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Chronic health conditions and school experience in school-aged children in 19 European countries

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HBSC is an international study carried out in collaboration with WHO/EURO. The International Coordinator of the 2017/2018 survey was Jo Inchley (University of Glasgow) and the Data Bank Manager was Oddrun Samdal (University of Bergen). The present study used data from 19 countries/regions in the 2017/2018 survey, conducted by the following principal investigators: Sergey Sargsyan and Marina Melkumova (Armenia), Rosemarie Felder-Puig (Austria), Gahraman Hagverdiyev (Azerbaijan), Lidiya Vasileva (Bulgaria), Michal Kalman (Czech Republic), Mette Rasmussen (Denmark), Fiona Brooks and Ellen Klemra (England), Jorma Tynjälä (Finland), Emmanuelle Godeau (France), Lela Shengelia (Georgia), Ágnes Németh (Hungary), Saoirse Nic Gabhainn (Ireland), Lina Kjostarova Unkovska (North Macedonia), Joanna Mazur and Agnieszka Malkowska-Szcutnik (Poland), Galina Lesco (Republic of Moldova), Jo Inchley (Scotland), Petra Lofstedt (Sweden), and Chris Roberts (Wales). For details, see <http://www.hbsc.org>

ABSTRACT

Objectives

This study investigates chronic conditions (CC) prevalence among children in mainstream schools, their school experience and life satisfaction in Europe.

Methods

Data was collected from the 2017/2018 HBSC survey, a cross-national study using self-reported questionnaires administered in classrooms. Nationally representative samples of children aged 11, 13, and 15 years in mainstream schools from 19 European countries (n=104,812) were used. School experience was assessed using four variables: low school satisfaction, schoolwork pressure, low teacher support, and peer-victimization, which were related to life satisfaction. Latent class analysis (LCA) was conducted to identify patterns of school experience among students with CC.

Results

The prevalence of CC varied from 8.4% (Armenia) to 28.2% (Finland). Children with CC (n=17,514) rated their school experience and life satisfaction lower than children without CC. LCA identified three school experience patterns: “negative on all items” (37%), “negative on all items, except school pressure” (40%) and “overall positive” (23%). The distribution of subgroups varied across countries - in countries with a higher proportion of children with CC in mainstream schools, children reported more negative school experiences. Compared to the “overall positive” group, low life satisfaction was highest for students classified as “negative on all items” (relative risk (RR)=2.9; 95% CI 2.2-3.8) with a lesser effect for “negative on all items, except school pressure” (RR)=1.8; 95% CI 1.4-2.4).

Conclusions

These findings provide cross-national data documenting the diversity in inclusive educational practices regarding school placement and school experiences, and suggest that efforts are still needed to allow a fully inclusive environment.

KEYWORDS

Inclusive education, chronic conditions, school experience, life satisfaction

DECLARATIONS

Funding

There is no specific support was obtained for this study

Conflicts of interest/Competing interests

The authors have no conflicts of interest relevant to this article to disclose

Availability of data and material

Mariane Sentenac had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis

Code availability

Not applicable

Authors' contributions

Dr Sentenac, conceptualized and designed the study, performed the analysis of data, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr Santos and Dr Godeau conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr Augustine, Dr Michelsen, Dr Movsesyan, Dr Ng, and Dr Małkowska-Szkutnik contributed to the interpretation of the drafted the manuscript, and provided critical revision of the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

INTRODUCTION

Over the last two decades, the prevalence of children with chronic illnesses and disabilities in mainstream schools has increased in many countries, reflecting a wide range of factors, including improved survival for children with severe health conditions, access to health services, evolution of diagnoses and treatments, as well as changes in educational policies. In high income countries, estimates of chronic health conditions prevalence range from 3.5 to 35% of children under 17 years old.[1] These children face higher risks of psychosocial and developmental difficulties during childhood and adolescence.[2, 3] Compared to their peers without chronic condition, students with chronic condition struggle with more school difficulties,[4] academic setbacks,[5] school stress,[6] poor academic performance and academic self-perception, with reduced ability to cope with the demands of a classroom,[7] lower school attendance,[8] gaps in cognitive development, namely a decreased readiness to learn,[9] and social isolation from peers.[2] Moreover, students with chronic diseases or disabilities are more likely to be bullied,[10-12] spend more time on screen-based behaviors,[13] and encounter adverse psychosocial outcomes.[14]

Inclusive education was established as a right in 2006 by the UN Convention on the Rights of Persons with Disabilities (CRPD), and is described as “a process ... to provide all students ... with an equitable and participatory learning experience and environment that best corresponds to their requirements and preferences”.[15] This principle of inclusive society resulted from the international paradigm shift in the field of disability occurring in 2001 through the International Classification of Functioning, Disability and Health (ICF),[16] in which a biopsychosocial model of disability and health put the attention on the role of environmental factors as potential facilitators or barriers of social participation. Participation in school may be affected by cultural, educational and financial circumstances, as well as the availability of treatment and access to health care services.[17] But inclusion in education is a broader multi-dimensional concept not only defined by access and attendance to the mainstream educational system of students who have

a disability, but also by the quality of the students' participation and their progress in terms of learning and well-being.[18].

Including all students and ensuring that each one has an equal and personalized opportunity for educational progress remains a major challenge for national educational systems in Europe.[19, 20] Despite significant achievements in legislation promoting inclusive education, practical implementation differs widely across Europe,[21] in terms of the comprehensiveness of targeted groups, the considered age and education levels, and the nature of legislative provisions.[18] International comparisons are crucial for understanding the differences in children's school experiences, but population-level studies rarely cover this topic, despite specific recommendations in the UN CRPD (article 31).[22]

The Health Behaviour in School-aged Children: WHO Collaborative Cross-National survey (HBSC), uses a school-based design and provides information about health, well-being, social environment, and health behaviour of 11-, 13- and 15-year-old in 50 countries or regions across Europe and North America. In the 2017/18 survey, nineteen countries included an optional module on children with chronic conditions (CC). Relying on student's self-perceptions, the present study aims to: 1) describe the overall prevalence of self-reported CC among students in mainstream schools; 2) identify patterns of school experience (i.e. school pressure, bullying victimization, liking school, teacher support) of students with CC across countries; and 3) analyze the relationship between those patterns and life satisfaction.

