Epidemiological trends and risk factors for tobacco, alcohol and drug use among adolescents in Scotland, 2002-2013

Running title: Trends in substance use in Scotland

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Abstract

Background: This study estimates trends in prevalence, and patterns, of individual and multiple substance use between 2002 and 2013 amongst adolescents in Scotland.

Methods: The study uses data from 134,387 participants of the biennial national 'Scottish Schools Adolescent Lifestyle and Substance Use Survey' on smoking, alcohol and illicit drug use. Current regular use and current heavy use of smoking, alcohol, illicit drugs and multiple substances was measured. Time trends in the prevalence of each outcome were estimated using univariate and multivariate logistic regression.

Results: Regular smoking, alcohol, illicit drug and multiple substance use declined significantly amongst adolescents in Scotland. However, multivariate analyses that focussed upon high risk levels of these behaviours revealed an upward linear trend in heavy alcohol (OR 1.06; 95% CI: 1.04, 1.07) and heavy illicit drug (OR 1.04; 95% CI: 1.00, 1.08) use (p<0.05). Non-white pupils were more likely to be involved in individual and multiple substance use than ethnically white British pupils. In comparison to pupils from the least deprived socioeconomic quintile, pupils from the most deprived quintile had increased odds of 1.41 (95% CI: 1.02, 1.97; p<0.05) and 1.62 (95% CI: 1.14, 2.29; p<0.05) of being regular and heavy multiple substance users, respectively.

Conclusions: Further effort is required to tackle heavy alcohol and heavy illicit drug use amongst adolescents in Scotland. Prevention strategies should be informed by the risk profiles of substance misusers and evidence around the clinical and cost-effectiveness of preventive interventions.

Keywords: tobacco, alcohol, illicit drugs, adolescents, Scotland

Introduction

The adverse sequelae of tobacco, alcohol and illicit drug use are well documented.(1-6) The World Health Organization (WHO) has highlighted that understanding the prevalence and role of these behavioural risk factors should play a crucial part in developing clear and effective strategies for improving global health.(7) In industrialised nations, initiation of tobacco, alcohol and illicit drug use tends to occur during adolescence, a critical period of life in which risky behaviours often result in embeddedness during the remaining life course.(8) Moreover, risky adolescent behaviours such as tobacco, alcohol and illicit drug use often co-occur, which in turn compounds the risk of a host of adverse health, social and economic consequences.(9)

The prevalence of risky adolescent behaviours during adolescence varies by behaviour and across jurisdictions. Data for the years 2000 to 2007 from 140 WHO member states collected as part of the Global Youth Tobacco Survey revealed that approximately 9.5% of 13 to 15 year olds smoked cigarettes, with prevalence ranging from 4.9% in the Eastern Mediterranean Region to 19.2% in the European Region.(10) In the United States, surveillance data collected during 2010 and 2011 revealed that 18.1% of high school students in grades 9 to 12 had smoked cigarettes during the 30 days before the survey, with evidence of higher prevalence amongst male (19.9%) than female (16.1%) students.(11) Furthermore, data compiled across national surveys in the United States reveal that more than one half of adolescents in the United States report alcohol use, and nearly one fourth report exposure to illicit drugs.(12) In the United Kingdom (UK), recent evidence based on national surveys suggests a reduction in the prevalence of cigarette smoking, alcohol use and illicit drug use amongst adolescents in England.(13) However, close scrutiny of these epidemiological data suggests mixed patterns of multiple substance use amongst adolescents that differ by

sociodemographic profile, highlighting areas where future preventive efforts should be targeted.(13)

In contrast to other industrialised nations, there is a relative paucity of published national epidemiological evidence on substance use amongst adolescents in Scotland. Levin and colleagues analysed national data on 2,692 15-year olds included in The Scottish Health Behaviour in School-aged Children Study, conducted between March and June 2010.(14) They found that 13.6% of boys and 18.9% of girls were current smokers, broadly in accordance with data from unpublished reports based on The Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS).(15, 16) They also found that prevalence of smoking was highest amongst those living in the second most deprived socioeconomic quintile. Recent Scotland-wide epidemiological data on alcohol and illicit drug use amongst adolescents has, to our knowledge, been restricted to unpublished reports.(15-17)

Since the Scottish Parliament was established in 1999, the Scottish Government has introduced a number of policy initiatives aimed at tackling substance misuse amongst adolescents. This has included, but not limited to, a ban on tobacco advertising in 2002, an increase in the age for tobacco sales from 16 to 18 years in 2007, a ban on the display of cigarettes for sale in shops and self-service sales from automatic vending machines in 2010, and national frameworks aimed at mitigating the damaging impacts that alcohol and drug misuse have on families and communities, including young people. The objective of this study was to estimate trends in the prevalence, and patterns, of individual and multiple substance use amongst adolescents in Scotland against this policy background.

Methods

Data sources

Data from SALSUS formed the basis of this empirical investigation. SALSUS is a continuation of a series of biennial national surveys on smoking, alcohol and illicit drug use among young people that were carried out jointly in Scotland and England between 1982 and 2000.(15) From 2002, Scotland has carried out its own national survey, namely SALSUS, which generates epidemiological data on substance use among adolescents, and provides a vehicle for monitoring progress towards Scottish Government targets on smoking, alcohol and illicit drug use. The SALSUS surveys were carried out biennially between 2002 and 2010 (2002: n=23,090; 2004: n=7,062; 2006: n=23,180; 2008: n=10,063; 2010: n=37,307) and subsequently after a three year period in 2013 (n=33,685). SALSUS takes the form of a confidential, self-completed questionnaire completed by secondary school second year (S2) (average age of 13 years) and secondary school fourth year S4 (average age of 15 years) pupils in school settings. In each survey year, the Scottish Government schools database was used as the sampling frame and included all state funded, grant-maintained and independent secondary schools across the country, but excluded schools dedicated to children with additional support needs. Each survey adopted a multistage sample design that determined the probability of being a selected school, and the probability of being a selected class within that school. With the exception of the 2004 survey, weighting for school type and age group non-response was also applied within local authority strata to ensure that the samples were representative both at a national and a local authority level; the weighting system applied in 2004 ensured that the sample was nationally representative. Consent to participate was provided both by schools and the pupils and their parents. The overall response rate,

calculated from the school, class and pupil response rates, varied between 57% in 2006 and 65% in 2002. Detailed methodology for each of the SALSUS surveys, including survey design, sampling strategy, questionnaire design and consent procedures is described in the appendices of the SALSUS annual reports (http://www.scotpho.org.uk/publications/overview-of-key-data-sources/surveys-cross-sectional/scottish-schools-adolescent-lifestyle-a-substance-use-survey). SALSUS data are publicly available and were downloaded from the UK Data Archive on 16th May 2016 (http://www.data-archive.ac.uk/).

Outcome measures

All substance use measures were self-reported by the adolescents as part of questionnaires completed under exam conditions. Each questionnaire was returned to the class teacher in a sealed envelope without the reporting of names to ensure confidentiality. The outcome variables were defined separately for two levels of substance misuse: current regular use and current heavy use. Current regular smoking was defined as usually smoking one cigarette a week or more; current regular alcohol use was defined as drinking once a week or more on average; and current illicit drug use was defined as having taken any illicit drugs in the last month. These definitions were broadly consistent with those applied in previous studies of adolescent substance use in the UK.(13) Current regular multiple substance use was defined as engaging simultaneously in all these behaviors. Using these definitions, data were available for all study years with the exception of 2004. With regards to current heavy substance use, the report of smoking at least 60 cigarettes in last week, drinking at least 21 units of alcohol in the last week and taking illicit drugs most days were considered measures of heavy smoking, alcohol and illicit drug use, respectively. In keeping with the operational

definition adopted by SALSUS, heavy multiple substance use was defined as engaging in at least two out of three of these behaviors.(15, 16) Using these definitions, data were available for all study years with the exception of 2002 for heavy smoking, 2002, 2004 and 2006 for heavy alcohol use, and 2004 for heavy illicit drug use. Sociodemographic data incorporated in the SALSUS surveys included gender (male, female), school year (S2, S4; indicative of age) and ethnicity (Scottish/white British, white other, other ethnicity, don't know/refused to answer). It also included socioeconomic quintile derived from Scottish Index of Multiple Deprivation (SIMD)(18) ranks that were themselves derived from postcodes for home addresses reported by the pupils. Socioeconomic data were only available from 2006 onwards.

