (93.9)	1158 (95.8)	542 (92.6)
Took illicit drug	113 (5.4)	45 (2.6)	68 (17.7)	70 (6.8)	43 (4.0)	19 (6.1)	51 (4.2)	43 (7.4)

than in-school adolescents self-identified as employed and Muslim and reported that their father had more than one wife and they had more than four siblings. Nearly half of the street-connected adolescents reported that they lived alone or with another person and they endorsed 'myself or other person' as their primary caretaker.

Prevalence estimates of self-harm

Table 2 shows the lifetime, 12-month and 1-month prevalence estimates of self-harm as reported by the adolescents in this study. For in-school adolescents the prevalences (15%–20% 12 months and lifetime) were similar to those reported from high-income countries, with a predominance of girls and young women. Lower prevalences were reported by street-connected adolescents (lifetime=12.2% (95% CI 9.0% to 15.0%), 12-month=9.4% (95% CI 6.0% to 12.0%) and 1-month=1.0% (95% CI 0.0 to 3.0%)), than by in-school adolescents (lifetime=22.0% (95% CI 20.0% to 24.0%), 12-month=18.2% (95% CI 16.0% to

20.0%) and 1-month=3.5% (95% CI 3.0% to 5.0%)). An age gradient for 12-month and lifetime prevalence was noticeable for the in-school but not the street-connected adolescents.

For the total sample, the age at first onset of self-harm varied between 8 and 20 years, with a mean age of 14.4 years (SD: 1.93) and a modal age of 14 years. The minimum ages at first onset of self-harm among the age groups were 9 years (13–15 years old), 8 years (16–17 years old) and 10 years (among the 18–21 years old). There were no differences in age at onset according to gender.

Methods of self-harm

The methods of self-harm as reported by the participants were categorised into 'self-injury only', 'self-poisoning only', 'other methods only' and 'multiple methods'. Results are provided in table 3. Self-injury (54.5%) was commoner than self-poisoning (16.2%). More adolescents in school (58.8%) than street-connected

**Table 3** Methods of self-harm ever used

Variable	Overall	Adolescent groups		Sex		Age groups (years)		
	n=426*	In-school n=379*	Street-connected n=47*	Male *n=169*	Female n=257*	13–15 n=51*	16–17 n=249*	18–21 n=126*
Method of self-harm ever used:	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Self-injury (only)	232 (54.5)	223 (58.8)	9 (19.1)	102 (60.3)	130 (50.6)	28 (54.9)	149 (59.8)	55 (43.7)
Self-poisoning (only)	69 (16.2)	62 (16.4)	7 (14.9)	26 (15.4)	43 (16.7)	3 (5.9)	37 (14.9)	29 (23.0)
Other method (only)	14 (3.3)	14 (3.7)	–	5 (3.0)	9 (3.5)	2 (3.9)	8 (3.2)	4 (3.2)
Multiple methods of self-harm	111 (26.0)	80 (21.1)	31 (66.0)	36 (21.3)	75 (29.2)	18 (35.3)	55 (22.1)	38 (30.1)

Self-injury (only): any one of: burning, cutting, stabbing, gun/firearm, hanging, jumping, hitting body, strangling, suffocating, stepped into traffic.

Self-poisoning (only): any one of: alcohol, medications, illicit drugs, poison/caustic substances.

Other method (only): any one of: drowning, stopped required medication/treatment, ingestion of foreign object, starvation, non-reporting of ill health, indiscriminate unprotected sex.

Multiple methods of self-harm: simultaneous use of self-injury and self-poisoning and/or other method.

*Denominator for computation=lifetime self-harm frequency.

adolescents (19.1%) reported self-injury, but self-poisoning was comparable between females (16.7%) and males (15.4%), and similar between in-school (16.4%) and street-connected (14.9%) adolescents. However, more street-connected adolescents (38.5%) than adolescents in school (24.4%) and more females (35.8%) than males (12.3%) reported that they used medications as a means of self-poisoning. Alcohol (39.2%) and medications (27.7%) were the commonly reported means of self-poisoning. Results of the specific means of self-injury and self-poisoning are presented in online supplemental eTables 4, 5 and 6.

Stated reasons for last episode of self-harm

Reported reasons for the last episode of self-harm were categorised into intrapersonal reasons such as own thoughts, and interpersonal reasons such as family disputes (see table 4). More street-connected adolescents than adolescents in school indicated intrapersonal reasons, while more females than males reported interpersonal reasons for the last episode of self-harm. The total negative life events endorsed by the participants ranged from 0 to 22 (overall sample (mean=6.6, SD=4.1, median=6), school sample (mean=6.1, SD=3.9, median=6), street-connected sample (mean=9.0, SD=3.6, median=9)).

Notably, 32% of the overall sample reporting a self-harm history indicated “I wanted to die” as at least one of the reasons for the last episode of self-harm (28% in-school adolescents and 64% street-connected adolescents), with 13% of the participants (11% adolescents in school, 24% street-connected adolescents) reported “I wanted to die” as the sole reason for the last episode of self-harm.

Factors associated with self-harm: multilevel logistic regression analysis

Only the multilevel logistic regression analyses are reported here.^{31 32} The participants were clustered by school and street contexts. To test the significance of the clusters' effects, a likelihood ratio test (LR) compared

the null multilevel model with a null single-level model; the results showed strong evidence that variation between clusters in terms of self-harm was significantly not zero (LR=61.33, $p<0.001$)—see also caterpillar plot online supplemental eFigure 2. In the next step, all the potential exposure variables were entered into two models: model 1 assessed the associations between adolescents' sociodemographic characteristics and individual negative events, and self-harm during the past 12 months; model 2 examined the associations between adolescents' sociodemographic characteristics and total number of negative events, and self-harm during the past 12 months (see table 5).

Model 1 showed that history of self-harm prior to the past 12 months, non-heterosexual orientation, knowledge about a friend's attempted suicide, having knowledge about a family member's attempted suicide, having conflict with parents, being physically abused, being in a romantic relationship, weekly alcohol use and reporting schoolwork problems were more likely to be associated with self-harm. However, having more than four siblings, having relationship problems and primary caretaker being myself or other person were associated with lower risk of self-harm. In model 2, adolescents with non-heterosexual orientation, and with any weekly alcohol use, were more likely to report self-harm during the previous 12 months.

In both model 1 and model 2, having a history of self-harm prior to the past 12 months increases the odds of self-harm by 28 times, whereas gender and age showed no statistically significant associations with self-harm during the previous 12 months.

Associations between exposure variables and frequency of occurrence of self-harm during the past 12 months: multilevel negative binomial regression analysis

A LR test comparing the null multilevel model with a null single-level model showed that the variation between clusters, in terms of the counts of self-harm during the

Table 4 Stated reasons for last episode of self-harm

Reason	Overall	Adolescent groups		Sex		Age groups (years)		
		In-school	Street-connected	Male	Female	13–15	16–17	18–21
	n=426*	n=379*	n=47*	n=169*	n=257*	n=51*	n=249*	n=126*
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
My thoughts were so unbearable, I could not endure them any longer	196 (46.0)	170 (44.9)	26 (55.3)	69 (40.8)	127 (49.4)	22 (43.1)	112 (45.0)	62 (49.2)
It seemed that I lost control of myself, and I do not know why I did it	102 (23.9)	98 (25.9)	4 (8.5)	48 (28.4)	54 (21.0)	8 (15.7)	65 (26.1)	29 (23.0)
The situation was so unbearable that I could not think of any other alternative	137 (32.2)	112 (29.6)	25 (53.2)	48 (28.4)	89 (34.6)	17 (33.3)	79 (31.7)	41 (32.5)
I wanted to get away for a while from an unacceptable situation	118 (27.7)	107 (28.2)	11 (23.4)	47 (27.8)	71 (27.6)	10 (19.6)	59 (23.7)	49 (38.9)
I wanted to sleep for a while	33 (7.7)	27 (7.1)	6 (12.8)	11 (6.5)	22 (8.6)	4 (7.8)	15 (6.0)	14 (11.1)
I wanted to punish myself	8 (1.9)	8 (2.1)	0	4 (2.4)	4 (1.6)	1 (2.0)	3 (1.2)	4 (3.2)
I wanted to die	137 (32.2)	107 (28.2)	30 (63.8)	36 (21.3)	101 (39.3)	14 (27.5)	72 (28.9)	51 (40.5)
I wanted to show someone how much I loved him/her	64 (15.0)	59 (15.6)	5 (10.6)	24 (14.2)	40 (15.6)	4 (7.8)	34 (13.7)	26 (20.6)
I wanted others to know how desperate I felt	58 (13.6)	52 (13.7)	6 (12.8)	18 (10.7)	40 (15.6)	6 (11.8)	37 (14.9)	15 (11.9)
I wanted to get help from someone	73 (17.1)	65 (17.2)	8 (17.0)	31 (18.3)	42 (16.3)	7 (13.7)	38 (15.3)	28 (22.2)
I wanted to know if someone really cared about me	145 (34.0)	137 (36.1)	8 (17.0)	46 (27.2)	99 (38.5)	18 (35.3)	81 (32.5)	46 (36.5)
I wanted others to pay for the way they treated me	69 (16.2)	64 (16.9)	5 (10.6)	30 (17.8)	39 (15.2)	5 (9.8)	46 (18.5)	18 (14.3)
I wanted to make someone feel guilty	77 (18.1)	70 (18.5)	7 (14.9)	27 (16.0)	50 (19.5)	13 (25.5)	45 (18.1)	19 (15.1)
I wanted to persuade someone to change his/her mind	57 (13.4)	53 (14.0)	4 (8.5)	26 (15.4)	31 (12.1)	10 (19.6)	27 (10.8)	20 (15.9)
I wanted to make things easier for others	67 (15.7)	58 (15.3)	9 (19.1)	24 (14.2)	43 (16.7)	11 (21.6)	38 (15.3)	18 (14.3)
It was the work of the devil	27 (6.3)	25 (6.6)	2 (4.3)	16 (9.5)	11 (4.3)	3 (5.9)	14 (5.6)	10 (7.9)
Reporting at least one type of reason								
Intrapersonal	346 (81.2)	302 (79.7)	44 (93.6)	136 (80.5)	210 (81.7)	38 (74.5)	195 (78.3)	113 (89.7)
Interpersonal	276 (64.8)	246 (64.9)	30 (63.8)	101 (59.8)	175 (68.1)	34 (66.7)	156 (62.7)	86 (68.3)
Other	27 (6.3)	25 (6.6)	2 (4.3)	16 (9.5)	11 (4.3)	3 (5.9)	14 (5.6)	10 (7.9)

Similar to the findings from the Child & Adolescent Self-harm in Europe (CASE) Study¹⁷:

“My thoughts were so unbearable, I could not endure them any longer”, “It seemed that I lost control of myself, and I do not know why I did it”, “The situation was so unbearable that I could not think of any other alternative”, “I wanted to get away for a while from an unacceptable situation”, “I wanted to sleep for a while”, “I wanted to punish myself” and “I wanted to die” are categorised as ‘intrapersonal reasons’.

