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ORIGINAL ARTICLE

# Socioeconomic inequalities in mental health and health-related quality of life (HRQOL) in children and adolescents from 11 European countries

**Luis Rajmil · Michael Herdman · Ulrike Ravens-Sieberer · Michael Erhart · Jordi Alonso · The European KIDSCREEN group**

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**Abstract**
*Objectives* To assess the presence and magnitude of social inequalities in mental health and health-related quality of life (HRQOL) in the population aged 8–18 years in 11 European countries.
*Methods* Cross-sectional surveys were carried out in representative samples of children/adolescents (8–18 years) from the participating countries of the KIDSCREEN project. Mental health was assessed using the Strengths and Difficulties Questionnaire (SDQ), and HRQOL by means of the KIDSCREEN-10. Socioeconomic status (SES) was assessed using the Family Affluence Scale and parental level of education. The association between health outcomes and SES was analyzed with the regression-based relative index of inequalities (RII) and population attributable risk.
*Results* A total of 16,210 parent–child pairs were included. The SDQ showed inequalities in mental health according to family level of education in all countries (RII = 1.45; 1.37–1.53). The RII for HRQOL was 2.15 (1.79–2.59) in the whole sample, with less consistent results by age and country.
*Conclusions* Socioeconomic inequalities in mental health were consistently found across Europe. Future research should clarify the causes of these inequalities and define initiatives which prevent them continuing into adulthood.

**Keywords** Adolescents · Children · Inequalities · Health-related quality of life · Mental health

Members of the KIDSCREEN group are listed in "Appendix".

L. Rajmil (✉)
Catalan Agency for Health Information, Assessment and Quality (CAHIAQ), Carrer de Roc Boronat, 81–95 (2na planta), 08005 Barcelona, Spain
e-mail: lrajmil@gencat.cat; lrajmil@imim.es

L. Rajmil · J. Alonso
CIBER en Epidemiología y Salud Pública (CIBERESP), Madrid, Spain

L. Rajmil · J. Alonso
Institut de Recerca Hospital del Mar (IMIM), Barcelona, Spain

M. Herdman
Insight Consulting and Research, Mataró, Spain

U. Ravens-Sieberer
Department of Psychosomatics in Children and Adolescents, University Medical Center, Hamburg, Germany

M. Erhart
Zentralinstitut für die kassenärztliche Versorgung in Deutschland, Berlin, Germany

## Introduction

Numerous studies have shown the existence of inequalities in health and mortality in adult populations (Mackenbach et al. 1997, 2008; Vågerö and Erikson 1997). Social inequalities in child health refer to the health differences between populations of children defined according to their social condition, economic status, demography or geography. Health inequities are determined socially and are unfair and modifiable differences (Starfield 2008). There is considerable evidence indicating the existence of social class gradients in health and mortality in children and adolescents (Victora et al. 2003; Goodman 1999; Starfield et al. 2002a, b), although some authors have suggested that social inequalities in health disappear or are attenuated in early adolescence (equalization hypothesis) (Spencer 2005;

West 1997; MacIntyre and West 1995). Many of the studies on social inequalities in health carried out to date in children and adolescents have, nevertheless, been performed in only one country or have used only limited indicators of health or socioeconomic status (SES) (Emerson et al. 2005; Goodman 1999; MacIntyre and West 1995; Starfield et al. 2002a, b; Spencer 2005; West 1997). A small number of studies have performed comparisons at the international level. The International study Health-Behavior in School-aged children (HBSC) showed that restricted access to material resources and psychosocial strains at individual level were potential factors for inequalities in health complaints (Ravens-Sieberer et al. 2009), in the prevalence rates of substance use (Pitel et al. 2013) or in bullying behavior (Elgar et al. 2013). On the other hand, a combined individual and area deprivation model predicted that the most disadvantaged and younger students were eight times more likely to have poor self-rated health compared to the least disadvantaged students (Torsheim et al. 2004). Social structure and level of development of a welfare state have also been shown to play a role in the strength of association between low socioeconomic position and poor health (Zambon et al. 2006). These studies generally focused on single-item outcome indicators or were based on self-reported symptoms with unclear cross-cultural equivalence (Torsheim et al. 2004; Zambon et al. 2006), and a few studies have explored the relationship between social inequalities and health-related quality of life (HRQOL) (von Rueden et al. 2006).

