

# Trends in the psychosocial characteristics of 11–15-year-olds who still drink, smoke, take drugs and engage in poly-substance use in England

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## Abstract

**Introduction and Aims.** Youth substance use is declining in many high-income countries. As adolescent substance use becomes less common, it may concentrate in higher-risk groups. This paper aims to examine how the psychosocial characteristics of young substance users in England have changed over time. **Design and Methods.** Annual cross-sectional data from the 2001–2014 Smoking, Drinking and Drug Use Among Young People in England survey are analysed ( $n = 112\,792$ , age: 11–15). Logistic and Poisson regression analyses are used to test whether the sex, socioeconomic status (SES) and prevalence of truancy and exclusion from school of those who drink alcohol, smoke cigarettes, take cannabis, take other drugs and engage in poly-substance use changed across the study period. **Results.** Use of all substances decreased and there were shifts in the psychosocial characteristics of young smokers, illicit drug users and poly-substance users. The proportion of current smokers and ever-users of cannabis of low SES and who had been excluded increased significantly between 2001/2003–2014. The proportion of last month drug users who had been excluded from school also increased significantly and there were increases in the proportion of polysubstance-users who had truant and been excluded. The proportion of low SES alcohol users who had been excluded also increased significantly, but this change was very small. There was no evidence of substance use becoming more or less concentrated in one gender. **Discussion and Conclusions.** There is some evidence that smoking, illicit drug use and poly-substance use are becoming more concentrated in potentially at risk populations. There is limited evidence of concentration amongst young drinkers. [Oldham M, Livingston M, Whitaker V, Callinan S, Fairbrother H, Curtis P, Meier P, Holmes J. Trends in the psychosocial characteristics of 11–15-year-olds who still drink, smoke, take drugs and engage in poly-substance use in England. *Drug Alcohol Rev* 2021;40:597–606]

**Key words:** adolescent, underage drinking, tobacco smoking, illicit drugs.

## Introduction

In England, substance use amongst young people is in decline [1,2]. The proportion of 11–15 year-olds who reported ever having an alcoholic drink fell from 61% in 2003 to 38% in 2014 [2]. Those young people who do drink are consuming alcohol less often and in smaller quantities. There have also been concurrent declines in smoking and cannabis use in England. The proportion of 11–15-year-olds who reported ever trying smoking fell from 43% in 1998 to 17% in 2016, while the proportion who had ever tried cannabis

dropped from 18% in 2001 to 11% in 2016. The average age of initiation also increased between 2001 and 2016 from 11.6 to 12.3 for drinking, 11.4 to 12.6 for smoking and 13.2 to 13.6 for cannabis use [2]. These trends are mirrored internationally, with reports of declining youth consumption of alcohol, cigarettes and drugs across many high-income countries [1–10]. However, it is currently unclear whether declines in adolescent substance use are occurring consistently across different socio-demographic groups and important questions remain around which young people are still engaging in these behaviours.

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Adolescence is both a peak time for initiation of substance use [8] and a period of heightened sensitivity to the negative health impacts of alcohol and drugs, as adolescent substance use can disrupt the developing brain [11,12]. Adolescent substance use is also linked to short-term harms such as accidents [13,14] and risky behaviours, with potentially negative consequences including sexually transmitted infections, injuries, criminality and victimisation [13–18]. Substance use can also negatively impact educational attainment and is associated with academic disengagement [16] and failure to complete education [19]. Declining substance use amongst adolescents, therefore, is likely to have both short- and long-term public health and social benefits.

Two theories, the substance use normalisation thesis [20,21] and hardening theory [22], suggest that as substance use becomes less prevalent, it may become more concentrated in populations at greater risk of harm, such as those of lower socioeconomic status (SES) or those who engage in the heaviest substance use. According to the substance use normalisation thesis, increases in the prevalence of substance use amongst youth are generally due to increased social acceptability of the substance and initiation of the behaviour in populations less vulnerable to harm [23,24]. Conversely, declines in substance use occur in line with increased negative attitudes of substance use which can lead to increasing marginalisation of remaining users [25]. Similarly, hardening theory, which has generally been applied to smoking, suggests that drops in tobacco use occur mostly amongst lighter or less addicted smokers who find it easier to quit. Those still smoking may be the heaviest smokers, are more likely to be from poorer or adverse backgrounds and are more likely to suffer comorbid psychosocial problems [26].