Statistical analysis

The prevalence of individual and multiple regular and heavy substance use behaviours was calculated for the total sample in each survey year and separately by gender, school year, ethnicity and socioeconomic quintile within each survey year. Statistical analysis provided a description of the time trends for each outcome measure in two alternative ways: a) percentage change between the first and last survey year available and its 95% confidence interval (CI), calculated using univariate logistic regression with survey year as the only independent variable considered on a nominal scale; and b) annual change adjusted for the independent variables (gender, school year, ethnicity and socioeconomic quintile) using multivariate logistic regression with survey year treated as a continuous independent variable. The rationale for these two different methods of time trend calculation was to evaluate the effects of restricting the trend to be linear on a logarithmic scale with survey year as a continuous predictor variable and of adjusting for the independent variables other than survey

year. The univariate logistic regressions were used to calculate the marginal distributions of the survey year estimates (via the post-estimation command "margins" in STATA). Subsequently, the differences between the first versus last survey year estimates were divided by their respective time spans to generate average annual changes. The latter were then multiplied by 100 to generate average annual percentage point changes. In addition, estimates of marginal odds and associated standard errors within the univariate regressions were converted into odds ratios (ORs) and corresponding 95% CIs, and presented graphically as time trends. Interactions between the independent variables were also investigated. In keeping with previous similar studies with large samples,(13) missing data were handled by using listwise deletion, except for known confounding effects of non-response such as refusing to answer or answering "don't know" to the question on respondent's ethnicity. The latter may be an indicator of social vulnerability (e.g. for immigrants) and correlated with higher risk of substance use. All regression analyses accounted for clustering of respondents within primary sampling units and the varying probability of selecting an individual from the target population.

The distribution of multivariate regression residuals was examined to verify whether the assumptions for model estimation had been met. In addition, two types of sensitivity analysis were performed: a) by adding independent variables related to family circumstances (free school meal entitlement, household composition, maternal and paternal knowledge of children's activities, amount of pocket money) in order to verify the stability of time trends for substance use; and b) by applying more conservative definitions of current regular use of tobacco and alcohol covering the past month rather than the past week in order to enhance comparability with some international surveys.(10, 19) All analyses were performed using STATA software (StataCorp. 2013. *Stata Statistical Software:* Release 13. College Station, TX: StataCorp LP).

Results

Prevalence of substance use

Table 1 summarises the weighted prevalence of adolescent substance use by type of substance and heaviness of use for the overall samples in each survey year. The weighted prevalence of regular smoking, alcohol, illicit drug and multiple substance use declined steadily between 2002 and 2013 from 13.06% to 5.22%, 27.09% to 6.78%, 14.27% to 5.61% and 5.48% to 1.44%, respectively. Uninterrupted declines in regular substance use were also observed in each sociodemographic subgroup with the exception of all ethnicity subgroups for which the prevalence of regular smoking, alcohol and multiple substance use peaked in 2006, and all socioeconomic subgroups for which the prevalence of regular smoking, illicit drug and multiple substance use peaked in 2008 (data not reported).

In contrast to the pattern for regular substance use, the weighted prevalence of heavy smoking, alcohol and multiple substance use peaked in 2008 and declined thereafter. Moreover, this pattern was observed for all gender, school year (age), ethnicity and socioeconomic subgroups.

Trends in substance use: Univariate regressions

Table 2 summarises the results of the univariate logistic regressions estimating time trends in substance use by type of substance and heaviness of use with survey year as the only independent variable. Average annual percentage point declines of 0.65%, 1.69%, 0.72% and 0.34% were estimated for regular smoking, alcohol, illicit drug and multiple substance use,

respectively, between 2002 and 2013 (p<0.0001). Lower average annual percentage point declines of 0.14%, 0.46% and 0.09% were estimated for heavy smoking, alcohol and illicit drug use, respectively, between the first and last years surveyed for each of these substances (p<0.0001). Notably, however, an average annual percentage point increase of 0.04% was estimated for heavy multiple substance use between the first and last years surveyed (p<0.0001). Graphical representations of the time trends in probabilities of regular and heavy substance use, by type of substance, are presented in Figure 1.

Appendices 1-4 summarise the results of the univariate logistic regressions estimating time trends in substance use for each type of substance and heaviness of use, by sociodemographic subgroup. For each gender (Appendix 1) and school year (Appendix 2) subgroup, there were statistically significant average annual percentage point decreases in regular smoking, alcohol, illicit drug and multiple substance use and in heavy smoking, alcohol and illicit drug use, but also a statistically significant increase in heavy multiple substance use. A similar pattern was observed for the ethnicity subgroups with the exception of regular smoking, for which a non-statistically significant decline was estimated in all the ethnicity subgroups, and heavy illicit drug use, for which an increase in use was estimated in all the ethnicity subgroups (Appendix 3). Similarly, when the analyses were replicated by socioeconomic quintile, a temporal increase in heavy drug use was estimated within each quintile, although the estimated average annual percentage point increase was only statistically significant (p=0.039) in the most deprived socioeconomic quintile (Appendix 4).

Trends and patterns in substance use: Multivariate regressions

The multivariate regressions revealed significant downward linear trends over time for all forms of regular substance use: ORs (95% CIs) of 0.92 (0.91, 0.94), 0.84 (0.83, 0.85), 0.96

(0.95, 0.97) and 0.91 (0.87, 0.93) for regular smoking, alcohol, illicit drug and multiple substance use, respectively (p<0.001) (Table 3). In contrast, the multivariate regressions revealed significant upward linear trends over time for heavy alcohol (OR 1.06; 95% CI: 1.04, 1.07) and illicit drug (OR 1.04; 95% CI: 1.00, 1.08) use (p<0.05).

When sociodemographic risk factors were considered, girls had a significantly increased odds of being a regular smoker than boys (OR 1.28; 95% CI: 1.19, 1.37), but also had a significantly decreased odds of regular use of illicit drugs (OR 0.75; 95% CI: 0.69, 0.80) and multiple substances (OR 0.91; 95% CI: 0.89, 0.93) and heavy use of alcohol (OR 0.68; 95% CI: 0.63, 0.74), illicit drugs (OR 0.32; 95% CI: 0.25, 0.40) and multiple substances (OR 0.57; 95% CI: 0.48, 0.68) (p<0.001). With the exception of regular multiple substance use, S4 (average age of 15 years) pupils had a significantly increased odds of all forms of regular and heavy substance use than S2 (average age of 13 years) pupils.

Ethnically white non-British pupils had a significantly increased odds of being a regular (OR 1.38; 95% CI: 1.12, 1.69; p<0.001) and heavy (OR 1.80; 95% CI: 1.08, 3.00; p<0.05) illicit drug user than ethnically white British pupils. With the exception of regular alcohol use, non-white pupils and pupils who were unaware or refused to identify their ethnicity had a significantly increased odds of taking all forms of regular and heavy substance use compared to ethnically white British pupils. With regards to socioeconomic status, significantly increased odds of regular smoking and alcohol use were estimated with increasing levels of socioeconomic deprivation. Finally, in comparison to pupils from the least deprived socioeconomic quintile, pupils from the most deprived quintile had increased odds of 1.41 (95% CI: 1.02, 1.97; p<0.05) and 1.62 (95% CI: 1.14, 2.29; p<0.05) of being regular and heavy multiple substance users, respectively.

