School-level factors associated with teacher connectedness: a multilevel analysis of the structural and relational school determinants of young people’s health

I. García-Moya1, F.M. Brooks1,2, N.H. Spencer3

1CRIPACC, School of Health and Social Work, University of Hertfordshire, College Lane Campus, Hatfield, Hertfordshire, AL10 9AB, UK
2Faculty of Health, University of Technology Sydney, PO Box 123 Broadway, Sydney, NSW 2007, Australia
3Hertfordshire Business School, University of Hertfordshire, de Havilland Campus, Hatfield, Hertfordshire, AL10 9AB, UK

Address correspondence to I. García-Moya, E-mail: i.garcia-moya2@herts.ac.uk

ABSTRACT

Background Conducting research on the antecedents of teacher connectedness (TC) is key to inform intervention and policy that can leverage the public health potential of teachers for young people’s well-being. As part of the EU-funded Teacher Connectedness Project, this study aims to examine the contribution of a variety of school-level factors (including type of school, school size, student–teacher ratio, students per class and teacher gender).

Methods Sample consisted of 5335 adolescents aged 11, 13 and 15 years that had participated in the HBSC study in England. Multilevel multinomial regression was used to examine the contributions of sociodemographic and school-level factors to TC.

Results TC was lower in older adolescents and those from less affluent families, but similar in boys and girls. Regarding school-level factors, it was not the size of the school but the ratio of students per teacher which was significantly associated to TC, with higher student–teacher ratio being significantly associated with lower odds of medium-to-high TC. Some differences between mixed and all-girls schools were also found.

Conclusions Health promotion strategies targeting student–teacher relationships need to consider how TC changes by age and SES and give attention to school-level factors, in particular the student–teacher ratio.

Keywords educational settings, social determinants, young people

Introduction

Schools are fundamental sites for young people not only from an educational point of view, but also from a public health perspective.1 The role of teachers in fostering students’ health and well-being is complementary to that of other health professionals in schools2 and teachers and the relationships they build with their students have been considered central for the effectiveness of public health initiatives at the school.3

An important domain in the current way school factors that act as determinants of health are conceptualized is the character of teacher–student relationships.4 Connectedness with both school and teachers have been associated with a variety of positive educational and health outcomes.5–9 The mechanisms by which school environment influences young people’s health are not currently completely understood but teacher connectedness (TC) seems to act both as a health asset10 and a protective factor, especially for the involvement in risk behaviours.11

The integrative theoretical approach by Bonell et al.12 suggests that school commitment, including the students’ attachment to the staff, shapes students’ affiliation with committed or non-committed peers, which will contribute to students’ cognitions and ultimately to their behavioural choices. Therefore, when relationships are built that foster commitment with school, young people are more likely to involve in pro-school activities and avoid risk behaviours.12 Qualitative research also
points in this direction and underlines the key role of positive
relationships with teachers in the process by which school
environment affects young people’s health.13

School social ecology models assert that school connectedness
results from the inter-relations between (i) structural and organi-
izational factors and (ii) caring and supportive interpersonal rela-
tionships in the schools.14 Given that the school structural
environment, such as school location and school composition
are other important domains of school determinants of health,4
these inter-relations are worth exploring. Furthermore, relation-
ships with teachers have shown potential as modifiable factors
in interventions to decrease adolescent substance use15,16 and
violence;17 therefore, it is important that efforts in this direction
can take into consideration how structural and composition
factors in the targeted schools may affect TC.