These theories suggest that downward trends in youth substance use could be driven by declines in populations who are less at risk of harm. Therefore, recent declines in youth substance use may mean the remainder of substance use is concentrated within high-risk populations. This could mean that the health benefits of declining youth substance use are accruing in non-marginalised populations. As such, the potential health benefits of the decline in youth substance use may not be fully realised and the decline could exacerbate existing, or contribute to the emergence of new, inequalities. There is mixed empirical support for this proposition in relation to declining youth alcohol consumption. Studies have shown that alcohol use is declining across all young drinkers [9,25] and indeed there is some evidence that declines in the UK are largest amongst heavier drinkers [9]. Furthermore, studies in Norway [27] and Sweden [28] have largely found that the psychosocial correlates of youth

drinking, including depressive symptoms, conduct problems and levels of self-reported harm, remained stable over time despite increases or reductions in youth drinking. Alternatively, other studies show that having parents of lower SES [29], truancy [30] and school exclusion [31] are associated with an increased likelihood of frequent and heavy adolescent drinking. One study examining other substance use showed truants are also more likely to smoke and more likely to take illegal drugs than non-truants [32]. Here, we add to this literature by examining the psychosocial characteristics of young substance users in a new geographic context, England, and examine a wider range of substance use behaviours.

This paper examines whether youth substance use has become concentrated in groups of more vulnerable young people during a period of declining substance use. Specifically, we examine whether there have been increases in the proportion of 11–15-year-old drinkers, smokers, drug users and poly-substance users who are of low SES, and who have been excluded from or truanted from school. We also examine whether there have been shifts in the sex of young substance users, as declines in youth alcohol consumption are smaller in girls [33].

## Methods

### Data

The Smoking, Drinking and Drug Use Among Young People Survey (SDD) is a repeat cross-sectional, school-based survey in England [1]. For the present analyses, SDD data are used from 2001, when the overall decline in substance use reported in this survey began. We use data up to and including 2014, as due to financial constraints, there was no survey in 2015 and the measure of free school meals (a proxy of SES in England) was dropped in 2016. Survey data were collected annually between 2001 and 2014, providing 14 waves of data over 14 years with a combined sample size totalling 112 792 (57 297 males).

In each year, secondary schools in England are selected to participate using a multi-stage, stratified sampling method. The data are comparable across years, with few major changes to the sampling, mode of administration or questionnaire over the study period. The majority of secondary schools are eligible to participate in the SDD. Only very small schools, special educational needs schools, special hospital schools and pupil referral units (special units for students removed from mainstream education, often for behavioural reasons) are excluded.

The sample size at each wave varied between 5189 and 10 390 students aged from 11 to 15 years. The

large variation in the sample size is due to differences in funding each year and does not vary systematically over time. Students are randomly selected within schools such that approximately 30 children from each school participate. Students self-complete the survey under exam conditions.

### Measures

Six dependent variables relating to drinking patterns (ever drank alcohol and drank alcohol in the last week), cigarette smoking (current smoker and smoked in the last 7 days) and drug use (ever tried cannabis and used drugs in last 4 weeks) are examined. All variables are treated as binary variables (0 = did not engage in the behaviour, 1 = engaged in the behaviour). Finally, we create a measure of recent poly-substance use that includes last week smoking, last week drinking and last month drug use (last week drug use is not measured). Participants receive a score from 0 to 3 based upon how many substances they report taking.

Four self-reported factors are entered as independent variables in the models, these are: sex (males as the reference group); whether the student has ever truanted from school; whether the student has ever been excluded from school; and whether the student receives free school meals (hereafter referred to as FSM; a proxy of socioeconomic status in England).

These measures were selected as they are consistently measured over the period of interest.

Survey year is also entered in the regression model as an independent variable in order to account for baseline trends. Changes were made across all British national surveys in 2007 to account for upward shifts in the typical size and strength of alcoholic drinks. To account for this, a dummy variable (coded as 0 = pre-2007, 1 = post-2007) is also included in the analyses. As the pupils were sampled within schools, school ID number was included as a cluster variable.

To examine whether there were changes in the composition of those who were in the drinking, smoking, drug and poly-substance using groups over time, interaction terms with year and each of the other independent variables are entered in the regression model.

