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Title: School-level variation in health outcomes in adolescence: analysis of three longitudinal studies in England

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ABSTRACT

Purpose At individual level, school factors are associated with many health outcomes in adolescence. However, previous studies report inconsistent findings about the degree of school-level variation for health outcomes, particularly for risk behaviours. This study uses data from three large longitudinal studies in England to investigate school-level variation in a range of health indicators.

Methods Participants were drawn from the Longitudinal Study of Young People in England (LSYPE), the Me and My Schools study (MAMS) and Research with East London Adolescent Community Health Survey (RELACHS). Outcome variables included risk behaviours (smoking, alcohol/cannabis use, sexual behaviour), behavioural difficulties and victimisation, obesity and physical activity, mental and emotional health, and educational attainment. Multi-level models were used to calculate the proportion of variance in outcomes explained at school level, expressed as intraclass correlations (ICCs) adjusted for gender, ethnicity and socio-economic status of the participants.

Results ICCs for health outcomes ranged from nearly nil to .28 and were almost uniformly lower than for attainment (.17-.23) . Most adjusted ICCs were smaller than unadjusted values, suggesting that school-level variation partly reflects differences in pupil demographics. School-level variation was highest for risk behaviours. ICCs were largely comparable across datasets, as well as across years within datasets, suggesting that school-level variation in health remains fairly constant across adolescence.

Conclusions School level variation in health outcomes remains significant after adjustment for individual demographic differences between schools, confirming

likely effects for school environment. Variance is highest for risk behaviours, supporting the utility of school environment interventions for these outcomes.

INTRODUCTION

Behavioural risk factors are the leading cause of mortality in modern society (McGinnis, Williams-Russo, & Knickman, 2002; Mokdad, Marks, Stroup, & Gerberding, 2004) and are largely acquired in adolescence (Donaldson, 2008; Lawrence, Gootman, & Sim, 2009; World Health Organization, 2011). Adolescence is also an important period for population mental health, with half of all lifetime mental illness presenting by the age of 14 and 75% by the mid 20s (Kessler et al., 2005). A number of school factors have been repeatedly shown to protect against health behaviour and poor mental health outcomes, particularly pupil perceptions of connection to the school (Resnick et al., 1997; Viner et al., 2012). Because of this, there has been extensive research and policy interest in using school-based interventions to improve young people's health (Department of Health [DH], 2009; Hale & Viner, 2012; National Institute for Health and Clinical Excellence, 2010).

Schools may affect health and health behaviour and well-being both directly, through the health and safety measures in place, the enactment of school rules, peer influences, social activities, teacher support and school connectedness, and indirectly by influencing student-level traits, skills and knowledge related to health and health behaviours (Deschesnes, Martin, & Hill, 2003). This includes raising awareness and understanding of health risk (Eccles & Roeser, 2011), increasing self-esteem and resistance to social pressure and promoting prosocial relationships (Greenberg et al., 2003). A 2006 systematic review (Sellström & Bremberg) investigated school-level variation across a range of health outcomes, analysing 17 studies from Australia, USA and several European countries with a single British

study. For substance misuse, the proportion of explained variance after adjusting for individual level factors varied substantially, with estimates from different studies ranging from 4 to 40% of total variance in smoking. Variation in measures of problem behaviour and well-being were generally lower than for substance use. These studies varied in methodological approaches and the extent to which sociodemographic variables were controlled which may account for divergences in findings.

Understanding of school level variation in health outcomes is important as it informs the extent to which interventions on school level factors may influence health i.e. schools' capacity to promote health amongst students. Further, such data are essential for planning interventions in schools; for example school level intra-class correlation coefficients (ICC) are necessary to estimate power required for school-based cluster randomized trials. However, there has been little research into links between school level factors and young people's health and no systematic study of school level variation in adolescent health outcomes in English schools. Three large, recent, longitudinal studies in England offer the opportunity to redress this gap by studying school-level variation across a range of health outcomes using consistent analytic methods that adjust for likely confounding factors.