METHODS

Study design, participants, and procedure

Data from the 2017/2018 HBSC survey was used, collected through self-reported questionnaires developed cooperatively by researchers according to a standard methodology detailed in the international study protocol.[23] Each country used cluster sampling with school

class as a sampling unit (or school in the absence of a sampling frame of classes). This study used the data from mainstream schools in 19 countries (**Table 1**), corresponding to all countries that included the optional questions on CC. In each country ethical approval was obtained where required and compliance with data protection rules ensured according to national legislation.

Measures

Chronic conditions

The non-categorical Chronic Conditions Short Questionnaire, validated in a school-based population,[24] was designed to measure the occurrence of long-term health conditions, including chronic diseases and disabilities, without referring to specific condition.[18] In line with previous literature on definitions and measurements,[1, 3, 17] we retained the umbrella term of chronic conditions in this study. Students with CC were defined according to their answers provided to the following question: ‘Do you have a long-term illness, disability, or medical condition (such as, diabetes, arthritis, allergy or cerebral palsy) that was diagnosed by a doctor?’ (yes/no). Missing data varied between 1.3% and 13.8% according to the country. A subsequent question identified students with CC that felt restricted in attendance or participation at school, which was considered a proxy for CC’s severity (overall rate of missing data: 5.6%).[11] Data was collected across all age groups except in Finland where 11-year-olds were not asked. Missing data and inconsistencies were handled as recommended in the HBSC protocol (Appendix A).

School experience

Four HBSC items were used to measure different domains of the school experience (schoolwork pressure, peer-victimization, school satisfaction, perceived teacher support). Consistent with the 2017/18 study protocol, items were categorized into binary variables.[23]

Students were asked ‘How pressured do you feel by the schoolwork you have to do?’ (answers: not at all (1); a little (2); some (3); and a lot (4)). Students were categorized as not pressured (1-2) versus pressured (3-4). Students were classified as victims of bullying by peers if they reported being bullied at school at least 2-3 times a month in the past couple of months. School satisfaction was assessed by: ‘How do you feel about school at present?’ with four answer options (I like it a lot (1); I like it a bit (2); I don’t like it very much (3); and I don’t like it at all (4)) grouped as high school-satisfaction (1) vs low (2 thru 4). Lastly, teacher support was measured by a three-item additive scale covering teacher acceptance, care and trust ; students indicated their level of agreement on a five-point Likert scale (strongly agree (1) to strongly disagree (5)) combined into a mean score ranging from 3 to 15, and dichotomized into high support (3) versus low support (4-15).[23, 25]

Life satisfaction

Students were asked to rate their present life satisfaction using the Cantril ladder,[26] last rung (0) representing the worst possible life and the top (10) measuring the best possible life. Respondents with scores between 0 and 5 were classified as having low life satisfaction.[27]

Statistical analyses

The prevalence of CC was estimated in each country with 95% CI using sex- and age-adjusted logistic regressions to facilitate comparability of estimates across countries.[28] Indicators of school experience and life satisfaction were described by CC status. A latent class analysis (LCA)[29] was conducted to identify patterns of school experience in students reporting CC. LCA is a statistical model-based clustering approach that identifies latent subgroups among individuals, using a set of logistic regression equations describing relationships between the observed dependent variables (school experience items) and the categorical latent variable.[30]

Models were estimated using from one to four latent classes adjusted for the students' age group and countries, and sampling weights). The optimal number of latent classes was identified using several model fit criteria including Log-likelihood, Akaike Information Criteria (AIC), the Bayesian Information Criteria (BIC), sample size adjusted Bayesian Information Criterion (SSA-BIC), and entropy. A visual interpretation of latent classes was provided based on the item-response probabilities, which represents the probabilities of each observed item given class membership. The distribution of the identified latent classes across countries was graphically examined. Direction and strength of the association between the prevalence of CC and the latent class distribution across countries were graphically examined and using Spearman's correlation coefficient.

To study the association between the estimated latent classes of school experiences and life satisfaction, risk ratios (RRs) with 95% CIs for low life satisfaction were estimated performing modified Poisson regression models with a log link and a robust variance estimator.[31] Multilevel mixed-effects generalized linear models were performed with random intercepts at the country and the school level to account for the correlation within-group clustering. Models were adjusted for student's age group and sex. The rate of missing data did not exceed 5% for any variable. All analyses used sampling weights, and were performed using Stata V.14.1, except for the LCA which used MPlus (version 8.4 Demo, Muthén and Muthén).

RESULTS

The sample consisted of 104,812 students across 19 countries of whom 34.1% were 11 year olds, 34.7% were 13 and 31.2% were 15 ; 49.6% were boys (see **Online Resource 1** for age and sex distributions by country). The predicted prevalence of students reporting CC over countries was 18%, ranging between 8.4% in Armenia and 28.2% in Finland (median value of the cross-country distribution=17.5%); and the predicted prevalence of CC affecting attendance

or participation at school was 4.4%, varying between 1.9% (Armenia) and 9.4% (Sweden) (**Table 1**)(see **Online Resource 2** for the distribution of by country and by age group). The rates of negative school experience were significantly higher in students with CC compared to others for all four indicators of school experience, as well as the rate of low life satisfaction (**Table 2**).