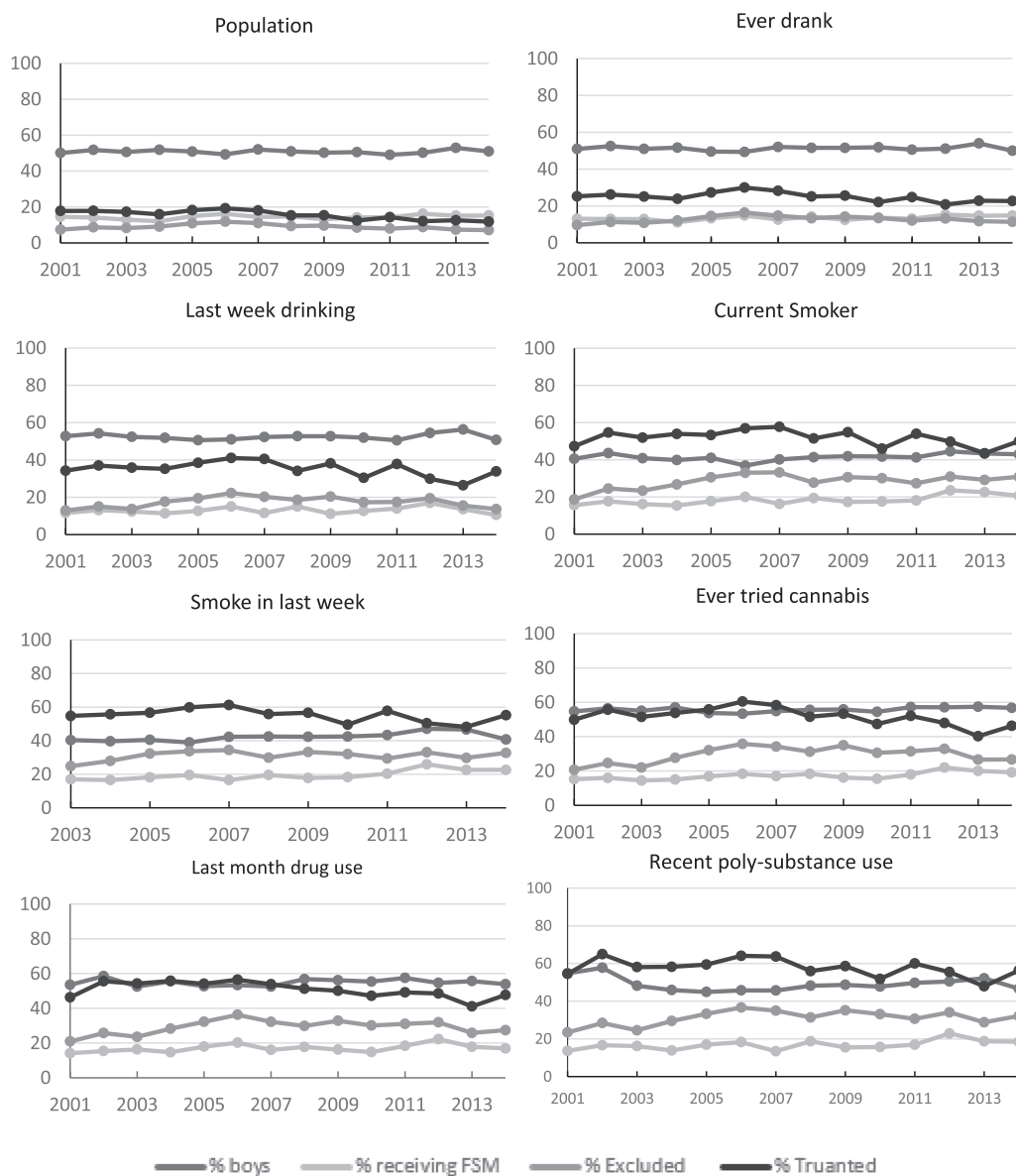
### Analysis

Regression models are used to examine whether there are changes in the psychosocial characteristics of those in the drinking, smoking, drug use and poly-substance use groups over time. Interactions terms between year and each independent variables are the main result of interest. Binary logistic models are used for all dependent variables except policy-substance use, where we use Poisson regression. Analyses are carried out using the *logistic* and *Poisson* command in Stata 15. Stata omits rows with missing data from analyses.

