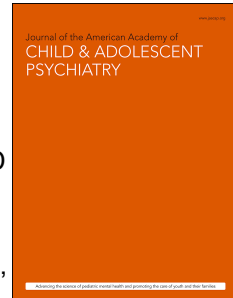


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## The Role of Schools in Early Adolescents' Mental Health: Findings From the MYRIAD Study

Tamsin Ford, FRCPsych, PhD, Michelle Degli Esposti, DPhil, Catherine Crane, DPhil, Laura Taylor, DPhil, Jesús Montero-Marín, PhD, Sarah-Jayne Blakemore, PhD, Lucy Bowes, PhD, Sarah Byford, PhD, Tim Dalgleish, PhD, Mark T. Greenberg, PhD, Elizabeth Nuthall, PGDip, Alice Phillips, MRes, Anam Raja, MSc, Obioha C. Ukoumunne, PhD, Russell M. Viner, PhD, J. Mark G. Williams, PhD, Matt Allwood, BSc, Louise Aukland, PGCE, Triona Casey, MSc, Katherine De Wilde, PGCE, Eleanor-Rose Farley, MSc, Nils Kappelmann, MSc, Liz Lord, MSc, Emma Medicott, MSc, Lucy Palmer, PhD, Ariane Petit, MSc, Isobel Pryor-Nitsch, MSc, Lucy Warriner, BSc, Anna Sonley, MEd, The MYRIAD Team, Willem Kuyken, PhD

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## The Role of Schools in Early Adolescents' Mental Health: Findings From the MYRIAD Study

RH = School Influences on Youth Mental Health

Tamsin Ford, FRCPsych, PhD, Michelle Degli Esposti, DPhil, Catherine Crane, DPhil, Laura Taylor, DPhil, Jesús Montero-Marín, PhD, Sarah-Jayne Blakemore, PhD, Lucy Bowes, PhD, Sarah Byford, PhD, Tim Dalgleish, PhD, Mark T. Greenberg, PhD, Elizabeth Nuthall, PGDip, Alice Phillips, MRes, Anam Raja, MSc, Obioha C. Ukoumunne, PhD, Russell M. Viner, PhD, J. Mark G. Williams, PhD, Matt Allwood, BSc, Louise Aukland, PGCE, Triona Casey, MSc, Katherine De Wilde, PGCE, Eleanor-Rose Farley, MSc, Nils Kappelmann, MSc, Liz Lord, MSc, Emma Medlicott, MSc, Lucy Palmer, PhD, Ariane Petit, MSc, Isobel Pryor-Nitsch, MSc, Lucy Warriner, BSc, Anna Sonley, MEd, The MYRIAD Team, Willem Kuyken, PhD

Editorial

Supplemental Material

Clinical Guidance

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Profs. Ford, Blakemore, and Dalgleish are with the University of Cambridge, United Kingdom. Prof. Blakemore is also with University College London, United Kingdom. Prof. Dalgleish is also with Cambridgeshire and Peterborough NHS Foundation Trust, Cambridgeshire, United Kingdom. Drs. Esposti, Crane, Taylor, Montero-Marín, Profs. Bowes, Williams, Kuyken, Mss. Nuthall, Phillips, Raja, Aukland, De Wilde, Farley, Lord, Medlicott, Petit, Pryor-Nitsch, Sonley, and Mr. Allwood are with the University of Oxford, United Kingdom. Prof. Byford is with King's College London, United Kingdom. Prof. Greenberg is with Penn State University, Centre County, Pennsylvania. Dr. Ukoumunne is with the University of Exeter, United Kingdom. Prof. Viner is with the Institute of Child Health, London, United Kingdom. Ms. Casey is with University College Cork, Ireland. Mr. Kappelmann is with Max Planck Institute of Psychiatry, Munich, Germany, and International Max Planck Research School for Translational Psychiatry (IMPRS-TP), Munich, Germany. Dr. Palmer is with the University of Texas South-western Medical Center, Dallas. Ms. Warriner is with University of York, United Kingdom.

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The corresponding study protocol can be found at

<https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-017-1917-4>. R code is available from the Open Science Framework

[https://osf.io/s63fm/?view\\_only=5ae58f6c053c4a16b5ddfccd0e6e1ece](https://osf.io/s63fm/?view_only=5ae58f6c053c4a16b5ddfccd0e6e1ece). The baseline data and

codebook from the MYRIAD trial is available from Prof. Kuyken upon request (release of data is subject to an approved proposal and a signed data access agreement).

Data collection for the MYRIAD Project is ongoing and the data used for this paper were from an interim cut taken on April 18, 2019. Data may be subject to change for future publications due to retrospective data deletion requests.

Dr. Ukoumunne served as the statistical expert for this research.

#### Author Contributions

*Conceptualization:* Ford, Crane, Taylor, Montero-Marín, Blakemore, Byford, Dalglish, Greenberg, Nuthall, Ukoumunne, Viner, Williams, Lord, Sonley, Kuyken

*Data curation:* Phillips, Raja, Allwood, Casey, De Wilde, Farley, Kappelmann, Lord, Medicott, Palmer, Petit, Pryor-Nitsch, Sonley

*Formal analysis:* Ford, Degli Esposti, Taylor, Montero-Marín, Sonley, Kuyken

*Funding acquisition:* Ford, Byford, Williams, Kuyken

*Investigation:* Taylor, Montero-Marín, Kuyken

*Methodology:* Bowes

*Project administration:* Nuthall, De Wilde, Warriner, The MYRIAD Team

*Resources:* Phillips, Kuyken

*Writing – original draft:* Ford, Degli Esposti, Crane, Taylor, Montero-Marín, Blakemore, Bowes, Byford, Kuyken

*Writing – review and editing:* Degli Esposti, Crane, Taylor, Montero-Marín, Blakemore, Dalglish, Greenberg, Nuthall, Phillips, Raja, Viner, Williams, Allwood, Auckland, Casey, Farley, Kappelmann, Lord, Medicott, Palmer, Petit, Pryor-Nitsch, Sonley, The MYRIAD Team, Kuyken