“I wanted to show someone how much I loved him/her”, “I wanted others to know how desperate I felt”, “I wanted to get help from someone”, “I wanted to know if someone really cared about me”, “I wanted others to pay for the way they treated me”, “I wanted to make someone feel guilty”, “I wanted to persuade someone to change his/her mind” and “I wanted to make things easier for others” are categorised as ‘interpersonal reasons’.

‘It was the work of the devil’ was categorised as ‘other’ reason.

*Denominator (n) for computation of proportion is lifetime self-harm frequency.

previous 12 months, was significantly non-zero (LR=12.76, $p<0.001$)—see also caterpillar plot (online supplemental eFigure 3).

All potential exposure variables were entered into two models: model 1 assessed the associations between adolescents’ sociodemographic characteristics and individual

**Table 5** Multilevel logistic regression assessing the associations between sociodemographic characteristics and negative events during the past 12 months, and self-harm during the past 12 months

Variable	Model 1			Model 2		
	Adjusted OR	95% CI	P value	Adjusted OR	95% CI	P value
Sex (female)	1.24	0.84 to 1.83	0.277	1.43	0.99 to 2.04	0.053
Age group (years)						
13–15	Reference			Reference		
16–17	0.89	0.50 to 1.67	0.682	1.02	0.58 to 1.79	0.939
18–21	0.62	0.32 to 1.21	0.162	0.62	0.32 to 1.19	0.148
Religious group (Muslim)	0.81	0.40 to 1.65	0.567	0.92	0.49 to 1.73	0.794
Employment status (employed)	0.54	0.22 to 1.32	0.180	0.52	0.22 to 1.24	0.141
Living arrangement						
One or both parents	Reference			Reference		
Other relative	1.02	0.59 to 1.74	0.952	0.92	0.55 to 1.52	0.740
Alone or with other person	1.89	0.89 to 3.98	0.095	1.47	0.72 to 3.02	0.289
Primary caretaker						
One or both parents	Reference			Reference		
Other relative	1.14	0.59 to 2.19	0.692	0.98	0.53 to 1.81	0.961
Myself or other person	0.46	0.20 to 1.06	0.069	0.58	0.27 to 1.26	0.171
Primary caretaker's employment status (employed)	0.56	0.31 to 1.03	0.063	0.59	0.34 to 1.04	0.071
Sexual orientation (non-heterosexual)	3.81	1.57 to 9.24	0.003	3.29	1.42 to 7.63	0.006
Weekly cigarettes (one or more cigarettes)	1.36	0.19 to 9.84	0.758	2.45	0.42 to 14.21	0.319
Weekly alcohol use (one or more drinks)	1.64	1.01 to 2.65	0.043	1.83	1.16 to 2.90	0.009
Illicit drug use (took illicit drug)	1.55	0.56 to 4.23	0.396	1.41	0.54 to 3.68	0.479
Family structure (father more than one wife)	1.13	0.73 to 1.74	0.585	1.18	0.81 to 1.72	0.387
Sibling size (>4 siblings)	0.89	0.59 to 1.35	0.587	0.88	0.59 to 1.30	0.527
School residential status (day student)	1.04	0.61 to 1.77	0.881	1.04	0.62 to 1.75	0.882
In romantic relationship (yes)	1.53	1.00 to 2.33	0.048	1.29	0.91 to 1.85	0.151
Self-harm prior to the past 12 months (yes)	28.01	18.34 to 42.80	0.000	28.21	18.88 to 42.16	0.000
Total negative events during the past 12 months						
≤5				Reference		
6–10				3.19	2.13 to 4.77	0.000
>10				6.13	3.69 to 10.18	0.000
Sexual orientation worries (yes)	1.48	0.78 to 2.81	0.229			
Parental separation/divorce (yes)	1.17	0.77 to 1.78	0.445			
Conflict with parents (yes)	1.87	1.24 to 2.81	0.003			
Conflict between parents (yes)	1.07	0.73 to 1.56	0.724			
Serious accident or illness of family member (yes)	0.73	0.50 to 1.08	0.113			
Death of family member (yes)	0.77	0.51 to 1.18	0.233			
Knowledge about a family member's suicide (yes)	0.53	0.21 to 1.32	0.171			
Knowledge about a family member's attempted suicide (yes)	2.48	1.46 to 4.22	0.000			
Schoolwork problems (yes)	1.55	1.06 to 2.25	0.022			
Truancy (>5 days)	0.55	0.29 to 1.02	0.059			
Sacked from school (yes)	0.94	0.64 to 1.37	0.749			
Serious romantic relationship problems (yes)	0.87	0.52 to 1.48	0.621			
Breakup (yes)	1.21	0.77 to 1.92	0.405			
Difficulty making/keeping friends (yes)	1.24	0.85 to 1.80	0.262			
Conflict with friends (yes)	1.07	0.73 to 1.57	0.724			
Serious accident or illness of close friend (yes)	1.17	0.79 to 1.71	0.423			

Continued

Table 5 Continued

Variable	Model 1			Model 2		
	Adjusted OR	95% CI	P value	Adjusted OR	95% CI	P value
Death of friend (yes)	1.20	0.81 to 1.79	0.362			
Knowledge about a friend's suicide (yes)	0.79	0.29 to 2.19	0.654			
Knowledge about a friend's attempted suicide (yes)	2.61	1.57 to 4.34	0.000			
Bullying victimisation (yes)	1.45	0.99 to 2.13	0.055			
Physical abuse victimisation (yes)	1.69	1.16 to 2.47	0.007			
Sexual abuse victimisation (yes)	1.21	0.78 to 1.87	0.392			
Trouble with police (yes)	1.43	0.59 to 3.43	0.424			
Other negative events during the past 12 months (yes)	1.16	0.77 to 1.75	0.462			
Random effect (intercept)	0.041	0.02 to 0.11	0.000	0.046	0.02 to 0.12	0.000

negative events, and frequency of self-harm during the past 12 months, and model 2 examined the associations between adolescents' sociodemographic characteristics and total negative events, and the frequency of self-harm during the past 12 months.

In model 1, as shown in table 6, having a history of self-harm prior to the past 12 months, living alone or with another person, knowledge about a friend's attempted suicide, having one or more alcoholic drinks weekly, experiencing other negative events, being in a romantic relationship, experiencing conflict between parents and having difficulty making/keeping friends were associated with higher frequency of self-harm during the past 12 months. In model 2, female gender and having one or more alcoholic drinks weekly were associated with a higher frequency of self-harm during the past 12 months.

In both model 1 and model 2, weekly alcohol use and having a history of self-harm before the previous 12 months showed a statistically significant association with higher frequency of self-harm during the past 12 months.

Clustering of adolescents

From the various cluster solutions identified in the R statistical package, the model-based three-cluster solution showed the lowest AIC (the AIC asymptotically selects a model that minimises mean squared error of prediction, hence, minimises maximum plausible risk in fixed sample sizes). Lower AIC value suggests better model fit.^{37 38} The final three-cluster solution included 14 sociodemographic variables (adolescent groups, gender, age groups, religious groups, employment status, living arrangement, primary caretaker, primary caretaker's employment status, sexual orientation, family structure, sibling size, school residential status, in romantic relationship and weekly alcohol use), eight negative events (the eight negative events during the previous 12 months were conflict with parents, knowledge about a family member's attempted suicide, schoolwork problems, conflict with friends, knowledge about a friend's attempted suicide, bullied, physically abused and sexually abused) and self-harm 'before', and 'during' the past 12 months.

Inspection of the final three-cluster solution showed that these 24 variables had higher density and as such provided a clear descriptive separation within the three clusters. Table 7 provides a summary of the characteristics of the three clusters.

Cluster 1 (n=837)

All the adolescents were in-school and cared for by one or both parents, who were employed. Most of the adolescents were males, aged 16–17 years, not involved in any paid work. They were not in romantic relationships, never drank alcohol and self-identified as Christian and heterosexual. Fewer than 10% of the adolescents in this cluster responded 'yes' to four or more of the eight negative events enquired about during the previous 12 months.

Four per cent of the adolescents in this cluster reported a history of self-harm prior to the past 12 months, and 5% reported self-harm during the past 12 months. Cluster 1 is thus described as a low adversity cluster with low self-harm prevalence.

Cluster 2 (n=481)

Predominantly, adolescents in this cluster were in-school, aged between 18 and 21 years, self-identified as Christian, heterosexual and the majority never drank alcohol. Seven per cent identified as street-connected, 1 in 10 lived alone or with another non-family member. Regarding negative events experienced during the previous 12 months, >10% reported: bullying victimisation, conflict with parents or sexual abuse victimisation; 30%–50% reported conflict with friends, schoolwork problems and having been physically abused in the last 12 months.

Fewer than 10% of the adolescents in this cluster reported a history of self-harm during the past 12 months (6%) or self-harm prior to the past 12 months (5%). Thus, cluster 2 is described as a moderate adversity group with low self-harm prevalence.