**Table 1.** Percentage of 11–15-year-olds who report substance use by year

Year	<i>n</i>	Ever drank (%)	Last week drinking (%)	Current smoker (%)	Last week smoking (%)	Ever tried cannabis (%)	Last month drug use (%)	Survey response rate (%)
2001	9357	61	27	15	—	18	11	61
2002	9859	61	26	15	—	17	11	63
2003	10 390	61	25	14	13	18	11	65
2004	9715	59	24	13	12	16	9	62
2005	9202	58	23	13	13	16	10	60
2006	8200	55	24	13	12	14	8	55
2007	7831	54	21	10	10	13	8	53
2008	7789	52	21	11	9	12	7	51
2009	7674	51	18	10	9	12	7	47
2010	7296	45	17	9	8	10	6	41
2011	6519	45	13	8	8	10	5	42
2012	7589	43	14	7	7	10	6	43
2013	5189	38	10	6	6	9	5	38
2014	6173	37	7	6	5	9	5	35

*Note:* The declining overall response rate was predominantly due to declining response rates amongst schools; pupil response rates within participating schools were similar across years. The main reasons given by schools for not taking part were a lack of time and resources and the large number of school surveys being conducted. Analyses in 2010 suggested that the drop in response rates has not affected key trends [34].



**Figure 1.** Proportion of each population who were male, who received free school meals and who reported exclusion or truanting.

## Results

### Descriptive statistics

There were declines in all substance use between 2001/2003 and 2014 (see Table 1). The trends in the majority of the independent variables of interest were stable over time. Figure 1 shows relatively stable trends in the proportion of boys (50% in 2001 and 51% in 2014), those receiving free school meals (15% in 2001 and 2014) and those who were excluded (7% in 2011 and 2014) within the whole sample of the SDD between 2001 and 2014. However, the proportion of pupils who had truanted in the full sample fell from 18% in 2001 to 12% in 2014. This is not a concern for the main analyses as the inclusion of survey year in the

regression model accounts for the baseline trends in each of the independent variables.

### Drinking

The proportion of 11–15-year-olds who reported ever having consumed alcohol decreased from 61% to 37% over the study period [odds ratio (OR) = 0.92, SE < 0.01,  $P < 0.001$ , Table 2]. There was no significant interaction between year and sex, indicating no change in the sex composition of ever drinkers (OR = 1.00, SE < 0.01,  $P = 0.755$ ). However, there were small but significant increases in the proportion of ever drinkers who received FSM (from 13% to

**Table 2.** Binary logistic regression models for ever drinking and last week drinking by survey year, sex, truanted, exclusion and socioeconomic status

	OR	SE	Z	P	% in drinking group in 2001	% in drinking group in 2014
<i>Ever drank<sup>a</sup></i>						
Survey year	0.92	0.01	-15.34	<0.001		
Sex	1.03	0.03	0.78	0.435		
FSM	0.63	0.03	-9.80	<0.001		
Excluded	1.76	0.11	9.12	<0.001		
Truanted	6.45	0.36	33.45	<0.001		
Pre-/post-2007	1.06	0.04	1.28	0.201		
Year*sex (reference males)	1.00	<0.01	0.31	0.755	51	50
Year*FSM (reference received FSM)	<b>1.02</b>	<b>0.01</b>	<b>2.76</b>	<b>0.006</b>	<b>13</b>	<b>15</b>
Year*excluded (reference had been excluded)	<b>1.02</b>	<b>0.01</b>	<b>1.99</b>	<b>0.046</b>	<b>10</b>	<b>12</b>
Year*truanted (reference had truanted)	<b>0.98</b>	<b>0.01</b>	<b>-3.42</b>	<b>&lt;0.001</b>	<b>25</b>	<b>23</b>
<i>Drank in the last week<sup>b</sup></i>						
Survey year	0.89	<0.01	-18.23	<0.001		
Sex	1.00	0.03	-0.07	0.941		
FSM	0.64	0.03	-8.79	<0.001		
Excluded	1.66	0.09	9.08	<0.001		
Truanted	4.31	0.17	36.97	<0.001		
Pre-/post-2007	1.18	0.05	3.75	<0.001		
Year*sex	1.01	0.01	0.97	0.330	53	51
Year*FSM	1.01	0.01	1.56	0.119	12	11
Year*excluded	<b>1.02</b>	<b>0.01</b>	<b>2.27</b>	<b>0.023</b>	<b>13</b>	<b>14</b>
Year*truanted	0.99	0.01	-1.06	0.290	34	34

<sup>a</sup> $n = 106, 780, \chi^2(10) = 6556.30, P < 0.001$ . <sup>b</sup> $n = 107, 612, \chi^2(10) = 7360.66, P < 0.001$ . Bold values denote significance ( $P < 0.050$ ). FSM, free school meals; OR, odds ratio.