The LCA was conducted among students with CC (17,514 students with complete data on school experiences out of 17,885 students with CC). The model with three latent classes of school experience was found to be optimal (*i.e.* with the smallest values of AIC, BIC and SSA-BIC, the largest log-likelihood, and entropy values approaching 1, indicating a better class separation) (**Online Resource 3**). The class membership probabilities for the three estimated classes were 0.37 (class 1), 0.40 (class 2), and 0.23 (class 3). The item-response probabilities within each class membership are shown in **Figure 1**, and classes were labelled accordingly. Class 1, characterized by elevated probabilities of the four negative school experience items, was therefore labeled as “Overall negative school experience”. Students belonging to the latent class 2 were likely to report low teacher support (0.938), being victims of bullying (0.11) and low school satisfaction (0.905), but no school pressure, hence labelled “Negative school experience without pressure”. And class 3, labelled “Overall positive school experience”, was characterized by lower probabilities of negative school experience on the four items.

The distribution of the three latent classes varied widely across countries (**Figure 2**). The prevalence of class 1 “Overall negative school experience” varied from 6.1% (Azerbaijan) to 62.8% (Finland). The prevalence of class 2 “Negative school experience without pressure” varied between 19.7% (Macedonia) and 60.2% (Slovakia). Conversely, the lowest prevalence values of class 3 “Overall positive school experience” were found in Finland (5.9%) and in Czech Republic (6.7%), whereas the highest prevalence values were reported in Georgia

(33.3%) and in Azerbaijan (73.9%). The prevalence of CC was negatively correlated to the proportion of the latent class 3 (Spearman coefficient=-0.791; $p<0.001$)(**Figure 3**).

Results from the generalized linear model indicated that, compared to students in class 3, students in class 1 had a higher risk for low life satisfaction (RR= 2.9; 95% CI 2.2 to 3.8), as well as students in class 2 (RR=1.8; 95% CI 1.4 to 2.4)(**Online resource 4**).

DISCUSSION

Using data from 19 European countries in a cross-national school-based study, we found that almost one in five students (18%) reported a CC with a wide range across countries. Students with CC reported lower ratings on all items describing their school experience and low values on a life satisfaction scale, compared to those without CC. Among students with CC, three common patterns of school experience were identified, with distributions differing between countries. Students classified in the group with an “overall negative school experience” were more likely to report a low life satisfaction in comparison to the group with the most positive school experience. This was also the case of those with negative experiences but lower level of school pressure, yet with weaker strength. The percentage of children reporting a positive school experience by country was inversely associated to the prevalence of students reporting CC.

Our results showing a high prevalence of CC among children in mainstream schools and wide variation in prevalence between countries is concordant with previous cross-national studies.[15, 32] A recent UNESCO report estimated that “children, adolescents and youth with disabilities accounted for 12% of the school population” with wide variation between countries (1% to over 50%) depending on national definitions.[18] There are several possible explanations for the variation in CC prevalence among students in our study. The first relates to the definition of CC, which was derived from a standardized self-completed questionnaire

using a generic approach without disaggregation by diagnosis. A major challenge in research on CC in children and adolescents has been finding consensual definitions and methods to measure CC and dealing with the wide variability in its reported prevalence in the literature, which derives from the multiplicity of concepts, data collection methods and populations studied.[1, 3, 33, 34] Recently, it was highlighted that a diagnosis-based approach would not increase the understanding of inclusion in education over a more comprehensive approach,[18] given that similar experiences might be shared by people with CC, independently of a specific disorder or impairment.[3] However, the observed variations between countries raise additional questions on cross-country differences in diagnostic criteria and youth's understanding and awareness regarding their conditions. The diversity in health care systems and services across countries[35] might relate to difference in official recognition of certain mild to moderate chronic conditions, such ADHD diagnosis or learning disabilities[21] or asthma,[36] and therefore of the awareness of the family and the child regarding such conditions. These variations also reflect differences in the initiation and content of national policies on inclusive education.[21, 37-39] During the past decades, many countries have made efforts to restructure their educational policies and systems to align with international recommendations on inclusive education and to increase the number of students with disabilities in mainstream settings, but many differences remain. For instance, countries such as Sweden and Finland, with high prevalence rates of self-reported CC (*i.e.* 23.5% and 28.2%, respectively) have made more progress towards inclusion than some eastern European countries. Sweden implemented *one school for all* after the second World War, and started restructuring its educational system in the early 1960s.[40] Similarly in Finland, the Basic Education Act adopted in 1998 set the principle of equity in education, and was followed by several reforms providing support for learning and schooling to all which increased the number of students in general education.[41] In contrast, Armenia's education law was amended in 2014 to commit to introduce a universal

inclusive education system by 2025[18] and presents the lower rates in our study (8.4%) together with Macedonia (10.1%) and Georgia: (11.3%).[40, 42]

Our results support previous research showing that students with CC are more likely to face negative school experiences than their peers without CC.[12, 43] We build on this previous knowledge, by using LCA to identify three common patterns of school experience among students with CC: one group with an overall negative school experience, another group of students reporting low teacher support and low school satisfaction but no pressure from school work, and a third group of students with an overall positive school experience. These patterns showed that negative school experiences (classes 1 and 2) reported by a majority of students with CC prevail throughout Europe. The only country where most of the students with CC reported overall positive experiences was Azerbaijan (73.9%). Over all countries, a negative correlation was found between the percentage of children reporting CC and the proportion of children with positive school experience. This could be partially explained by the selection into mainstream schooling of children with conditions that differently affect school participation and experiences. For instance, countries with low prevalence might be less likely to include children with cognitive disorders that have been related with more negative attitudes and behaviors.[44] A study conducted in Armenia in 2011 revealed that a majority of children with intellectual disabilities attended special educational programs or did not attend school at all.[45] Furthermore, a selection of the less emotionally and psychologically vulnerable students in countries reporting lower rate of children with CC could contribute to this negative correlation, due to cultural characteristics, as well as specific national initiative (e.g. information campaign on inclusion of people with disability in North Macedonia).[46]

Such findings warrant further investigation; the current heterogeneity in Europe represents an opportunity to understand how these contextual factors influence children's school experiences.