#### ORCID

Tamsin Ford, FRCPsych, PhD: <https://orcid.org/0000-0001-5295-4904>

Michelle Degli Esposti, DPhil: <https://orcid.org/0000-0002-0068-5754>

Catherine Crane, DPhil: <https://orcid.org/0000-0002-4579-0670>

Laura Taylor, DPhil: <https://orcid.org/0000-0001-5529-8578>

Jesús Montero-Marín, PhD: <https://orcid.org/0000-0001-5677-1662>

Sarah-Jayne Blakemore, PhD: <https://orcid.org/0000-0002-1690-2805>

Lucy Bowes, PhD: <https://orcid.org/0000-0001-5645-3875>

Sarah Byford, PhD: <https://orcid.org/0000-0001-7084-1495>

Tim Dalglish, PhD: <https://orcid.org/0000-0002-7304-2231>

Mark T. Greenberg, PhD: <https://orcid.org/0000-0001-7189-5882>

Elizabeth Nuthall, PGDip: <https://orcid.org/0000-0002-5092-7643>

Alice Phillips, MRes: <https://orcid.org/0000-0003-0387-6131>

Anam Raja, MSc: <https://orcid.org/0000-0002-9058-6564>

Obioha C. Ukoumunne, PhD: <https://orcid.org/0000-0002-0551-9157>

Russell M. Viner, PhD: <https://orcid.org/0000-0003-3047-2247>

J. Mark G. Williams, PhD: <https://orcid.org/0000-0002-9884-2614>

Matt Allwood, BSc: <https://orcid.org/0000-0002-4845-1199>

Louise Auckland, PGCE: <https://orcid.org/0000-0002-8068-3176>

Tríona Casey, MSc: <https://orcid.org/0000-0002-7789-9072>

Katherine De Wilde, PGCE: <https://orcid.org/0000-0001-9429-2697>

Eleanor-Rose Farley, MSc: <https://orcid.org/0000-0001-9406-3659>

Nils Kappelmann, MSc: <https://orcid.org/0000-0002-2923-4455>

Liz Lord, MSc: <https://orcid.org/0000-0002-1160-4948>  
Emma Medlicott, MSc: <https://orcid.org/0000-0003-3429-9912>  
Lucy Palmer, PhD: <https://orcid.org/0000-0002-2218-6104>  
Ariane Petit, MSc: <https://orcid.org/0000-0001-6026-9616>  
Isobel Pryor-Nitsch, MSc: <https://orcid.org/0000-0002-8148-6326>  
Lucy Warriner, BSc: <https://orcid.org/0000-0003-4190-5167>  
Anna Sonley, MEd: <https://orcid.org/0000-0001-7616-1538>  
The MYRIAD Team: <https://orcid.org/0000-0003-3206-4669>  
Willem Kuyken, PhD: <https://orcid.org/0000-0002-8596-5252>

The MYRIAD Team comprises of Saz Ahmed, PhD, of University College London, Susan Ball, MSc, of University of Exeter, Marc Bennett, PsyD, of the University of Cambridge, Nicola Dalrymple, MSc, of the University of Oxford, Darren Dunning, PhD, of the University of Cambridge, Katie Fletcher, HSD, of the University of Oxford, Lucy Foulkes, PhD, of University College London, Poushali Ganguli, MSc, of Kings College London, Cait Griffin, MSc, Kirsty Griffiths, MSc, of the University of Cambridge, Konstantina Komninidou, BEd, of the University of Oxford, Rachel Knight, MSc, of the University of Cambridge, Suzannah Laws, BSc, of the University of Oxford, Jovita Leung, MSc, of University College London, Jenna Parker, MSc, of UEA, Blanca Piera Pi-Sunyer, MSc, of University College London, J. Ashok Sakhardande, BSc Hons, Jem Shackelford, MA, MSc, and Kate Tudor, PhD, of the University of Oxford, Maris Vainre, MA, of the University of Cambridge, and Brian Wainman, BEng, of Plymouth University. These individuals have worked across the MYRIAD strategic award '*Promoting Mental Health and Building Resilience in Adolescence: Investigating Mindfulness and Attentional Control*'; they are acknowledged as group authors in this paper for their substantial contributions to the project development, in accordance with the MYRIAD Dissemination Protocol.

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Correspondence to Professor Willem Kuyken, Professor of Mindfulness and Psychological Science, University of Oxford, Warneford Hospital, Warneford Ln, Headington, Oxford, OX3 7JX; e-mail: [willem.kuyken@psych.ox.ac.uk](mailto:willem.kuyken@psych.ox.ac.uk)

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**Abstract**

**Objective:** Recent studies suggest deteriorating youth mental health. The current UK policy emphasises the role of schools for mental health promotion and prevention, but little data exist on what aspects of schools explain pupils' mental health. We explored school-level influences on the mental health of young people in a large school-based sample from the UK.

**Method:** We analyzed baseline data from a large cluster randomized controlled trial (ISRCTN 86619085) collected between 2016–2018 from mainstream UK secondary schools selected to be representative in relation to their quality rating, size, deprivation, mixed or single-sex pupil population and country. Participants were pupils in their first or second year of secondary school. We assessed whether school-level factors were associated with pupil mental health.

**Results:** 26,885 pupils (response rate=90%), aged 11–14 years, 55% of which were female, attending 85 UK schools, were included. Schools accounted for 2.4% (95% CI=2.0–2.8;  $p<0.0001$ ) of the variation in psychopathology, 1.6% (95% CI=1.2–2.1;  $p<0.0001$ ) of depression and 1.4% (95% CI=1.0–1.7;  $p<0.0001$ ) of well-being. Schools in urban locations, with a higher percentage of free school meals and of White British, were associated with poorer pupil mental health. A more positive school climate was associated with better mental health.

**Conclusion:** School-level variables, primarily related to contextual factors, characteristics of their pupil population, and school climate explain a small but significant amount of variability in young people's mental health. This might be used to identify schools that are in need of more resources to support young people's mental health.

**Key words:** adolescents, mental health, well-being, schools, school climate

## Introduction

A significant proportion of children and young people are impaired by mental health conditions, with some studies suggesting recent increases in young people with anxiety, depression and self-harm.<sup>1,2</sup> Approximately 75% of those who suffer poor mental health in adulthood will first experience difficulties before age 18.<sup>3</sup> Those affected by mental health problems during this developmental window pay a heavy price in terms of poorer educational and occupational outcomes, relationship difficulties, and recurring depression.<sup>4,5</sup> So it is particularly worrying that recent evidence suggests worse outcomes in recent cohorts, even prior to the COVID-19 Pandemic.<sup>6</sup>

Different aspects of school experience may influence young people's mental health and well-being through various mechanisms (see Figure S1, available online). Some factors, such as the experience of pervasive bullying in the school environment, may directly impact a young person's mental health, while others may act indirectly, for instance the quality and character of the school as an institution, often referred to as school climate<sup>7</sup>. Furthermore, some potential influences will be outside the school's control yet may still be important influences on pupil mental health, and therefore could be an indicator of need or additional resource, for example the socio-economic profile of the school catchment area.<sup>8</sup> Given the long-term and near universal access that education provides, schools are a potentially powerful setting for delivering effective interventions to support well-being, to prevent mental health problems, and to triage identified difficulties.<sup>9</sup> Mental health provision in schools is highly variable within as well as between countries, and is a current policy focus in the UK, which traditionally has not had a strong school-based mental health service.<sup>10</sup>