15%, OR = 1.02, SE = 0.01,  $P = 0.006$ ) and who had been excluded from school (from 10% to 12%, OR = 1.02, SE = 0.01,  $P = 0.046$ ). In line with baseline trends, there was a decrease in the proportion of ever drinkers who had truanted from school (from 25% to 23%, OR = 0.98, SE = 0.01,  $P < 0.001$ ).

The proportion of 11–15-year-olds who reported drinking alcohol in the last week decreased from 27% to 7% over the study period (OR = 0.89, SE < 0.01,  $P < 0.001$ ). There were no significant interactions between year and sex (OR = 1.01, SE = 0.01,  $P = 0.330$ ), year and FSM (OR = 1.01, SE = 0.01,  $P = 0.119$ ) and year and truanted (OR = 0.99, SE = 0.01,  $P = 0.290$ ), indicating no change in the composition of last week drinkers for each of these variables (Table 2). There was a very small but significant increase in the proportion of last week drinkers who had been excluded from school (from 13% to 14%, OR = 1.02, SE = 0.01,  $P = 0.023$ ).

### Smoking

The proportion of 11–15-year-olds who reported being a current smoker decreased from 15% to 6% over the study period (OR = 0.93, SE = 0.01,  $P < 0.001$ ,

Table 3). There were significant increases in the proportion of current smokers who received FSMs (from 16% to 21%, OR = 1.01, SE = 0.01,  $P = 0.044$ ) and who had been excluded from school (from 19% to 31%, OR = 1.03, SE = 0.01,  $P = 0.003$ ). There was no significant interaction between year and gender (OR = 0.99, SE = 0.01,  $P = 0.166$ ) or year and truanted (OR = 1.00, SE = 0.01,  $P = 0.523$ ), indicating no change in the composition of current smokers in terms of gender or past truanted.

The proportion of 11–15-year-olds who reported last week smoking decreased from 13% to 5% over the study period (OR = 0.93, SE = 0.01,  $P < 0.001$ ). There was a very small but statistically significant decrease in the proportion of last week smokers who were male (from 50% to 49%, OR = 0.97, SE = 0.01,  $P < 0.001$ ). There was no significant interaction between year and truanted (OR = 1.00, SE = 0.01,  $P = 0.643$ ), year and free school meals (OR = 1.02, SE = 0.01,  $P = 0.058$ ) and year and exclusion (OR = 1.02, SE = 0.01,  $P = 0.064$ ).

### Drug use

The proportion of 11–15-year-olds who reported ever using cannabis decreased from 18% to 9% over the

**Table 3.** Binary logistic regression models for current smoking and last week smoking by survey year, sex, truanting, exclusion and free school meals (FSM)

	OR	SE	Z	P	% in drinking group in 2001	% in drinking group in 2014
<i>Current smoking<sup>a</sup></i>						
Survey year	0.93	0.01	-8.62	<0.001		
Sex	2.27	0.11	16.94	<0.001		
FSM	0.88	0.05	-2.11	0.035		
Excluded	2.99	0.18	17.74	<0.001		
Truanted	6.79	0.31	41.87	<0.001		
Pre-/post-2007	0.94	0.04	-1.24	0.214		
Year*sex	0.99	0.01	-1.39	0.166	41	43
Year*FSM	<b>1.01</b>	<b>0.01</b>	<b>2.02</b>	<b>0.044</b>	<b>16</b>	<b>21</b>
Year*excluded	<b>1.03</b>	<b>0.01</b>	<b>2.95</b>	<b>0.003</b>	<b>19</b>	<b>31</b>
Year*truanted	1.00	0.01	0.64	0.523	47	50
<i>Last week smoking<sup>b</sup></i>						
Survey year	0.93	0.01	-6.97	<0.001		
Sex	2.62	0.17	14.43	<0.001		
FSM	0.91	0.07	-1.16	0.246		
Excluded	3.23	0.28	13.41	<0.001		
Truanted	8.13	0.52	32.43	<0.001		
Pre-/post-2007	00.99	0.05	-0.27	0.786		
Year*sex	<b>0.97</b>	<b>0.01</b>	<b>-3.92</b>	<b>&lt;0.001</b>	<b>50</b>	<b>49</b>
Year*FSM	1.02	0.01	1.90	0.058	17	23
Year*excluded	1.02	0.01	1.85	0.064	25	33
Year*truanted	1.00	0.01	-0.46	0.643	55	55