Socioeconomic status and family environment are known to be associated with mental health in childhood (Amone-P'Olak et al. 2009; Bradley and Corwyn 2002; Curtis et al. 2001; Dooley and Stewart 2007). A variety of mechanisms linking SES to child well-being and mental health have been proposed, with most focusing on differences in access to material and social resources, reactions to stress-inducing conditions by both the children themselves and their parents (Bradley and Corwyn 2002) or a multilevel multidomain approach (Schreier and Chen 2012). A small number of international studies have also explored the influence of factors such as cognitive abilities to mediate the adverse effects of SES on mental health (Huisman et al. 2012).

The KIDSCREEN European project was designed to develop a standardized HRQOL questionnaire for children and adolescents 8–18 years old and was performed in 13 European countries (Ravens-Sieberer et al. 2008). The study also collected data on SES, physical and mental health status, and perceived health and well-being. It therefore provided an opportunity to study inequalities over a range of different aspects of health in several European countries using a standard methodology.

The objective of the present study was to assess the presence and magnitude of inequalities in mental health and HRQOL in the population aged 8–18 years among 11 European countries using two different approaches to assessing inequalities. A further objective was to explore patterns of age differences and socioeconomic inequalities across countries.

Based on the results of the literature review, we expected the pattern of inequalities to vary according to the outcome and SES measures analyzed (i.e., we expected inequality to be greater on self-reported family financial resources than on educational level, and on mental health compared to HRQOL). We also hypothesized that inequalities would be less marked at intermediate ages (equalization hypothesis) and that the pattern would vary according to the level of development of the welfare state (i.e., greater inequalities in eastern European countries compared to western European countries and no clear pattern in the Mediterranean countries).

## Methods

### Participants

The present study was based on the fieldwork of the KIDSCREEN project, a cross-sectional study carried out in 13 European countries during 2003. In the present study, data from Ireland and Sweden were excluded from the analysis due to unavailability of parents' data. The following countries are the focus of this investigation: Austria (AT), Czech Republic (CZ), France (FR), Germany (DE), Greece (EL), Hungary (HU), Poland (PL), Spain (ES), Switzerland (CH), the Netherlands (NL), and the United Kingdom (UK). The target population was children and adolescents 8–18 years old. The sample was designed to be representative by age, sex and region, as described elsewhere (Berra et al. 2007).

### Study design

Three approaches to sample selection and administration were followed: (1) telephone sampling followed by mail survey (Austria, Switzerland, Spain, France and the Netherlands), (2) school sampling and administration (Greece, Hungary), or school sampling and mail administration (Poland) and (3) multistage random sampling of communities and households (Czech Republic). In the UK, a combination of telephone and school sampling methods was used.

Telephone sampling was carried out using a computer-assisted telephone interview (CATI) which employed random-digit dialing (RDD). The sampling frame was

households with a fixed phone line. Households were contacted by telephone and asked to participate by trained interviewers. If the family member contacted agreed to participate, the questionnaire and other study materials were mailed together with a stamped, addressed envelope for return of the completed questionnaire. Two reminders were sent in cases of non-response (after 2 and 5 weeks).

In the case of school sampling, sample selection was based on school listings, and schools were randomly selected in each geographical or administrative region, except in Hungary where classrooms (not schools) were randomly selected by region. Children completed the questionnaires in school. Questionnaires for parents were sent with the children and collected during a second visit to schools after 3–7 days.

Multistage probability sampling was only used in the Czech Republic. Communities were randomly selected from all regions of the country. Households within each selected community were then randomly selected from the local telephone directory. Trained interviewers contacted families with potentially eligible children who had been identified by telephone. If the family agreed to participate in the study, the interviewer provided standardized information and left the questionnaires, which were collected again 2–5 days later. In all countries, questionnaires were self-administered.

Fieldwork was carried out between May and September 2003. All procedures were carried out following the data protection requirements of the European Parliament (directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data). The ethical and legal requirements in all participating countries were adhered to, and signed informed consent was obtained from all study participants.

## Mental health and HRQOL measures

Two outcome indicators were used in this study: mental health, and HRQOL.