The limited literature suggests that school has a small but significant influence on pupils' mental health, explaining 1-6% of the variation.<sup>11,12</sup> For example, the sense of school-



connectedness is associated with mental health and educational outcomes<sup>7</sup>, a relationship between school-level sense of community and the well-being of the young people has been observed<sup>12</sup>, young adolescents attending schools with higher levels of bullying are more likely to have poor mental health<sup>13</sup>, while school-level collective efficacy is more strongly related to adolescent alcohol use, than the neighbourhood-level collective efficacy.<sup>14</sup>

Nevertheless, schools operate in a wider structural or socio-economic context, with factors such as deprivation directly and consistently affecting mental health.<sup>15</sup> Even though schools may not be able to alter the broader context of the catchment area from which their pupils come, there is some evidence that they can still affect children's mental health over and above these powerful structural influences. For example, the UK National Longitudinal Study of Adolescent Health suggested that school-level variables influence symptoms of depression in adolescents over and above structural neighbourhood factors.<sup>16</sup> Similarly, a Scottish cohort study that followed up children into middle-age reported school-level effects on adult self-rated health, after accounting for structural socio-economic factors.<sup>17</sup> Together this limited literature suggests that, while schools operate in a wider context, they may, nonetheless, have a specific role to play in the mental health of their students. At minimum, understanding these factors and mechanisms could help target prevention and intervention, using the school as a vehicle for evidence-based programmes.<sup>8</sup>

In this study, we aimed to: (1) determine the extent to which variability in pupils' mental health is attributable to schools, and (2) describe which school-related factors are associated with pupils' mental health, including wider structural socio-economic factors (urbanity, area-level deprivation), characteristics of the school community (free school meals, special educational needs or disabilities support, ethnicity), and operational features of the school (school size, pupil-teacher ratio, mixed/single sex, school quality, social and emotional learning [SEL] provision, and school climate). We used a large (N=26,885) sample of pupils

attending 85 secondary schools from the United Kingdom, collecting data on psychopathology, depression and well-being, using well-established continuous measures.

## **Method**

This study is a cross-sectional secondary analysis of baseline data collected as part of the “MYRIAD” trial; a cluster randomised controlled trial evaluating whether school-based mindfulness training improves young people’s mental health (ISRCTN ref: 86619085).<sup>18</sup> Data used in this study were collected prior to randomisation of the schools and at least one year prior to the delivery of any intervention, and thus the current analysis is not part of the intervention study. The rationale for the trial is explained in the protocol.<sup>18</sup> Administrative data were linked and collected from the 85 UK schools participating in the trial (75 in England, 4 in Northern Ireland, 3 in Scotland, and 3 in Wales), 739 teachers, and 26,885 pupils aged 11–14 years who were in their first or second year of secondary school, during the 2016/2017 and 2017/2018 academic years. The study was approved by the University of Oxford Medical Sciences Division Ethics Committee (R45358).

We recruited schools (N=85) in two cohorts: pupils provided baseline data in the academic year 2016/2017 (Cohort 1; n=13) or 2017/2018 (Cohort 2; n=72). Participant flow is described in Figure S2, available online, and additional details about study design, recruitment and procedure are provided in the Supplement, 1 available online. All mainstream UK secondary schools, including private schools, were eligible if they had a substantive appointed headteacher, had not been judged inadequate in their most recent official inspection (to mitigate any risk for trial implementation), and had a strategy and structure in place for delivery of SEL (which is usually taught in ‘Personal, Social, Health, and Economic Education’ [PSHE] in England; see Supplement 2, available online).

Three groups of school-level factors were identified: those that related to the broader school context; characteristics of the school community, and operational features of the school (Figure S1, available online). Measures that were directly comparable across England, Northern Ireland, Scotland, and Wales were selected, where possible, otherwise measures were mapped to their English equivalent. Pupil level measures included mental health and demographics.

The broader school context represented wider structural socio-economic factors in which the school was located, including whether a school was in a 'rural' or 'urban' area, and area-level deprivation (Index of Multiple Deprivation, IMD, decile rating, see Supplement 1 and 2, available online) obtained by linking to the school's post-code. In terms of characteristics of school community, we obtained the number of pupils in each school who were eligible for free school meals (as an indicator of socio-economic status), received support for special educational needs or disabilities, and were White British (see Supplement 2, available online). The operational features of the school were the total number of pupils and the pupil-teacher ratio for all schools, which were also classified as mixed- or single-sex. An ordinal variable described overall school quality based on inspection ratings (Office for Standards in Education for England, see Supplement 2, available online), which was analyzed as an ordinal categorical variable (0=requires improvement; 1=good; 2=outstanding). SEL provision was assessed against 16 quality indicators via semi-structured interview with the member of staff with overall responsibility for the subject (see Supplement 2, available online). Participating teachers within each school completed three subscales from the Alaska School Climate and Connectedness Survey (School Leadership and Involvement, Staff Attitudes, and Respectful Climate) to provide a rating of school climate (data sources and further details are provided in Supplement 1 and Supplement 2, available online).

Pupils' mental health (e.g. psychopathology, depression, and well-being) was measured with three validated self-report questionnaires: the Strengths and Difficulties Questionnaire (SDQ<sup>19</sup>), the Center for Epidemiologic Studies Depression Scale (CES-D<sup>20</sup>), and the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS<sup>21</sup>), respectively. The SDQ is a 25-item questionnaire that assesses psychopathology over the previous 6 months and is validated for use in school-aged children. The five sub-scales assess emotional symptoms, conduct problems, hyperactivity/inattention, peer problems, and pro-social behaviour. We report a total score (range 0-40), derived by summing the first four subscales, where higher scores indicate higher levels of psychopathology. The CES-D is a 20-item questionnaire that assesses depressive symptoms and has been validated for use in adolescents. Each item is rated on a scale from 0 to 3, yielding a total score between 0 and 60, where higher scores indicate more symptoms of depression. The WEMWBS is a 14-item measure assessing mental well-being that has been validated for use in adolescents. Each item is scored on a scale from 1 to 5, yielding a total score from 14 to 70 (higher scores indicate greater well-being). Pupils also provided data on their gender (male, female, other/prefer not to say), and ethnicity (White, Asian, Black, Mixed and other ethnic minorities (e.g., Arab)). Pupils' ages were obtained from school.

