

# Trends in multiple recurrent health complaints in 15-year-olds in 35 countries in Europe, North America and Israel from 1994 to 2010

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**Background:** Health complaints are a good indicator of an individual's psychosocial health and well-being. Studies have shown that children and adolescents report health complaints which can cause significant individual burden.

**Methods:** Using data from the international Health Behaviour in School-aged Children study, this article describes trends in multiple recurrent health complaints (MHC) in 35 countries among  $N=237\,136$  fifteen-year-olds from 1994 to 2010. MHC was defined as the presence of two or more health complaints at least once a week. Logistic regression analysis was performed to evaluate trends across the five survey cycles for each country. **Results:** Lowest prevalence throughout the period 1994–2010 was 16.9% in 1998 in Austria and highest in 2006 in Israel (54.7%). Overall, six different trend patterns could be identified: No linear or quadratic trend (9 countries), linear decrease (7 countries), linear increase (5 countries), U-shape (4 countries), inverted U-shape (6 countries) and unstable (4 countries). **Conclusion:** Trend analyses are valuable in providing hints about developments in populations as well as for benchmarking and evaluation purposes. The high variation in health complaints between the countries requires further investigation, but may also reflect the subjective nature of health complaints.

## Introduction

Health complaints are an important indicator of an individual's psychosocial health and well-being.<sup>1</sup> The majority of children and adolescents do not have any serious diagnosable health problems; however, a growing number experience a variety of health complaints, such as pain, nervousness and sleeping difficulties. Subjective health complaints may indicate a more serious underlying health problem.<sup>2</sup> Clustering or co-occurrence of health complaints is common among adolescents.<sup>3</sup> Recurrent health complaints not only compromise the health of the individual, but also have negative consequences on their everyday functioning, e.g. school attendance.<sup>4</sup> Persisting symptoms can develop into chronic and more serious health problems later on in life<sup>5</sup>, early identification is, therefore, essential. Girls and boys differ in terms of their risk for health complaints, with girls reporting psychosomatic symptoms more often than boys. Health complaints also increase with age.<sup>6</sup> One generally differentiates between somatic (pains) and psychological complaints (also referred to as mental health complaints<sup>7</sup>).

To date, no publication exists on international trends in health complaints in adolescents. Previous publications have looked at

specific types of symptoms only and/or are limited to national samples.<sup>7–10</sup> The majority of these national trend papers showed an increasing trend in health complaints in children and adolescents,<sup>1,7,10</sup> with the exception of Dür et al.<sup>8</sup> who report a decreasing trend for Austria for 1994–2006. Ottova et al.<sup>9</sup> also found a slightly decreasing tendency in children and adolescents in Germany (between 2006 and 2010). This article will describe the trends in multiple health complaints (MHC) in 15-year-old adolescents in Europe, North America and Israel from 1994 to 2010.

## Methods

Data were obtained from the international Health Behaviour in School-aged Children (HBSC) study, a cross-sectional survey in 11-, 13- and 15-year-old schoolchildren in Europe, North America and Israel. The survey is conducted every four years and all participating countries follow a standardized research protocol.<sup>11</sup> The present analyses are based on data from 1994, 1998, 2002, 2006 and 2010 from 35 countries/regions. Given the fact that the prevalence of health complaints increases with age,<sup>12</sup> we focused on 15-year-olds only as this group experiences the highest burden. The median sample size at country level was 1349, 1431, 1390, 1561 and

1648 for survey years 1994, 1998, 2002, 2006 and 2010, respectively. Time points where countries had less than half of the recommended sample size were excluded from the analysis (Belgium-French and Estonia, both 1998). This rule did not apply to Greenland due to their relatively small population size. The sample sizes ranged from 238 (Greenland, 2002) to 5441 (Canada, 2010). A full overview of sample sizes for 15-year-olds by country and survey year is provided in table 1.