Additional analyses

The distribution of multivariate logistic regression residuals was centred around zero and approximately normal. Also, the residuals' correlation with the main exposure variable (survey years) was close to zero (details not shown), suggesting that key assumptions for the parameter estimation had been met. The sensitivity analyses revealed that estimates of temporal trends in substance use remained robust to the incorporation of independent variables related to family circumstances (Appendix 5) and application of more conservative definitions of current regular use (Appendix 6).

Discussion

Main findings of this study

This study revealed that regular smoking, alcohol, illicit drug and multiple substance use declined significantly amongst adolescents in Scotland over the period 2002-2013. However, multivariate analyses that focussed upon high risk levels of these behaviours revealed an upward trend over this time horizon in heavy alcohol and illicit drug use. Sociodemographic patterns within the study data suggest complex gender profiles with girls more likely to be regular smokers, but boys more likely to be use alcohol, illicit drugs and multiple substances in risky ways. Older adolescents were significantly more likely to use individual substances either regularly or in risky ways than younger adolescents. Our results also suggest that non-white pupils and those who were unaware or refused to identify their ethnicity were more

likely to be involved in individual and multiple substance use. Furthermore, we observed an association between socioeconomic deprivation and an increased likelihood of being involved in all types of individual and multiple substance use.

What is already known on this topic?

A number of large cross-sectional surveys have revealed high levels of risky behaviours in adolescents that vary by behaviour and jurisdiction (10-12, 14). The findings of this study affirm analyses of national representative data from several industrialised nations, which previously suggested that adolescent substance use has been declining since the turn of the 21st century (13, 20, 21). Furthermore, the sociodemographic predictors of individual and multiple substance use, by heaviness of use, revealed by this study are broadly consistent with the previous literature (9, 13, 14, 22-24). A number of theoretical and small observational studies have identified socialization, cultural and environmental mechanisms for the initiation and sustenance of adolescent substance use (25-28), but data on these factors are largely absent from national cross-sectional and longitudinal surveys.

What this study adds

Our study findings provide a transparent, nuanced account of recent declines in the prevalence of regular substance misuse amongst adolescents in Scotland against concerted policy initiatives aimed at its prevention. However, in contrast to recent epidemiological evidence from England, which showed a significant downward linear trend for a combination of risky alcohol use (either heavy regular drinking or binge drinking), regular smoking and regular illicit drug use amongst 11-15 year olds between 1998-2009 (OR 0.90; 95% CI: 0.88,

0.93; $p<0.001$) (13), we did not observe a decline in the prevalence of multiple heavy substance use. Differences between our results and those from England may be explained by a number of factors including differences in the time horizons of the underpinning data, categorisation of individual and multiple exposures, and covariates incorporated into each set of models. Nevertheless, we cannot discount the possibility that patterns of behavioural risk factors differ between adolescents in the two nations.

Our findings highlight the need for implementation of effective prevention strategies that particularly target heavy alcohol and heavy illicit drug use amongst adolescents in Scotland. Randomised controlled trials of family-based or school-based interventions aimed at preventing adolescents misusing tobacco (29), alcohol (30) or illicit drugs (31) have been carried out to good effect. However, less is known about the effectiveness of prevention programmes targeting high risk behaviours in adolescence, nor about the common antecedents to multiple risk factors that should be the focus of future prevention efforts (32). Moreover, to our knowledge, a feature of all the trials aimed at preventing or alleviating the effects of substance misuse in adolescents is their failure to collect detailed economic information and, therefore, to assess the cost-effectiveness of the interventions. It is imperative that economic evaluations of these interventions are conducted and that resources in this area are allocated in a manner that is both clinically and cost effective. The effects of broader macroeconomic measures affecting prices of substances, and tighter controls around illicit markets, sales practices and enforcement, also remain the basis of future enquiry.

Our study also generated subtle differences in sociodemographic predictors of individual and multiple substance use with those observed in England (13). In particular, the English data suggest that girls are at increased risk of multiple substance use whereas our study suggests that boys are at increased risk. In addition, the English data suggest that the prevalence of individual and multiple substance use across years is higher amongst white

adolescents whereas our study suggests that they are higher amongst non-white adolescents. This highlights the need for policy responses that are informed by an understanding of localised behavioural patterns.

Limitations of this study

There are a number of study caveats that should be borne in mind by readers. First, although the overall study population included 134,387 adolescents, the samples for some of the sociodemographic subgroups within some study years were relatively small. Caution is therefore required when drawing conclusions about the sociodemographic risk profiles of adolescent substance misuers in Scotland. Second, the type and degree of substance use was self-reported by adolescents, a method that has previously been shown to only have fair validity when corroborated against biochemical test results (33). Moreover, the definitions of self-reported heavy substance use that we applied have not been widely used in international surveys (10, 12, 34, 35). Third, the categorisation of key covariates within our multivariate models, namely ethnicity and socioeconomic status, was driven by the design of the SALSUS questionnaires, and does not reflect the more granulated and personalised approaches to ethnicity and socioeconomic profiling applied in some national (36, 37) and international (38) surveys. Fourth, the summary statistics generated by our statistical approaches for estimating time trends in substance use do not fully convey peaks and troughs in prevalence within intermediate years. Fifth, as noted above, a number of socialization, cultural and environmental factors were not collected within SALSUS and were therefore omitted from our analyses. Sixth, the study excluded other health risk behaviours during adolescence, such as early or risky sexual behaviours, which often co-occur with substance use and compound the risk of long-term adverse sequelae (9). Finally, our study does not prove causality

between recent policy initiatives introduced by the Scottish Government, or changes in behavioural, inter-personal and social factors, and trends in the prevalence, and patterns, of individual and multiple substance use.

Conclusions

This study reveals that, in keeping with other nations of the UK, the prevalence of regular individual and multiple substance use amongst adolescents in Scotland has declined since the turn of the 21st century. Of particular concern, however, is the upward trend in heavy alcohol and heavy illicit drug use, which should be the focus of future prevention efforts. Targeted strategies should be informed by the risk profiles of substance misusers and evidence around the clinical and cost-effectiveness of preventive interventions.

Acknowledgments

We would like to thanks participants of the successive 'Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS)' annual surveys, conducted by the Information Services Division, NHS National Services Scotland, on behalf of Scottish Government.

Funding

Stavros Petrou receives support from the UK National Institute for Health Research (NIHR) as a NIHR Senior Investigator. The Warwick Clinical Trials Unit, University of Warwick, benefited from facilities funded through the Birmingham Science City Translational Medicine Clinical Research and Infrastructure Trials Platform, with support from Advantage West Midlands. The views herein expressed are those of the authors and not necessarily those of the funding bodies.

Conflicts of interest

None to declare.

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Table 1: Number (%)* of adolescents using substances by type of substance, heaviness of use and year of survey

	2002	2004	2006	2008	2010	2013
Total surveyed (N)	23,090	7,062	23,180	10,063	37,307	33,685
Regular substance use	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Smoking	2,949 (13.06)	-	2,118 (9.67)	891 (9.54)	2,857 (7.80)	1,670 (5.22)
Drinking	6,166 (27.09)	-	4,472 (20.12)	1,579 (16.76)	4,645 (12.90)	2,236 (6.78)
Drug use	3,165 (14.27)	-	1,787 (8.31)	769 (8.13)	2,502 (6.95)	1,849 (5.61)
Multiple substances	1,222 (5.48)	-	719 (3.40)	332 (3.53)	961 (2.59)	476 (1.44)
Heavy substance use	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Smoking	-	171 (2.42)	389 (1.89)	339 (3.76)	658 (1.81)	327 (1.08)
Drinking	-	-	-	511 (5.32)	1,587 (4.29)	840 (2.55)
Drug use	416 (1.93)	-	203 (0.95)	85 (0.83)	323 (0.85)	294 (0.88)
Multiple substances	-	-	44 (0.25)	124 (1.32)	410 (1.08)	200 (0.60)

* Note: Survey weights were not applied for the number of respondents using a substance (n) and the total surveyed (N). This differed from the respective percentages in parentheses, which were multiplied by survey weights, i.e. (n/N) x (survey weight) x100.