### **Analytic Approach**

Multilevel linear regression models were fitted using the *lme4* package in *R* (version 3.5.2) to estimate school-level variance in pupil's mental health – psychopathology, depression, and well-being – which were analyzed separately throughout. We reported the intra-cluster (intra-school) correlation coefficient (ICC), which is the proportion of the total variance in the outcome attributed at the school level. We fitted variance components (empty) multilevel models with no fixed predictors to estimate the ICCs for pupil's mental health. We then fitted multilevel models to estimate the ICCs for pupil's mental health, whilst using pupil's gender,

age, and ethnicity as predictors to control differences across clusters on these individual level variables. Ninety-five percent confidence intervals (95% CI) and p values for the ICCs were obtained using non-parametric bootstrapping.

We explored whether school factors accounted for any school-level variation in pupils' mental health. First, we examined the unique associations between each school factor and pupils' mental health, while accounting for pupils' nesting within schools using multilevel regression models, with random intercepts only. Next, we fitted our three main multilevel models corresponding to the three types of school-level factors, as described above and in Figure S1, available online. School-related factors that belonged to the same type were entered as covariates in the same multivariable model. We further adjusted for gender, age, and ethnicity at the pupil level to verify that the associations between school factors and pupil's mental health remained stable. We report sensitivity analyses to test for possible differences between pupils who were in their first year of secondary school compared to those who were in their second year, as well as between pupil's scoring above and below cut-off for probable caseness of psychopathology. Thus, we stratified by year group and separately by SDQ caseness<sup>22</sup> ( $SDQ \geq 18$ ), and we re-ran the analyses on the different sub-samples and descriptively compared them to spot any potential substantial difference. We also used a similar approach to run restricted sub-analyses for schools in England only (schools=75; pupils=24,842).

To assist the interpretation of results, we grand-mean centred all continuous pupil (age) and school factors. Multilevel models were fitted using restricted maximum likelihood estimation (REML), and model assumptions and fit were checked via absolute model fit indices (root mean square error of approximation [RMSEA]  $< 0.10$ , and standardized root mean square residual [SRMR]  $< 0.08$ )<sup>23</sup>. We conducted complete case analyses as there were minimal missing data (range: 0.0%–2.8%; see Table S1 and Table S2, available online), and used two-

sided contrasts with a significance level of 0.05. Although the study was exploratory, we checked for inflation of Type I errors from multiple testing by controlling for the false discovery rate and calculating Benjamini-Hochberg adjusted p-values<sup>24</sup>.

## Results

Table 1 describes the sample of schools and pupils. Most schools were in an urban area (85%). Inspection quality ratings suggested that 17% “required improvement,” 58% were “good,” and 25% were “outstanding.” There was, however, considerable variation between schools in terms of pupil ethnicity, levels of pupil eligibility for free school meals, and receipt of support for special educational needs or disabilities. School area-level deprivation also differed markedly between schools and there was variation between schools in their size, pupil-teacher ratio, and SEL provision. Eleven (13%) schools were single-gender, all of which were girl schools. Pupils’ mental health was in line with national estimates for this age group (range: 10–14 years old).<sup>20-22</sup>

A small but statistically significant proportion of the total variance in pupils’ mental health was explained at the school level (Table 2). The amount of variance attributable to schools was highest for pupils’ psychopathology at 2.4% (95% CI: 2.0% to 2.8%), followed by pupils’ depression at 1.6% (95% CI: 1.2% to 2.1%), and pupils’ well-being at 1.4% (95% CI: 1.0% to 1.7%). All three ICCs were similar after including pupils’ individual characteristics (gender, age, and ethnicity; Table 2) as predictors in the model. A sensitivity analysis showed no difference between pupils who were in their first year of secondary school compared to those who were in their second year, nor between pupil’s scoring above and below cut-off for caseness of psychopathology (see Table S3 and Table S4, available online). Restricted analyses for England showed a similar pattern of results (see Table S5, available online).

Associations for the three types of school-related factors and pupil psychopathology, depression and psychological well-being are described in Table 3 (the unique associations can be seen in Table 4). Amongst school context variables, urban location was positively associated with pupil depression (regression coefficient (B)=0.90; 95% CI: 0.05 to 1.74;  $p=0.04$ ), even when adjusting for school area-level deprivation and individual confounders. School area-level deprivation, in contrast, was not associated with pupil psychopathology, depression and psychological well-being, suggesting better mental health and well-being among pupils attending schools located in rural areas, irrespective of whether the area surrounding the school is affluent or deprived.

In the school community, a higher percentage of free school meal eligibility was associated with higher levels of pupil psychopathology (B=0.06; 95% CI: 0.03 to 0.09;  $p<0.001$ ), even while accounting for the percentage of pupils receiving special educational needs or disabilities support and school ethnic composition. A higher proportion of White British pupils in schools was correlated with higher levels of psychopathology (B=0.02; 95% CI: 0.01 to 0.03;  $p<0.001$ ) and lower levels of well-being (B=-0.02; 95% CI: -0.03 to -0.01;  $p=0.001$ ), when accounting for the percentage of pupils receiving special educational needs or disabilities support, and free school meal eligibility. The association with well-being remained after adjusting for individual-level confounders, but was attenuated for psychopathology (B=0.01; 95% CI: 0.00 to 0.032;  $p=0.054$ ). There was no association between the percentage of pupils receiving support for special educational needs or disabilities and pupil mental health.

Amongst operational features of the school, teacher-rated school climate was the only school-level factor to show associations with pupil mental health. In schools with a more positive school climate, pupils reported less psychopathology, less depression and greater mental well-being (Table 4). Teacher-rated positive school climate remained associated with lower levels

of psychopathology ( $B=-1.11$ ; 95% CI:  $-2.19$  to  $-0.03$ ;  $p=0.046$ ) after adjusting for other operational variables (mixed-/single-sex school, school quality, school size, pupil-teacher ratio, and SEL provision), and after adjusting for individual confounders (Table 2 and 3). However, the associations between school climate and depression or well-being were attenuated when adjusted for other operational variables and confounders (Table 2 and 3). Some associations were attenuated when using  $p$  values adjusted for multiple testing (e.g., school urbanity and higher depression) but differences were minimal (Table 5). Results also did not significantly change when restricting the analyses to England only (see Table S6, available online). The only potentially meaningful difference was that school size was negatively associated with higher levels of depression in English schools, after controlling for individual characteristics.

To assess whether these relationships were influenced by how long young people had been in the school, we compared pupil year groups (e.g., those in their first year who had recently joined the school, and pupils in their second year who have typically been immersed in the school culture for 12 months longer). We found no evidence to suggest that there were systematic differences in school-level variance across these two-year groups.