Adolescents were asked to indicate how often they had experienced the following symptoms in the last 6 months: headache; stomach ache; feeling low; irritable or bad tempered; feeling nervous; difficulties in getting to sleep; and feeling dizzy. Response options ranged from 'about every day' to 'rarely or never'. The psychometric properties of the HBSC symptom checklist were previously tested using Confirmatory Factor Analysis and Differential Item Functioning. All items proved to be unidimensional.<sup>12</sup> Quantitative studies show an acceptable test-retest reliability of Pearson- $r=0.79$  for the entire HBSC symptom scale and Pearson- $r=0.61-0.76$  for the single symptoms.<sup>13</sup> We dichotomized the measure into two or more health complaints more than once a week (MHC) vs. less, based on HBSC recommendations and previous literature (e.g. Ravens-Sieberer et al.<sup>14</sup>).

Gender-adjusted prevalences of MHC were calculated for each country and each survey year using the entire study population as reference. Logistic regression analysis was used to evaluate gender adjusted temporal trends per 4 years of study in MHC within each country. Time was used as a covariate to model the shape of the observed trends of the included 35 countries in a parsimonious way. Linear time trends were examined for countries with 3 time points, whereas linear and quadratic time trends were tested for countries with 4 or 5 time points. Higher order terms were excluded because a maximum of five time points were available. The time variable was centred to avoid collinearity with its squared term. The significance of the quadratic term was evaluated by entering both values of the time variable and the square of the time variable. The quadratic term was dropped from the model if it was not significant (Wald-test), and the linear term was then tested. The difference between the maximum prevalence and the minimum prevalence across survey years was used as an absolute effect size measure (ES). Because of the clustered sample design, we adjusted the  $P$ -value to be more conservative using a design factor of 1.2 corresponding to an unadjusted  $P$ -value of 0.018 indicating statistical significance.

## Results

The prevalence of MHC varied considerably by country and survey cycle (table 2). In 2010, the prevalence of MHC varied from 19.5% in Slovenia to 52.3% in Italy, whereas in 2002, it ranged from 18.2% in Germany to 53.8% in Israel. The following patterns were observed: Seven countries displayed a linear decline (Croatia, Greece, Macedonia, Portugal, Slovenia, Spain and Ukraine), whereas five countries showed a linear increase (Belgium-Flemish, Denmark, Finland, Greenland and Norway). A U-shaped trend, or an initial decline followed by an increase at a later cycle, was observed in four countries (Austria, Canada, Czech Republic and Scotland). An inverted U-shape, or an initial increase followed by a decrease at a later cycle, was observed in six countries (England, Estonia, Lithuania, Poland, Slovakia, Sweden). Four countries (France, Latvia, Russia and USA) displayed unstable patterns with considerable fluctuations between survey years. The remaining nine countries did not display a clear linear or quadratic trend of MHC and were relatively stable over time. Most notable increases in MHC were found in Greenland (ES = 12.5), Norway (ES = 10.7), Poland (ES = 10.3) and Czech Republic (ES = 12.2). In contrast, USA (ES = 9.0), Portugal (ES = 8.6) and Spain (ES = 8.6) displayed rather sharp declines over time.

**Table 1** Sample size (15-year-olds) by country and survey year

Country	1994	1998	2002	2006	2010
Austria	1815	1376	1277	1494	1820
Belgium-Flemish	1349	1559	2030	1616	1226
Belgium-French	1676	1676	1381	1414	1341
Canada	2219	2403	1207	2289	5441
Croatia	–	–	1435	1630	2424
Czech Republic	–	1229	1660	1665	1522
Denmark	1314	1546	1369	1552	1226
England	–	1872	1764	1451	1118
Estonia	1179	–	1267	1587	1398
Finland	1194	1545	1741	1685	2110
France	1260	1245	2614	2222	1906
Germany	1050	1599	1741	2552	1640
Greece	–	1322	1324	1416	1648
Greenland	375	599	238	417	397
Hungary	1759	818	1310	1187	1733
Ireland	–	1457	919	1685	1695
Israel	1352	1385	1547	1997	1352
Italy	–	–	1220	1335	1546
Latvia	1263	1265	1112	1330	1375
Lithuania	1759	1435	1904	1861	1792
Macedonia	–	–	1399	1896	1536
Netherlands	–	–	1273	1363	1457
Norway	1637	1670	1622	1534	1339
Poland	1540	1636	2127	2287	1410
Portugal	–	1245	800	1383	1553
Russia	1354	1322	2574	2754	1847
Scotland	1373	1727	1149	2198	2567
Slovakia	934	843	–	1252	1914
Slovenia	–	–	1052	1561	1815
Spain	–	–	1756	3065	2003
Sweden	1151	1151	1218	1526	2090
Switzerland	–	1832	1501	1500	2246
Ukraine	–	–	1601	1829	1897
USA	–	1808	1625	1284	1892
Wales	1266	1427	1164	1350	1637
Total sample	28 819	37 316	49 921	59 167	61 913