METHODS

Datasets

Longitudinal Study of Young People in England (LSYPE; Department for Education, 2011)

L SYPE was initiated in 2004 with Year 9 participants (age 13-14) followed-up annually until 2010, resulting in 7 waves of data collection. We report data from the

first four waves (during secondary school) and the fifth to seventh for post-school (wave five for bullying, six for substance use and exercise and seven for sexual risk). For the purpose of this paper, we restricted analyses to pupils who had participated in all waves (N=7809; 631 schools). 48.5% of the sample was male and mean age of participants in 2004 was 14.2 years (SD=.31).The sample is predominantly white (68.9%) with 4.6% mixed, 19.5% Asian, 6.0% black and 1.0% 'other'. 13.5% of pupils were eligible for free school meals at wave 1. The survey was amended annually with many health-related items removed or added; this means not all items were available in all waves.

Me and My School Study (MAMS; Wolpert et al., 2011)

Data were collected for three consecutive years from 2008-2010 in secondary schools with respondents in Year 7 in wave one. 2647 pupils from 37 schools participated in all three years and were included in analyses. 45.6% of the sample was male and mean age in 2008 was 11.7 years(SD=0.29). 71.3% of the sample was white British, 7.3% Pakistani, 4.3% Bangladeshi, 3.7% Indian, 3% Black African, 1.6% any other white, 1.5% any other Asian, 1.2% black Caribbean. Other ethnic groups such as Chinese, gypsy/Romany, mixed groups made up less than 1% each and information was not available for 1.6% of the sample. 17.1 % of the sample were eligible for free school meals.

Research with East London Adolescent Community Health Survey (RELACHS; Stansfeld et al., 2003)

RELACHS is a school-based epidemiological survey that collected data on year 7 and year 9 students in 2001 (Wave 1), year 9 and year 11 students in 2003 (Wave 2) and year 11 students in 2005 (Wave 3) from 28 schools across South East England. The sample size for Year 7 was 1,381. As prevalence for health outcomes were similar across cohorts, they were combined, roughly doubling the sample size for the Year 9 and Year 11 sample (N=2385 and 2271 respectively).

In Year 7, the sample was 21.4% White UK, 7.1% White other, 22.8% Bangladeshi, 7.5% Asian Indian, 7.0% Pakistani, 6.5% Black Caribbean, 10.8% Black British, 4.4% Black British, 7.8% Mixed Ethnicity, 4.8% Chin/Viet & Other. 50.2% of the sample were male and the mean age of participants was 12.2 years (SD=0.01) in Year 7, 14.2 years (SD=0.01) in Year 9 and 16.1 years (SD=0.01) in Year 11. The proportion of pupils eligible for free school meals (FSM) was 50.3% in Year 7, 49.5% in Year 9 and 51.1% in Year 11.

Outcome variables

Risk Behaviours

Smoking, drinking, cannabis use and sexual risk behaviour were included as risk behaviours with variables in both LSYPE and RELACHS datasets. In line with the definition used for national statistics for adolescents (Bridges, Gill, Omole, Sutton, & Wright, 2011) regular smoking was defined as one or more cigarettes per week and regular drinking was drinking once or more per week. Regular cannabis use referred to having used cannabis at least once in last 30 days. Measures regarding ever having tried smoking, cannabis and alcohol were also included. Risky sexual

behaviour was characterised by ever having had unprotected sex on one or more occasions.

Externalising behaviours and victimization

Behavioural difficulties were measured in the MAMS dataset using the behavioural difficulties scale of the Me and My School questionnaire (Deighton et al., in press) and in the RELACHS dataset using the conduct problems scale of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). In LSYPE, fighting constituted having ever been in a fight or public disturbance for Year 9 respondents, and in the last year for other waves. Being a victim of bullying was defined in LSYPE as any bullying in the last 12 months including name-calling, social exclusion, physical violence, being threatened or being forced to hand over possessions. In RELACHS, adolescents were asked whether they had ever been bullied at their school.