## **Discussion**

Given the increasing recent focus of policy makers and researchers on the role of schools in young people's mental health,<sup>9,10</sup> we examined the extent to which variation in young people's mental health could be explained by variables operating at the school level in current UK secondary schools. We considered wider structural socio-economic factors, characteristics of the school community, and also operational features of the school. We used data obtained from a sample of 26,885 pupils attending 85 schools from across the United Kingdom.



Consistent with the limited previous research,<sup>2,6,25</sup> we found that schools accounted for only 1.4% to 2.4% of the variability in early adolescents' mental health. Several factors explained this between-school variability; most related to the broader school context and characteristics of the pupil population, rather than operational features of the school. Specifically, schools in urban locations, with a greater proportion of adolescents eligible for free school meals, and with more White British pupils, were attended by pupils with poorer mental health.

Urban living is associated with greater income inequality, familial isolation, and exposure to substance abuse, violence and crime, as well as lower community cohesion, which are all related to the higher prevalence of mental health problems often detected in urban populations.<sup>26</sup> There is similarly a long established relationship between socio-economic adversity and poor childhood mental health.<sup>4,5,27</sup> The mechanisms by which deprivation influences mental health in childhood are multifaceted and incompletely understood, but likely involve parental mental health, family function, nutrition, and sleep among others.<sup>27</sup> The increase in mental health inequalities seen this century in higher income countries, particularly in relation to emotional problems, is likely to be exacerbated by the disproportional impact of COVID-19 on youth, families, and facing debt and financial strain.<sup>28,29</sup> Furthermore, socio-economic and health inequalities may be even wider in urban areas,<sup>26</sup> and are anticipated to increase as a result of the COVID-19 Pandemic.<sup>27-9</sup> A public mental health approach that encompasses community and well as school mental health is essential to prevent further deterioration in the mental health of children and young people.

The finding that children attending schools with a higher proportion of White pupils had poorer mental health than those in schools with more ethnically diverse pupil populations is surprising. Earlier UK studies suggest that young people from ethnic minorities had a higher prevalence of mental health conditions,<sup>4</sup> but the results of the present study echoes the recent large UK children and young people's mental health surveys<sup>5,29,30</sup>. Recent austerity policies in

the UK have resulted in drastic reductions in the support for children, families and schools, which were previously less accessed or accessible to ethnic minorities.<sup>31</sup> Young people from ethnic minorities may, therefore, have been less adversely affected by these policies. In addition, there is some evidence that psychological distress may be related to ethnic density. Specifically, there could be a possible beneficial effect of more culturally diverse environments for minority students, but majority students seem to be insensitive for this effect<sup>32,33</sup>. Finally, the meaning of ethnicity varies greatly with culture, time and geography, and our findings raise interesting questions about the role of ethnic diversity as well as ethnic minority status as influences on pupil mental health, which require further empirical study.

The only operational, and thus obviously tractable, feature of schools associated with young people's mental health was teacher-rated school climate. Researchers are increasingly encouraged to define school climate as a construct that encompasses school engagement, safety and environment, both physical and social.<sup>34</sup> School climate predicts key educational outcomes<sup>7</sup> as well as mental health<sup>7</sup> and well-being<sup>13</sup> of both staff and pupils.<sup>35</sup> A recent systematic review of school climate interventions concluded that those aiming to promote social-emotional learning and school-wide positive behaviour programmes seemed more effective than those focusing on bullying, community development or teachers' working conditions.<sup>35</sup> However, few of the 18 experimental studies detected were sufficiently methodological rigorous, and the outcome of primary interest was teachers and pupils perception of school climate. Another systematic review concluded that there was a clear association between school-climate and pupil mental health but as most of the 48 studies were observational and cross-sectional, we cannot claim a causal relationship.<sup>36</sup> The authors also suggest that future research should pay greater attention to the components that comprise both constructs, such as well-being as well as poor mental health, and school connectedness, safety, academic environment and peer relationships, and examine how these interact.

As they suggest, theory-driven studies are needed that follow children up over several years to examine how broader school context (e.g. deprivation), school characteristics (e.g. ethnic composition), school operational features (e.g. school climate) and pupil individual factors (e.g. psychopathology) interact to shape the trajectory of young people's mental health over time (Figure S1, available online).<sup>36</sup> Such frameworks could also be used to examine how SEL and targeted interventions may be more or less effective in certain contexts, schools and with sub-populations of pupils. In this sense, studies should ideally be designed to enable inferences about causality that can shape both policy and intervention development.

While the direct influence of schools on mental health seems to be small, this does not negate schools as a setting in which mental health can be improved via universal and targeted interventions. Furthermore, these small school level effects may translate into more significant impacts if the substantial future health, economic and societal costs of poor mental health in adolescence were modelled.<sup>4,6,37</sup> Indeed, there is a growing evidence base that school-level interventions can enhance young people's resilience and functioning, and for those living in deprived areas, such interventions may be particularly important.<sup>1,35</sup>

Prospective interventional research is needed to explore how broader contextual and school variables interact with interventions to effect changes in young people's mental health during key developmental windows.<sup>5-9,13-18, 36,38</sup> This is something we are doing in our larger MYRIAD study,<sup>18</sup> which is collecting data from these schools over two years, so that we will be able to examine the associations over time between the broader school context, school characteristics and operational features and young people's mental health and well-being.

As limitations, we recognize that our sample excluded schools that inspections had classified as 'inadequate' or had no SEL strategy. The inclusion of these poorly functioning schools might have increased the proportion of variation in pupil mental health attributable to the school level. Schools were representative of UK schools, but these were schools that had

demonstrably good PSHE and participated in a trial. We included private schools, but in the UK, these institutions serve only 5-7% of the population; a number insufficient to support a subgroup analysis. Future studies should over-sample from uncommon types of school to study if different types of provision may differ in their influence on mental health.

The usual caveats of how populations vary across country apply to generalising outside the UK. However, our findings are consistent with the reported proportion of variation at the school level in other similar studies, including some in other countries.<sup>14,15,32,38,39</sup> School-level influences on pupil mental health may only be observable in pupils with significant problems, although this was not supported by our sensitivity analysis. Our sample cannot represent those pupils who were opted-out prior to the study commencement by their parents or by their school. Furthermore, we lacked data on some potentially important variables, such as family socio-economic status, academic attainment, school level violence, and pubertal status, which might all influence mental health and wellbeing. Finally, our measure of school climate was based on teacher ratings alone, while a measure that also included pupil, parent and teacher ratings may have added different and valuable perspectives.<sup>35</sup>

In summary, our findings converge with others to suggest that for young people aged 11-14 school influences explain 1.4% to 2.4% of the variance in mental health and well-being. These small school-level effects may reflect a relative uniformity across UK schools in current approaches to pupil mental health. Pupils from schools that are urban, with young people from predominantly white, disadvantaged backgrounds have poorer mental health in early adolescence. At a population level such findings are potentially important. Policy and system interventions focused on deprivation are likely to yield improvements in young people's mental health. In terms of schools, our findings converge with others to suggest the importance of school climate to support young people's mental health and well-being. In

summary, this study has examined school structural and social features, both of which have important implications for guiding policy and the targeting of interventions.