School characteristics, such as the size of the school, the
demographics of their students or the neighbourhood the
school is located in, socioeconomic status and school sector
(government, independent and Catholic) have all been found
to have an impact on school connectedness.18–20 School size
has probably been the most extensively studied of these fac-
tors and a recent review suggests that developing and maintain-
ing close relationships is easier for teachers in small
schools, whereas higher disorganization and a more imper-
sonal environment would make supportive student–teacher
relationships less likely in large schools.21

However, one important challenge in the study of these
school-level factors is that factors such as school size, sector,
location, student composition and neighbourhood character-
istics tend to be significantly interrelated,22 which makes it
important to control for potentially confounding effects in
this type of research. For example, the size of schools in rur-
al areas tends to be smaller than in urban ones, but it has
also been hypothesized that rurality may be associated with
a more communitarian environment as opposed to the more
bureaucratic one in urban schools; in other occasions an
urban location has been linked to a higher prevalence of
behavioural problems and violence.23,24

In addition, it seems advisable to further the study of school
composition, which has tended to focus mostly on students.25
Teachers’ demographics especially gender may arguably be
similarly important. For example, Bokhorst, Sumter and
Westenberg26 hypothesized that the higher levels of teacher
support found in girls in their study may have to do with a pro-
portion of almost 80% female teachers in the Netherlands’
educational system and recommended the incorporation of
teacher gender in future studies analysing teacher support. The
relevance of examining the role of teachers’ gender is also sup-
ported by studies that describe significant differences in self-
efficacy and teaching goals between female and male
teachers,27 that may impact student–teacher connectedness.
The relative number of teachers compared to students, which
allows for calculating the student–teacher ratio, is also con-
sidered to be an important school-level indicator.25,28

Finally, an additional challenge in understanding the role of
school-level factors for TC is that most studies have tended to
subsume relationships with teachers within the broader concept
of school connectedness (along with other aspects such as rela-
tionships with peers, liking school and school engagement).18,19
With the promotion of positive student–teacher relationships
being increasingly seen as an effective strategy to promote stu-
dents’ health at schools,13,16 the contribution of school factors
to TC specifically warrants further attention.

As part of the EU-funded Teacher Connectedness Project
‘Well-being among European youth: The contribution of stu-
dent–teacher relationships in the secondary-school population’,
the overall aim of this study was to examine the potential con-
tribution of a wide variety of school-level factors, including
structural school characteristics and demographic composition,
to TC. The Health Behaviour in School-aged Children (HBSC)
study20 offers a nationally representative database based on
both students’ and school staff’s data which includes information
on both students’ perceptions of their relationships with
teachers and information provided by the head, deputy head
or subject head teacher on a number of school features that
makes it especially suitable for this study’s aim.

Methods
Participants
Participants came from the representative sample in the 13/14
edition of the international WHO collaborative survey
HBSC in England. A random sampling of all secondary
schools in England stratified by region and type of school
(state vs independent school) was used to obtain a nationally
representative sample, which consisted of 5335 adolescents
aged 11, 13 and 15 years from 48 schools (a total of 261
classes). From them, we selected the students from the 32
schools that had completed the school-level questionnaire
(SLQ): 2927 adolescents (49.5% boys and 50.5% girls) aged
11–15 years. A more detailed description of the participants
and their schools is provided as Supplementary Material.

Measures
Variables were selected from two linked sources of data avail-
able in the HBSC study. Sociodemographic variables and TC
measures were part of the self-completed questionnaires filled
in by students, whereas information on school-level factors
was collected by means of a separate SLQ completed by
Regarding the dependent variable, TC was measured by means of the following three items on supportive teacher–student relationships, which are answered on a 5-point