Mental health status was assessed using the Strengths and Difficulties Questionnaire (SDQ) collected from parents. The SDQ is a brief behavioral screening questionnaire for children and adolescents that asks about their mental health symptoms and positive attitudes (Goodman 1997). It consists of 25 items measuring five dimensions. All items are scored on a three-point scale with: 0, not true; 1, somewhat true; and 2, certainly true. Higher scores indicate more problems except on the pro-social behavior dimension. Items are summed to give a total difficulties score ranging from 0 (no problems) to 40 (maximum problems). The SDQ has been shown to be valid and reliable (Goodman 2001; Goodman et al. 2000).

Health-related quality of life was assessed using the KIDSCREEN-10 Index (Ravens-Sieberer et al. 2010). The index includes ten items and was developed as a short version of the KIDSCREEN-27 (Ravens-Sieberer et al. 2007; Robitail et al. 2007) questionnaire for use in health surveys and epidemiological studies. It meets all of the necessary criteria for this type of questionnaire, including unidimensionality, good internal consistency (0·82) and satisfactory validity. The index includes questions on physical well-being, psychological well-being, autonomy and relationship with parents, peers and social support, and school environment. The scores on the KIDSCREEN-10 index were obtained by summing up scores from each item, then Rasch person parameters (PP) were assigned to each possible sum score. Mean values and standard deviations were applied from the multinational European sample described in this manuscript. The index score is transformed into $T$ values with a mean of 50 and a standard deviation (SD) of 10. Higher scores indicate better HRQOL. In the present study we stratified children into two categories based on their $T$ scores on the KIDSCREEN-10 index: individuals scoring 1 SD below the mean (score below 40) in the KIDSCREEN-10 index were defined as having poor HRQOL.

## Measures of SES

SES was assessed using the self-reported Family Affluence Scale (FAS) and parental level of education. The FAS is a child/adolescent self-report measure of family financial status with items on car ownership, having their own unshared room, the number of computers at home and how many times they spent on holidays in the past 12 months (Boyce et al. 2006; Currie et al. 1997). FAS scores were categorized as low (0–3), intermediate (4–5) and high (6–7). Parental level of education was collected from parents and coded according to the International Standard Classification of Education (ISCED) (UNESCO 1997; Eurostat 1996) as low (a maximum of lower secondary level, ISCED 0–2), medium (upper secondary level, ISCED 3–4) and high (university degree, ISCED 5–6).

## Analysis

The proportion of children reporting <1 SD on the KIDSCREEN-10 index, together with mean total difficulties scores on the SDQ were computed by SES measure for each country and for the overall sample. The relative index of inequalities (RII) (Mackenbach and Kunst 1997) was used to calculate the magnitude of inequalities in health. This index measures the size of differences in health across all SES levels. Each SES category (i.e., FAS or parental educational level) was given a rank score indicating the

proportion of the population having lower socioeconomic level. The RII can be interpreted as a relative risk for poor health comparing the hypothetically best-off person with the worst-off person in the SES hierarchy. Poisson regression analysis or logistic regression analysis, depending on the nature of the dependent variable, was used to obtain the RII and its 95 % confidence interval (95 % CI). Regression models were stratified by age and country, and adjusted by age, sex and country for the whole sample.

The population attributable risk (PAR) was also computed as a complementary measure of inequalities (Mackenbach and Kunst 1997). The PAR is the difference between the proportion of respondents with poor health status on the different health indicators in the overall population and the proportion in the wealthiest group divided by the proportion in the overall population.

Census data obtained from Eurostat (http://europa.eu.int/comm/eurostat/) was used to weight the sample to adjust for non-response bias by age and sex, and country population size. The STATA survey data analysis module was used to estimate variance in the total sample after applying weights to take into account population size in each country.

## Results

The final sample consisted of 16,210 children aged 8–18 years and their parents. The response rate for child–parent pairs ranged from 24.2 % (Spain) to 72.0 % (EL and CZ) across countries. Table 1 shows the sample characteristics. The percentage of children in the lowest category on the FAS varied considerably among countries, ranging from 8.3 % in France to 49 % in the Czech Republic. The same was true for parental level of education; the proportion of respondents in the lowest category ranged from 1.4 % in the Czech Republic to 44.8 % in Spain. Mental health measured by means of parent responses on the SDQ total difficulties score ranged from 6.4 in the UK to 10.0 in the Czech Republic; and <1 SD in the HRQOL index ranged from 4.4 % in Switzerland to 20 % in Poland.