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**Table 1. Characteristics of Schools (N = 85) and Pupils (N = 26,885)**

Characteristic	n (%) / Mean (SD)
<b>School context</b>	
Urbanicity (n, %)	
Rural	13 (15.29)
Urban	72 (84.71)
Area-level deprivation (IMD; mean, SD)	5.82 (2.73)
<b>Characteristics of school community</b>	
Percentage of pupils eligible for free school meals (mean, SD)	12.21 (9.33)
Percentage of pupils receiving SEND support (mean, SD)	9.99 (5.56)
Percentage of pupils that are White British (mean, SD)	76.15 (24.58)
<b>Operational features of the school</b>	
Mixed or single sex school (n, %)	
Mixed	74 (87.06)
Female only	11 (12.94)
Number of pupils (mean, SD)	1016.15 (337.02)
Pupil-teacher ratio (mean, SD)	15.92 (1.85)
School quality (OFSTED rating <sup>a</sup> ; n, %)	
Requires improvement	14 (17.28)
Good	47 (58.02)
Outstanding	20 (24.69)
SEL provision quality rating (mean, SD)	11.99 (2.58)
Teacher-rated school climate (SCCS; mean, SD)	3.94 (0.28)
<b>Pupil sociodemographics</b>	
Gender (n, %)	
Female	14,499 (55.25)
Male	11,201 (42.68)
Other / Prefer not to say	543 (2.07)
Age (years; mean, range)	12.20 (10.90-14.73)
Ethnicity (n, %)	
White British	19,652 (75.18)
Asian	2,731 (10.45)
Black	1,432 (5.48)
Mixed and other ethnic minorities (e.g., Arab)	2,325 (8.89)
<b>Pupil mental health</b>	
Psychopathology <sup>b</sup> (SDQ; mean, SD)	11.85 (6.50)
Normal (n, %)	17,781 (67.60)
Borderline (n, %)	3,309 (12.58)
High (n, %)	1,657 (6.30)
Very high (n, %)	3,554 (13.51)
Depression <sup>c</sup> (CES-D; mean, SD)	13.62 (10.06)
Normal (n, %)	17,844 (67.21)
At risk (n, %)	5,910 (22.26)
Caseness (n, %)	2,796 (10.53)
Well-being (WEMWBS; mean, SD)	49.57 (9.87)

**Note.** Sample size (n) and percentages (%) are given for categorical variables and means and SD for continuous variables. Based on complete sample (schools = 85; pupils = 26,885) but N varies due to missing data. CES-D = Center for Epidemiological Studies-Depression Scale; IMD = index of multiple deprivation; OFSTED = Office for Standards in Education; SCCS = School Climate and Connectedness Survey; SDQ = Strengths and Difficulties Questionnaire; SEL = social and emotional learning; SEND = special educational needs and disability; WEMWBS = Warwick-Edinburgh Mental Wellbeing Scale.

<sup>a</sup> Ofsted operates in England only.

<sup>b</sup> SDQ cut-points: normal (0-14); borderline (15-17); high (18-19); and very high (20-40)<sup>25</sup>.

<sup>c</sup> CES-D cut-points: low (0-15); at risk of depression (16-27); and caseness (28-60)<sup>23</sup>.

**Table 2. Intra-Class Correlations (ICCs) for School-Level Variance of Pupils' Mental Health**

Pupil's mental health	N		Unadjusted models		N		Adjusted models for pupil's age, gender, and ethnicity	
	Pupils	Schools	ICC (95% CIs)	<i>p</i>	Pupils	Schools	ICC (95% CIs)	<i>p</i>
Psychopathology (SDQ)	26303	85	0.024 (0.020 - 0.028)	<0.0001	26127	85	0.022 (0.017 - 0.026)	<0.0001
Depression (CES-D)	26549	85	0.016 (0.012 - 0.021)	<0.0001	26078	85	0.015 (0.011 - 0.018)	<0.0001
Well-being (WEMWBS)	26463	85	0.014 (0.010 - 0.017)	<0.0001	26073	85	0.014 (0.010 - 0.017)	<0.0001

**Note.** Multilevel models are based on complete case analysis; total sample (schools = 85; pupils = 26,885) but N varies due to missing data. CES-D = Center for Epidemiologic Studies Depression Scale; ICC = intra-class correlation coefficient; SDQ = Strengths and Difficulties Questionnaire; WEMWBS = Warwick-Edinburgh Mental Well-being Scale.

**Table 3. Results From Multilevel Models With Random Intercepts Showing Grouped Associations Between Different Types of School Factors and Pupils' Mental Health**