Cluster 3 (n=413)

The majority of the adolescents in cluster 3 were in-school, female, aged 16–17 years, self-identified as

**Table 6** Multilevel negative binomial regression assessing associations between characteristics of adolescents (sociodemographics and negative events) and frequency of self-harm during the past 12 months

Variable	Category	Model 1			Model 2		
		Adjusted IRR	95% CI	P value	Adjusted IRR	95% CI	P value
Sex	Male	Reference			Reference		
	Female	1.17	0.91–1.50	0.223	1.30	1.01–1.65	0.035
Age group (years)	13–15	Reference			Reference		
	16–17	0.82	0.56–1.19	0.288	0.80	0.54–1.16	0.237
	18–21	0.73	0.47–1.12	0.149	0.65	0.43–0.99	0.046
Religious group	Christian	Reference			Reference		
	Muslim	0.72	0.45–1.16	0.179	0.73	0.46–1.17	0.189
Employment status	Unemployed	Reference			Reference		
	Employed	0.63	0.36–1.10	0.106	0.66	0.39–1.13	0.129
Living arrangement	One or both parents	Reference			Reference		
	Other relative	1.13	0.78–1.63	0.519	1.06	0.75–1.52	0.716
	Alone or with other person	1.82	1.12–3.00	0.016	1.49	0.92–2.41	0.106
Primary caretaker	One or both parents	Reference			Reference		
	Other relative	1.00	0.65–1.53	0.998	0.92	0.61–1.40	0.711
	Myself or other person	0.59	0.36–0.97	0.038	0.72	0.45–1.16	0.181
Primary caretaker's employment status	Unemployed	Reference			Reference		
	Employed	0.91	0.61–1.36	0.649	0.86	0.59–1.26	0.437
Sexual orientation	Heterosexual	Reference			Reference		
	Non-heterosexual	1.22	0.74–2.02	0.430	1.25	0.76–2.06	0.376
Weekly cigarettes	Never/stopped smoking	Reference			Reference		
	≥1 cigarette	1.31	0.42–4.06	0.637	2.14	0.75–6.08	0.153
Weekly alcohol use	Never drink	Reference			Reference		
	One or more drinks	1.51	1.11–2.04	0.008	1.68	1.24–2.27	0.001
Illicit drug use	Never take drugs	Reference			Reference		
	Took illicit drug	0.92	0.54–1.55	0.746	1.07	0.63–1.81	0.799
Family structure	Father has one wife	Reference			Reference		
	Father has more than one wife	1.00	0.76–1.34	0.952	1.07	0.83–1.37	0.624
Sibling size	0–4	Reference			Reference		
	>4	0.75	0.56–0.99	0.041	0.76	0.58–1.00	0.051
School residential status	Boarding	Reference			Reference		
	Day student	1.10	0.79–1.52	0.579	1.10	0.78–1.53	0.582
In romantic relationship	No	Reference			Reference		
	Yes	1.44	1.08–1.90	0.011	1.16	0.90–1.48	0.240
Self-harm prior to the past 12 months	No	Reference			Reference		
	Yes	10.32	8.13–13.09	0.000	11.36	8.96–14.40	0.000
Total negative events during the past 12 months	≤5				Reference		
	6–10				2.40	1.78–3.24	0.000
	>10				3.55	2.50–5.05	0.000
Sexual orientation worries	No	Reference					
	Yes	1.31	0.90–1.91	0.159			
Parental separation divorce	No	Reference					
	Yes	1.01	0.77–1.32	0.941			
Conflict with parents	No	Reference					

Continued

Table 6 Continued

Variable	Category	Model 1			Model 2		
		Adjusted IRR	95% CI	P value	Adjusted IRR	95% CI	P value
Conflict between parents	Yes	1.30	0.99–1.71	0.057			
	No	Reference					
Serious accident or illness of family member	Yes	1.32	1.02–1.70	0.034			
	No	Reference					
Death of family member	Yes	1.04	0.80–1.34	0.769			
	No	Reference					
Knowledge about a family member's suicide	Yes	0.91	0.70–1.19	0.503			
	No	Reference					
Knowledge about a family member's attempted suicide	Yes	0.69	0.40–1.18	0.175			
	No	Reference					
Schoolwork problems	Yes	1.13	0.81–1.57	0.479			
	No	Reference					
Truancy	Yes	1.25	0.97–1.60	0.081			
	0–5 days	Reference					
	>5 days	0.80	0.56–1.15	0.228			
Sacked from school	No	Reference					
	Yes	1.04	0.80–1.33	0.783			
Serious romantic relationship problems	No	Reference					
	Yes	0.70	0.49–0.99	0.044			
Breakup	No	Reference					
	Yes	1.20	0.89–1.61	0.224			
Difficulty making/keeping friends	No	Reference					
	Yes	1.32	1.03–1.68	0.027			
Conflict with friends	No	Reference					
	Yes	0.99	0.76–1.29	0.946			
Serious accident or illness of close friend	No	Reference					
	Yes	0.89	0.70–1.15	0.379			
Death of friend	No	Reference					
	Yes	1.05	0.81–1.36	0.710			
Knowledge about a friend's suicide	No	Reference					
	Yes	1.56	0.93–1.59	0.090			
Knowledge about a friend's attempted suicide	No	Reference					
	Yes	1.74	1.26–2.39	0.001			
Bullying victimisation	No	Reference					
	Yes	1.25	0.97–1.50	0.081			
Physical abuse victimisation	No	Reference					
	Yes	1.21	0.94–1.56	0.148			
Sexual abuse victimisation	No	Reference					

Continued



Table 6 Continued

Variable	Category	Model 1			Model 2		
		Adjusted IRR	95% CI	P value	Adjusted IRR	95% CI	P value
Trouble with police	Yes	1.13	0.85–1.49	0.410			
	No	Reference					
Other negative events	Yes	1.51	0.88–2.59	0.134			
	No	Reference					
Random effect (intercept)	Yes	1.45	1.12–1.87	0.004	0.074	0.04–0.14	0.000

IRR, incidence rate ratio.

Christian and heterosexual and not involved in any paid work. Three-quarters lived with one or both parents, who were employed. Over 25% of this cluster reported that they had one or more alcoholic drinks weekly and more than half were in a romantic relationship. With regard to the negative events experienced during the previous 12 months, more than half reported conflict with friends, being physically or sexually abused, schoolwork problems, bullying victimisation and conflict with parents.

In this cluster, half reported self-harm during the past 12 months. Cluster 3 is therefore described as a high adversity group with high self-harm prevalence.

DISCUSSION

To the best of our knowledge, this is the first study of self-harm (defined without regard to purpose) in a regionally representative non-clinical sample of both in-school and street-connected adolescents from Ghana. Overall, one in five adolescents reported having self-harmed in their lifetime—approximately 1 out of 5 in-school, and 1 in 8 street-connected adolescents. Similarly, 1 in 6 adolescents reported an episode of self-harm during the previous 12 months—approximately 1 out of 5 in-school, and 1 in 11 street-connected adolescents. The reported prevalence of self-harm increased with age, at least among the in-school adolescents.

These prevalence estimates are comparable to those reported by recent systematic reviews of the global literature and add to the evidence that self-harm is an important global public health problem among adolescents.^{39–43} As has been found in other populations, the prevalence estimates were higher among females and older adolescents.⁴⁴ However, a striking finding was the low prevalence among the street-connected adolescents, especially given their experience of high rates of social adversity.

Although self-injury and self-poisoning were the common methods of self-harm reported, self-injury, typically self-cutting, was the most frequently used method; alcohol and medication were the main methods of self-poisoning, with males reporting use of drugs and alcohol, and females using medication. Street-connected

adolescents in this study tended to report methods of self-harm that involved higher risk of death, and though self-harm frequency was lower in this group they were also much more likely to report that their last episode of self-harm was associated with a wish to die.

We found many associations with self-harm in the previous 12 months, mainly in the sphere of interpersonal adversity, although intrapersonal reasons for self-harm (primarily seeking relief from unbearable thoughts) also featured, particularly for street-connected adolescents. This difference might reflect greater relative levels of distress, as evidenced by the wish to die, coupled with the looser social network (family) structures experienced by street-connected young people compared with those by in-school adolescents, where often the interpersonal reasons focused on the family. Female adolescents reported more of both intrapersonal and interpersonal reasons for their self-harm, possibly a reflection of greater emotional literacy and an inclination towards the need to explain and communicate their self-harm behaviour.^{45–47}

Modelling revealed that having a history of self-harm in the preceding 12 months, knowledge about a friend's or a family member's attempted suicide, non-heterosexual orientation and experience of multiple negative life events were associated with reports of self-harm and more frequent self-harm. One possibility is that direct experience of others attempting to manage distress through self-harm provided a viable but worrying model for young people experiencing difficult circumstances.^{48–49} Frequency of self-harm was associated with problems in romantic and friendship relationships, suggesting that difficulties in these areas make adolescents especially vulnerable to self-harm.

Cluster analysis suggested three groups of adolescents. The largest group was characterised by low adversity and low prevalence of self-harm. An intermediate group had moderate levels of adversity and low prevalence of self-harm. This cluster included the highest proportion of street-associated adolescents, who reported a high frequency of wish to die associated with their last self-harm episode. It is plausible that street-connected adolescents are more resilient, but when coping fails the impact

Table 7 Characteristics of adolescents in cluster analysis (sociodemographics, negative events and self-harm)

Variable	Category	Cluster 1	Cluster 2	Cluster 3
		n=837	n=481	n=413
Sociodemographics				
Adolescent groups	School adolescents	100%	93%	98%
	Street-connected adolescents	0	7%	2%
Sex	Male	54%	51%	40%
	Female	46%	49%	60%
Age group (years)	13–15	16%	7%	8%
	16–17	70%	44%	60%
	18–21	14%	49%	32%
Religious group	Christian	91%	91%	93%
	Muslim	9%	9%	7%
Employment status	Unemployed	99%	85%	95%
	Employed	1%	15%	5%
Living arrangement	One or both parents	93%	45%	76%
	Other relative	5%	43%	18%
	Alone or with other person	2%	12%	6%
Primary caretaker	One or both parents	100%	54%	81%
	Other relative	0	32%	10%
	Myself or other person	0	14%	9%
Primary caretaker's employment status	Unemployed	3%	13%	10%
	Employed	97%	87%	90%
Sexual orientation	Heterosexual	99%	98%	94%
	Non-heterosexual	1%	2%	6%
Family structure	Father has one wife	89%	57%	64%
	Father has more than one wife	11%	43%	36%
Sibling size	0–4	85%	54%	75%
	>4	15%	46%	25%
School residential status	Boarding	30%	5%	21%
	Day student	70%	95%	79%
In romantic relationship	No	79%	56%	41%
	Yes	21%	44%	59%
Weekly alcohol use	Never drink	95%	86%	72%
	One or more drinks	5%	14%	28%
Negative events				
Conflict with parents	No	91%	86%	47%
	Yes	9%	14%	53%
Knowledge about a family member's attempted suicide	No	97%	95%	77%
	Yes	3%	5%	23%
Schoolwork problems	No	81%	62%	37%
	Yes	19%	38%	63%
Conflict with friends	No	70%	59%	24%
	Yes	30%	41%	76%
Knowledge about a friend's attempted suicide	No	96%	96%	75%
	Yes	4%	4%	25%
Bullying victimisation	No	81%	76%	44%
	Yes	19%	24%	56%
Physical abuse victimisation	No	86%	67%	37%