Obesity and exercise

For the LSYPE data, sport and exercise participation was defined as taking part in sports (or, post-school, any exercise) more than once a week. In the RELACHS study, weight and height information were used to calculate Body Mass Index (BMI) of pupils and prevalence of obesity was defined as a BMI at or above the 95th percentile. Sedentary Lifestyle was measured using a question adapted from the HEA (Health Education Authority, 1997) and was defined as over 2 hours of sedentary behaviour per day

Mental and emotional health

The SDQ total difficulties score was measured in both the MAMS and RELACHS datasets. Emotional difficulties were assessed using the emotional symptoms score of the SDQ in RELACHS and the emotional difficulties scale of the Me and My School questionnaire for MAMS. We also report data on from the Short Moods and Feelings questionnaire (Angold et al., 1995) in RELACHS which included items about emotions and behaviour over the past 2 weeks. In the LSYPE dataset mental health was measured using the General Health Questionnaire -12 (GHQ-12; Goldberg & Williams, 1988).

Attainment

For LSYPE data Key Stage 3 average scores were used for pupils in Year 9 and obtaining the GCSE Level-2 threshold for Year 11 (meaning obtaining at least 5 GCSEs above C) in Year 11. For MAMS, Year 9 academic attainment was represented by Key stage 3 attainment merged into eight established attainment levels. Attainment was included in the analysis as a benchmark against which to assess school-level variation in health outcomes.

Analysis

Multi–level models (MLMs) were run in Stata 12 (StataCorp, 2011). Intraclass correlations (ICCs) were computed to determine variance explained by the school level. ICCs are descriptive statistics which give an indication of similarity between units clustered within the same higher-order group (Browne, Subramanian, Jones, & Goldstein, 2005), in this case, students within schools. In the first set of analyses,

unadjusted models were analysed without any predictors entered, with a second set of analyses undertaken to control for socio-economic status, gender and ethnicity. Socioeconomic status was represented by free school meal eligibility; a well-established proxy for deprivation (Hobbs & Vignoles, 2010). Ethnicity was defined differently in each database; the ethnicities reported above for the ethnic composition of each dataset were used in the analyses. Logistic MLMs were used for binary outcomes and for continuous variables a MLM with maximum likelihood estimation was run. Confidence Intervals for the ICC's were calculated using the *iccconf* package in STATA (Visintainer, 2008).

RESULTS

Descriptive statistics for all health outcomes are presented in Table 1. Risk behaviours typically increased with age, with externalising behaviours and bullying decreasing. Mental health was largely stable across years, with no clear patterns emerging for obesity and exercise. Unadjusted ICCs indicate that the school level explained between 0% and 47% of the total variance for the included outcomes (Table 2). After adjusting for gender, ethnicity and socio-economic status (Table 3), the majority of ICCs were reduced. Where comparable outcomes were available in more than one dataset, no discernible pattern emerges in regards to ICC sizes between datasets.

ICCs for health-related outcomes were almost uniformly lower than those for attainment. School-level variance was largest for health risk behaviours. ICCs of between 0.03 and 0.12 were typical for this category. In the unadjusted model, having ever tried drinking showed the largest school-level variance, accounting for

between 21 and 47% of the variance in the LSYPE dataset, though this dropped substantially in the adjusted model. School-level variance was lower for fighting and behavioural difficulties, with a range between 1 and 4%. For obesity and exercise, ICCs were largely comparable, though in LSYPE in Year 9 and 10 school level-variance for sport and exercise reached 6 and 8% respectively. Finally, mental health variables also had low school-level variance compared to risk behaviours, peaking at 6%, but 1 or 2% was more typical.

In both the unadjusted and adjusted models, no clear pattern emerged across years with ICCs for most health outcomes not significantly different in subsequent years. LSYPE was the only dataset which included health measures after respondents had left school, and showed that variance at the previous school-level remained largely stable after leaving school, though for regular drinking (unadjusted) and being bullied, ICCs were substantially larger post-school.

DISCUSSION

Our findings demonstrate that school-level variation for health indicators both during and shortly after secondary school is generally low, especially after controlling for individual socio-demographic characteristics. School-level variance is highest for health risk behaviours. ICCs were generally stable across years suggesting that school-level variances are similar throughout secondary school and that such effects persist after young people leave school. School-level variation for nearly all health outcomes was lower than for educational attainment. This is perhaps unsurprising, since the principal aim of schools is to promote academic attainment. We found that ICCs decreased in size for most outcomes after controlling for socio-demographic

variables suggesting that at least some of the identified school-level variance is due to the pupil composition within schools.