School factors	Psychopathology (SDQ)				Depression (CES-D)				Well-being (WEMWBS)			
	Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity	
	Coefficient (95% CIs)	p value	Coefficient (95% CIs)	p value	Coefficient (95% CIs)	p value	Coefficient (95% CIs)	p value	Coefficient (95% CIs)	p value	Coefficient (95% CIs)	p value
<b>Broader school context</b>												
Urban vs Rural	0.36 (-0.29 - 1.01)	0.29	0.49 (-0.12 - 1.10)	0.12	0.90 (0.05 - 1.74)	0.040	0.89 (0.09 - 1.69)	0.032	-0.65 (-1.44 - 0.14)	0.11	-0.73 (-1.51 - 0.05)	0.07
Area-level deprivation	-0.07 (-0.15 - 0.02)	0.13	-0.08 (-0.16 - 0.00)	0.055	-0.06 (-0.17 - 0.05)	0.30	-0.06 (-0.17 - 0.04)	0.26	-0.01 (-0.11 - 0.10)	0.87	0.00 (-0.10 - 0.10)	0.99
<b>Characteristics of school community</b>												
Pupils eligible for free school meals (%)	0.06 (0.03 - 0.09)	<0.001	0.06 (0.03 - 0.09)	<0.001	0.04 (0.00 - 0.09)	0.05	0.05 (0.01 - 0.09)	0.011	-0.03 (-0.06 - 0.01)	0.17	-0.04 (-0.07 - 0.00)	0.041
SEND support (%)	-0.01 (-0.06 - 0.04)	0.70	0.00 (-0.05 - 0.04)	0.89	-0.04 (-0.11 - 0.03)	0.26	-0.03 (-0.09 - 0.03)	0.36	0.01 (-0.05 - 0.07)	0.63	0.01 (-0.05 - 0.06)	0.86
Ethnicity of pupils (%): White	0.02 (0.01 - 0.03)	<0.001	0.01 (0.00 - 0.02)	0.054	0.01 (-0.01 - 0.02)	0.33	0.01 (0.00 - 0.02)	0.10	-0.02 (-0.03 - -0.01)	0.001	-0.02 (-0.03 - -0.01)	0.005
<b>Operational features of the school</b>												
Mixed or single-sex school	-0.01 (-0.77 - 0.75)	0.98	0.00 (-0.73 - 0.73)	0.99	0.80 (-0.22 - 1.82)	0.13	-0.16 (-1.16 - 0.84)	0.76	0.01 (-0.95 - 0.97)	0.99	0.69 (-0.25 - 1.63)	0.15
School quality	-0.13 (-0.66 - 0.40)	0.62	-0.04 (-0.53 - 0.45)	0.87	0.02 (-0.69 - 0.72)	0.97	0.09 (-0.60 - 0.77)	0.80	0.40 (-0.27 - 1.06)	0.24	0.27 (-0.35 - 0.90)	0.40
School size (per 100 pupils)	-0.06 (-0.14 - 0.02)	0.15	-0.06 (-0.13 - 0.02)	0.16	-0.11 (-0.22 - 0.01)	0.07	-0.10 (-0.22 - 0.02)	0.08	0.03 (-0.06 - 0.13)	0.53	0.03 (-0.07 - 0.13)	0.60
Pupil-teacher ratio	-0.06 (-0.19 - 0.08)	0.44	-0.06 (-0.19 - 0.08)	0.40	-0.05 (-0.25 - 0.14)	0.58	-0.08 (-0.28 - 0.12)	0.40	0.00 (-0.18 - 0.17)	0.98	0.04 (-0.14 - 0.21)	0.69
SEL provision	0.00 (-0.10 - 0.09)	0.92	-0.01 (-0.09 - 0.07)	0.83	-0.02 (-0.14 - 0.09)	0.71	-0.02 (-0.13 - 0.10)	0.81	-0.05 (-0.17 - 0.07)	0.41	-0.04 (-0.16 - 0.08)	0.49
Teacher-rated SCCS	-1.11 (-2.19 - -0.03)	0.046	-1.22 (-2.22 - -0.22)	0.020	-1.19 (-2.64 - 0.26)	0.11	-1.20 (-2.61 - 0.21)	0.10	0.58 (-0.77 - 1.94)	0.40	0.69 (-0.60 - 1.99)	0.30

**Note.** Estimates are based on complete case analyses; total sample (schools = 85; pupils = 26,885) but N varies due to missing data. CES-D = Center for Epidemiologic Studies-Depression Scale; SCCS = School Climate and Connectedness Survey; SDQ = Strengths and Difficulties Questionnaire; SEL = social and emotional learning; SEND = special educational needs and disability; WEMWBS = Warwick-Edinburgh Mental Well-being Scale.

**Table 4: Unique Associations From Multilevel Models With Random Intercepts between School Factors and Pupil's Mental Health**

School factors	Psychopathology (SDQ)				Depression (CES-D)				Well-being (WEMWBS)			
	Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity	
	Coefficient (95% CIs)	<i>p</i>	Coefficient (95% CIs)	<i>p</i>	Coefficient (95% CIs)	<i>p</i>	Coefficient (95% CIs)	<i>p</i>	Coefficient (95% CIs)	<i>p</i>	Coefficient (95% CIs)	<i>p</i>
<b>Urban vs Rural</b>	0.49 (-0.14 - 1.12)	0.13	0.64 (0.05 - 1.24)	0.037	1.02 (0.20 - 1.83)	0.017	1.01 (0.24 - 1.79)	0.012	-0.63 (-1.39 - 0.13)	0.11	-0.73 (-1.48 - 0.02)	0.06
<b>Area-level deprivation</b>	-0.08 (-0.16 - 0.00)	0.06	-0.10 (-0.18 - -0.02)	0.018	-0.09 (-0.20 - 0.02)	0.11	-0.09 (-0.20 - 0.01)	0.09	0.01 (-0.09 - 0.12)	0.79	0.03 (-0.08 - 0.13)	0.62
<b>Pupils eligible for free school meals (%)</b>	0.03 (0.01 - 0.06)	0.016	0.03 (0.01 - 0.06)	0.010	0.02 (-0.02 - 0.05)	0.29	0.02 (-0.01 - 0.05)	0.26	0.00 (-0.03 - 0.03)	0.89	-0.01 (-0.04 - 0.02)	0.65
<b>SEND support (%)</b>	0.02 (-0.02 - 0.07)	0.32	0.02 (-0.02 - 0.07)	0.28	-0.01 (-0.07 - 0.05)	0.75	0.00 (-0.06 - 0.06)	0.94	-0.01 (-0.06 - 0.05)	0.83	-0.01 (-0.07 - 0.04)	0.65
<b>Ethnicity of pupils (%): White</b>	0.01 (0.00 - 0.02)	0.048	0.00 (-0.01 - 0.01)	0.63	0.00 (-0.01 - 0.01)	0.77	0.01 (-0.01 - 0.02)	0.42	-0.02 (-0.03 - -0.01)	0.004	-0.01 (-0.02 - 0.00)	0.032
<b>Mixed or single sex school</b>	-0.31 (-0.99 - 0.37)	0.37	-0.19 (-0.85 - 0.47)	0.57	0.61 (-0.28 - 1.50)	0.18	-0.24 (-1.11 - 0.63)	0.59	0.38 (-0.44 - 1.20)	0.37	0.95 (0.14 - 1.75)	0.024
<b>School quality</b>	-0.48 (-0.83 - -0.13)	0.009	-0.41 (-0.75 - -0.07)	0.019	-0.32 (-0.80 - 0.16)	0.20	-0.45 (-0.90 - -0.01)	0.06	0.55 (0.12 - 0.97)	0.014	0.61 (0.19 - 1.02)	0.005
<b>School size (per 100 pupils)</b>	-0.06 (-0.13 - 0.00)	0.071	-0.06 (-0.13 - 0.00)	0.054	-0.10 (-0.19 - -0.01)	0.035	-0.09 (-0.18 - -0.01)	0.032	0.03 (-0.05 - 0.12)	0.43	0.03 (-0.05 - 0.11)	0.51
<b>Pupil-teacher ratio</b>	-0.1 (-0.23 - 0.03)	0.14	-0.09 (-0.22 - 0.03)	0.16	-0.09 (-0.27 - 0.08)	0.31	-0.09 (-0.26 - 0.08)	0.29	0.04 (-0.12 - 0.20)	0.62	0.06 (-0.10 - 0.22)	0.46
<b>SEL provision</b>	-0.02 (-0.11 - 0.07)	0.67	-0.02 (-0.10 - 0.07)	0.72	-0.01 (-0.13 - 0.11)	0.84	-0.02 (-0.13 - 0.10)	0.75	-0.04 (-0.15 - 0.07)	0.49	-0.03 (-0.13 - 0.08)	0.65
<b>Teacher-rated SCCS</b>	-1.48 (-2.27 - -0.70)	<0.001	-1.35 (-2.10 - -0.59)	<0.001	-1.22 (-2.30 - -0.13)	0.030	-1.45 (-2.47 - -0.44)	0.006	1.31 (0.32 - 2.29)	0.011	1.50 (0.54 - 2.47)	0.003