Continued



Table 7 Continued

Variable	Category	Cluster 1	Cluster 2	Cluster 3
		n=837	n=481	n=413
Sexual abuse victimisation	Yes	14%	33%	63%
	No	95%	87%	54%
	Yes	5%	13%	46%
Self-harm				
Self-harm prior to the past 12 months	No	96%	95%	62%
	Yes	4%	5%	38%
Self-harm during the past 12 months	No	95%	94%	49%
	Yes	5%	6%	51%

is relatively greater.⁵⁰ The cluster with the highest prevalence of adversity and self-harm contained more in-school older females who experienced multiple negative events, were in romantic relationships, used alcohol weekly and had a history of self-harm prior to the previous 12 months. The use of alcohol may reflect an additional means by which to cope with their circumstances.⁵¹

Strengths of the study

With a larger and more varied sample than previous surveys and in securing street-connected participants from charity facilities and across census enumeration zones, our study has a sample of greater diversity and more heterogeneity in exposures than any previous study related to self-destructive behaviours in Ghana.^{52 53} In this study, we did not aim to compare the in-school and street-connected adolescents, but to obtain a comprehensive or unbiased sample and therefore less biased view of the problem of self-harm among adolescents in Ghana. Comparisons are designed to show the bias that results if you only study the easily accessible. For example, as shown in table 2, the prevalence estimates of self-harm were substantially higher among in-school adolescents (lifetime=22.0%, 12-month=18.2% and 1-month=3.5%) than among street-connected adolescents (lifetime=12.2%, 12-month=9.4% and 1-month=1.0%). This result (and others shown elsewhere in this study under *methods of self-harm, reported reasons and associations*) illustrate the bias that would have ensued by excluding the street-connected adolescent sample. Given that knowledge and practices related to value systems and sociocultural norms, education, family life and street living are more similar than different in countries within sub-Saharan Africa,^{5 54} our results can be applicable to both the context of Ghana and the situation in other countries within sub-Saharan Africa.

Limitations of the study

We measured self-harm through the use of a single item on the questionnaire, and any items about risks were similarly unelaborated. Non-disclosure of self-harm behaviours in anonymous self-report surveys has been reported among young people.⁵⁵ In Ghana, non-heterosexual orientation,

illicit drug use and self-harming behaviours are culturally proscribed and criminalised which might have led some participants to provide guarded or socially desirable responses to some of the survey questions.²⁵ The overrepresentation of the school sample compared with the street-connected sample, with more adolescents in public than private second cycle schools, is likely to have skewed the findings of the multivariable modelling.

The cross-sectional nature of this study does not permit causal interpretation of the findings.¹⁰

The structured questionnaire did not allow for detailed exploration of the reasons for self-harm and especially more socially or culturally specific reasons that might lie behind the rather high-level categories represented in the survey. More detailed exploration of the experience of self-harm in Ghana as compared with other countries would be likely to reveal differences that are concealed by the similarities indicated by our findings. Similarly, we could not explore why the adolescents chose self-harm as an appropriate response rather than another behaviour, such as seeking help. Also, we did not assess the mental states of our participants (e.g., depressive and anxiety symptoms or disorders), which have been found to be associated with self-harm in young people.²⁶

The design of the current study does not readily allow for further exploration of a number of our findings. Friend/family member suicide, which is known to be a strong risk factor for self-harm in high-income countries, was not found to be associated with self-harm in this study. CIs around these estimates were wide, indicating limited power to answer the question, but risk estimates were for the most part not in the expected direction. Also, having more than four siblings, having relationship problems and primary caretaker being myself or other person were associated with lower risk of self-harm in this study. Future research using more robust approaches, including carefully designed qualitative studies, may be useful in exploring personal and meaningful explanations for these findings.

The high response rate in our study is within the range of response rates reported by previous school-based health surveys from Ghana,^{42 52} however, the 'captive'

nature of school sampling and the Ghanaian (and the general African) mores that young people must submit to and obey their parents and respect their elders might have created a sense of compulsion to participate, despite emphasis that participation was voluntary.⁵⁴

CONCLUSION

Self-harm is a significant public health problem among in-school and street-connected adolescents in the Greater Accra region of Ghana. The prevalence estimates of self-harm are higher among females and in-school adolescents than in males and (surprisingly) street-connected adolescents. At the level of abstraction represented in the questions asked, the reported reasons for self-harm are very similar to those found in other countries.^{45 46} The implications for prevention and treatment is that specialist mental healthcare alone is less a priority than interventions aimed at ameliorating social and familial adversity—mental healthcare services need to be supplemented with family/social interventions. Further studies are needed to explore the individual, social and cultural meanings of self-harm—to inform evidence-based intervention and prevention efforts aimed more specifically at young people in Ghana.

Acknowledgements The authors would like to thank all the key stakeholders who granted permissions for this study: heads of the participating schools, directors and management of the selected charity organisations, the Greater Accra Regional Office of the Ghana Education Service, the Department of Social Welfare headquarters, Accra, and parents/guardians of the underage participants. The authors would also like to thank all the participants who contributed the data about their self-harm for this study.

Contributors EN-BQ, MGW and AH conceived, designed and organised the study. EN-BQ carried out the study, including data collection and coding of data for analysis. FS and EN-BQ performed the statistical analysis of the data, and MGW and AH contributed to the interpretation of the data. EN-BQ drafted the manuscript, and MGW, AH and FS critiqued the manuscript for important intellectual content. EN-BQ serves as guarantor for the contents of this paper. All authors read and approved the final version of the manuscript.

Funding This study was supported by the Leeds International Research Scholarship at the University of Leeds, School of Psychology, in the form of a doctoral scholarship to the first author (EN-BQ)—Grant No: CFN/sy/200631403.

Disclaimer The funder of the study had no role in study design, data collection, data analysis, data interpretation or writing of the report. The views expressed in this paper are those of the authors and not necessarily those of the Leeds International Research Scholarship.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This study received ethical approval from two Institutional Review Boards (the School of Psychology Ethics Committee, University of Leeds, UK (Ref. No: 16-0373) and the Ethics Committee for the Humanities, University of Ghana, Accra, Ghana (Ref. No: ECH078/16-17)) and institutional permissions were also obtained to conduct this study. The participants provided a signed written consent prior to taking part in the survey. Written consent of the parents/guardians of in-school adolescents aged 13–17 years was sought, while the underage adolescents assented to participate. Written consent to participate in the study was obtained from the management of charity facilities and street social workers on behalf of street-connected adolescents aged 13–17 years.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Emmanuel Nii-Boye Quarshie <http://orcid.org/0000-0002-8720-2355>
Allan House <http://orcid.org/0000-0001-8721-8026>

REFERENCES

- Platt S, Bille-Brahe U, Kerkhof A, *et al*. Parasuicide in Europe: the WHO/EURO multicentre study on parasuicide. I. Introduction and preliminary analysis for 1989. *Acta Psychiatr Scand* 1992;85:97–104.
- World Health Organisation. *Practice manual for establishing and maintaining surveillance systems for suicide attempts and self-harm*. Geneva, Switzerland: WHO, 2016.
- Aggarwal S, Berk M. Nonsuicidal self-injury in Indian adolescents: Nonexistent or unacknowledged? *Int J Soc Psychiatry* 2015;61:516–7.
- Aggarwal S, Patton G, Reavley N, *et al*. Youth self-harm in low- and middle-income countries: systematic review of the risk and protective factors. *Int J Soc Psychiatry* 2017;63:359–75.
- Quarshie EN-B, Waterman MG, House AO. Self-harm with suicidal and non-suicidal intent in young people in sub-Saharan Africa: a systematic review. *BMC Psychiatry* 2020;20:1–26.
- Grandclerc S, De Labrouhe D, Spodenkiewicz M, *et al*. Relations between nonsuicidal self-injury and suicidal behavior in adolescence: a systematic review. *PLoS One* 2016;11:e0153760.
- Mars B, Heron J, Klonsky ED, *et al*. Predictors of future suicide attempt among adolescents with suicidal thoughts or non-suicidal self-harm: a population-based birth cohort study. *Lancet Psychiatry* 2019;6:327–37.
- Naghavi M. Global burden of disease self-harm Collaborators. global, regional, and national burden of suicide mortality 1990 to 2016: systematic analysis for the global burden of disease study 2016. *BMJ* 2019;364:i94.
- Vandenbroucke JP, von Elm E, Altman DG, *et al*. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. *PLoS Med* 2007;4:e297.
- Woodward M. *Epidemiology. Study design and data analysis*. London: CRC Press, Taylor & Francis Group, 2014.
- Department of Social Welfare (DSW), Ricerca e Cooperazione, Catholic Action for Street Children. *Census on street children in the greater Accra region, Ghana*. Accra, Ghana: DSW, 2011.
- Ghana Education Service – GES. *Report on basic statistics and planning parameters for public and private senior high schools, and technical and vocational institutes 2015*. Accra, Ghana: GES, 2015.
- Krejcie RV, Morgan DW. Determining sample size for research activities. *Educ Psychol Meas* 1970;30:607–10.
- Kelley K, Clark B, Brown V, *et al*. Good practice in the conduct and reporting of survey research. *Int J Qual Health Care* 2003;15:261–6.
- Button KS, Ioannidis JPA, Mokrysz C, *et al*. Power failure: why small sample size undermines the reliability of neuroscience. *Nat Rev Neurosci* 2013;14:365–76.
- van Smeden M, Moons KG, de Groot JA, *et al*. Sample size for binary logistic prediction models: beyond events per variable criteria. *Stat Methods Med Res* 2019;28:2455–74.
- Madge N, Hewitt A, Hawton K, *et al*. Deliberate self-harm within an international community sample of young people: comparative findings from the Child & Adolescent Self-harm in Europe (CASE) Study. *J Child Psychol Psychiatry* 2008;49:667–77.
- Owusu A. *Global school-based student health survey (GSHS): Ghana report*. Murfreesboro: Middle Tennessee State University, Ghana Education Service, & WHO, 2012.