Generally low school-level variance may be due to the increase in policies and interventions targeting mental health problems and risk behaviours nation-wide (Department for Education and Skills, 2003, 2005; DH/Department for Education and Employment, 1999) which may be reducing both the prevalence of these behaviours and between-school variations. However, it is important to note that the size of school-level effects say little about the absolute prevalence of health or risk behaviours within schools or of the importance of school practices for promoting health. Therefore, an alternate explanation is that schools simply have little impact on health compared to other domains including family, neighbourhood, peer and genetic factors.

Low ICCs for health-risk behaviours were consistent with existing literature (Mrug, Gaines, Su, & Windle, 2010; Sellström & Bremberg, 2006). Despite generally small ICCs for risk behaviours in our study, they were almost uniformly larger than for other health indicators. Relatively high school-level variation for risk behaviours may be explained by the importance of peer influences on such behaviours. Moffitt (1993) posits that risk behaviours arise partly as a result of social mimicry, in which adolescents re-enact the risk-taking behaviours of their peers to gain social acceptance and as a supposed display of maturity. The visibility of a small number of students within a given school displaying risk behaviours could lead to a proliferation of such behaviour within that school. Peer effects appear to decrease with age

(Gardner & Steinberg, 2005) which may explain the decreases in school-level effects for risk behaviours found within the LSYPE data

Our findings suggest that lifestyle factors related to adiposity rarely have school-level variance above 4%. Research has shown that for physical activity performed at school, the school level intra-class correlation is very small (Murray et al., 2004). This may be due to school-mandated physical exercise being policy regulated and therefore, largely homogeneous. ICCs for aggression, victimization and behavioural difficulties were surprisingly low, given strong evidence that a number of school characteristics are related to these outcomes (Cook, Gottfredson, & Na, 2010; Gendron, Williams, & Guerra, 2011; Gottfredson & DiPietro, 2011). The school-level variance for externalization and victimization in our study are generally lower than previous studies using multi-level modelling (Mooij, 1998; Wilcox & Clayton, 2001). English schools may be more homogeneous in this area due to recent policy initiatives and school inspections focusing on school climate, bullying and peer and teacher relationships (Ofsted, 2009). Between-school differences were also small for emotional and behavioural difficulties, and depression and mood disorders suggesting that mental health is mainly an individual phenomenon and that only a small part of it is shared among the adolescents belonging to the same school (Roeger, Allison, & Martin, 2001).

Our findings revealed no clear patterns across age. Past research also offers no firm conclusions. A study examining substance use throughout adolescence found that school variance was larger at 13 years-old than 15 for smoking, larger at 15 for drugs, but found no difference for alcohol (West, Sweeting, & Leyland, 2004). A

study regarding depression found that ICCs dropped annually from Year 8 to Year 10 (Roeger et al., 2001). In some cases we were able to examine school-level variation once pupils have left their secondary schools. There is little, if any, comparable data currently in the literature. Our findings show that school-level effects persist after leaving the school environment. This suggests that the school influences health at least partially through indirect mechanisms: by providing a set of skills, behavioural repertoires, knowledge and other resources which influence health both within the school context and beyond. In fact, the ICC for being a victim of bullying increased significantly after secondary school suggesting that, for this variable at least, the contribution of the school environment itself is less important than the set of skills and traits bestowed within schools. Interestingly, the sole area where school-variance decreased after leaving school was sport and exercise. This may be because at many schools, involvement in sport and exercise is mandated making it an area where the school environment itself is responsible for school-level effects, rather than distal effects.

Strengths and Limitations

The strength of this study is bolstered by the use of three large datasets each containing a number of health outcomes. Two of the datasets were nationally-representative, while the third had a large proportion of ethnic minority participants. This allows for a comparison between dataset populations and health variables using a similar methodology to analyse all three datasets. The availability of data from Year 7 students through to post-secondary school allowed for comparisons across secondary-school age and examination of the pervading effects of the school after

leaving the school environment. In two of the three datasets, the same students were followed longitudinally making comparisons across year particularly robust. This study is particularly valuable considering the limited availability of data regarding school-level variance for health, especially within the UK.