Table 2: Average annual average percentage point change in substance use between first and last year surveyed; all adolescents

Type of substance use	Time span (complete calendar years)[±]	Annual average % point change[#]	SE	95% CI	*P*-value
Regular substance use					
Smoking	12	-0.653	0.007	(-0.535, -0.771)	<0.0001
Drinking	12	-1.692	0.008	(-1.559, -1.825)	<0.0001
Drug use	12	-0.722	0.006	(-0.621, -0.823)	<0.0001
Multiple substances	12	-0.336	0.004	(-0.276, -0.396)	<0.0001
Heavy substance use					
Smoking	10	-0.135	0.002	(-0.092, -0.177)	<0.0001
Drinking	6	-0.462	0.003	(-0.367, -0.558)	<0.0001
Drug use	12	-0.087	0.001	(-0.064, -0.111)	<0.0001
Multiple substances	8	0.043	0.001	(0.023, 0.064)	<0.0001

[±] Time span (years) between first and last year surveyed.

[#] Annual percentage point change in substance use between first and last year surveyed.

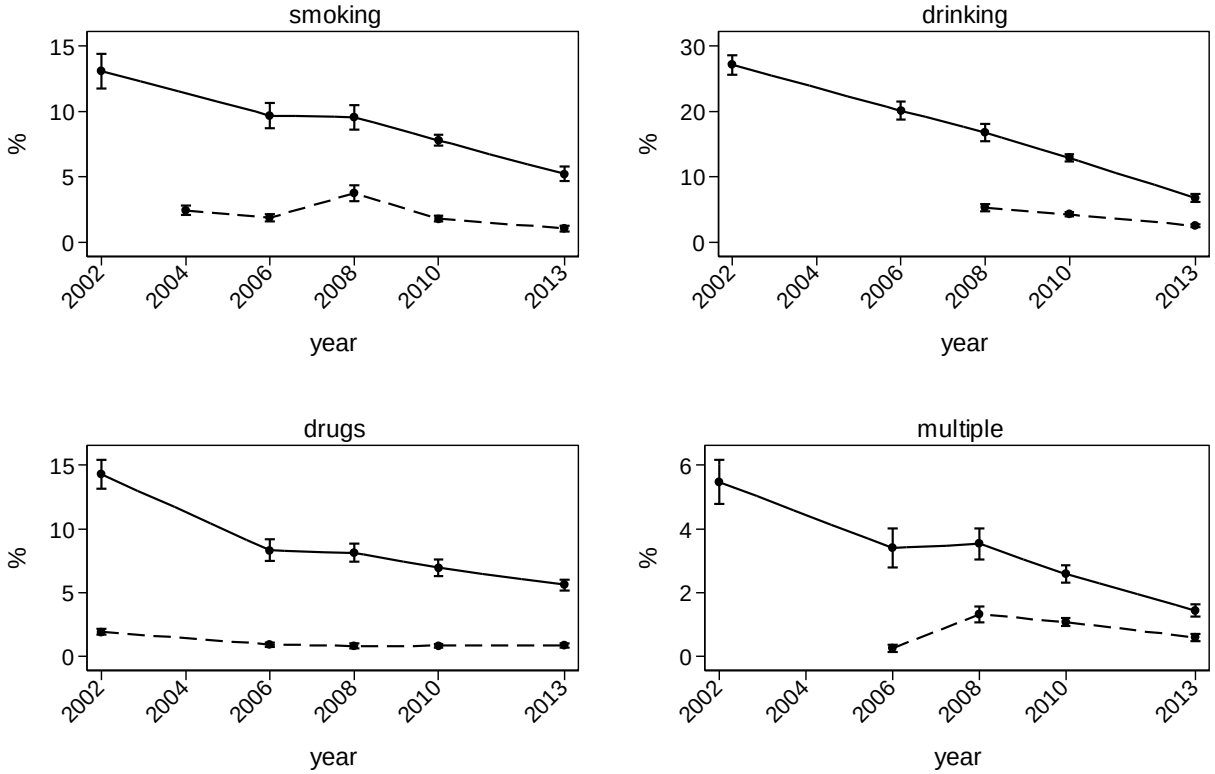
SE denotes standard error; CI denotes confidence interval.

Table 3: Factors predicting individual risk behaviours amongst all adolescents (n =96721);± 2002-2013

	Regular Substance Use				Heavy Substance Use			
	Smoking	**Drinking**	**Drug Use**	**Multiple**	**Smoking**	**Drinking**	**Drug Use**	**Multiple**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Year	0.92 [a] (0.91, 0.94)	0.84 [a] (0.83, 0.85)	0.96 [a] (0.95, 0.97)	0.91 [a] (0.87, 0.93)	0.91 [a] (0.89, 0.93)	1.06 [b] (1.04, 1.07)	1.04 [b] (1.00, 1.08)	1.02 (0.99, 1.05)
Gender								
Male[#]	1.00							
Female	1.28 [a] (1.19, 1.37)	0.96 (0.92, 1.01)	0.75 [a] (0.69, 0.80)	0.91 [a] (0.89, 0.93)	0.99 (0.88, 1.10)	0.68 [a] (0.63, 0.74)	0.32 [a] (0.25, 0.40)	0.57 [a] (0.48, 0.68)
School Year								
S2 (13 year olds)[#]	1.00							
S4 (15 year olds)	4.95 [a] (4.36, 5.63)	4.49 [a] (4.09, 4.92)	4.62 [a] (4.22, 5.07)	1.01 (0.90, 1.13)	6.15 [a] (5.06, 7.49)	4.02 [a] (3.56, 4.54)	3.61 [a] (2.97, 4.37)	5.98 [a] (4.62, 7.74)
Ethnicity								
Scottish/White British[#]	1.00							
White Other	1.12 (0.90, 1.39)	0.99 (0.83, 1.18)	1.38 [a] (1.12, 1.69)	1.11 (0.70, 1.78)	0.90 (0.65, 1.26)	1.21 (0.96, 1.53)	1.80 [b] (1.08, 3.00)	1.28 (0.70, 2.34)
Other Ethnicity	1.20 [b] (1.00, 1.43)	1.04 (0.85, 1.27)	1.70 [a] (1.41, 2.06)	1.39 [a] (1.09, 1.77)	1.40 [b] (1.00, 1.96)	1.49 [a] (1.17, 1.90)	5.00 [a] (3.96, 6.30)	2.72 [a] (1.92, 3.85)
Don't Know/Refused	2.86 [a] (2.45, 3.35)	2.19 [a] (1.93, 2.48)	1.79 [a] (1.41, 2.27)	2.12 [a] (1.67, 2.69)	4.21 [a] (2.96, 5.98)	2.44 [a] (1.93, 3.10)	6.84 [a] (4.78, 9.79)	3.54 [a] (2.42, 5.17)
Socioeconomic Quintile								
Fifth (least deprived)[#]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fourth	1.21[a] (1.07, 1.37)	1.18[a] (1.10, 1.28)	1.03 (0.94, 1.13)	0.98 (0.83, 1.16)	0.98 (0.73, 1.32)	1.11 (94, 1.30)	0.73 (0.53, 1.01)	0.67[b] (0.50, 0.89)
Third	1.41[a] (1.25, 1.59)	1.32[a] (1.21, 1.45)	1.21[a] (1.06, 1.39)	1.15 (0.94, 1.39)	1.38[b] (1.06, 1.78)	1.41[a] (1.17, 1.70)	0.91 (0.67, 1.25)	1.13 (0.79, 1.61)
Second	1.70[a] (1.49, 1.94)	1.32[a] (1.17, 1.49)	1.33[a] (1.15, 1.53)	1.25[b] (1.01, 1.54)	1.86[a] (1.48, 2.32)	1.53[a] (1.31, 1.79)	1.03 (0.62, 1.71)	1.32 (0.91, 1.89)
First (most deprived)	1.96[a] (1.58, 2.44)	1.40[a] (1.18, 1.66)	1.54[a] (1.30, 1.82)	1.41[b] (1.02, 1.97)	2.27[a] (1.68, 3.09)	1.56[a] (1.22, 1.99)	1.11 (0.89, 1.38)	1.62[b] (1.14, 2.29)