<sup>a</sup> $n = 106, 449$ ,  $\chi^2(10) = 10\ 183.50$ ,  $P < 0.001$ . <sup>b</sup> $n = 88, 804$ ,  $\chi^2(10) = 9467.63$ ,  $P < 0.001$ . Bold values denote significance ( $P < 0.050$ ). OR, odds ratio.

study period (OR = 0.94, SE = 0.01,  $P < 0.001$ , Table 4). There were significant increases in the proportion of ever cannabis users who received FSMs (from 15% to 19%, OR = 1.02, SE = 0.01,  $P = 0.009$ ) and who had been excluded from school (from 21% to 27%, OR = 1.04, SE = 0.01,  $P < 0.001$ ). There was a significant decrease in ever cannabis users who had truanted from school (from 50% to 46%, OR = 0.98, SE = 0.01,  $P = 0.009$ ). There was no significant interaction between year and gender (OR = 1.00, SE = 0.01,  $P = 0.575$ ) indicating no change in the gender composition of ever cannabis users.

The proportion of 11–15-year-olds who reported taking any drugs in the last month decreased from 11% to 5% over the study period (OR = 0.92, SE = 0.01,  $P < 0.001$ , Table 4). There were significant increases in the proportion of last month drug users who had been excluded from school (from 21% to 28%, OR = 1.04, SE = 0.01,  $P < 0.001$ ). There were no significant interactions between year and sex (OR = 1.00, SE = 0.01,  $P = 0.675$ ), year and FSM (OR = 1.01, SE = 0.01,  $P = 0.121$ ) and year and truanting (OR = 1.00, SE = 0.01,  $P = 0.627$ ), indicating no change in the composition of last month drug users for each of these variables.

#### Recent poly-substance use

In line with trends for individual substances, between 2003 and 2014, there was an increase in the proportion of young people who reported using no substances from 67% to 74%. There was also declines in the proportion of 11–15-year olds who reported use of one (from 21% to 18%), two (from 8% to 6%) and three (from 5% to 2%) substances (Table 5).

The proportion of 11–15-year-olds who reported polysubstance use decreased from 13% to 8% over the study period ( $\beta = -0.09$ , SE = 0.01,  $P < 0.001$ , Table 6). There were significant increases in the proportion of polysubstance users who had been excluded from school (from 23% to 32%,  $\beta = 0.03$ , SE = 0.01,  $P < 0.001$ ) and who had truanted ( $\beta = 0.01$ , SE = 0.01,  $P = 0.002$ ). There was no change in the proportion of polysubstance users who were male ( $\beta = -0.01$ , SE < 0.01,  $P = 0.142$ ), who received FSM ( $\beta = 0.01$ , SE = 0.01,  $P = 0.412$ ).

#### Discussion

Here for the first time, we examine whether the psychosocial characteristics of young substance users in

**Table 4.** Binary logistic regression models for tried cannabis and last month drug use by survey year, sex, truanting, exclusion and free school meals (FSM)

	OR	SE	Z	P	% in drinking group in 2001	% in drinking group in 2014
<i>Ever tried cannabis<sup>a</sup></i>						
Survey year	0.94	0.01	-8.15	<0.001		
Sex	0.94	0.04	-1.49	0.137		
FSM	0.82	0.05	-3.22	0.001		
Excluded	2.73	0.17	16.25	<0.001		
Truanted	7.64	0.33	46.58	<0.001		
Pre-/post-2007	0.92	0.04	-1.84	0.066		
Year*sex	1.00	0.01	0.56	0.575	55	57
Year*FSM	<b>1.02</b>	<b>0.01</b>	<b>2.60</b>	<b>0.009</b>	<b>15</b>	<b>19</b>
Year*excluded	<b>1.04</b>	<b>0.01</b>	<b>4.31</b>	<b>&lt;0.001</b>	<b>21</b>	<b>27</b>
Year*truanted	<b>0.98</b>	<b>0.01</b>	<b>-2.60</b>	<b>0.009</b>	<b>50</b>	<b>46</b>
<i>Last month drug use<sup>b</sup></i>						
Survey year	0.92	0.01	-8.79	<0.001		
Sex	0.99	0.05	-0.25	0.806		
FSM	0.85	0.05	-2.55	0.011		
Excluded	2.35	0.15	13.31	<0.001		
Truanted	6.34	0.32	36.22	<0.001		
Pre-/post-2007	1.03	0.06	0.56	0.576		
Year*sex	1.00	0.01	0.42	0.675	54	54
Year*FSM	1.01	0.01	1.55	0.121	14	17
Year*excluded	<b>1.04</b>	<b>0.01</b>	<b>4.05</b>	<b>&lt;0.001</b>	<b>21</b>	<b>28</b>
Year*truanted	1.00	0.01	-0.049	0.627	46	48