For some health outcomes in our data, such as substance use in early waves, prevalence is very low so results may be skewed by small numbers of pupils within the same schools who were participating in health risk behaviours. Also, we were limited by the selection of health indicators available within the selected datasets and the way they were defined within surveys and their availability across survey years. Furthermore, it is difficult to isolate school-effects from other effects including neighbourhood, family, and sociodemographic. Though we adjusted for several sociodemographic characteristics, it is doubtful that this entirely attenuated the effects of school composition thereby inflating school-level variation. Additionally, since cohorts of pupils often transition together from primary to secondary schools school-level effects in secondary schools may reflect residual primary school effects (West & Sweeting, 2002).

Implications and conclusions

The magnitude of school-level variance of health outcomes is relevant to public health research, health services and policy, and epidemiology. Firstly, our results suggest there should be less emphasis on school choice with regards to mental health and some health risk behaviours as there appears to be a relatively consistent standard throughout the English education system. Our findings are relevant in the development of interventions to reduce health risk behaviours and suggests that

school environment interventions, particularly those targeting peer influence within schools, may be appropriate. Since schools do not differ a great deal in regards to health, similar interventions may be applicable across schools.

Our results are also applicable in power calculations for cluster-randomised school-based trials. Large within-cluster similarities inflate the variance of the difference to be detected within the trial (Hemming, Girling, Sitch, March, & Lilford, 2011). Put simply, trials with outcome measures with large ICCs will require larger sample sizes to be adequately powered to detect outcome effects. Our results are useful both in showing that in general, school-level variance is low for health indicators, and in providing specific ICCs for a number of health indicators which can be used in power calculations.

For nearly all health outcomes, school variance in English secondary schools is substantially lower than that for attainment. This is particularly true for mental health, behavioural difficulties and diet and exercise. Health risk behaviour has relatively higher school-level variance compared to other health outcomes. Though our results do not affirm the causal mechanisms behind school-level variance, they suggest that school effects may not contribute heavily to differences in health amongst secondary school students.

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Table 1. Prevalences (for binary variables) and means (for continuous variables) for health-related outcomes for the three datasets (95% CIs in brackets)

Variable	Longitudinal Study of Young People in England					MAMS			RELACHS		
	Year 9 (2004)	Year 10 (2005)	Year 11 (2006)	Year 12 (2007)	Post-school (2008)	Year 7 (2008)	Year 8 (2009)	Year 9 (2010)	Year 7 (2001)	Year 9 (2001/3)	Year 11 (2003/5)
Risk behaviours											
Ever tried smoking	7.1 (6.6, 7.7)	15.4 (14.6, 16.2)	20.4 (19.5, 21.3)	-	-	-	-	-	24.9 (22.5, 27.2)	49.3 (47.4, 51.2)	57.5 (55.3, 59.6)
Regular smoking	3.0 (2.6, 3.4)	7.5 (7.0, 8.1)	10.8 (10.1, 11.5)	-	-	-	-	-	0.7 (0.3, 1.2)	7.3 (6.3, 8.3)	15.7 (14.1, 17.2)
Ever drank	46.2 (45.1, 47.3)	58.1 (57.0, 59.2)	66.7 (65.7, 67.8)	76.6 (75.7, 77.6)	-	-	-	-	18.6 (16.5, 20.7)	36.1 (34.2, 38.0)	43.1 (41.0, 45.3)
Regular drinking	5.8 (5.2, 6.3)	10.3 (9.7, 11.0)	14.0 (13.3, 14.8)	28.9 (27.9, 29.9)	54.7 (53.6, 55.8)	-	-	-	2.0 (1.2, 2.7)	4.8 (4.0, 5.6)	8.8 (7.6, 10.0)
Tried cannabis	7.0 (6.4, 7.5)	15.4 (14.6, 16.2)	21.3 (20.4, 22.2)	30.9 (29.9, 31.9)	31.2 (30.2, 32.2)	-	-	-	2.2 (1.4,2.9)	13.6 (12.2, 14.9)	24.3 (21.7, 26.9)
Regular can. use	-	-	-	-	10.6 (9.9, 11.2)	-	-	-	0.7 (0.3, 1.2)	8.0 (6.9, 9.0)	14.2 (12.7, 15.8)
Sexual risk	-	-	-	-	32.1 (31.1, 33.2)	-	-	-	-	4.3 (3.2, 5.4)	9.4 (8.2, 10.8)
Externalizing behaviour and victimization											
Fighting	14.1 (13.4, 14.9)	13.3 (12.5, 14.0)	11.4 (10.7, 12.1)	-	-	-	-	-	-	-	-
Behavioural difficulties*	-	-	-	-	-	3.2 (3.1, 3.3)	3.0 (2.9, 3.1)	3.0 (3.0, 3.1)	2.5 (2.4, 2.6)	2.6 (2.6, 2.7)	2.5 (2.4, 2.6)
Victim of bullying	44.8 (43.6, 45.9)	37.7 (36.6, 38.8)	26.5 (25.5, 27.5)	16.2 (15.3, 17.0)	5.7 (5.2, 6.2)	-	-	-	39.4 (36.8, 42.0)	29.3 (27.5, 31.0)	21.5 (19.7, 23.2)
Obesity and exercise											