### Table 1 Sociodemographic and school-level variables in the study

<table>
<thead>
<tr>
<th>Source</th>
<th>Categories</th>
<th>Rationale for coding and other observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>HBSC students’ questionnaire</td>
<td>Boys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
</tr>
<tr>
<td>Grade</td>
<td>HBSC students’ questionnaire</td>
<td>Year 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year 11</td>
</tr>
<tr>
<td>Family affluence</td>
<td>HBSC students’ questionnaire: FAS-III</td>
<td>Low (0–6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium (7–10)</td>
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<tr>
<td></td>
<td></td>
<td>High (11–13)</td>
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<tr>
<td><strong>School-level factors</strong></td>
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<tr>
<td>Type of school I</td>
<td>HBSC SLQ</td>
<td>Secondary school</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle school</td>
</tr>
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<td></td>
<td></td>
<td>High school</td>
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<td></td>
<td></td>
<td>Grammar school</td>
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<td></td>
<td></td>
<td>Independent school</td>
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<tr>
<td>Type of school II</td>
<td>HBSC SLQ</td>
<td>All girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All boys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed</td>
</tr>
<tr>
<td>Size of school</td>
<td>HBSC SLQ</td>
<td>&lt;500 students</td>
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<tr>
<td></td>
<td></td>
<td>Between 500 and 1000 students</td>
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<tr>
<td></td>
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<td>Between 1000 and 1500 students</td>
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<td></td>
<td></td>
<td>&gt;1500 students</td>
</tr>
<tr>
<td>Student–teacher ratio</td>
<td>HBSC SLQ</td>
<td>NA</td>
</tr>
<tr>
<td>Female teachers</td>
<td>HBSC SLQ</td>
<td>NA</td>
</tr>
<tr>
<td>School location</td>
<td>HBSC SLQ</td>
<td>Village, hamlet or rural area (&lt;3000 inhabitants)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small town (3000–15 000 inhabitants)</td>
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<td>Town (15 000–100 000 inhabitants)</td>
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<td>City (100 000 to 1 million inhabitants)</td>
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<td></td>
<td></td>
<td>Big city (&gt;1 million inhabitants)</td>
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<tr>
<td>Neighbourhood problems in the school area</td>
<td>HBSC SLQ</td>
<td>NA</td>
</tr>
<tr>
<td>Migrant/minority students</td>
<td>HBSC SLQ</td>
<td>NA</td>
</tr>
<tr>
<td>Student per class</td>
<td>HBSC SLQ</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA = Not applicable.
Likert scale from strongly disagree to strongly agree: ‘I feel that my teachers accept me as I am’, ‘I feel that my teachers care about me as a person’, and ‘I feel a lot of trust in my teachers’ Items in this scale were originally developed and validated within the international HBSC network and has been subjected to subsequent refinement and validation. Without explicit evidence to assume that the categories in the variable can be considered equally spaced on an underlying continuous scale, it can be inappropriate to treat it as continuous. Therefore, we used quartiles as a reference for recoding this ordinal variable into three groups to identify those with the lowest 25% of scores and those with the highest 25% of scores, leaving 50% in the middle category. Due to the grouped nature of the numbers underlying the scale, actual divisions were scores 1–3.33 as low (25.8%), 4.67–5 as high (30%), leaving 3.67–4.33 as middle (44.2%).

Procedure
Data collection took place in the schools, students completed the questionnaires themselves and the confidentiality and anonymity of the data was ensured. Specifically, questionnaires were administered at schools either by teachers or members of the research team and students were asked to fill their questionnaires under exam type conditions; once completed, each student placed their questionnaire in an envelope and sealed it. Ethical approval was obtained from the University of Hertfordshire Ethics Committee for Health and Human Sciences (HSK/SK/UH/00007).

Regarding statistical analyses, multilevel multinomial regression modelling was carried out using MLwiN from within the R statistical package. Although TC was an ordinal variable, multilevel modelling of such dependent variables relies on estimation algorithms that sometimes lack stability. Initial modelling revealed that this was the case here. Treating the dependent variable as if it were simply multinomial solved such stability issues and an examination of the results did not show any inconsistencies introduced.

Size of the school, student–teacher ratio, female teachers and our two type of school indicators were initially included in the model based on our literature review. Additionally, stepwise selection (with the criterion for entry set at the 1% level of significance) was undertaken to investigate the possibility to include the additional school-level factors (location, neighbourhood problems, percentage of ethic or minority students, percentage of non-native speakers of English and mean number of students per class). Sex, grade and family affluence were also included in the model so that their potential confounding effects could be controlled for.

Results
The obtained multilevel multinomial regression model of sociodemographic and school-level factors on TC is presented in Table 2. Grade, family affluence, student–teacher ratio, type of school II and school location were significantly associated with TC ($P < 0.01$). In contrast, TC was not significantly associated with sex, size of the school, percentage of female teachers and type of school I (secondary, middle, high, grammar or independent).