Our findings underscore the association of school experiences with life satisfaction. Multiple characteristics in the students' school environment have been previously linked to psychosomatic complaints and their subjective health appraisal, including bullying victimization[47, 48] and school absenteeism.[49] Although it has been suggested that children with CC were more likely to encounter difficulties regarding their well-being and their psychological and mental development overall,[50] inappropriate attitudes or behaviours encountered at school may mediate this relationship.[51] This highlights that inclusive education is not only a matter of setting (mainstream vs special), but also needs to take into account the environmental barriers experienced by students with CC within their school environment,[21, 37, 52] including dimensions such as teacher training, attitudes, resources and structures.[21] In the present study, school pressure differentiated between two latent classes describing negative school experience and when present, was associated with worse life satisfaction, which is in line with findings from a general population study where a majority of 15-year-old students showed concordance between school pressure and low school satisfaction.[53] In the specific case of students with CC, school pressure may be related to teacher's expectations or absenteeism due to CC,[54] and additional research is needed to better understand school pressure's determinants in students with CC.

This study's strengths include the use of a large population-based, cross-national sample of school-aged children in European countries with various national educational systems, as well as the analysis of complementary indicators of school experience. It also has several limitations. First, the self-reported single-item measure of CC may lead to some bias in results because it relies on interpretation by respondents. Potential cross-national differences in children's CC profiles related to diversity in diagnostic criteria and health care systems and services across countries, should be kept in mind in interpreting the results. Second, we lacked contextual data within country and it was not possible to relate differences in CC prevalence or in the

distribution of the latent classes to specific schooling policies. In Finland, CC questions were not asked to the 11-year-old students which might affect the overall Finish results although analyses were age-adjusted. Third, the cross-sectional design limits inferences about causal relationships between school experiences and life satisfaction.

CONCLUSION

This study provided previously unavailable cross-national data on school-aged children with CC, their school experiences and life satisfaction in 19 European countries. Such results can inform plans to implement educational policies to promote full inclusive education across Europe. The findings confirmed the negative relationship between CC, school experience and life satisfaction across a wide range of settings, highlighting diverse experiences of children with CC in mainstream schools. Latent class analysis identified pressure by schoolwork, in addition to other negative school experiences, as being most strongly associated with low life satisfaction. These results emphasize the importance of creating supportive environments for students with CC in order to optimize school experiences and fully achieve international targets for inclusion in education.

APPENDIX A : Cleaning and coding of self-reported CC data in the HBSC

Variables

CC2 : long-term illness, disability, or medical condition (Yes=1; No=2)

CC4: School attendance and participation restricted due to CC (Do not have CC=1; CC with restriction =2; CC without restriction =3) – In Sweden, response options were : CC with restriction =2; CC without restriction =3.

CC2_corr: corrected variable for CC2 (Yes=1; No=2)

CC4_corr: corrected variable for CC4 (Do not have CC=1; CC with restriction=2; CC without restriction=3)

Three steps

Step 1 – If CC2="No" and CC4="CC without restriction", it was assumed that the respondent do not have CC (>> CC4_corr="Do not have CC")

Step 2 – Coding of missing data on CC2 and CC4

- If CC2 is missing and CC4="Do not have CC", it was assumed that the respondent do not have CC (>> CC2_corr="No")
- If CC2 is missing and CC4="CC with restriction", it was assumed that the respondent have CC (>> CC2_corr="Yes")
- If CC2="No" and CC4 is missing, it was assumed that the respondent do not have CC (CC4_corr="Do not have CC")

Step 3 – Coding of inconsistencies between CC2 and CC4 into missing data

- If CC2="Yes" and CC4="Do not have CC", CC4_corr was coded as missing
- If CC2="No" and CC4="CC with restrictions", CC2_corr and CC4_corr were coded as missing

Specific coding applied to Finland and Sweden

- In Finland, CC4 was missing when CC2="No". Therefore, if CC2="No" and region="Finland", CC4_corr was coded as "Do not have CC"
- Given that the response option "Do not have CC=1" was not provided in Sweden, CC4_corr was coded as "Do not have CC" when CC2="No" and region="Sweden"

STATA syntax

```
*/ Corrected variables
```

```
gen CC2_corr=CC2
```

```
gen CC4_corr=CC4
```

```
*/ Step 1
```

```
replace CC4_corr=1 if CC2==2 & CC4==3
```

```
*/ Step 2 : Coding of missing data on CC2 and CC4
```

```
replace CC2_corr = 2 if CC2==. & CC4==1
```

```
replace CC2_corr = 1 if CC2==. & CC4==2
```

```
replace CC4_corr = 1 if CC2==2 & CC4==.
```

```
*/ Step 3 : Coding of inconsistencies between CC2 and CC4 into missing data
```

```
replace CC4_corr = . if CC2==1 & CC4==1
```

```
replace CC2_corr = . if CC2_corr==2 & CC4_corr==2
```

```
replace CC4_corr = . if CC2_corr==2 & CC4_corr==2
```

*/ Specific coding applied to Finland and Sweden
* For Sweden,
replace CC4_corr=1 if CC2_corr==2 & region=="SE"

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TABLES AND FIGURES

Table 1 – Predicted probabilities of self-reported chronic health conditions in students, without and with restriction in their school participation, adjusted for sex and age distribution, by country (%)