Legend: '–' denotes no survey

## Discussion

The trends reported here are based on international HBSC data over a period of 16 years. We analysed the trends for MHC, which reflect the more burdensome end of the spectrum, i.e. accumulation of health symptoms that occur on a regular and frequent basis. Moreover, we focused on 15-year-olds, as they are known to have a higher prevalence of health complaints than younger age groups.<sup>10,14</sup> Age- and gender-specific differences are presented in another paper.

A majority of the countries showed either a rather stable pattern or a changing trend (U-shape or inverted U-shape). For most of these countries, the trends corresponded with the trends in life satisfaction.<sup>15</sup> A relatively small number of countries had a clear downward trend and high fluctuations emerged in only four countries. Interestingly, all four of these countries showed a uniform up-down-up-down pattern in 1994–2010. The fact that the countries are fairly evenly distributed across the six different 'trend types' raises the question why countries differ so much in health complaints. Individual circumstances, such as high expectations (from family, school, peers) and a certain lifestyle can be a source of stress which raises adolescents' vulnerability for health symptoms.<sup>16</sup> Typical stressors are school pressure, bullying and familial problems (e.g. divorce, financial problems), but also external and inner pressure and concerns about the future play a role. The current social and economic situation of a country may intensify this effect. Biological factors, such as early pubertal onset can also take effect. Although, unclear whether there is a secular trend in decreasing pubertal age, research on pubertal timing

**Table 2** Gender adjusted temporal trends in multiple recurrent health complaints in 15-year-old adolescents (1994–2010)

Country	Prevalence (%)					Linear Term				Quadratic Term				Trends	
	1994	1998	2002	2006	2010	B	SE	OR	P-value	B	SE	OR	P-value	ES	Trend type <sup>a</sup>
Austria	21.5	16.9	20.5	20.8	24.4	.013	.005	1.013	.008	.004	.001	1.004	.000	7.5	4
Belgium-Flemish	22.0	25.6	27.8	26.5	27.7	.015	.005	1.015	.002					5.8	3
Belgium-French	40.2		38.1	39.5	39.4	-.001	.005	.999	.772					2.1	1
Canada	39.4	33.0	34.6	34.5	37.5	-.003	.003	.997	.320	.004	.001	1.004	.000	6.4	4
Croatia	–	–	36.6	35.7	32.4	-.026	.009	.974	.003					4.2	2
Czech Republic	–	33.1	30.0	35.5	42.2	.037	.006	1.038	.000	.007	.002	1.007	.000	12.3	4
Denmark	18.1	22.8	21.2	24.7	24.7	.022	.005	1.022	.000					6.6	3
England	–	30.4	35.8	34.6	34.0	.012	.006	1.012	.065	-.004	.002	.996	.011	5.4	5
Estonia	32.1		38.8	34.6	32.8	-.008	.006	.992	.174	-.004	.001	.996	.000	6.7	5
Finland	26.0	26.5	27.6	30.7	28.8	.012	.004	1.012	.008					4.7	3
France	38.2	43.4	34.7	41.1	39.3	.002	.004	1.002	.688					8.7	6
Germany	21.3	22.9	18.2	23.5	21.8	.005	.005	1.005	.369					5.3	1
Greece	–	50.6	53.6	46.8	47.7	-.016	.006	.984	.009					6.8	2
Greenland	20.8	25.0	30.0	31.2	33.3	.039	.009	1.040	.000					12.4	3
Hungary	39.8	37.9	37.2	38.9	36.0	-.009	.004	.991	.031					3.8	1
Ireland	–	31.8	31.8	32.4	34.8	.009	.006	1.009	.154					3.0	1
Israel	52.6	53.6	53.8	54.7	49.8	-.004	.004	.996	.346					4.9	1
Italy	–	–	50.8	52.3	52.3	.009	.010	1.009	.384					1.6	1
Latvia	29.8	36.6	32.8	37.9	34.1	.012	.005	1.012	.014	-.003	.001	.997	.005	8.1	6
Lithuania	36.3	40.7	41.5	43.3	38.3	.008	.004	1.008	.047	-.003	.001	.997	.000	7.0	5
Macedonia	–	–	39.2	36.7	33.7	-.031	.010	.969	.002					5.5	2
Netherlands	–	–	23.2	24.4	22.4	-.007	.012	.993	.558					2.1	1
Norway	21.8	24.8	28.3	27.6	32.5	.031	.005	1.031	.000					10.7	3
Poland	29.0	39.3	39.0	37.8	39.3	.021	.004	1.021	.000	-.004	.001	.996	.000	10.3	5
Portugal	–	33.5	34.3	25.7	26.3	-.036	.007	.965	.000					8.6	2
Russia	33.8	39.3	32.1	36.6	36.0	.003	.004	1.003	.530					7.2	6
Scotland	30.6	30.9	30.8	28.8	34.4	.006	.004	1.006	.129	.002	.001	1.002	.008	5.6	4
Slovakia	32.0	37.2		42.9	37.5	.019	.005	1.019	.000	-.005	.001	.995	.000	10.9	5
Slovenia	–	–	26.5	21.7	19.5	-.049	.012	.952	.000					7.0	2
Spain	–	–	41.9	34.5	33.3	-.047	.009	.954	.000					8.6	2
Sweden	30.4	35.5	38.2	40.7	35.9	.018	.005	1.018	.000	-.004	.001	.996	.000	10.3	5
Switzerland	–	28.7	24.7	30.2	28.9	.006	.006	1.006	.275					5.5	1
Ukraine	–	–	45.0	43.3	40.0	-.028	.009	.973	.002					5.0	2
USA	–	45.7	38.7	45.9	36.9	-.022	.005	.978	.000					9.0	6
Wales	29.6	32.7	33.4	30.1	31.5	.001	.005	1.001	.912					3.9	1