Table 2 shows the results of the bivariate analysis. Higher (worse) scores were seen on the SDQ in children with low FAS category and lower family level of education. HRQOL was also observed to be generally lower in those with a lower socioeconomic status.

Table 3 shows the results for RII by country and for the whole sample. Overall, statistically significant RII values were seen on the two health indicators and using either of the SES measures. The SDQ showed inequalities in mental health according to family level of education in all countries, ranging from 1.22 (1.15–1.30) in PL to RII = 2.0 (1.86–2.21) in the UK. RII in HRQOL was 215 (1.79–2.59) according to the FAS. No statistically significant differences were found in HRQOL according to the level of education. Table 4 shows the results for RII stratified by age group and country. The figures were similar to the whole sample results, with homogeneous pattern of inequalities on mental health across countries and age groups, and similar results but to a lesser extent for HRQOL.

Figures 1 and 2 show the results for the two health indicators using PAR for the overall sample and by country. In the overall sample, PAR was 0.11 for poor mental health according to family level of education. At country level, PAR for HRQOL was particularly high in the Czech Republic, UK and Poland.

## Discussion

This study provides additional evidence of socioeconomic inequalities in mental health and quality of life in European child and adolescent populations. The results were particularly consistent when using the aggregate data, though at individual country level the results depended on the outcome measure used and the means of determining socioeconomic status. Using the RII, inequalities were most widespread for mental health, whereas a less clear pattern was observed for HRQOL.

The study had some limitations. Firstly, the response rate was low in some countries. To take this into account several strategies were applied to assess sample representativeness and possible response biases. For instance, a short telephone interview was carried out with non-responders and responders and comparative analyses showed few differences on major characteristics (age, gender) by country, and no differences were found on self-perceived health between respondents and non-respondents. Moreover, we did not find any specific relationships between sampling strategy, response rates and mean scores on mental health SDQ or HRQOL (KIDSCREEN-10 index). Likewise, the samples in all participating countries in our study showed a similar distribution by age and sex to EUROSTAT data, suggesting that the samples were representative at least on these two variables. A more detailed description of the methods and representativeness of the KIDSCREEN study are presented elsewhere (Berra et al. 2007). Secondly, the validity of the FAS and the educational level classification as measures of socioeconomic status is likely to vary across countries. Although both are recognized measures of socioeconomic status which have been previously used in multinational studies (Mackenbach et al. 2008; von Rueden et al. 2006; Zambon et al. 2006), the study would likely have benefited from the use of country-specific indicators where those exist. In contrast,

**Table 1** Socio-demographic characteristics and mental health status and health-related quality of life (HRQOL) of participants in the European KIDSCREEN study (2003)