Countries	n (1)	Students with CC with or without restriction in participation		Students with CC with restriction in participation (2)	
		%	95% CI	%	95% CI
Armenia	4,505	8.4	(7.5 ; 9.2)	1.9	(1.5 ; 2.3)
Austria	3,921	17.4	(16.2 ; 18.6)	na	na
Azerbaijan	4,393	12.0	(11.0 ; 13.0)	2.7	(2.2 ; 3.2)
Bulgaria	4,548	14.3	(13.2 ; 15.3)	na	na
Czech Republic	10,144	26.5	(25.6 ; 27.5)	6.7	(6.2 ; 7.3)
Denmark	3,134	18.9	(17.6 ; 20.3)	4.7	(4.0 ; 5.4)
England	3,268	23.7	(22.1 ; 25.2)	7.3	(6.4 ; 8.2)
Finland (3)	2,126	28.2	(26.2 ; 30.3)	6.2	(5.1 ; 7.4)
France	9,032	17.5	(16.6 ; 18.4)	3.5	(3.1 ; 4.0)
Georgia	3,973	11.3	(9.9 ; 12.8)	2.3	(1.8 ; 2.8)
Hungary	3,679	19.4	(18.1 ; 20.7)	2.4	(1.9 ; 2.9)
Ireland	3,724	20.4	(19.1 ; 21.7)	5.7	(4.9 ; 6.4)
Macedonia	4,543	10.1	(9.2 ; 11.0)	2.0	(1.6 ; 2.4)
Poland	5,164	15.0	(14.1 ; 16.0)	3.4	(2.9 ; 4.0)
Republic of Moldova	4,598	12.3	(11.4 ; 13.3)	na	na
Scotland	4,943	17.0	(15.8 ; 18.2)	5.4	(4.7 ; 6.1)
Slovakia	4,731	22.5	(21.3 ; 25.2)	6.1	(5.4 ; 6.7)
Sweden	4,014	23.5	(22.2 ; 24.8)	9.4	(8.5 ; 10.3)
Wales	15,176	19.2	(18.5 ; 19.9)	6.7	(6.2 ; 7.1)
All countries	99,616	18.0	(17.8 ; 18.3)	4.4	(4.3 ; 4.6)

(1) Number of observations with complete data on the main question on CC status

(2) Percentages were provided among complete data on the subsequent question related to the participation. The majority of country has less than 5% of missing data except for Czech Republic (13.8%) and Georgia (10.3%).

(3) Finland collected data on CC only from 13- and 15-year-olds

Abbreviation: CC : chronic conditions; na : not available; CI: confidence interval

Note: Austria, Bulgaria and Republic of Moldova did not ask the question on restriction in participation

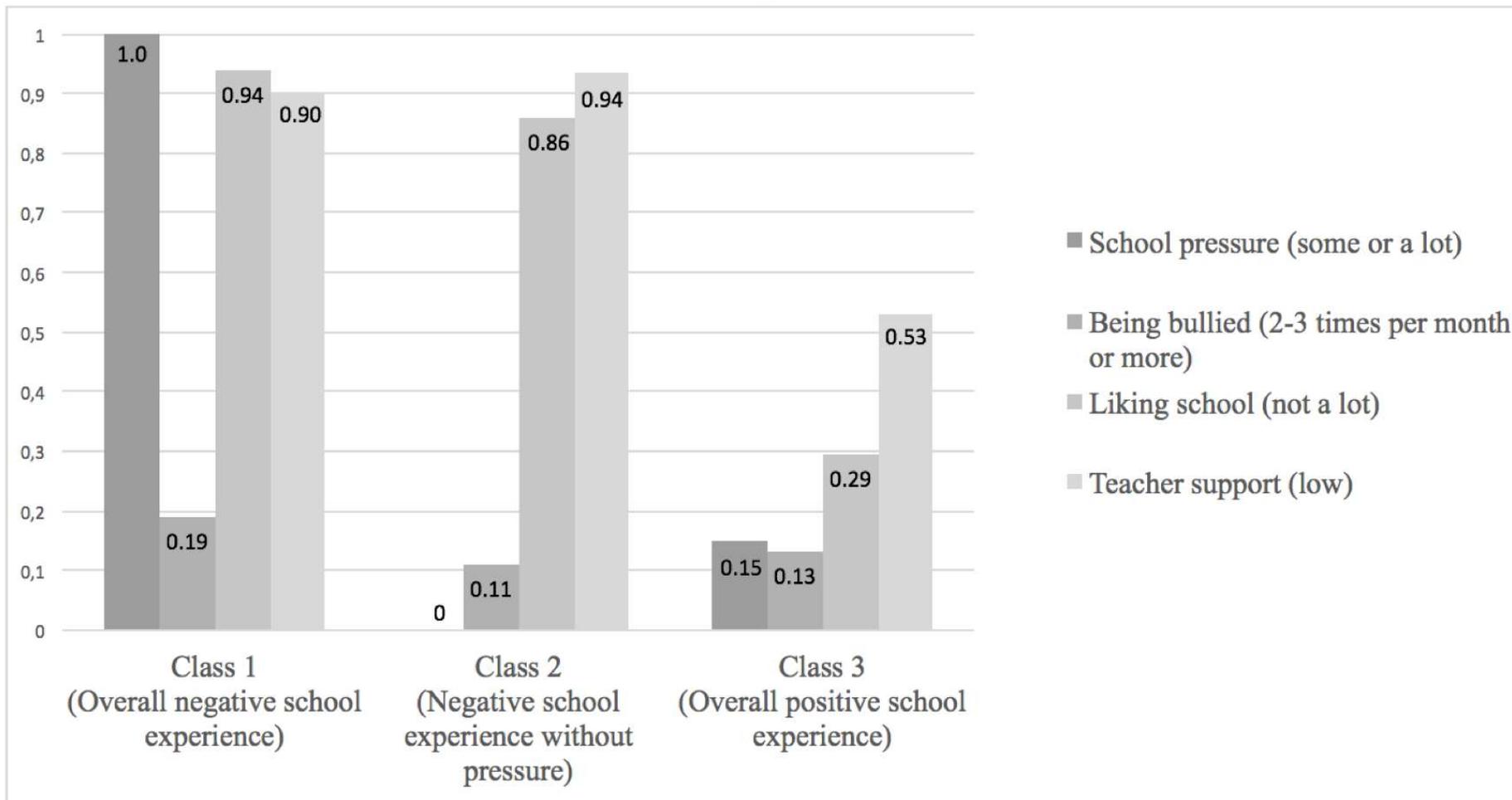
Table 2 – Demographic, school experiences items and life satisfaction by chronic condition (CC) status