Sport and exercise	64.5 (63.5, 65.5)	57.9 (56.6, 58.8)	-	40.6 (39.5, 41.7)	63.8 (62.7, 64.8)	-	-	-	-	-	-
Sedentary Lifestyle	-	-	-	-	-	-	-	-	62.6 (60.0, 65.2)	77.0 (75.4, 78.6)	76.6 (74.8, 78.4)
Obesity (95th percentile)	-	-	-	-	-	-	-	-	23.5 (21.1, 25.8)	20.3 (18.8, 21.9)	19.8 (18.0, 21.5)
Mental and emotional health											
GHQ *	-	1.7 (1.6, 1.8)	-	2.1 (2.0, 2.2)	-	-	-	-	-	-	-
SDQ*	-	-	-	-	-	10.3 (10.1, 10.5)	9.8 (9.5, 10.0)	9.7 (9.5,9.9)	10.9 (10.7, 11.2)	11.2 (11.0, 11.3)	11.0 (10.8, 11.2)
MFQ*	-	-	-	-	-	-	-	-	4.9 (4.7, 5.2)	5.3 (5.1, 5.5)	6.0 (5.7, 6.2)
Emotional difficulties*	-	-	-	-	-	5.5 (5.4, 5.7)	4.8 (4.7, 5.0)	4.7 (4.6, 4.9)	3.0 (2.9, 3.1)	3.0 (2.9, 3.1)	3.0 (2.9, 3.1)
Attainment											
Academic attainment**	35.1 (35.0, 35.3)	-	70.3 (69.3, 71.3)	-	-	-	-	5.5 (5.5 ,5.6)	-	-	-

* denotes continuous variables. **: Continuous excepting LSYPE in Year 11. – signifies data is not available for the item.

Table 2. Unadjusted intraclass correlations and 95% confidence intervals for school-level variance of health-related outcomes.