a: Trend type: 1 = no linear or quadratic trend, 2 = linear decrease, 3 = linear increase, 4 = U-shape, 5 = inverted U-shape, 6 = unstable  
Legend: '–' denotes no survey

indicates that children who experience early puberty are at a greater risk for psychosocial difficulties.<sup>17</sup> LeResche et al.<sup>17</sup> found that pubertal development status predicted pain and psychosomatic symptoms better than age, although the results differed for boys and girls.

The prevalence of MHC varied greatly between the survey years (>30% between countries) which can have several reasons. It is plausible that country-specific characteristics, such as the economic situation, high unemployment rates, rising social insecurity may account for some of these large country differences. National wealth and income inequality were investigated in Ottová-Jordan et al.<sup>18</sup>, but the effects were small. Macro-level factors are more likely to function indirectly through mediating factors, such as the family's economic situation/affluence status, parental or individual employment status,<sup>19</sup> or through other social context factors. The association between individual social position and health has in fact not decreased over the past 16 years.<sup>20</sup>

Despite large differences in the prevalence between and within countries, health complaints are an internationally relevant public health issue. Trend analyses can deliver important hints on developments in the population, and provide an important basis for benchmarking/target goal planning, as well as for evaluation purposes. In Sweden for instance, data on deteriorating mental health in children and adolescents<sup>21</sup> has activated the national government to put mental health at the top of their priority agenda.

HBSC data facilitates the investigation of various research questions through a standardized data collection procedure and the assessment of a wide range of determinants and health

outcomes. Although trend data cannot investigate causal relationships, they increase the information value of cross-sectional studies by facilitating an analysis of patterns across time and the monitoring of the health of different populations. The lack of information between the survey years and the fact that only marginal time points were considered, though, limit the generalizability of the results.

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## Key points

- Multi-national perspective on the prevalence of health complaints in 35 countries in Europe, North America and Israel from 1994 to 2010.
- Despite generally rather stable patterns of health complaints across countries, great variation in prevalence rates between countries and survey years.
- Highest reported prevalence 54.7% in 2006 is more than three times as high as the lowest reported value in 1998 (16.9%).
- Trend data can deliver important insight on long-term developments in health and is useful for benchmarking and evaluation purposes.

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