	n	With CC n=17,885	Without CC n=81,731	Wald test p-value adjusted for country
Gender				
Girls	50,361	51.8	50.4	0.002
Boys	49,255	48.2	49.6	
Age				
11 years old	32,859	31.6	33.3	<0.001
13 years old	35,514	35.6	35.0	
15 years old	30,797	32.9	31.7	
School satisfaction				
High	29,111	25.5	30.8	<0.001
Low	68,447	74.5	69.2	
Schoolwork pressure				
Not pressured	64,465	59.7	67.2	<0.001
Pressured	33,067	40.3	32.8	
Teacher support				
High	16,276	15.3	17.5	<0.001
Low	79,124	84.7	82.6	
Victims of bullying				
No	85,602	85.5	91.1	<0.001
Yes	9,482	14.5	8.9	
Life satisfaction				
High (score 6-10)	85,723	83.0	88.2	<0.001
Low (score 0-5)	12,491	17.0	11.8	

Figure 1– Estimated posterior probability of school experiences items by latent class among students with chronic condition (CC) (n=17,514)

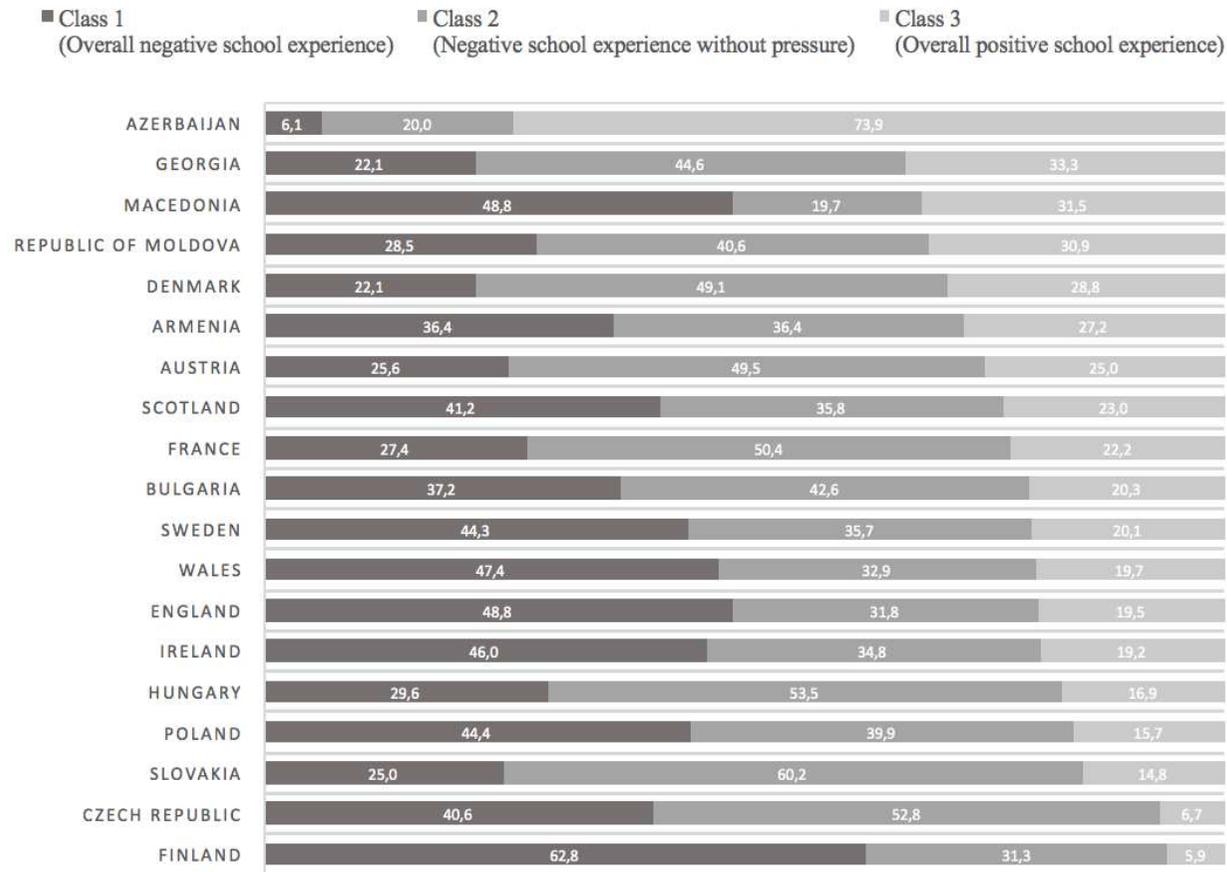
Figure 2- Distribution of each class by country among students with chronic condition (CC)

Figure 3 – Comparison of prevalence of chronic condition (CC) with proportion of students having an overall positive school experience (class 3) by country