Variable	Longitudinal Study of Young People in England					MAMS			RELACHS		
	Year 9 (2004)	Year 10 (2005)	Year 11 (2006)	Year 12 (2007)	Post-school (2008)	Year 7 (2008)	Year 8 (2009)	Year 9 (2010)	Year 7 (2001)	Year 9 (2001/3)	Year 11 (2003/5)
Risk behaviours											
Ever tried smoking	0.07 (0.05, 0.08)	0.03 (0.02, 0.04)	0.04 (0.03, 0.05)	-	-	-	-	-	0.05 (0.03, 0.11)	0.04 (0.02, 0.08)	0.04 (0.02, 0.08)
Regular smoking	0.08 (0.06, 0.10)	0.07 (0.06, 0.09	0.07 (0.06, 0.09)	-	-	-	-	-	0.30 (0.01, 0.07)	0.14 (0.09, 0.24)	0.08 (0.05, 0.15)
Ever drank	0.21 (0.19, 0.24)	0.28 (0.25, 0.31)	0.36 (0.33, 0.39)	0.47 (0.44, 0.50)		-	-	-	0.14 (0.09, 0.25)	0.23 (0.15, 0.35)	0.21 (0.14, 0.33)
Regular drinking	0.12 (0.10, 1.14)	0.12 (0.11, 0.15)	0.11 (0.09, 0.13)	0.12 (0.10, 0.14)	0.20 (0.18, 0.23)	-	-	-	0.14 (0.09, 0.25)	0.15 (0.09, 0.25)	0.17 (0.11, 0.28)
Tried cannabis	0.10 (0.09, 0.12)	0.06 (0.05, 0.07)	0.07 (0.05, 0.08)	0.06 (0.05, 0.08)	0.07 (0.05, 0.08)	-	-	-	0.00 (0.01, 0.02)	0.06 (0.03, 0.11)	0.08 (0.05, 0.15)
Regular can. use	-	-	-	-	0.05 (0.04, 0.06)	-	-	-	0.03 (0.00, 0.08)	0.09 (0.05, 0.17)	0.08 (0.04, 0.14)
Sexual risk	-	-	-	-	0.04 (0.03, 0.06)	-	-	-	-	0.07 (0.03, 0.14)	0.07 (0.04, 0.13)
Externalizing behaviour and victimization											
Fighting	0.01 (0.00, 0.02)	0.03 (0.02, 0.04)	0.03 (0.02, 0.04)	-	-	-	-	-	-	-	-
Behavioural difficulties*	-	-	-	-	-	0.03 (0.01, 0.06)	0.03 (0.02, 0.06)	0.04 (0.02, 0.07)	0.02 (0.00, 0.05)	0.01 (0.00, 0.03)	0.01 (0.00, 0.03)
Victim of bullying	0.03 (0.02, 0.05)	0.03 (0.02, 0.04)	0.02 (0.01, 0.03)	0.03 (0.01, 0.04)	0.09 (0.07, 0.11)	-	-	-	0.04 (0.02, 0.09)	0.01 (0.00, 0.03)	0.03 (0.01, 0.06)
Obesity and exercise											
Sport and exercise	0.06 (0.05, 0.08)	0.08 (0.06, 0.10)	-	0.04 (0.03, 0.05)	0.01 (0.00, 0.02)	-	-	-	-	-	-

Sedentary Lifestyle	-	-	-	-	-	-	-	-	0.01 (0.00, 0.03)	0.00 (0.00, 0.01)	0.02 (0.01, 0.05)
Obesity (95th percentile)	-	-	-	-	-	-	-	-	0.00 (0.00, 0.02)	0.01 (0.00, 0.02)	0.00 (0.00, 0.01)
Mental and emotional health												
GHQ *	-	0.02 (0.01, 0.03)	-	0.03 (0.02, 0.04)	-	-	-	-	-	-	-	-
SDQ*	-	-	-	-	-	0.04 (0.02, 0.07)	0.02 (0.01, 0.04)	0.02 (0.01, 0.04)	0.02 (0.01, 0.06)	0.02 (0.01, 0.04)	0.01 (0.00, 0.03)
MFQ*	-	-	-	-	-	-	-	-	0.00 (0.00, 0.02)	0.04 (0.02, 0.07)	0.03 (0.01, 0.07)
Emotional difficulties*	-	-	-	-	-	0.02 (0.01, 0.04)	0.03 (0.01, 0.05)	0.02 (0.01, 0.05)	0.02 (0.01, 0.06)	0.04 (0.02, 0.08)	0.06 (0.03, 0.11)
Attainment												
Academic attainment**	0.21 (0.19, 0.24)	-	0.25 (0.22, 0.28)	-	-	-	-	0.19 (0.13, 0.29)	-	-	-	

* denotes continuous variables. **: Continuous excepting LSYPE in Year 11. – signifies data is not available for the item.

Table 3. Adjusted intraclass correlations and 95% confidence intervals for school-level variance of health-related outcomes