**Note.** Estimates are based on complete case analyses; total sample (schools = 85; pupils = 26,885) but *n* varies due to missing data. CES-D = Center for Epidemiologic Studies-Depression Scale; SCCS = School Climate and Connectedness Survey; SEL = social and emotional learning; SEND = special educational needs and disability; SDQ = Strengths and Difficulties Questionnaire; WEMWBS = Warwick-Edinburgh Mental Well-being Scale.

**Table 5: Results From Multilevel Models With Random Intercepts Showing Grouped Associations Between Different Types of School Factors and Pupils' Mental Health Using Adjusted *p* Values for Multiple Comparisons**

School factors	Psychopathology (SDQ)				Depression (CES-D)				Well-being (WEMWBS)			
	Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity		Unadjusted models		Adjusted models for pupil's age, gender, and ethnicity	
	Coefficient (95% CIs)	B-H <i>p</i>	Coefficient (95% CIs)	B-H <i>p</i>	Coefficient (95% CIs)	B-H <i>p</i>	Coefficient (95% CIs)	B-H <i>p</i>	Coefficient (95% CIs)	B-H <i>p</i>	Coefficient (95% CIs)	B-H <i>p</i>
<b>Broader school context</b>												
Urban vs Rural	0.36 (-0.29 - 1.01)	0.40	0.49 (-0.12 - 1.10)	0.20	0.90 (0.05 - 1.74)	0.080	0.89 (0.09 - 1.69)	0.065	-0.65 (-1.44 - 0.14)	0.19	-0.73 (-1.51 - 0.05)	0.13
Area-level deprivation	-0.07 (-0.15 - 0.02)	0.21	-0.08 (-0.16 - 0.00)	0.10	-0.06 (-0.17 - 0.05)	0.41	-0.06 (-0.17 - 0.04)	0.37	-0.01 (-0.11 - 0.10)	0.94	0.00 (-0.10 - 0.10)	0.99
<b>Characteristics of school community</b>												
Pupils eligible for free school meals (%)	0.06 (0.03 - 0.09)	<0.001	0.06 (0.03 - 0.09)	<0.001	0.04 (0.00 - 0.09)	0.10	0.05 (0.01 - 0.09)	0.023	-0.03 (-0.06 - 0.01)	0.27	-0.04 (-0.07 - 0.00)	0.081
SEND support (%)	-0.01 (-0.06 - 0.04)	0.81	0.00 (-0.05 - 0.04)	0.96	-0.04 (-0.11 - 0.03)	0.37	-0.03 (-0.09 - 0.03)	0.48	0.01 (-0.05 - 0.07)	0.75	0.01 (-0.05 - 0.06)	0.94
Ethnicity of pupils (%): White	0.02 (0.01 - 0.03)	0.002	0.01 (0.00 - 0.02)	0.10	0.01 (-0.01 - 0.02)	0.45	0.01 (0.00 - 0.02)	0.18	-0.02 (-0.03 - -0.01)	0.002	-0.02 (-0.03 - -0.01)	0.010
<b>Operational features of the school</b>												
Mixed or single-sex school	-0.01 (-0.77 - 0.75)	0.99	0.00 (-0.72 - 0.71)	0.99	0.80 (-0.23 - 1.82)	0.22	-0.16 (-1.17 - 0.85)	0.86	0.01 (-0.95 - 0.97)	0.99	0.69 (-0.24 - 1.62)	0.25
School quality	-0.13 (-0.65 - 0.39)	0.74	-0.04 (-0.53 - 0.45)	0.94	0.02 (-0.69 - 0.72)	0.99	0.09 (-0.60 - 0.77)	0.90	0.40 (-0.26 - 1.06)	0.36	0.27 (-0.36 - 0.91)	0.51
School size (per 100 pupils)	-0.06 (-0.14 - 0.02)	0.25	-0.06 (-0.13 - 0.02)	0.26	-0.11 (-0.22 - 0.01)	0.12	-0.10 (-0.21 - 0.01)	0.14	0.03 (-0.07 - 0.14)	0.64	0.03 (-0.07 - 0.13)	0.72
Pupil-teacher ratio	-0.06 (-0.20 - 0.09)	0.55	-0.06 (-0.19 - 0.08)	0.51	-0.05 (-0.25 - 0.14)	0.71	-0.08 (-0.27 - 0.11)	0.51	0.00 (-0.18 - 0.18)	0.99	0.04 (-0.14 - 0.21)	0.81
SEL provision	-0.01 (-0.10 - 0.09)	0.97	-0.01 (-0.10 - 0.08)	0.92	-0.02 (-0.15 - 0.10)	0.82	-0.02 (-0.14 - 0.11)	0.90	-0.05 (-0.17 - 0.07)	0.51	-0.04 (-0.15 - 0.07)	0.60
Teacher-rated SCCS	-1.11 (-2.18 - -0.04)	0.09	-1.22 (-2.22 - -0.22)	0.041	-1.19 (-2.64 - 0.26)	0.19	-1.20 (-2.6 - 0.21)	0.18	0.58 (-0.77 - 1.94)	0.51	0.69 (-0.61 - 1.99)	0.41

**Note.** Estimates are based on complete case analyses; total sample (schools = 85; pupils = 26,885) but N varies due to missing data. Benjamini-Hochberg (B-H) adjusted *p* values are presented to control for false discovery rate from multiple testing. B-H *p* value = Benjamini-Hochberg adjusted *p* value; CES-D = Center for Epidemiologic Studies Depression-Scale; SCCS = School Climate and Connectedness Survey; SEL = social and emotional learning; SEND = special educational needs and disability; SDQ = Strengths and Difficulties Questionnaire; WEMWBS = Warwick-Edinburgh Mental Well-being Scale.

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