- 19 Nock MK, Holmberg EB, Photos VI, *et al.* Self-Injurious thoughts and behaviors interview: development, reliability, and validity in an adolescent sample. *Psychol Assess* 2007;19:309–17.
- 20 Linehan MM, Comtois KA, Brown MZ, *et al.* Suicide attempt self-injury interview (SASII): development, reliability, and validity of a scale to assess suicide attempts and intentional self-injury. *Psychol Assess* 2006;18:303–12.
- 21 Hjelmeland H, Hawton K, Nordvik H, *et al.* Why people engage in parasuicide: a cross-cultural study of intentions. *Suicide Life Threat Behav* 2002;32:380–93.
- 22 Hjelmeland H, Knizek BL, Kinyanda E, *et al.* Suicidal behavior as communication in a cultural context: a comparative study between Uganda and Norway. *Crisis* 2008;29:137–44.
- 23 Graham JW. Missing data analysis: making it work in the real world. *Annu Rev Psychol* 2009;60:549–76.
- 24 Graham JW. *Missing data: analysis and design*. New York: Springer, 2012.
- 25 Criminal Offences Act of Ghana. *Act 29, 1960*. Accra, Ghana: Assembly Press, 1960.
- 26 Hawton K, Saunders KEA, O'Connor RC. Self-Harm and suicide in adolescents. *The Lancet* 2012;379:2373–82.
- 27 Paul E. Proximally-occurring life events and the first transition from suicidal ideation to suicide attempt in adolescents. *J Affect Disord* 2018;241:499–504.
- 28 Liu B-P, Wang X-T, Liu Z-Z, *et al.* Stressful life events, insomnia and suicidality in a large sample of Chinese adolescents. *J Affect Disord* 2019;249:404–9.
- 29 Hox JJ. *Multilevel analysis: techniques and applications*. 2nd edn. New York: Routledge, 2010.
- 30 Finch WH, Bolin JE, Kelley K. *Multilevel modeling using R*. London: CRC Press/Taylor & Francis Group, 2014.
- 31 Stapleton LM, McNeish DM, Yang JS. Multilevel and single-level models for measured and latent variables when data are clustered. *Educ Psychol* 2016;51:317–30.
- 32 Rabe-Hesketh S, Skrondal A. Multilevel modelling of complex survey data. *J R Stat Soc Ser A Stat Soc* 2006;169:805–27.
- 33 Cohen J, Cohen P, West SG. *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah: Lawrence Erlbaum, 2003.
- 34 Sterne JAC, Smith GD. Sifting the evidence—what's wrong with significance tests? *Phys Ther* 2001;81:1464–9.
- 35 Greenland S, Senn SJ, Rothman KJ, *et al.* Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. *Eur J Epidemiol* 2016;31:337–50.
- 36 Linzer DA, Lewis JB. polCA : an R package for polytomous variable latent class analysis. *J Stat Softw* 2011;42:1–29.
- 37 McLachlan GJ, Basford KE. *Mixture models: inference and applications to clustering*. New York: Marcel Dekker, 1988.
- 38 Akaike H. A new look at the statistical model identification. *IEEE Trans Automat Contr* 1974;19:716–23.
- 39 Muehlenkamp JJ, Claes L, Havertape L, *et al.* International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child Adolesc Psychiatry Ment Health* 2012;6:10.
- 40 Valencia-Agudo F, Burcher GC, Ezepeleta L, *et al.* Nonsuicidal self-injury in community adolescents: a systematic review of prospective predictors, mediators and moderators. *J Adolesc* 2018;65:25–38.
- 41 Brown RC, Plener PL. Non-suicidal self-injury in adolescence. *Curr Psychiatry Rep* 2017;19:1–8.
- 42 Uddin R, Burton NW, Maple M, *et al.* Suicidal ideation, suicide planning, and suicide attempts among adolescents in 59 low-income and middle-income countries: a population-based study. *Lancet Child Adolesc Health* 2019;3:223–33.
- 43 Lim K-S, Wong CH, McIntyre RS, *et al.* Global lifetime and 12-month prevalence of suicidal behavior, deliberate self-harm and non-suicidal self-injury in children and adolescents between 1989 and 2018: a meta-analysis. *Int J Environ Res Public Health* 2019;16:4581.
- 44 Zubrick SR, Hafekost J, Johnson SE, *et al.* Self-harm: prevalence estimates from the second Australian child and adolescent survey of mental health and wellbeing. *Aust N Z J Psychiatry* 2016;50:911–21.
- 45 Scoliers G, Portzky G, Madge N, *et al.* Reasons for adolescent deliberate self-harm: a Cry of pain and/or a Cry for help? *Soc Psychiatry Psychiatr Epidemiol* 2009;44:601–7.
- 46 Rasmussen S, Hawton K, Philpott-Morgan S. Why do adolescents self-harm? an investigation of motives in a community sample. *Crisis* 2016;37:176–83.
- 47 Doyle L, Sheridan A, Treacy MP. Motivations for adolescent self-harm and the implications for mental health nurses. *J Psychiatr Ment Health Nurs* 2017;24:134–42.
- 48 Jarvi S, Jackson B, Swenson L, *et al.* The impact of social contagion on non-suicidal self-injury: a review of the literature. *Arch Suicide Res* 2013;17:1–19.
- 49 Insel BJ, Gould MS. Impact of modeling on adolescent suicidal behavior. *Psychiatr Clin North Am* 2008;31:293–316.
- 50 Oppong Asante K, Meyer-Weitz A. International note: association between perceived resilience and health risk behaviours in homeless youth. *J Adolesc* 2015;39:36–9.
- 51 Borges G, Bagge CL, Cherpitel CJ, *et al.* A meta-analysis of acute use of alcohol and the risk of suicide attempt. *Psychol Med* 2017;47:949–57.
- 52 Oppong Asante K, Kugbey N, Osafo J, *et al.* The prevalence and correlates of suicidal behaviours (ideation, plan and attempt) among adolescents in senior high schools in Ghana. *SSM Popul Health* 2017;3:427–34.
- 53 Oppong Asante K, Meyer-Weitz A. Prevalence and predictors of suicidal ideations and attempts among homeless children and adolescents in Ghana. *J Child Adolesc Ment Health* 2017;29:27–37.
- 54 Gyekye K. *African cultural values. An introduction*. Accra, Ghana: Sankofa publishing company, 2003.
- 55 De Luca S, Yan Y, Lytle M, *et al.* The associations of race/ethnicity and suicidal ideation among college students: a latent class analysis examining precipitating events and disclosure patterns. *Suicide Life Threat Behav* 2014;44:444–56.

Supplementary Material

eAppendix 1: Sampling and questionnaire administration

eFigure 1: Categories of second cycle schools in the Greater Accra region which agreed to participate in the study

eTable 1. Inclusion criteria for recruitment of street-connected adolescents

eTable 2. Coding of variables and proportions of missing data

eTable 3. Chi-square tests assessing the relationships between adolescents' characteristics (socio-demographic factors and negative life events) and self-Harm during the past 12 months.

eTable 4. Means of self-injury ever used

eTable 5. Means of self-poisoning ever used

eTable 6. Means of "other method" of self-harm ever used

eFigure 2. Caterpillar plot showing cluster effect with 95% CI resulting from the null multilevel logistic regression model

eFigure 3. Caterpillar plot showing cluster effect with 95% CI resulting from the null multilevel negative binomial regression model.

eAppendix 1: Sampling and questionnaire administration

In-school Adolescents

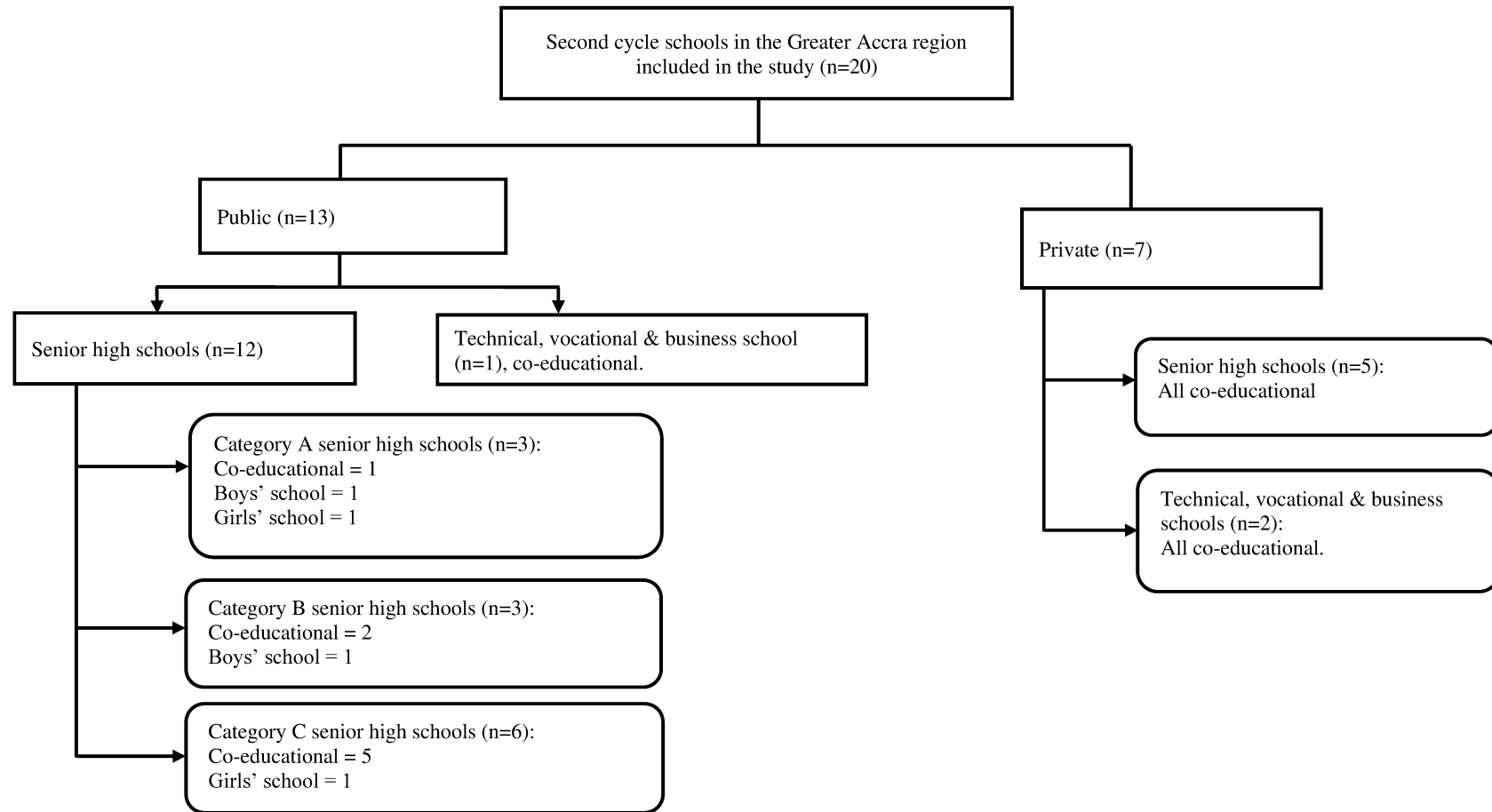
A two-stage sampling technique was used to recruit in-school adolescents, involving a random selection of schools, and then random selection of classes.