[±] Multivariate analysis based on sample with complete data for outcomes and all covariates.
[#] Reference category. OR denotes odds ratio; CI denotes confidence interval.
[a] $P<0.001$; [b] $P<0.05$.

Figure 1: Time trends in probability of regular and heavy substance use; all adolescents[±]



[±] Solid lines represent regular substance use; dashed lines represent heavy substance use.

Appendix 1: Average annual average percentage point change in substance use between first and last year surveyed; by gender

Type of substance use	Time span (years)[±]	Annual average % point change[#]	SE	95% CI	*P*-value
Boys					
Regular substance use					
Smoking	12	-0.577	0.007	(-0.465, -0.688)	<0.0001
Drinking	12	-1.719	0.009	(-1.565, -1.874)	<0.0001
Drug use	12	-0.805	0.007	(-0.696, -0.915)	<0.0001
Multiple substances	12	-0.323	0.004	(-0.264, 0.004)	<0.0001
Heavy substance use					
Smoking	10	-0.454	0.005	(-0.328, 0.005)	<0.0001
Drinking	6	-0.541	0.004	(-0.423, -0.659)	<0.0001
Drug use	12	-0.134	0.002	(-0.094, -0.173)	<0.0001
Multiple substances	8	0.056	0.001	(0.027, 0.085)	0.0002
Girls					
Regular substance use					
Smoking	12	-0.728	0.008	(-0.594, -0.861)	<0.0001
Drinking	12	-1.665	0.007	(-1.543, -1.787)	<0.0001
Drug use	12	-0.641	0.006	(-0.541, -0.740)	<0.0001
Multiple substances	12	-0.350	0.004	(-0.283, -0.416)	<0.0001
Heavy substance use					
Smoking	10	-0.536	0.006	(-0.388, -0.684)	<0.0001
Drinking	6	-0.383	0.003	(-0.297, -0.468)	<0.0001
Drug use	12	-0.042	0.001	(-0.029, -0.056)	<0.0001
Multiple substances	8	0.031	0.001	(0.017, 0.045)	<0.0001

[±] Time span (years) between first and last year surveyed.

[#] Annual percentage point change in substance use between first and last year surveyed.

SE denotes standard error; CI denotes confidence interval.

Appendix 2: Average annual average percentage point change in substance use between first and last year surveyed; by school year

Type of substance use	Time span (years)[±]	Annual average % point change[#]	SE	95% CI	*P*-value
S2: 13 year olds					
Regular substance use					
Smoking	12	-0.314	0.003	(-0.262, -0.366)	<0.0001
Drinking	12	-0.973	0.006	(-0.875, -1.072)	<0.0001
Drug use	12	-0.352	0.003	(-0.296, -0.408)	<0.0001
Multiple substances	12	-0.112	0.001	(-0.089, -0.136)	<0.0001
Heavy substance use					
Smoking	8	-0.029	0.001	(-0.012, -0.046)	<0.0001
Drinking	6	-0.196	0.002	(-0.141, -0.252)	<0.0001
Drug use	12	-0.043	0.001	(-0.030, -0.057)	<0.0001
Multiple substances	8	0.012	0.001	(0.005, 0.020)	0.002
S4: 15 year olds					
Regular substance use					
Smoking	12	-1.016	0.012	(-0.820, -1.211)	0.001
Drinking	12	-2.446	0.012	(-2.253, -2.638)	<0.0001
Drug use	12	-1.118	0.010	(-0.955, -1.280)	<0.0001
Multiple substances	12	-0.570	0.006	(-0.468, -0.672)	<0.0001
Heavy substance use					
Smoking	8	-0.167	0.003	(-0.091, -0.243)	<0.0001
Drinking	6	-0.720	0.005	(-0.561, -0.880)	<0.0001
Drug use	12	-0.135	0.002	(-0.097, -0.173)	<0.0001
Multiple substances	8	0.074	0.001	(0.039, 0.108)	<0.0001

[±] Time span (years) between first and last year surveyed.

[#] Annual percentage point change in substance use between first and last year surveyed.

SE denotes standard error; CI denotes confidence interval.

Appendix 3: Average annual average percentage point change in substance use between first and last year surveyed; by ethnicity

Type of substance use	Time span (years)[±]	Annual average % point change[#]	SE	95% CI	*P*-value
Scottish/White British					
Regular substance use					
Smoking	12	-0.058	0.005	(-0.136, 0.019)	0.140
Drinking	12	-0.860	0.009	(-0.716, -1.005)	<0.0001
Drug use	12	-0.348	0.010	(-0.183, -0.514)	<0.0001
Multiple substances	12	-0.154	0.004	(-0.082, -0.227)	<0.0001
Heavy substance use					
Smoking	8	-0.094	0.002	(-0.048, -0.139)	<0.0001
Drinking	6	-0.431	0.003	(-0.337, -0.525)	<0.0001
Drug use	12	0.025	0.001	(0.011, 0.039)	<0.0001
Multiple substances	8	0.037	0.001	(0.019, 0.055)	<0.0001
White Other					
Regular substance use					
Smoking	12	-0.060	0.010	(-0.216, 0.096)	0.454
Drinking	12	-0.843	0.013	(-0.627, -1.059)	<0.0001
Drug use	12	-0.449	0.018	(-0.147, -0.751)	0.004
Multiple substances	12	-0.162	0.010	(-0.001, -0.323)	0.048
Heavy substance use					
Smoking	8	-0.079	0.004	(-0.165, 0.008)	0.075
Drinking	6	-0.519	0.009	(-0.241, -0.798)	0.0003
Drug use	12	0.041	0.003	(-0.014, 0.095)	0.142
Multiple substances	8	0.046	0.003	(-0.015, 0.108)	0.140
Other Ethnicity					
Regular substance use					
Smoking	12	-0.063	0.009	(-0.202, 0.077)	0.379
Drinking	12	-0.829	0.015	(-0.587, -1.072)	<0.0001
Drug use	12	-0.516	0.017	(-0.234, -0.799)	0.0003
Multiple substances	12	-0.201	0.008	(-0.071, -0.331)	0.002

Heavy substance use					
Smoking	8	-0.114	0.004	(-0.008, -0.220)	0.035
Drinking	6	-0.559	0.009	(-0.274, -0.845)	0.0001
Drug use	12	0.123	0.005	(0.039, 0.207)	0.004
Multiple substances	8	0.092	0.003	(0.027, 0.156)	0.005
Don't know/Refused					
Regular substance use					
Smoking	12	-0.123	0.012	(-0.313, 0.067)	0.205
Drinking	12	-1.297	0.012	(-1.107, -1.487)	<0.0001
Drug use	12	-0.510	0.010	(-0.353, -0.667)	<0.0001
Multiple substances	12	-0.258	0.005	(-0.185, -0.332)	<0.0001
Heavy substance use					
Smoking	8	-0.298	0.011	(-0.035, -0.562)	0.027
Drinking	6	-0.903	0.013	(-0.470, -1.336)	<0.0001
Drug use	12	0.147	0.005	(0.059, 0.235)	0.001
Multiple substances	8	0.121	0.004	(0.033, 0.210)	0.007

[±] Time span (years) between first and last year surveyed.