<sup>a</sup> $n = 96, 390, \chi^2(10) = 11\,560.55, P < 0.001.$  <sup>b</sup> $n = 107\,612, \chi^2(10) = 8583.46, P < 0.001.$  Bold values denote significance ( $P < 0.050$ ).

England have changed over a period of declining youth substance use. All substance use declined substantially over the survey period in line with international trends [2,3,10]. Last week drinking is now similar in prevalence to last week smoking and last week drug use. Current smoking (but not last week smoking) and cannabis use were increasingly concentrated among young people receiving FSMs and those who have been excluded from school. The proportion of last month drug users who had been excluded from school increased significantly since 2001/2003. Finally, there were increases in the proportion of polysubstance users who had truanted and been excluded from school. There was only limited evidence of similar concentration for alcohol in that the significant increases in the proportion of alcohol users who received FSMs and who had been excluded were accompanied by very small percentage shifts. Finally, there was also little evidence of concentration by sex.

Both hardening theory and the substance use normalisation thesis suggest that declining youth substance use could result in substance use becoming concentrated in more at risk or marginalised groups [20,21]. However, previous studies in Norway and Sweden have found no evidence in support of this in relation to alcohol consumption, as both psychosocial

characteristics of young drinkers and self-reported harms remained stable over periods of increasing and decreasing youth drinking [27,28]. Our results are in line with these studies as we find little evidence that youth drinking is becoming more concentrated in more vulnerable or at-risk groups. Although we do see significant increases in the proportion of adolescent drinkers who receive FSMs and who have been excluded from school, these findings reflect practically meaningless percentage changes (1–2%). However, our results vary by substance and increases in the proportion of current smokers and those who have ever tried cannabis who receive free school meals and who have been excluded from school are much more pronounced. Similarly, there have been meaningful increases in the proportion of last month drug users and poly-substance users who have been excluded from school and in the case of polysubstance users who have truanted. The reasons for differing levels of concentration across substances is unclear but could be due in part to the way that alcohol is socially perceived. Alcohol use may be more socially accepted across society than smoking and drug use. Alcohol is legal and is widely advertised and accessible in a number of settings. Although smoking is also legal, the introduction of the smoking ban in England in 2007

**Table 5.** Percentages of 11–15 year-olds who report recent use of zero, one, two and three substances

Year	Used 0 substances	Used 1 substances	Used 2 substances	Used 3 substances
2003 <sup>a</sup>	6970 (67%)	2167 (21%)	785 (8%)	468 (5%)
2004	6804 (70%)	1863(19%)	651 (7%)	397 (4%)
2005	6436 (70%)	1759 (19%)	624 (7%)	383 (4%)
2006	5800 (71%)	1569 (19%)	557 (7%)	274 (3%)
2007	5719 (73%)	1407 (18%)	452 (6%)	253 (3%)
2008	5750 (74%)	1382 (18%)	436 (6%)	230 (3%)
2009	5867 (76%)	1203 (16%)	396 (5%)	208 (3%)
2010	5746 (79%)	1068 (15%)	328 (5%)	154 (2%)
2011	5320 (82%)	833 (13%)	243 (4%)	123 (2%)
2012	6184 (81%)	987 (13%)	288 (4%)	130 (2%)
2013	4404 (85%)	547 (11%)	171 (3%)	67 (1%)
2014	5406 (88%)	531 (9%)	161 (3%)	75 (1%)
Total	83 809 (74%)	19 779 (18%)	6442 (6%)	2762 (2%)

<sup>a</sup>Last week smoking was measured from 2003 onwards so this analysis focuses on 2003–2014.