Selection of schools

The latest list of second cycle schools in the Greater Accra region was obtained from the Regional Directorate of the Ghana Educational Service, providing the school names, their specific geographical locations, gender (whether mixed or single-sex), type of school (i.e., senior high school, or technical, vocational and business school) and the school category (A, B, or C)^a. Simple random selection of the schools was then performed using the Random Order Generator tool^b. The required number of schools in each category was picked consecutively beginning from the top of the generated list. Of the 28 schools invited, the heads of 20 schools agreed and returned the consent form permitting the study in their schools. The heads of eight schools declined for the following reasons; three school headteachers indicated that several similar surveys had been conducted recently in their schools; the heads of two cited busy academic work; while the heads of three schools did not respond to the invitation to participate. As shown in eFigure 3, 13 government schools (12 senior high schools, and 1 technical, vocational and business school), and seven privately owned second cycle schools (5 senior high schools, and 2 technical, vocational and business schools) participated in the study. Following determination of the required sample per school, names of all classes, regardless of the study year, were entered into the Random Order Generator tool. Eligible classes were picked consecutively beginning at the top of the generated list. All students in each selected class were eligible to participate. Previous nationally representative school-based studies examining health behaviours in Ghana found the multi-stage random student sampling strategy useful in accessing representative samples.

^a Typically, senior high schools (grammar schools) in Ghana are ranked A, B, and C categories. Category A schools score higher on prestige and academic performance. They have good academic facilities, and some have expansive infrastructure, compared to schools in categories B and C. Across the country, schools in category A are few and are often located in the rich cities (e.g., Accra, Kumasi, Cape Coast etc.), towns, and wealthy districts. Schools in category B can be described as average performing schools, with modest infrastructure, and student population. However, schools in category C perform slightly below average and are less endowed in terms of infrastructure. The majority of senior high school students in Ghana are in category C schools.

^b Random Order Generator tool is available at: www.endmemo.com/math/randomorder.php



eFigure 1: Categories of second cycle schools in the Greater Accra region which agreed to participate in the study

Recruitment of in-school adolescents

Following permission by the headteachers, the primary researcher arranged to present the study to the randomly selected classes in the assembly hall of each school. In addition to English, the primary researcher made the presentation also in Ga^c, and Twi, the two main local languages spoken in the Greater Accra Region. The primary researcher then gave each student a participant information sheet and an informed consent form. Additionally, each student aged less than 18 years received two copies of a letter for consent to parents/guardians and a parent/guardian consent form seeking their consent for the students' participation.

Administration of survey to in-school adolescents

On the agreed future date for the survey, students who took part in the study presentation session were gathered in the school's assembly hall or a larger classroom designated for the survey. Upon completing the survey, each student placed their questionnaire and the additional consent form (whether filled and signed or not) in an opaque envelope and dropped it in a box placed nearer the exit door.

The response rate across the 20 schools ranged between 80.8% and 100%. A total of 1,928 students were invited to participate in the study, with 1,723 answered questionnaires (Males = 838; Females = 885) included in the final analysis, representing a response rate of 89.4%. There were 164 students excluded for the following reasons; the parents/guardians of 49 students declined to give their consent, while 38 students were absent from school on the survey day.

Recruitment of Street-connected Adolescents

The sampling for street-connected adolescents involved four steps: formulation of inclusion and exclusion criteria, recruitment and training of fieldwork assistants, access and recruitment of street-connected adolescents, and administration of the survey to street-connected adolescents.

Criteria for inclusion and exclusion of street-connected adolescents

A street-connected child or adolescent in the Greater Accra region is identified by the Department of Social Welfare as "one who is under 18 years, is born on the street and lives with parent(s) on the street; migrated to the street; or is an urban poor child or street mother who survives working in the street". The list of inclusion criteria used are shown in eTable 1.

^c The Ga language is also known in Ghana as the Ga-Dangme language.

eTable 1. Inclusion criteria for recruitment of street-connected adolescents

Parameter	Inclusion criterion
Age, "street life age" ^d , and sleeping condition	A boy or a girl aged between 13 and 25 years ^e who self-identifies as sleeping rough for, at least, the last 6 months prior to the present study.
Living arrangement and relationship with family	<ul style="list-style-type: none"> – A boy or a girl born on the street, lives alone or with one or both parents on the street. – An urban poor adolescent or who survives working in the street. – A boy or girl who has migrated to the street and has remote or no contact with family.
Status	A street-connected mother or pregnant mother aged between 13 and 25 years who survives working in the street.

A street-connected adolescent was ineligible if they showed visible signs of ill health, neurological impairment or signs of alcohol or drug intoxication or withdrawal (e.g., tics, tremors, violent behaviour, irritated gestures etc.); or who attempted to participate more than once.

Access and recruitment of street-connected adolescents

Facility-based sampling, indigenous field worker sampling, snowball sampling, and time-location sampling strategies were used to identify and conveniently recruit street-connected adolescents aged between 13 and 25 years to participate. The primary researcher obtained a list of government approved charities working with street-connected children and youth within the region, and the report on the latest street children and youth census conducted by the Department of Social Welfare and collaborating organisations from the Department of Social Welfare, Ministry of Gender, Children and Social Protection, in Accra. The census report provides a list of specific street census enumeration areas within the region where street-connected children and youth are located. Facility-based sampling involves recruitment of a hard-to-reach population from facilities frequented by those at participants including charities, sexually transmitted diseases clinics, drug treatment centres, among others. For sampling within street census enumeration areas the Department of Social Welfare and collaborating organisations provide seven zones within the Greater Accra region where street-children and youth can be found: indigenous field worker sampling, snowball sampling, and time-location sampling techniques were used to access and recruit street-connected adolescents for this study within the selected street census enumeration areas.

Administration of the survey to street-connected adolescents

The primary researcher recruited and trained three fieldwork assistants to help in the administration of the survey to the street-connected adolescent participants. To address the varied and often poor literacy levels of street-connected children and youth, the survey administration combined researcher- and self-administration.

^d In this study, "street life age" is taken to mean the number of years a street-connected adolescent has being living in the street situation prior to the study.

^e The 13 – 25 age band criterion was applied to the street-connected adolescent sample as applied to the in-school adolescent sample in order to ensure consistency of age range between the two groups of adolescents studied.

eTable 2. Coding of variables and missing and proportions of data

Variable	Survey question	Coding on questionnaire	Recoded for analysis	Observation / Missing (%)
Socio-demographics				
Adolescent type	The data was divided into two sub-groups: "in-school adolescents" and "street-connected adolescents".	(1) In-school (2) Street-connected	In-school = 0 Street-connected = 1	N = 2107 / 0 (0%)
Sex	What is your sex?	(1) Male (2) Female	Male = 0 Female = 1	N = 2107 / 0 (0%)
Age	What is your age?	13-21 years (continuous)	13-15-years = 0 16-17 years = 1 18-21 years = 2	N = 2107 / 0 (0%)
Street life age*	How long have you been living in this area?	(1) 6months-1year (2) 2-5years (3) More than 5 years	6 months – 1 year = 0 > 1 year = 1	N = 384 / 0 (0%)
Still have contact with family*	Do you still have contact with your family?	(0) No (1) Yes	Unchanged	N = 384 / 0 (0%)
Still in School*	Do you still go to school?	(0) No (1) Yes	Unchanged	N = 384 / 0 (0%)
Educational background*	What is your highest educational background?	(1) No formal education (2) Primary school (3) Junior high school (4) Senior high school	No formal education = 0 Primary or Junior high school = 1	N = 384 / 0 (0%)
Religious group	What is your religious group?	(1) Christian (2) Muslim (3) African Traditional Religion (4) Other	Christian = 0 Muslim = 1	N = 2083 / 24 (1.1%)
Employment status	What is your employment status?	(1) Unemployed (2) Self-employed (3) I work for someone (4) Other	Unemployed = 0 Employed = 1	N = 2104 / 3 (0.1%)
Living arrangement	What is your living arrangement? I live	(1) alone (2) with my father and mother (3) with my father only (4) with my mother only (5) with my sister/brother (6) with an extended relative (7) with my partner (8) Other	with one or both parents = 0 with other relative = 1 alone or with other person = 2	N = 2107 / 0 (0%)