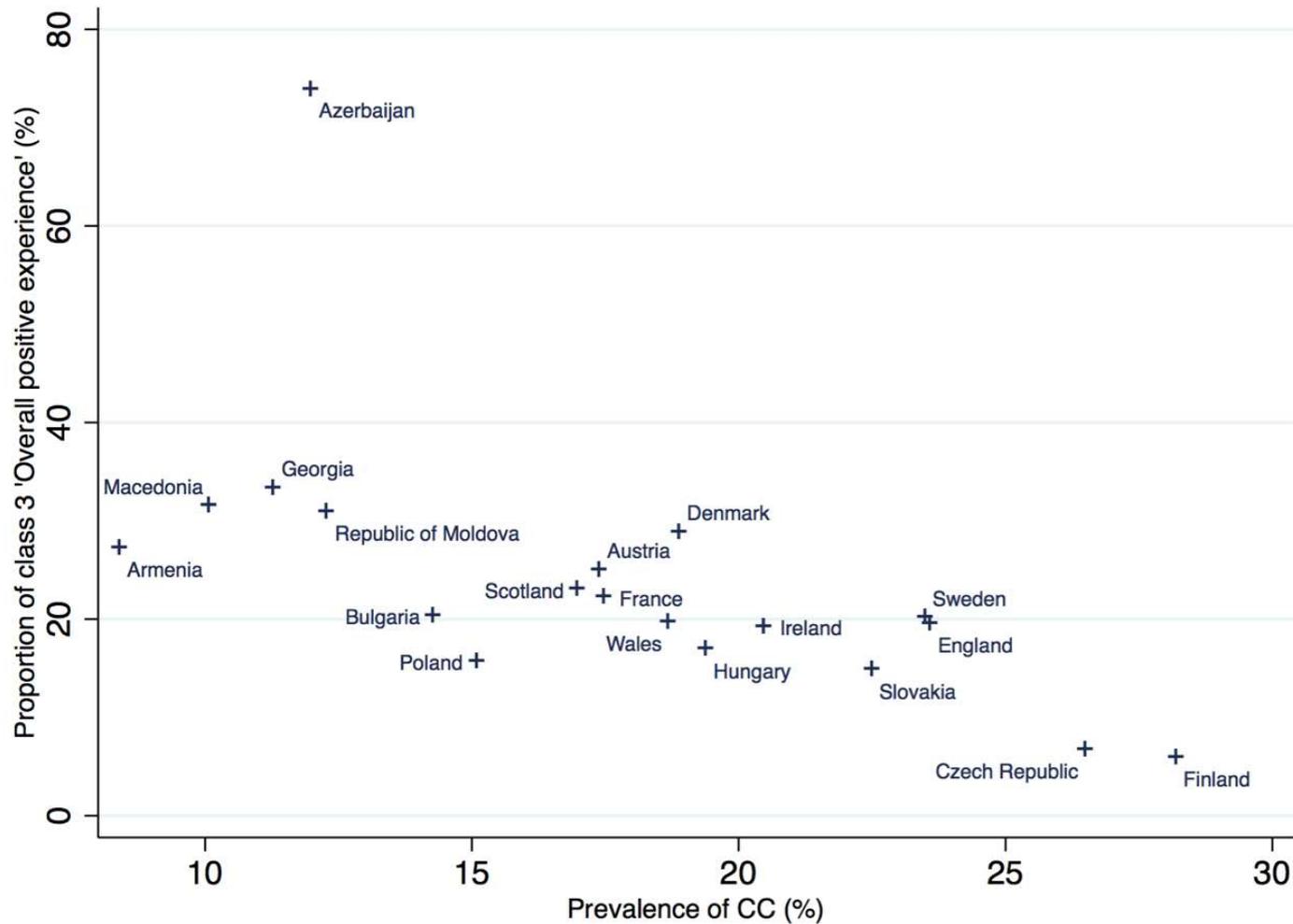
Example of interpretation: the probability for students reporting low teacher support to belong to class 1 is 0.90

Figure 1– Estimated posterior probability of school experiences items by latent class among students with chronic condition (CC) (n=17,514)



Note: Countries are ordered by the percentage of the class 3
 Example of interpretation: in Azerbaijan, the prevalence of the subgroup of students with CC having an "overall negative school experience" is 6,1%

Figure 2- Distribution of each class by country among students with chronic condition (CC)



Note: Spearman's correlation coefficient = -0.7912 ($p < 0.001$) (all countries) and -0.7709 ($p < 0.001$) (after excluding Azerbaijan)

Figure 3 – Comparison of prevalence of chronic condition (CC) with proportion of students having an overall positive school experience (class 3) by country

SUPPLEMENTAL MATERIAL

Chronic health conditions and school experience in school-aged children in 19 European countries

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Online Resource 1 – Main characteristics by country (age, sex)