[#] Annual percentage point change in substance use between first and last year surveyed.

SE denotes standard error; CI denotes confidence interval.

Appendix 4: Average annual average percentage point change in substance use between first and last year surveyed; by socioeconomic quintile

Type of substance use	Time span (years)[±]	Annual average % point change[#]	SE	95% CI	*P*-value
First Quintile (Most Deprived)					
Regular substance use					
Smoking	8	-0.512	0.013	(-0.205, -0.818)	0.001
Drinking	8	-1.596	0.015	(-1.222, -1.971)	<0.0001
Drug use	8	-0.199	0.008	(-0.407, 0.009)	0.061
Multiple substances	8	-0.189	0.006	(-0.046, -0.333)	0.010
Heavy substance use					
Smoking	8	-0.101	0.004	(-0.012, -0.190)	0.025
Drinking	6	-0.559	0.006	(-0.376, -0.741)	<0.0001
Drug use	8	0.038	0.001	(0.002, 0.074)	0.039
Multiple substances	8	0.081	0.001	(0.051, 0.112)	<0.0001
Second Quintile					
Regular substance use					
Smoking	8	-0.455	0.009	(-0.230, -0.681)	<0.0001
Drinking	8	-1.534	0.010	(-1.277, -1.790)	<0.0001
Drug use	8	-0.177	0.007	(-0.014, -0.340)	0.033
Multiple substances	8	-0.168	0.004	(-0.064, -0.272)	0.002
Heavy substance use					
Smoking	8	-0.083	0.003	(-0.012, -0.153)	0.022
Drinking	6	-0.531	0.004	(-0.397, -0.665)	<0.0001
Drug use	8	0.035	0.003	(-0.029, 0.098)	0.286
Multiple substances	8	0.064	0.001	(0.034, 0.093)	<0.0001
Third Quintile					
Regular substance use					
Smoking	8	-0.387	0.006	(-0.235, 0.006)	<0.0001
Drinking	8	-1.529	0.010	(-1.295, -1.763)	<0.0001
Drug use	8	-0.163	0.006	(-0.012, -0.313)	0.034
Multiple substances	8	-0.155	0.003	(-0.083, -0.227)	<0.0001

Heavy substance use					
Smoking	8	-0.061	0.002	(-0.018, -0.105)	0.006
Drinking	6	-0.496	0.004	(-0.368, -0.625)	<0.0001
Drug use	8	0.030	0.001	(-0.002, 0.061)	0.064
Multiple substances	8	0.054	0.001	(0.035, 0.073)	<0.0001
Fourth Quintile					
Regular substance use					
Smoking	8	-0.345	0.004	(-0.245, -0.444)	<0.0001
Drinking	8	-1.432	0.007	(-1.250, -1.615)	<0.0001
Drug use	8	-0.144	0.004	(-0.043, -0.246)	0.005
Multiple substances	8	-0.136	0.002	(-0.078, -0.195)	<0.0001
Heavy substance use					
Smoking	8	-0.045	0.002	(-0.008, -0.082)	0.018
Drinking	6	-0.413	0.003	(-0.317, -0.509)	<0.0001
Drug use	8	0.024	0.001	(-0.007, 0.056)	0.127
Multiple substances	8	0.034	0.001	(0.021, 0.047)	<0.0001
Fifth Quintile (Least Deprived)					
Regular substance use					
Smoking	8	-0.289	0.005	(-0.175, -0.402)	<0.0001
Drinking	8	-1.249	0.007	(-1.080, -1.418)	<0.0001
Drug use	8	-0.140	0.004	(-0.032, -0.248)	0.011
Multiple substances	8	-0.136	0.003	(-0.070, -0.203)	<0.0001
Heavy substance use				,	
Smoking	8	-0.045	0.002	(-0.001, -0.089)	0.045
Drinking	6	-0.367	0.003	(-0.270, -0.464)	<0.0001
Drug use	8	0.034	0.002	(-0.007, 0.075)	0.100
Multiple substances	8	0.050	0.001	(0.024, 0.076)	0.0002

[±] Time span (years) between first and last year surveyed.

[#] Annual percentage point change in substance use between first and last year surveyed.

SE denotes standard error; CI denotes confidence interval.

Appendix 5: Sensitivity analysis, including family circumstance factors, predicting individual risk behaviours amongst all adolescents;[±] 2002-2013

	Regular Substance Use				Heavy Substance Use			
	Smoking	**Drinking**	**Drug Use**	**Multiple**	**Smoking**	**Drinking**	**Drug Use**	**Multiple**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Year	0.92 [a] (0.90, 0.93)	0.86 [a] (0.85, 0.88)	0.95 [a] (0.94, 0.97)	0.90 [a] (0.88, 0.92)	0.91 [a] (0.89, 0.93)	1.06 [b] (1.04, 1.08)	1.03 (0.99, 1.07)	1.02 (0.99, 1.05)
Gender								
Male[#]	1.00							
Female	1.32 [a] (1.23, 1.42)	1.23 [a] (1.06, 1.18)	0.94 [a] (0.93, 0.96)	1.03 (0.92, 1.15)	1.04 (0.92, 1.17)	0.72 [a] (0.66, 0.79)	0.35 [a] (0.28, 0.43)	0.61 [a] (0.51, 0.73)
School Year								
S2 (13 year olds)[#]	1.00							
S4 (15 year olds)	4.77 [a] (4.23, 5.38)	5.69 [a] (5.17, 6.26)	4.65 [a] (4.25, 5.08)	6.26 [a] (5.48, 7.16)	5.40 [a] (4.46, 6.53)	3.45 [a] (3.13, 3.81)	2.96 [a] (2.44, 3.59)	4.75 [a] (3.73, 6.04)
Ethnicity								
Scottish/White British[#]	1.00							
White Other	1.04 (0.84, 1.29)	0.85 [a] (0.75, 0.97)	1.27 [a] (1.02, 1.57)	1.03 (0.64, 1.64)	0.84 (0.61, 1.16)	1.13 (0.90, 1.43)	1.63 (0.96, 2.76)	1.18 (0.66, 2.10)
Other Ethnicity	1.04 (0.88, 1.24)	0.59 [a] (0.48, 0.72)	1.35 [a] (1.09, 1.68)	1.20 (0.96, 1.49)	1.19 (0.87, 1.63)	1.29 [b] (1.01, 1.65)	3.95 [a] (3.11, 5.01)	2.23 [a] (1.57, 3.15)
Don't Know/Refused	1.53 [a] (1.27, 1.85)	1.80 [a] (1.49, 2.16)	3.83 [a] (2.86, 5.12)	2.23 [a] (1.68, 2.96)	2.08 [a] (1.23, 3.51)	1.66 [a] (1.11, 2.50)	6.73 [a] (4.62, 9.82)	2.74 [a] (1.75, 4.27)
Socioeconomic Quintile								
Fifth (least deprived)[#]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fourth	1.13[b] (1.01, 1.27)	1.17[a] (1.06, 1.30)	1.00 (0.90, 1.12)	0.92 (0.79, 1.07)	0.90 (0.67, 1.23)	1.05 (0.89, 1.24)	0.69 [a] (0.50, 0.95)	0.62 [a] (0.47, 0.82)
Third	1.24[a] (1.10, 1.39)	1.16[a] (1.06, 1.26)	1.12 (0.95, 1.31)	1.00 (0.83, 1.21)	1.18 (0.91, 1.53)	1.28 [a] (1.05, 1.57)	0.80 (0.58, 1.08)	0.97 (0.67, 1.40)
Second	1.36[a] (1.19, 1.25)	1.11[b] (1.00, 1.25)	1.15 (0.99, 1.34)	0.99 (0.80, 1.23)	1.45 [a] (1.17, 1.80)	1.29 [a] (1.10, 1.52)	0.82 (0.50, 1.36)	1.03 (0.71, 1.49)
First (most deprived)	1.38[a] (1.08, 1.76)	0.96 (0.80, 1.15)	1.26 [a] (1.03, 1.55)	1.00 (0.71, 1.43)	1.56 [a] (1.15, 2.12)	1.20 (0.90, 1.60)	0.82 (0.64, 1.04)	1.14 (0.78, 1.66)
Free school meal entitlement								
Yes	1.00							
No	0.59 [a] (0.53, 0.65)	0.84 [a] (0.73, 0.96)	0.64 [a] (0.57, 0.72)	0.60 [a] (0.50, 0.72)	0.60 [a] (0.48, 0.76)	0.73 [a] (0.62, 0.86)	0.44 [a] (0.34, 0.56)	0.50 [a] (0.39, 0.64)