Descriptives and ORs and their 95% CIs for each significant variable in all relevant comparisons are presented in Table 3 and Table 4, respectively. It must be noted that we decided to restrict the description of significant results to those comparisons where the $P$-value was <0.001 because of the large number of comparisons that were carried out. At this point, the variable location showed no strong overall patterns ($P < 0.001$) and, therefore, further analysis of this variable is not presented.

Regarding sociodemographic variables, adolescents in years 9 and 11 had lower odds of reporting medium (compared to low) and high (compared to medium or low) levels of TC than those in year 7 (see Table 4); those in year 7 were more represented in the medium and high TC categories and underrepresented in the low level compared to older adolescents (see Table 3). In addition, adolescents with a low FAS seemed to some extent overrepresented in the low TC category (see Table 3). ORs suggested that, compared to adolescents with low FAS, those with medium FAS had significant greater odds to report high than low TC. In contrast, no significant differences in the odds of reporting high (compared to medium and low) or medium (compared to low) TC were found between adolescents with high and medium FAS.

As for significant school-level factors, the student–teacher ratio mean tended to be higher in the schools of adolescents reporting low TC (see Table 3). ORs indicated that higher student–teacher ratio was significantly associated with lower odds of high or medium (compared to low) TC. As apparent when looking at ORs for 1-unit and 5-unit increases, as student–teacher ratio increased the likelihood of medium to high TC decreased. Finally, regarding type of school, adolescents in mixed schools were more likely to show medium or high TC compared with those in all-girls schools. The rest of comparisons in this variable did not reach statistical significance.

Discussion
Main finding of this study
TC was lower in adolescents from higher grades (school years) and less affluent families, however, strongly similar
### Table 2: Final multilevel multinomial regression model of sociodemographics and school-level factors on TC

<table>
<thead>
<tr>
<th>Coef.</th>
<th>SE</th>
<th>z</th>
<th>P-value</th>
</tr>
</thead>
</table>

**Sex (ref. category: boys)**
- Girl-medium TC: -0.07995, SE: 0.09093, z: -0.88, P-value: 0.3793
- Girl-high TC: -0.13572, SE: 0.09819, z: -1.38, P-value: 0.1669

**Grade (ref. category: year 7)**
- Year 9-medium TC: -0.95726, SE: 0.10382, z: -9.22, P-value: <0.001
- Year 9-high TC: -1.90569, SE: 0.11348, z: -16.79, P-value: <0.001
- Year 11-medium TC: -1.10295, SE: 0.10239, z: -10.77, P-value: <0.001
- Year 11-high TC: -2.12378, SE: 0.11347, z: -18.72, P-value: <0.001

**FAS (ref. category: low)**
- Medium-medium TC: 0.26107, SE: 0.11540, z: 2.26, P-value: 0.0237
- Medium-high TC: 0.34125, SE: 0.12611, z: 2.71, P-value: 0.0065
- High-medium TC: 0.18222, SE: 0.13190, z: 1.38, P-value: 0.1671
- High-high TC: 0.26871, SE: 0.14384, z: 1.87, P-value: 0.0617

**Type of school I (ref. category: secondary)**
- Middle-medium TC: 0.78366, SE: 0.44035, z: 1.78, P-value: 0.0751
- Middle-high TC: -0.03311, SE: 0.47085, z: -0.07, P-value: 0.9439
- High-school medium TC: -0.19254, SE: 0.28942, z: -0.67, P-value: 0.5059
- High-school high TC: -0.18303, SE: 0.30482, z: -0.60, P-value: 0.5482
- Grammar-medium TC: 0.16212, SE: 0.37244, z: 0.44, P-value: 0.6634
- Grammar-high TC: 0.75193, SE: 0.40832, z: 1.84, P-value: 0.0655
- Independent-medium TC: 0.67561, SE: 0.27412, z: 2.46, P-value: 0.0137
- Independent-high TC: 0.67630, SE: 0.28953, z: 2.34, P-value: 0.0195