Primary caretaker	Who is most responsible for taking care of your needs?	(1) Myself (2) Both my father and mother (3) My father only (4) My mother only (5) My sister/brother (6) An extended relation (7) Other	One or both parents = 0 Other relative = 1 Myself or with other person = 2	N = 2107 / 0 (0%)
Primary caretaker's employment status	What is the employment status of parent(s) or guardian?	(1) Self-employed (2) Employed (3) Unemployed (4) Retired (5) Other	Unemployed = 0 Employed = 1	N = 2011 / 96 (4.6%)
Personal level and lifestyle factors				
Sexual orientation	How would you describe your sexual orientation?	(1) Heterosexual (2) Lesbian (3) Gay (4) Bisexual (5) Transgender	Heterosexual = 0 Non-heterosexual = 1	N = 2104 / 3 (0.1%)
Sexual orientation worries	Have you had worries about your sexual orientation during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Cigarettes smoked weekly	How many cigarettes do you smoke in a typical week?	(1) I never smoke (2) I used to, but I have stopped. (3) Up to 5 cigarettes a week (4) 6–20 cigarettes a week (5) 21–50 cigarettes a week (6) More than 50 cigarettes	Never/stopped = 0 1 or more cigarettes = 1	N = 2107 / 0 (0%)
Weekly alcoholic drinks	In a typical week, how many times do you at least one alcoholic drink? (This includes drinking beer, akpeteshie, palm wine, pito, brukutu, gin, brandy, bonsamnsuo, yebudidi, schnapps, vodka, black label, bailey, alomo, club, ogidigidi, Guinness, Smirnoff, Hennessy, or Star. Drinking alcohol does not include drinking a few sips of wine for religious purposes. One "drink" is a glass of wine, a bottle of	(1) I never drink alcohol (2) One drink (3) 2-5 drinks (4) 6-10 drinks (5) 11-20 drinks (6) More than 20 drinks	Never drink = 0 1 or more drinks = 1	N = 2107 / 0 (0%)

	beer, a small glass of liquor, or a mixed drink).			
Illicit drug used in the past year	Please tick any of the following types of illicit drug you have taken during the past 12 months or 1 year.	(1) I never take illicit drugs (2) Marijuana/Wee/Ganja (3) Heroin / opium / morphine (4) Speed/LSD/ amphetamine (5) Cocaine / 'white powder' / 'coke' (6) Other illicit drugs and substances (not including medication).	Never take illicit drugs = 0 Took illicit drug = 1	N = 2106 / 1 (0.0%)
Self-harm prior to the previous 12 months	Did you ever in your life actually intentionally harm yourself before the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Age at first episode / onset of self-harm	How old were you the first time you actually harmed yourself?	8-20 years (continuous)	Unchanged	N = 426 / 0 (0%)
Family related factors				
Family Structure	How will you describe your family structure?	(1) My father has one wife (2) My father has more than one wife	My father has 1 wife = 0 My father has > 1 wife = 1	N = 2106 / 1 (0.0%)
Sibling size	How many siblings (brothers and sisters) do you have?	(1) I am an only child (2) 1 sibling (3) 2 siblings (4) 3 siblings (5) 4 siblings (6) 5 siblings (7) 6 siblings (8) More than 6 siblings	0 – 4 siblings = 0 > 4 siblings = 1	N = 2107 / 0 (0%)
Parental separation/divorce	Have your parents separated or divorced during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2105 / 2 (0.1%)
Conflict with parents	Have you had any serious arguments or fights with either or both of your parents during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Conflict between parents	Have your parents had any serious arguments or fights during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Serious accident or illness of family member	Have you or any member of your family had a serious illness or	(0) No (1) Yes	Unchanged	N = 2105 / 2 (0.1%)

	accident during the past 12 months or 1 year?			
Death of family member	Has anyone among your immediate family (mother, father, brother, or sister) died during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Family suicide	Has anyone among your family killed himself / herself during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Family attempted suicide	Has anyone among your family tried killing himself/herself or intentionally harmed himself/herself during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2105 / 2 (0.1%)
School related factors				
School residential status	If you are still in school, are you a boarding or day student?	(1) Boarding (2) Day student	Boarding = 0 Day student = 1	N = 1772 / 0 (0%)
School work problems	Have you had problems keeping up with school work during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 1771 / 1 (0.1%)
Truancy	During the past 12 months, on how many days were you absent from school without permission?	(1) 0 day (2) 1-5 days (3) 5-20 days (4) Other	0-5 days = 0 > 5 days = 1	N = 1770 / 2 (0.1%)
Sacked from school	Have you been sacked from school because you owed fees during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 1770 / 2 (0.1%)
Interpersonal level factors				
In romantic relationship	Do you have a boyfriend or girlfriend?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Serious relationship problems	Have you had any serious problems with your boyfriend or girlfriend during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Breakup	Have you had a break-up with a boyfriend or girlfriend during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Difficulty making/keeping friends	Have you had difficulty in making friends or keeping friends during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)

Conflict with friends	Have you had any serious arguments or fights with friends during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Serious accident or illness of close friend	Has any close friend had a serious illness or accident during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Death of Friend	Has any close friend to you died during the past year?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)
Knowledge about a friend's suicide	Has anyone among your friends killed himself / herself during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Knowledge about a friend's attempted suicide	Has anyone among your close friends tried killing himself/herself or intentionally harmed himself/herself during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Bullying victimisation	Have you been bullied at school or in your area during the past 12 months? Please note: Bullying occurs when a student or a group of students tease, threaten, spread rumours about, hit, shove, or hurt another student over and over again. It is not bullying when two students of about the same strength or power argue or fight or tease each other in a friendly and fun way.	(0) No (1) Yes	Unchanged	N = 2105 / 2 (0.1%)
Physical abuse victimisation	Have you been seriously physically beaten during the past year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Sexual abuse victimisation	Has anyone forced you (i.e. physically or verbally) to engage in sexual activities against your will during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Trouble with police	Have you been in trouble with the police during the past 12 months or 1 year?	(0) No (1) Yes	Unchanged	N = 2107 / 0 (0%)
Other negative life events	Has any other negative or unpleasant event occurred involving you, your family, or your close friends?	(0) No (1) Yes	Unchanged	N = 2106 / 1 (0.0%)

Note: * Item applies to street-connected adolescents only.

eTable 3. Chi-square tests assessing the relationships between adolescents' characteristics (socio-demographic factors and negative life events) and self-harm during the past 12 months.

Variable	Category	Self-harm during the past 12 months		χ^2	P-value (2-tailed)
		No 1757 (83.4%) n (%)	Yes 350 (16.6%) n (%)		
Socio-demographic Factors					
Adolescent type	In-school Street-connected	1409 (81.8) 348 (90.6)	314 (18.2) 36 (9.4)	17.75	< .001*
Sex	Male Female	900 (87.0) 857 (79.9)	134 (13.0) 216 (20.1)	19.55	< .001*
Age group	13-15-years 16-17 years 18-21 years	273 (87.5) 1000 (82.6) 484 (82.7)	39 (12.5) 210 (17.4) 101 (17.3)	4.47	.107
Religious group	Christian Muslim	1501 (82.9) 235 (86.4)	310 (17.1) 37 (13.6)	2.10	.147
Employment status	Unemployed Employed	1397 (81.8) 357 (90.2)	311 (18.2) 39 (9.8)	16.20	< .001*
Living arrangement	Live with one or both parents Live with other relative Live alone or with other person	1183 (83.4) 338 (81.6) 236 (86.1)	236 (16.6) 76 (18.4) 38 (13.9)	2.40	.301
Primary caretaker	One or both parents Other relative Myself other person	1289 (83.5) 198 (78.9) 270 (86.5)	255 (16.5) 53 (21.1) 42 (13.5)	5.92	.052
Primary caretaker's employment status	Unemployed Employed	130 (73.0) 1536 (83.8)	48 (27.0) 297 (16.2)	13.23	< .001*
Personal Level Factors					
Sexual orientation	Heterosexual Non-heterosexual	1714 (84.4) 41 (55.4)	316 (15.6) 33 (44.6)	43.48	< .001*
Sexual orientation worries	No Yes	1679 (84.8) 77 (60.6)	300 (15.2) 50 (39.4)	50.42	< .001*
Cigarettes smoked weekly	Never/stopped 1 or more cigarettes	1715 (83.6) 42 (72.0)	336 (16.4) 14 (25.0)	1.70	.087
Weekly alcoholic drinks	Never drink 1 or more drinks	1495 (85.9) 262 (71.6)	246 (14.1) 104 (28.4)	44.56	< .001*
Illicit drug used in the past year	Never take illicit drug Took illicit drug	1678 (84.2) 78 (69.0)	315 (15.8) 35 (31.0)	17.76	< .001*
Family Level Factors					
Family structure:	Father has 1 wife Father has > 1 wife	1235 (85.3) 521 (79.2)	213 (14.7) 137 (20.8)	12.19	< .001*
Sibling size:	0 – 4 siblings > 4 siblings	1223(83.1) 533 (83.9)	249 (16.9) 102 (16.1)	0.33	.568
Parental separation/divorce:	No Yes	1152 (86.3) 604 (78.4)	183 (13.7) 166 (21.6)	21.09	< .001*
Conflict with parent:	No Yes	1385 (88.3) 371 (69.0)	183 (11.7) 167 (31.0)	108.46	< .001*
Conflict between parents:	No Yes	1057 (89.0) 699 (76.1)	131 (11.0) 219 (23.9)	61.51	< .001*
Serious accident or illness of family member:	No Yes	875 (86.3) 880 (80.7)	139 (13.7) 211 (19.3)	12.03	< .01*
Death of family member:	No Yes	1128 (84.2) 629 (81.9)	211 (15.8) 139 (18.1)	1.93	.165
Knowledge about a family member's suicide:	No Yes	1689 (83.8) 68 (74.7)	327 (16.2) 23 (25.3)	5.15	< .05*
Knowledge about a family member's attempted suicide:	No Yes	1616 (85.7) 139 (63.2)	269 (14.3) 81 (36.8)	72.25	< .001*
School Level Factors					
School residential status:	Boarding Day student	311 (82.7) 1138 (81.5)	65 (17.3) 258 (18.5)	0.283	.594
School work problems:	No Yes	995 (88.1) 453 (70.6)	134 (11.9) 189 (29.4)	84.73	< .001*
Truancy:	0 – 5 days > 5 days	1300 (82.3) 147 (77.0)	279 (17.7) 44 (23.0)	3.29	.070