**Table 6.** Poisson regression model of poly-substance use by survey year, sex, truanted, exclusion and free school meals (FSM)<sup>a</sup>

Poly-substance use <sup>a</sup>	$\beta$	SE	t	P	% in 2 or more substance groups in 2003	% in 2 or more substance groups in 2014
Survey year	-0.09	0.01	-19.10	<0.001		
Sex	0.20	0.03	6.86	<0.001		
FSM	-0.15	0.04	-3.52	<0.001		
Excluded	0.40	0.04	10.36	<0.001		
Truanted	1.21	0.03	36.74	<0.001		
Pre-/post-2007	0.10	0.03	3.82	<0.001		
Year*Sex	-0.01	<0.01	-1.47	0.142	55	47
Year*FSM	0.01	0.01	0.82	0.412	14	19
<b>Year*excluded</b>	<b>0.03</b>	<b>0.01</b>	<b>6.53</b>	<b>&lt;0.001</b>	<b>23</b>	<b>32</b>
<b>Year*truanted</b>	<b>0.01</b>	<b>0.01</b>	<b>3.11</b>	<b>0.002</b>	<b>55</b>	<b>56</b>

<sup>a</sup> $n = 107\ 612$ ,  $\chi^2(10) = 20\ 613$ ,  $P < 0.001$ . Bold values denote significance ( $P < 0.050$ ).

may have increased levels of stigma around smoking [35,36]. This may also affect perceptions of cannabis, which is often smoked at the same time as tobacco. Similarly, cannabis and other illicit drug use is illegal and therefore, may be perceived as a more risk-laden and marginalised behaviour. As such, it is possible that wider acceptance of alcohol results in less stigma for users, even in times of lower use, which protects remaining users from marginalisation.

This paper provides an important step forward in characterising the nature of declines in youth substance use in England and extends the geographic focus of previous research using robust empirical methods and a large, nationally representative sample. However, it is not without limitations. Primarily, the present research is limited by the psychosocial and demographic variables that are consistently measured over a large enough period in the SDD to draw conclusions about trends. A similar analysis with a richer

data set would therefore be of value. More generally, there are concerns about the reliability of responses from self-report surveys. Attempts to check the reliability of self-reported smoking and drug use data through analysing cotinine levels in saliva samples and the inclusion of questions about a fictional drug in the SDD, demonstrate that respondents are largely honest [34]. Despite a lack of independent verification of self-reported alcohol consumption data in the SDD, studies that examine adolescents self-reported drinking, generally find the results to be reliable [37–39]. Finally, the present research is limited by the nature of the sample. The SDD is completed in mainstream schools. Pupil referral units, establishments that educate students who are permanently excluded from mainstream schools usually due to behavioural problems, are not included in the sample. This could mask the extent of hardening or marginalisation in young substance users who may be more prevalent in such alternative settings.



These results could have important implications both in terms of public health and policy. Given the health and social risks associated with youth substance use [13–16], declining youth substance use should carry both short- and long-term population health benefits. The apparent lack of concentration of alcohol use amongst more vulnerable or at-risk populations is positive and suggests that some of the health and social benefits of declining youth alcohol consumption should become apparent. However, the benefits of declining substance use may not be fully recognised as there is some evidence that smoking, drug use and poly-substance use is becoming concentrated in more vulnerable populations. Indeed, this concentration could result in widening inequalities and increased marginalisation and stigmatisation of young substance users [23,24]. These findings could also have implications in determining how policies should target substance use and related harms in young people. Young people who are excluded from schools could be harder to reach in terms of school-based information or education campaigns outlining the harms associated with substance use. Therefore, targeted campaigns focused on particularly vulnerable groups may be necessary and alternative ways of reaching young people who may not be attending school should be considered.

## Conclusion

Smoking and cannabis use is increasingly concentrated among young people receiving FSMs and those who have been excluded from school. Similarly, the proportion of last month drug users and poly-substance users who have been excluded has increased significantly since 2003. There was only limited evidence of similar concentration for alcohol, in that the significant effects were accompanied by very small percentage shifts. Finally, there was also little evidence of concentration by sex for any substance. There is some support for theories that suggest that declines in youth substance use could result in increasing marginalisation and inequalities for remaining substance users. However, this marginalisation seems less likely for young drinkers, possibly due to greater of social acceptance of alcohol relative to other substances.

## Conflict of Interest

The authors have no competing interests to declare.

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