Variable	Longitudinal Study of Young People in England					MAMS			RELACHS		
	Year 9 (2004)	Year 10 (2005)	Year 11 (2006)	Year 12 (2007)	Post-school (2008)	Year 7 (2008)	Year 8 (2009)	Year 9 (2010)	Year 7 (2001)	Year 9 (2001/3)	Year 11 (2003/5)
Risk behaviours											
Ever tried smoking	0.04 (0.03, 0.05)	0.01 (0.00, 0.02)	0.01 (0.00, 0.03)	-	-	-	-	-	0.02 (0.00, 0.06)	0.03 (0.01, 0.06)	0.04 (0.02, 0.08)
Regular smoking	0.03 (0.01, 0.04)	0.04 (0.03, 0.05)	0.03 (0.02, 0.05)	-	-	-	-	-	0.28 (0.19, 0.42)	0.16 (0.10, 0.26)	0.09 (0.05, 0.16)
Ever drank	0.03 (0.01, 0.04)	0.03 (0.02, 0.04)	0.03 (0.02, 0.04)	0.06 (0.05, 0.08)	-	-	-	-	0.04 (0.01, 0.08)	0.06 (0.03, 0.11)	0.09 (0.05, 0.16)
Regular drinking	0.05 (0.04, 0.07)	0.06 (0.04, 0.07)	0.03 (0.02, 0.04)	0.02 (0.01, 0.03)	0.04 (0.03, 0.05)	-	-	-	0.09 (0.05, 0.17)	0.04 (0.02, 0.08)	0.07 (0.04, 0.14)
Tried cannabis	0.09 (0.07, 0.11)	0.03 (0.02, 0.04)	0.04 (0.02, 0.05)	0.03 (0.02, 0.04)	0.04 (0.02, 0.05)	-	-	-	0.00 (0.00, 0.02)	0.04 (0.02, 0.08)	0.06 (0.03, 0.12)
Regular can. use	-	-	-	-	0.03 (0.02, 0.05)	-	-	-	0.02 (0.00, 0.06)	0.09 (0.05, 0.16)	0.07 (0.04, 0.14)
Sexual risk	-	-	-	-	0.01 (0.00, 0.03)	-	-	-	-	0.00 (0.00, 0.03)	0.03 (0.02, 0.08)
Externalizing behaviour and victimization											
Fighting	0.01 (0.00, 0.02)	0.02 (0.01, 0.03)	0.03 (0.02, 0.04)	-	-	-	-	-	-	-	-
Behavioural difficulties*	-	-	-	-	-	0.02 (0.01, 0.03)	0.03 (0.02, 0.06)	0.03 (0.02, 0.06)	0.02 (0.00, 0.05)	0.01 (0.00, 0.03)	0.00 (0.00, 0.02)
Victim of bullying	0.02 (0.01, 0.04)	0.02 (0.01, 0.03)	0.01 (0.00, 0.02)	0.01 (0.00, 0.02)	0.08 (0.06, 0.10)	-	-	-	0.02 (0.00, 0.05)	0.00 (0.00, 0.01)	0.02 (0.00, 0.04)
Obesity and exercise											
Sport and exercise	0.05 (0.04, 0.07)	0.06 (0.05, 0.08)	-	0.03 (0.01, 0.04)	0.00 (0.00, 0.01)	-	-	-	-	-	-

School-level variation in health outcomes

Sedentary Lifestyle	-	-	-	-	-	-	-	-	0.01 (0.00, 0.04)	0.00 (0.00, 0.01)	0.02 (0.01, 0.05)
Obesity (95th percentile)	-	-	-	-	-	-	-	-	0.00 (0.00, 0.02)	0.00 (0.00, 0.01)	0.00 (0.01, 0.02)
Mental and emotional health											
GHQ *	-	0.02 (0.01, 0.03)	-	0.02 (0.01, 0.03)	-	-	-	-	-	-	-
SDQ*	-	-	-	-	-	0.04 (0.02, 0.07)	0.02 (0.01, 0.04)	0.02 (0.01, 0.03)	0.03 (0.01, 0.08)	0.02 (0.01, 0.04)	0.01 (0.00, 0.03)
MFQ*	-	-	-	-	-	-	-	-	0.01 (0.01, 0.03)	0.01 (0.00, 0.04)	0.00 (0.00, 0.01)
Emotional difficulties*	-	-	-	-	-	0.02 (0.01, 0.04)	0.03 (0.01, 0.05)	0.02 (0.01, 0.04)	0.01 (0.00, 0.04)	0.01 (0.00, 0.02)	0.01 (0.00, 0.03)
Attainment											
Academic attainment**	0.17 (0.15, 0.19)	-	0.23 (0.21, 0.26)	-	-	-	-	0.17 (0.12, 0.27)	-	-	-

Adjusted for socio-economic status, gender and ethnicity

* denotes continuous variables. **: Continuous excepting LSYPE in Year 11. – signifies data is not available for the item.