Sacked from school:	No	801 (84.9)	142 (15.1)	13.32	< .001*
	Yes	647 (78.2)	180 (21.8)		
Interpersonal Level Factors					
In romantic relationship:	No	1156 (87.8)	161 (12.2)	48.79	< .001*
	Yes	601 (76.1)	189 (23.9)		
Serious relationship problems:	No	1432 (86.2)	229 (13.8)	45.19	< .001*
	Yes	325 (72.9)	121 (27.1)		
Breakup:	No	1383 (86.9)	208 (13.1)	59.03	< .001*
	Yes	373 (72.4)	142 (27.6)		
Difficulty making/keeping friends:	No	1142 (87.0)	171 (13.0)	32.38	< .001*
	Yes	615 (77.5)	179 (22.5)		
Conflict with friends:	No	950 (89.0)	118 (11.0)	48.52	< .001*
	Yes	806 (77.6)	232 (22.4)		
Serious accident or illness of close friend:	No	1130 (86.5)	176 (13.5)	24.37	< .001*
	Yes	627 (78.3)	174 (21.7)		
Death of Friend:	No	761 (87.6)	108 (12.4)	18.37	< .001*
	Yes	996 (80.5)	241 (19.5)		
Knowledge about a friend's suicide:	No	1701 (84.1)	322 (15.9)	17.66	< .001*
	Yes	56 (66.7)	28 (33.3)		
Knowledge about a friend's attempted suicide:	No	1610 (86.1)	260 (13.9)	87.98	< .001*
	Yes	147 (62.0)	90 (38.0)		
Other Factors					
Bullying victimisation:	No	1210 (87.8)	168 (12.2)	56.62	< .001*
	Yes	545 (75.0)	182 (25.0)		
Physical abuse victimisation:	No	1166 (88.8)	147 (11.2)	73.77	< .001*
	Yes	591 (74.4)	203 (25.6)		
Sexual abuse victimisation:	No	1472 (87.6)	2089 (12.4)	107.10	< .001*
	Yes	285 (66.7)	142 (33.3)		
Trouble with police:	No	1636 (83.6)	320 (16.4)	1.24	.264
	Yes	121 (80.1)	30 (19.9)		
Other negative life events during the past 12 months.	No	1281 (86.7)	196 (13.3)	40.03	< .001*
	Yes	475 (75.5)	154 (24.5)		
Total negative life events during the past 12 months	≤ 5	844 (94.0)	54 (6.0)	201.27	< .001*
	6 – 10	680 (81.7)	152 (18.3)		
	> 10	233 (61.8)	144 (38.2)		
Self-harm prior to the past 12 months	No	1690 (91.9)	148 (8.1)	761.38	< .001*
	Yes	67 (24.9)	202 (75.1)		

Notes: χ^2 = Chi squared value. * Denotes statistically significant relationship.

eTable 4. Means of self-injury ever used

Variable	Overall	Adolescent groups		Gender		Age groups		
	*n = 333	In-school *n = 293	Street-connected *n = 40	Male *n = 135	Female *n = 198	13-15 *n = 46	16-17 *n = 198	18-21 *n = 89
Means of Self-injury ever used:	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Burning (only)	15 (4.5)	14 (4.8)	1 (2.5)	9 (6.7)	6 (3.0)	2 (4.3)	5 (2.5)	8 (9.0)
Cutting (only)	129 (38.7)	117 (39.9)	12 (30.0)	50 (37.0)	79 (39.9)	21 (45.7)	72 (36.4)	36 (40.4)
Stabbing/puncture (only)	12 (3.6)	11 (3.8)	1 (2.5)	5 (3.7)	7 (3.5)	1 (2.2)	6 (3.0)	5 (5.6)
Hanging (only)	9 (2.7)	5 (1.7)	4 (10.0)	2 (1.5)	7 (3.5)	3 (6.5)	4 (2.0)	2 (2.2)
Jumping (only)	4 (1.2)	3 (1.0)	1 (2.5)	1 (0.7)	3 (1.5)	1 (2.2)	1 (0.5)	2 (2.2)
Hitting body (only)	47 (14.1)	44 (15.0)	3 (7.5)	22 (16.3)	25 (12.6)	2 (4.3)	35 (17.7)	10 (11.2)
Strangling (only)	2 (0.6)	2 (0.7)	–	–	2 (1.0)	1 (2.2)	–	1 (1.1)
Suffocating (only)	9 (2.7)	8 (2.7)	1 (2.5)	1 (0.7)	8 (4.0)	–	9 (4.5)	–
Stepped into traffic (only)	4 (1.2)	1 (0.3)	3 (7.5)	–	4 (2.0)	2 (4.3)	2 (1.0)	–
Multiple means of self-injury	102 (30.6)	88 (30.0)	14 (35.0)	45 (33.3)	57 (28.8)	13 (28.3)	64 (32.3)	25 (28.1)

Note:

Multiple means of self-injury = Simultaneous use of two or more means of self-injury.

* Denominator for computation = Total participants who reported having ever used any means of self-injury.

eTable 5. Means of self-poisoning ever used

Variable	Overall	Adolescent groups		Sex		Age groups		
	*n = 166	In-school *n = 127	Street-connected *n = 39	Male *n = 57	Female *n = 109	13-15 *n = 20	16-17 *n = 83	18-21 *n = 63
Means of Self-poisoning ever used:	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Alcohol (only)	65 (39.2)	61 (48.0)	4 (10.3)	29 (50.9)	36 (33.0)	4 (20.0)	34 (41.0)	27 (42.9)
Medications (only)	46 (27.7)	31 (24.4)	15 (38.5)	7 (12.3)	39 (35.8)	7 (35.0)	24 (28.9)	15 (23.8)
Illicit drugs (only)	4 (2.4)	–	4 (10.3)	3 (5.3)	1 (0.9)	2 (10.0)	2 (2.4)	–
Poison/caustic substances (only)	20 (12.0)	18 (14.2)	2 (5.1)	6 (10.5)	14 (12.8)	1 (5.0)	10 (12.0)	9 (14.3)
Multiple means of self-poisoning	31 (18.7)	17 (13.4)	14 (35.9)	12 (21.1)	19 (17.4)	6 (30.0)	13 (15.7)	12 (19.0)

Note:

Multiple means of self-poisoning = Simultaneous use of two or more means of self-poisoning.

* Denominator for computation = Total participants who reported having ever used any means of self-poisoning.

eTable 6. Means of “other method” of self-harm ever used

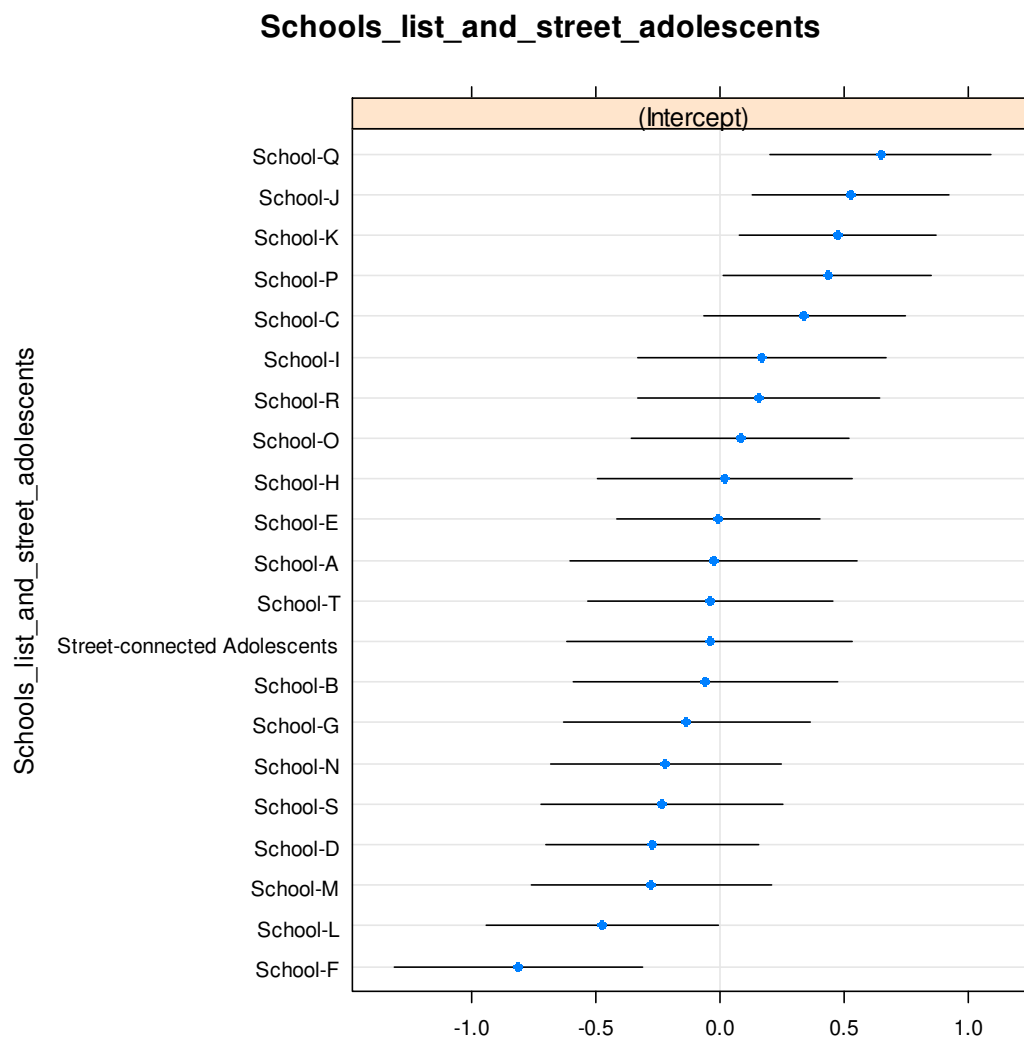
Variable	Overall	Adolescent groups		Sex		Age groups		
	*n = 71	In-school *n = 68	Street-connected *n = 3	Male *n = 24	Female *n = 47	13-15 *n = 7	16-17 *n = 41	18-21 *n = 23
Means of other methods of self-harm:	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Drowning (only)	23 (32.4)	21 (30.9)	2 (66.7)	13 (54.2)	10 (21.3)	1 (14.3)	11 (26.8)	11 (47.8)
Stopped required medication/treatment (only)	38 (53.5)	37 (54.4)	1 (33.3)	10 (41.7)	28 (59.6)	5 (71.4)	25 (61.0)	8 (34.8)
Ingestion of foreign object (only)	1 (1.4)	1 (1.5)	–	–	1 (2.1)	1 (14.3)	–	–
Starvation (only)	2 (2.8)	2 (2.9)	–	–	2 (4.3)	–	1 (2.4)	1 (4.3)
Indiscriminate unprotected sex (only)	2 (2.8)	2 (2.9)	–	–	2 (4.3)	–	–	2 (8.7)
Multiple means of “other method”	5 (7.0)	5 (7.4)	–	1 (4.2)	4 (8.5)	–	4 (9.8)	1 (4.3)

Note:

Multiple means “other method” of self-harm = Simultaneous use of two or more “other method” of self-harm.

* Denominator for computation = Total participants who reported having ever used any means of “other method” of self-harm.

Figure 2. Caterpillar plot showing cluster effect with 95% CI resulting from the null multilevel logistic regression model



eFigure 3. Caterpillar plot showing cluster effect with 95% CI resulting from the null multilevel negative binomial regression model.