**Type of school II (ref. category: all girls)**
- All boys-medium TC: 0.18491, SE: 0.41318, z: 0.45, P-value: 0.6545
- All boys-high TC: 0.55727, SE: 0.44584, z: 1.25, P-value: 0.2113
- Mixed-medium TC: 0.91149, SE: 0.26451, z: 3.45, P-value: <0.001
- Mixed-high TC: 1.08858, SE: 0.28801, z: 3.78, P-value: <0.001

**Location (ref. category: village, hamlet or rural area)**
- Small town-medium TC: 0.69846, SE: 0.33268, z: 2.10, P-value: 0.0358
- Small town-high TC: 0.53970, SE: 0.35742, z: 1.51, P-value: 0.1310
- Town-medium TC: 0.92756, SE: 0.32621, z: 2.84, P-value: <0.01
- Town-high TC: 0.67863, SE: 0.35106, z: 1.93, P-value: 0.0532
- City-medium TC: 0.42581, SE: 0.26189, z: 1.63, P-value: 0.1049
- City-high TC: 0.32142, SE: 0.27549, z: 1.17, P-value: 0.2433
- Large city-medium TC: 0.40917, SE: 0.35696, z: 1.15, P-value: 0.2517
- Large city-high TC: 0.21385, SE: 0.38169, z: 0.56, P-value: 0.5753

**Size of school (ref. category: <500 students)**
- Between 500 and 1000-medium TC: 0.25624, SE: 0.27758, z: 0.92, P-value: 0.3559
- Between 500 and 1000-high TC: 0.58227, SE: 0.29366, z: 1.98, P-value: 0.0474
- Between 1000 and 1500-medium TC: 0.30530, SE: 0.29671, z: 1.11, P-value: 0.2653
- Between 1000 and 1500-high TC: 0.55307, SE: 0.31334, z: 1.77, P-value: 0.0776
- >1500-medium TC: -0.15455, SE: 0.27066, z: -0.57, P-value: 0.5680
- >1500-high TC: -0.19174, SE: 0.28412, z: -0.67, P-value: 0.4998

**Student–teacher ratio**
- Student–teacher ratio-medium TC: -0.14008, SE: 0.03359, z: -4.17, P-value: <0.001
- Student–teacher ratio-high TC: -0.17514, SE: 0.03663, z: -4.78, P-value: <0.001

**Female teacher**
- Female teacher-medium TC: -0.00209, SE: 0.00921, z: -0.23, P-value: 0.8209
- Female teacher-high TC: 0.01234, SE: 0.01031, z: 1.20, P-value: 0.2316

The addition of interactions between significant main effects to the model was investigated but none could be added reliably.
among both boys and girls. Regarding school-level differences, we found that low TC was more likely as student–teacher ratio increased and less likely in mixed schools compared to all-girls schools. These school-level factors were found significant once students’ sex, age and SES had been controlled for.

In contrast, TC did not significantly vary depending on type of school (secondary, middle, high school, grammar and independent), school location, size of the school or mean number of students per class, percentage of migrant/ minority students, percentage of female teachers and neighbourhood problems in the school area.

**What is already known on this topic**

Previous studies have indicated that school connectedness and TC have a significant impact in young people’s health, and that it tends to be lower in older adolescents. It also seems that low SES is associated with lower teachers’ expectations as well as with students’ lower educational outcomes and higher behavioural problems, with all these aspects influencing one another probably resulting in the lesser closeness in student-teacher relationships. Research has also suggested that school characteristics can make a significant difference, with a smaller school size having been one of the most consistently reported factors favouring young people’s school connectedness.

**What this study adds**

This study took on board the aforementioned developments in the area and looked to the role of school characteristics in TC specifically, as a distinct and central element of school experience on its own.