Don’t know	0.62 [a]	0.88	0.66 [a]	0.58 [a]	0.55 [a]	0.75 [a]	0.48 [a]	0.46 [a]
	(0.51, 0.75)	(0.73, 1.05)	(0.54, 0.81)	(0.44, 0.78)	(0.40, 0.76)	(0.61, 0.91)	(0.35, 0.66)	(0.30, 0.69)
Missing	1.32 [a]	1.63 [a]	1.10	1.03	1.21	1.37 [a]	0.71 [a]	0.99
	(1.14, 1.53)	(1.30, 2.05)	(0.96, 1.26)	(0.83, 1.28)	(0.88, 1.65)	(1.03, 1.81)	(0.53, 0.96)	(0.67, 1.46)
Household composition								
Single parent	1.00							
Step parent (and one parent)	1.07	1.13 [a]	1.01	1.06	1.09	1.01	0.84	1.06
	(0.98, 1.18)	(1.04, 1.22)	(0.92, 1.10)	(0.23, 1.22)	(0.86, 1.39)	(0.88, 1.17)	(0.55, 1.27)	(0.82, 1.36)
Both parents	0.59 [a]	0.80 [a]	0.72 [a]	0.61 [a]	0.55 [a]	0.74 [a]	0.65 [a]	0.62 [a]
	(0.56, 0.62)	(0.73, 0.87)	(0.66, 0.78)	(0.54, 0.70)	(0.45, 0.67)	(0.68, 0.82)	(0.54, 0.78)	(0.50, 0.76)
Other	1.24 [a]	1.18 [a]	1.46 [a]	1.55 [a]	1.14	1.06	2.10 [a]	1.46 [b]
	(1.10, 1.41)	(1.05, 1.34)	(1.24, 1.71)	(1.37, 1.75)	(0.85, 1.54)	(0.88, 1.27)	(1.57, 2.81)	(1.01, 2.12)
Missing	0.75 [a]	0.82 [a]	0.54 [a]	0.78	1.00	0.74	0.56	0.96
	(0.61, 0.92)	(0.68, 0.98)	(0.39, 0.75)	(0.51, 1.17)	(0.72, 1.39)	(0.53, 1.02)	(0.30, 1.03)	(0.58, 1.59)
Maternal knowledge of child activities								
Below median	1.00							
Median	0.48 [a]	0.51 [a]	0.45 [a]	0.42 [a]	0.68 [a]	0.47 [a]	0.44 [a]	0.44 [a]
	(0.44, 0.53)	(0.47, 0.55)	(0.40, 0.50)	(0.37, 0.47)	(0.58, 0.79)	(0.41, 0.54)	(0.30, 0.66)	(0.32, 0.61)
Above median	0.37 [a]	0.42 [a]	0.35 [a]	0.39 [a]	0.75 [a]	0.46 [a]	0.65 [a]	0.55 [a]
	(0.33, 0.42)	(0.39, 0.45)	(0.32, 0.38)	(0.33, 0.46)	(0.63, 0.89)	(0.40, 0.52)	(0.51, 0.83)	(0.44, 0.67)
Missing	0.79 [a]	0.82 [a]	0.76 [a]	0.66 [a]	1.11	0.95	0.77 [b]	0.65 [a]
	(0.65, 0.97)	(0.68, 0.98)	(0.62, 0.90)	(0.50, 0.87)	(0.76, 1.64)	(0.77, 1.17)	(.59, 1.00)	(0.45, 0.93)
Paternal knowledge of child activities								
Below median	1.00							
Median	0.58 [a]	0.65 [a]	0.60 [a]	0.56 [a]	0.54 [a]	0.60 [a]	0.47 [a]	0.53 [a]
	(0.52, 0.64)	(0.60, 0.71)	(0.53, 0.68)	(044, 0.71)	(0.42, 0.70)	(0.52, 0.70)	(0.32, 0.69)	(0.34, 0.81)
Above median	0.74 [a]	0.74 [a]	0.72 [a]	0.80 [a]	0.75 [a]	0.89	0.89	0.92
	(0.67, 0.82)	(0.68, 0.81)	(0.67, 0.78)	(0.68, 0.93)	(0.63, 0.89)	(0.78, 1.01)	(0.70, 1.13)	(0.74, 1.14)
Missing	1.01	0.96	1.00	1.04	1.12	1.19 [a]	1.17	1.28
	(0.91, 1.11)	(0.87, 1.05)	(0.91, 1.09)	(0.89, 1.23)	(0.90, 1.39)	(1.05, 1.35)	(0.95, 1.43)	(1.03, 1.60)
Pocket money (£ per week)								
None	1.00							
< 1	1.36	0.75	1.43	1.92	1.29	-	1.59	-
	(0.60, 3.08)	(0.41, 1.39)	(0.64, 3.17)	(0.57, 6.48)	(0.30, 5.53)		(0.37, 6.73)	
1-4.99	0.93	0.86	0.86	0.72	0.83	0.62 [a]	0.32 [a]	0.38
	(0.77, 1.12)	(0.72, 1.03)	(0.70, 1.06)	(0.40, 1.29)	(0.49, 1.41)	(0.39, 0.98)	(0.18, 0.55)	(0.14, 1.02)
5-9.99	1.25 [a]	1.25 [a]	1.09	1.13	1.11	0.89	0.32 [a]	0.25 [a]
	(1.06, 1.47)	(1.06, 1.48)	(0.92, 1.30)	(0.72, 1.77)	(0.70, 1.78)	(0.63, 1.26)	(0.22, 0.49)	(0.13, 0.48)
10-19.99	1.90 [a]	1.92 [a]	1.69 [a]	2.21 [a]	1.95 [a]	1.48 [b]	0.68	1.04

	(1.54, 2.34)	(1.63, 2.25)	(1.36, 2.09)	(1.20, 3.43)	(1.25, 3.03)	(1.02, 2.15)	(0.41, 1.14)	(0.59, 1.83)
20-20.99	2.50 [a]	2.78 [a]	2.20 [a]	3.51 [a]	3.24 [a]	2.41 [a]	0.94	1.86 [a]
	(2.08, 3.00)	(2.36, 3.28)	(1.80, 2.68)	(2.29, 5.39)	(2.07, 5.05)	(1.70, 3.45)	(0.66, 1.35)	(1.13, 3.07)
30+	3.25 [a]	3.69 [a]	2.80 [a]	4.82 [a]	5.10 [a]	3.94 [a]	2.57 [a]	3.70 [a]
	(2.78, 3.79)	(3.09, 4.47)	(2.26, 3.48)	(3.08, 7.56)	(3.03, 8.57)	(2.80, 5.53)	(1.67, 3.97)	(2.11, 6.48)
Missing	1.85 [a]	1.95 [a]	0.85	0.88	1.65	1.11	0.35 [a]	0.66
	(1.45, 2.36)	(1.63, 2.33)	(0.61, 1.19)	(0.62, 1.26)	(0.94, 2.90)	(0.71, 1.74)	(0.18, 0.70)	(0.30, 1.45)

[±] Multivariate analysis based on sample with complete data for outcomes and all covariates, with addition of the following family circumstance covariates: free school meal entitlement, household composition, maternal and paternal knowledge of their children's activities, pocket money. Empty cells marked with "-".