	Gender		Age group	
	Males % (95%CI)	11 yrs % (95%CI)	13 yrs % (95%CI)	15 yrs % (95%CI)
Azerbaijan	48.2 (46.7,49.6)	34.5 (32.7,36.2)	33.6 (32.0,35.3)	31.9 (30.4,33.5)
Austria	49.3 (46.7,52.0)	32.0 (27.1,37.2)	35.2 (30.0,40.6)	32.9 (27.7,38.5)
Armenia	49.9 (48.0,51.7)	31.8 (28.1,35.7)	34.7 (30.8,38.8)	33.6 (26.9,40.9)
Bulgaria	48.4 (45.7,51.1)	36.5 (32.1,41.1)	30.1 (26.9,33.6)	33.4 (28.1,39.1)
CzechRepublic	50.1 (49.1,51.1)	32.6 (31.2,34.0)	34.4 (33.5,35.3)	33.0 (31.9,34.0)
Denmark	48.6 (46.5,50.6)	43.2 (37.9,48.6)	32.7 (29.5,36.2)	24.1 (20.9,27.6)
Finland	49.3 (47.5,51.1)	33.9 (30.2,37.9)	32.9 (30.0,35.9)	33.2 (29.9,36.6)
France	49.2 (47.9,50.6)	34.3 (29.1,40.0)	40.0 (34.7,45.6)	25.7 (20.7,31.3)
Georgia	49.7 (47.8,51.7)	32.8 (29.9,35.9)	35.4 (32.1,38.9)	31.8 (29.2,34.4)
Hungary	47.2 (44.9,49.5)	33.4 (27.5,39.8)	36.3 (30.4,42.6)	30.4 (24.3,37.2)
Ireland	50.6 (45.0,56.2)	33.3 (26.5,40.9)	38.3 (33.8,42.9)	28.5 (23.8,33.6)
Republic of Moldova	50.1 (48.5,51.8)	33.7 (30.8,36.7)	32.9 (31.1,34.8)	33.4 (31.1,35.9)
Poland	49.2 (47.6,50.7)	32.8 (28.8,37.0)	33.1 (29.3,37.1)	34.1 (28.6,40.1)
Slovakia	51.3 (49.7,52.9)	33.1 (31.2,35.2)	39.8 (38.0,41.7)	27.0 (25.5,28.6)
Sweden	49.7 (47.9,51.5)	27.8 (22.1,34.3)	33.9 (27.6,40.8)	38.3 (31.8,45.3)
Macedonia	48.9 (47.0,50.8)	34.6 (31.5,37.8)	33.3 (30.3,36.4)	32.1 (26.5,38.3)
England	51.6 (44.4,58.6)	38.9 (32.5,45.8)	35.3 (30.6,40.4)	25.7 (21.3,30.7)
Scotland	48.2 (46.8,49.6)	37.4 (30.3,45.1)	33.7 (28.0,39.9)	28.9 (23.8,34.7)
Wales	50.1 (48.1,52.0)	34.5 (31.8,37.2)	33.2 (30.3,36.2)	32.4 (28.8,36.2)

Online Resource 2: Distribution of CC by country and by age group

Country	11 yrs		13 yrs		15 yrs	
	%	CI	%	CI	%	CI
Armenia	8.1	[6.6,9.9]	7.7	[6.4,9.3]	9.5	[7.8,11.5]
Austria	15.7	[13.6,18.0]	16.9	[14.9,19.2]	19.4	[17.1,22.1]
Azerbaijan	18.6	[14.9,23.1]	10.6	[8.4,13.2]	6.5	[5.2,8.1]
Bulgaria	12.9	[10.8,15.4]	13.9	[11.4,16.9]	16.2	[14.4,18.3]
Czech Republic	22.0	[20.4,23.7]	27.1	[25.5,28.7]	29.9	[28.3,31.5]
Denmark	18.9	[17.0,21.0]	18.0	[14.7,21.9]	20.2	[17.5,23.2]
Finland		0	28.8	[25.8,32.0]	27.7	[24.4,31.2]
France	17.0	[15.3,18.8]	17.9	[16.4,19.5]	17.6	[15.8,19.5]
England	22.3	[19.6,25.3]	25.5	[23.0,28.3]	23.1	[20.4,26.1]
Scotland	17.4	[15.1,20.0]	17.2	[14.9,19.7]	16.2	[13.8,19.0]
Wales	19.7	[18.4,21.1]	19.6	[18.3,20.9]	18.3	[17.1,19.5]
Georgia	12.2	[10.1,14.7]	11.4	[9.2,14.0]	10.2	[8.4,12.4]
Hungary	18.3	[15.8,21.0]	18.5	[16.0,21.3]	21.6	[19.0,24.4]
Ireland	18.7	[16.3,21.3]	21.8	[20.0,23.8]	20.4	[18.3,22.7]
Republic of						
Moldova	12.8	[11.1,14.7]	11.9	[10.2,13.8]	12.2	[10.3,14.4]
Macedonia	11.2	[9.7,13.0]	9.2	[7.8,10.7]	9.9	[8.3,11.8]
Poland	11.8	[10.1,13.8]	15.4	[13.4,17.7]	17.7	[16.0,19.6]
Sweden	23.1	[20.1,26.4]	22.6	[20.4,25.1]	24.4	[22.2,26.8]
Slovakia	21.3	[19.2,23.6]	22.7	[20.7,24.8]	23.8	[21.2,26.7]

Online Resource 3: Results from latent class analysis of 4 school experiences (school satisfaction, being bullied, school pressure, teacher accept among students with CC- HBSC 2018 (n=17,514)

# of LC	Loglikelihood	# parameters	AIC	BIC	SSABIC	Entropy
1	-69557.847	8	139131.694	139193.860	139168.437	NA
2	-34242.232	11	68506.465	68591.943	68556.986	0.534
3	-34066.531	18	68169.062	68308.935	68251.732	0.743
4	-33992.766	25	68035.531	68229.800	68150.352	0.574

Online Resource 4: Multilevel mixed-effects generalized linear models (Poisson regression with robust error variance) with random intercepts at the country and the school level

Variables	RR	(95% CI)
School experience - latent classes		
Class 1 (Overall negative school experience)	2.9	2.2-3.8
Class 2 (Ref) (Overall positive school experience)	1	
Class 3 (Low teacher acceptance w/o school pressure)	1.8	1.4-2.4
Age		
11 years old	1	
13 years old	1.1	1.0-1.3
15 years old	1.3	1.1-1.5
Gender		
Boys	1	
Girls	1.3	1.2-1.5
Parameters of the random model		
Variance (country level)	.0273104	.0125513
Variance (school level)	.0257651	.0189444
Number of observations	17,294	
Log pseudolikelihood	-7869.6788	
Wald chi2 pr=0	404.48	
Degree of freedom	5	
AIC	15752.21	