Our findings suggest that it is not the absolute size of the school but the ratio of students per teacher which is significantly

<table>
<thead>
<tr>
<th>TC</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade: Year 7</td>
<td>10.8%</td>
<td>41.3%</td>
<td>47.9%</td>
</tr>
<tr>
<td>Grade: Year 9</td>
<td>33.6%</td>
<td>44.8%</td>
<td>21.6%</td>
</tr>
<tr>
<td>Grade: Year 11</td>
<td>36.1%</td>
<td>44.3%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Low FAS</td>
<td>30.5%</td>
<td>41.5%</td>
<td>28.0%</td>
</tr>
<tr>
<td>Medium FAS</td>
<td>25.3%</td>
<td>44.2%</td>
<td>30.5%</td>
</tr>
<tr>
<td>High FAS</td>
<td>24.3%</td>
<td>44.4%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Type of school: All-girls</td>
<td>32.7%</td>
<td>37.4%</td>
<td>29.9%</td>
</tr>
<tr>
<td>Type of school: All-boys</td>
<td>15.1%</td>
<td>46.8%</td>
<td>38.1%</td>
</tr>
<tr>
<td>Type of school: Mixed</td>
<td>26.1%</td>
<td>43.6%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Student–teacher ratio</td>
<td>13.11</td>
<td>12.68</td>
<td>12.51</td>
</tr>
</tbody>
</table>

**Table 3** Percentages of low, medium and high TC by grade, FAS and type of school (all-girls, all-boys, mixed) and student–teacher ratio means by TC

<table>
<thead>
<tr>
<th></th>
<th>Medium vs Low TC</th>
<th>P</th>
<th>High vs Low TC</th>
<th>P</th>
<th>High vs Medium TC</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Grade</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Year 9 vs Year 7</td>
<td>0.38 (0.31,0.47)</td>
<td>&lt;0.001</td>
<td>0.15 (0.12,0.19)</td>
<td>&lt;0.001</td>
<td>0.39 (0.26,0.57)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year 11 vs Year 7</td>
<td>0.33 (0.27,0.41)</td>
<td>&lt;0.001</td>
<td>0.12 (0.10,0.15)</td>
<td>&lt;0.001</td>
<td>0.36 (0.25,0.53)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year 11 vs Year 9</td>
<td>1.16 (0.95,1.41)</td>
<td>0.148</td>
<td>1.24 (0.98,1.58)</td>
<td>0.075</td>
<td>1.08 (0.74,1.57)</td>
<td>0.708</td>
</tr>
<tr>
<td>FAS</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Medium vs Low</td>
<td>1.30 (1.04,1.63)</td>
<td>0.024</td>
<td>1.41 (1.10,1.80)</td>
<td>&lt;0.001</td>
<td>1.08 (0.71,1.66)</td>
<td>0.714</td>
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<tr>
<td>High vs Low</td>
<td>1.20 (0.93,1.55)</td>
<td>0.167</td>
<td>1.31 (0.99,1.73)</td>
<td>0.062</td>
<td>1.09 (0.67,1.78)</td>
<td>0.730</td>
</tr>
<tr>
<td>High vs Medium</td>
<td>1.08 (0.90,1.30)</td>
<td>0.407</td>
<td>1.08 (0.88,1.31)</td>
<td>0.477</td>
<td>1.08 (0.74,1.57)</td>
<td>0.708</td>
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<tr>
<td>Type of school II</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>All boys vs All girls</td>
<td>1.20 (0.54,2.70)</td>
<td>0.654</td>
<td>1.75 (0.73,4.18)</td>
<td>0.211</td>
<td>1.45 (0.31,6.76)</td>
<td>0.635</td>
</tr>
<tr>
<td>All boys vs Mixed</td>
<td>2.49 (1.48,4.18)</td>
<td>&lt;0.001</td>
<td>2.97 (1.69,5.22)</td>
<td>&lt;0.001</td>
<td>1.19 (0.45,3.18)</td>
<td>0.723</td>
</tr>
<tr>
<td>Student–teacher ratio</td>
<td>0.48 (0.23,1.02)</td>
<td>0.058</td>
<td>0.59 (0.26,1.31)</td>
<td>0.194</td>
<td>1.22 (0.29,5.08)</td>
<td>0.789</td>
</tr>
</tbody>
</table>