[#] Reference category. OR denotes odds ratio; CI denotes confidence interval.

[a] $P<0.001$; [b] $P<0.05$.

Appendix 6: Sensitivity analysis for factors predicting regular substance use covering the past month rather than the past week amongst all adolescents;[±] 2002-2013

	Regular Substance Use			
	Smoking	**Drinking**	**Drug Use**	**Multiple**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Year	0.92 [a] (0.90, 0.93)	0.86 [a] (0.85, 0.88)	0.95 [a] (0.94, 0.97)	0.91 [a] (0.89, 0.92)
Gender				
Male[#]	1.00			
Female	1.32 [a] (1.23, 1.42)	1.23 [a] (1.06, 1.18)	0.94 [a] (0.93, 0.96)	1.28 [a] (1.21, 1.35)
School Year				
S2 (13 year olds)[#]	1.00			
S4 (15 year olds)	4.77 [a] (4.23, 5.38)	5.69 [a] (5.17, 6.26)	4.65 [a] (4.25, 5.08)	5.77[a] (5.18, 6.42)
Ethnicity				
Scottish/White British[#]	1.00			
White Other	1.04 (0.84, 1.29)	0.85 [a] (0.75, 0.97)	1.27 [a] (1.02, 1.57)	1.21[b] (1.01, 1.45)
Other Ethnicity	1.04 (0.88, 1.24)	0.59 [a] (0.48, 0.72)	1.35 [a] (1.09, 1.68)	0.97 (0.77, 1.24)
Don't Know/Refused	1.53 [a] (1.27, 1.85)	1.80 [a] (1.49, 2.16)	3.83 [a] (2.86, 5.12)	3.33 [a] (2.58, 4.30)
Socioeconomic Quintile				
Fifth (least deprived)[#]	1.00	1.00	1.00	1.00
Fourth	1.13[a] (1.01, 1.27)	1.17[a] (1.06, 1.30)	1.00 (0.90, 1.12)	1.03 (0.92, 1.15)
Third	1.24[a] (1.10, 1.39)	1.16[a] (1.06, 1.26)	1.12 (0.95, 1.31)	1.14[b] (1.01, 1.29)
Second	1.36[a] (1.19, 1.25)	1.11[b] (1.00, 1.25)	1.15 (0.99, 1.34)	1.14 (0.98, 1.31)
First (most deprived)	1.38[a] (1.08, 1.76)	0.96 (0.80, 1.15)	1.26 [a] (1.03, 1.55)	1.13 (0.90, 1.42)
Free school meal entitlement				
Yes	1.00			
No	0.89 [a] (0.82, 0.97)	0.97 (0.89, 1.06)	0.64 [a] (0.57, 0.72)	1.01 (0.95, 1.07)
Don't know	1.46 [a] (1.39, 1.54)	0.86 [a] (0.76, 0.96)	0.66 [a] (0.54, 0.81)	0.94 (0.84, 1.04)
Missing	0.72 [a] (0.65, 0.81)	1.76 [a] (1.51, 2.05)	1.10 (0.96, 1.26)	1.42 [a] (1.26, 1.59)
Household composition				
Single parent	1.00			
Step parent (and one parent)	0.89 [a] (0.82, 0.97)	1.20 [a] (1.13, 1.27)	1.01 (0.92, 1.10)	1.11 [a] (1.05, 1.18)
Both parents	1.46 [a] (1.39, 1.54)	0.81 [a] (0.77, 0.85)	0.72 [a] (0.67, 0.79)	0.90 [a] (0.85, 0.95)
Other	0.75 [a] (0.68, 0.82)	0.97 (0.89, 1.05)	1.46 [a] (1.24, 1.71)	0.99 (0.88, 1.10)
Missing	1.17 (0.99, 1.39)	0.74 [a] (0.62, 0.89)	0.54 [a] (0.39, 0.75)	0.75 [a] (0.63, 0.89)
Maternal knowledge of child activities				
Below median	1.00			
Median	2.10 [a] (1.98, 2.24)	0.48 [a] (0.45, 0.52)	0.45 [a] (0.40, 0.50)	0.61 [a] (0.58, 0.65)
Above median	2.71 [a] (2.56, 2.87)	0.39 [a] (0.37, 0.41)	0.35 [a] (0.32, 0.39)	0.55 [a] (0.53, 0.58)
Missing	1.24 [a] (1.08, 1.43)	0.70 [a] (0.63, 0.77)	0.75 [a] (0.62, 0.90)	0.81 [a] (0.73, 0.89)
Paternal knowledge of child activities				
Below median	1.00			
Median	1.65 [a]	0.70 [a]	0.60 [a]	0.83 [a]

	(1.55, 1.76)	(0.65, 0.74)	(0.53, 0.68)	(0.76, 0.90)
Above median	1.48 [a]	0.69 [a]	0.72 [a]	0.76 [a]
	(1.40, 1.57)	(0.65, 0.72)	(067, 0.78)	(0.71, 0.80)
Missing	1.09 [a]	0.88 [a]	1.00	0.93 [a]
	(1.03, 1.16)	(0.83, 93)	(0.91, 1.09)	(0.87, 0.98)
Pocket money (£ per week)				
None	1.00			
< 1	0.99	0.70	1.43	0.78
	(0.64, 1.52)	(0.42, 1.16)	(0.64, 3.17)	(0.47, 1.30)
1-4.99	1.01	1.15 [a]	0.86	1.08
	(0.87, 1.1.18)	(1.05, 1.26)	(0.70, 1.06)	(0.96, 1.21)
5-9.99	0.82 [a]	1.53 [a]	1.09	1.37 [a]
	(0.75, 0.91)	(1.38, 1.69)	(0.92, 1.30)	(1.20, 1.55)
10-19.99	0.61 [a]	2.20 [a]	1.69 [a]	1.85 [a]
	(0.54, 0.68)	(2.02, 2.39)	(1.35, 2.09)	(1.68, 2.04)
20-20.99	0.49 [a]	3.10 [a]	2.21 [a]	2.43 [a]
	(0.44, 0.55)	(2.81, 3.41)	(1.80, 2.68)	(2.17, 2.71)
30+	0.42 [a]	3.68 [a]	2.80 [a]	2.80 [a]
	(0.37, 0.47)	(3.35, 4.04)	(2.26, 3.48)	(2.48, 3.15)
Missing	0.58	2.06 [a]	0.85	1.41 [a]
	(0.47, 0.73)	(1.77, 2.39)	(0.61, 1.19)	(1.23, 1.61)

[±] Multivariate analysis based on sample with complete data for outcomes and all covariates, with addition of the following family circumstance covariates: free school meal entitlement, household composition, maternal and paternal knowledge of their children's activities, pocket money.

[#] Reference category. OR denotes odds ratio; CI denotes confidence interval.

[a] $P<0.001$; [b] $P<0.05$.