**Table 4** Odds ratios with 95% confidence intervals for grade, FAS, type of school (all-girls, all-boys, mixed) and student–teacher ratio
associated with TC, which significantly adds to previous research. Student–teacher ratio can affect TC via both direct and indirect mechanisms. Individualized interactions with students\textsuperscript{42} and the extent to which teachers notice students and know them at a personal level\textsuperscript{13} are important aspects of TC, and student–teacher ratio is significantly linked with the opportunities for these types of interactions at a school. Student–teacher ratio may also have indirect effects in the quality of student–teacher relationships because high ratios can result in teachers’ overload and stress.\textsuperscript{44} Small schools usually have lower ratios, but what our findings suggest is that it is an appropriate balance between the numbers in the student and teacher bodies that matters, i.e. that TC can also be fostered in large schools as far as they are sufficiently staffed.

In addition, in our sample, mixed schools were more likely to show high TC than all-girls schools, after controlling for potentially confounding effects of students’ demographics. Our findings in this respect must be cautiously interpreted because only four all-girls schools had taken part in the study; however, this is an interesting aspect to which research on single-sex vs mixed schools have paid little attention.\textsuperscript{45} The fact that school gender composition is related to many other variables makes it challenging to identify clear effects, but as mentioned by Smithers and Robinson ‘single-sex schools and co-educational schools can look and feel very different’,\textsuperscript{46} which makes one wonder whether that might have some impact on teacher–student interactions, an aspect which deserves further examination in future research.

Finally, our findings have important implications for public health. TC and most of the school-level factors examined in the present study are modifiable determinants of health, which means that they can be influenced by policy. For example, findings pointing to school size as a key variable led to initiatives in the US to divide large comprehensive schools into multiple smaller schools, so that structures facilitated personalization and strong relationships.\textsuperscript{47} Our results on the importance of student–teacher ratio over school size suggests that a better measure for the promotion of TC may be making sure that no school, large or small, is understaffed. In the UK context, where size of schools is highly influenced by parental demand and there is a relative freedom of the schools to determine their size,\textsuperscript{48} attention to student–teacher ratio is particularly important. Accordingly, the design and investment in effective recruitment and retaining policies should be a priority in educational policy. On the other hand, school location or type of schools (comparing state-funded and private schools as well as selective and non-selective schools), to name some examples, were not significant and therefore initiatives focusing on them are not likely to result in increases in TC. Regarding the role of co-educational vs single-sex schools our results are not conclusive and further research is recommended.

More broadly, the attention to TC as an important determinant of health calls for greater collaboration between the public health and educational sectors. With the potential of student–teacher interactions as protective for risk behaviours\textsuperscript{15–17} and the emerging concerns about mental health among youth\textsuperscript{49,50} the role of education systems as public health institutions and as sites for public health interventions become vitally important. It is therefore fundamental that public health adopts a more nuanced understanding of the elements within schools that operate as determinants of health and the links between them. In order to overcome the traditional disconnection between health and educational goals at schools,\textsuperscript{51} work should be done via education policy and in collaboration between public health professionals and school leaders to make sure our schools’ system, culture and ethos contribute to young people’s health and well-being.

Limitations of this study

A main limitation of this study is its cross-sectional design, which does not allow for drawing conclusions about the direction of the associations found.

Secondly, although the HBSC database was particularly useful for the aim of this study and the multilevel analyses conducted respected the nested nature of student- and school-level data, sampling focused on the representativeness of the students’ sample, and therefore did not ensure a balanced representation of certain types of schools, such as the abovementioned all-girls schools, which limits the generalization of that finding.

Finally, mixed method research may be useful to test some of the interpretations of our findings and get a deeper view of the perceptions of teachers and students on the ways and mechanisms through which school factors can impact student–teacher connectedness.

Supplementary data

Supplementary data are available at the Journal of Public Health online.

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Conflict of interest

The authors have no conflict of interest.

References