| | Total[a] | AU | CZ | FR | DE | EL | HU | NL | PL | ES | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No of child–parent pairs[a] | 16,210 (100) | 1,434 | 1,593 | 1,017 | 1,719 | 1,167 | 1,959 | 1,850 | 1,670 | 870 | 1,685 | 1,247 |
| Sex | | | | | | | | | | | | |
| Male | 8,308 (51.3) | 51.0 | 51.5 | 51.1 | 51.3 | 51.4 | 51.0 | 51.2 | 51.2 | 51.4 | 51.4 | 51.3 |
| Female | 7,901 (48.7) | 49.0 | 48.5 | 48.9 | 48.7 | 48.6 | 49.0 | 48.8 | 48.8 | 48.6 | 48.6 | 48.7 |
| Age | | | | | | | | | | | | |
| 8–11 | 5,584 (34.4) | 36.7 | 35.0 | 35.4 | 34.7 | N/A | 35.2 | 37.6 | 32.1 | 34.0 | 36.9 | 37.5 |
| 12–15 | 6,982 (43.1) | 41.9 | 37.7 | 42.9 | 42.0 | 68.9 | 41.8 | 41.1 | 42.1 | 42.2 | 43.2 | 44.7 |
| 16–18 | 3,643 (22.5) | 21.5 | 27.3 | 21.7 | 23.3 | 31.1 | 23.0 | 21.3 | 25.8 | 23.8 | 19.9 | 17.8 |
| FAS[b] (%) | | | | | | | | | | | | |
| Low | 2,762 (17.4) | 14.0 | 49.0 | 8.3 | 11.6 | 36.8 | 30.7 | 9.9 | 37.4 | 20.4 | 11.1 | 9.2 |
| Medium | 7,258 (45.7) | 50.0 | 41.5 | 44.0 | 48.2 | 45.1 | 47.2 | 49.0 | 48.8 | 50.0 | 46.0 | 38.3 |
| High | 5,876 (37.0) | 35.9 | 9.4 | 47.7 | 40.1 | 18.1 | 22.1 | 41.1 | 13.7 | 29.6 | 42.9 | 52.5 |
| Parental level of education (%) | | | | | | | | | | | | |
| Primary education | 3,204 (20.0) | 4.5 | 1.4 | 24.7 | 14.7 | 24.7 | 23.7 | 11.2 | 26.5 | 44.8 | 6.3 | 10.1 |
| Secondary | 6,484 (40.5) | 74.0 | 66.7 | 21.1 | 55.8 | 35.8 | 41.6 | 51.8 | 50.1 | 23.2 | 49.8 | 32.1 |
| University | 6,323 (39.5) | 21.5 | 31.9 | 54.2 | 29.6 | 39.5 | 34.7 | 37.0 | 23.5 | 32.0 | 43.9 | 57.8 |
| SDQ[c] | | | | | | | | | | | | |
| Total difficulties (parents: mean, SD) | 7.7 (5.1) | 7.5 (5.0) | 10.0 (5.1) | 8.1 (5.0) | 7.3 (5.2) | 8.6 (5.1) | 6.6 (4.8) | 7.0 (5.4) | 8.8 (5.2) | 8.1 (5.0) | 7.2 (5.1) | 6.4 (4.9) |
| KIDSCREEN-10 <1 SD (%) | | | | | | | | | | | | |
| | 2,031 (13.2) | 5.9 | 14.9 | 17.5 | 6.8 | 23.2 | 19.1 | 3.5 | 20.0 | 9.0 | 4.4 | 15.1 |

Countries: *AU* Austria, *CZ* Czech Republic, *DE* Germany, *FR* France, *EL* Greece (did not collect data on 8–11 years old children), *HU* Hungary, *NL* The Netherlands, *PL* Poland, *ES* Spain, *CH* Switzerland, *UK* United Kingdom

[a] Unweighted data. All percentages are weighted. Missing values: FAS, 314 (1.9 %); level of education, 199 (1.2 %)

[b] Family Affluence Scale

[c] SDQ, Strengths and Difficulties Questionnaire: total mean difficulties according to parents' responses

the administration of a cross-culturally developed and validated instrument to measure HRQOL and the use of the same, standardized process of data collection in all countries no doubt helped to strengthen comparability. Finally, it is worth noting that the data for the present study come from the year 2003. It might be possible that in current times of economic crises affecting Europe, the differences described here might have even increased.

Strengths of the study include the fact that data were collected using a standardized protocol across all countries, that we employed a range of indicators, and that we employed two different, but complementary approaches to data analysis (RII and PAR). Although there are variations depending on which indicators are used to measure socioeconomic status and mental health or HRQOL, the results are nevertheless robust in that they suggest that socioeconomic inequalities in health are present to a lesser or greater degree in all of the countries studied.

Although we observed substantial variation between countries regarding the magnitude of inequalities, there was no obvious pattern to these variations, though they are likely to be at least in part due to differences in the degree of economic development and health, social and political policies affecting wealth distribution (Navarro et al. 2004). Other authors have indicated that there are also considerable differences in the level of development and implementation of strategies to combat socioeconomic inequalities in health in Europe (Mackenbach et al. 2003). The large-scale HBSC study also repeatedly indicated the presence of socioeconomic inequalities in self-rated health with a multilevel effect of deprivation at individual, local and national level, and some specific patterns of inequalities. Moreover, the study by Zambon et al. (2006) found that those countries with a social-democratic tradition showed fewer social inequalities than the other countries studied in terms of self-perceived health. Another study in

**Table 2** Differences in mental health and health-related quality of life (HRQOL) by socioeconomic status (Family Affluence Scale), and parental level of education, and by country

| | Total | AU | CZ | FR | DE | EL | HU | NL | PL | ES | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDQ[a] | | | | | | | | | | | | |
| FAS[b] | | | | | | | | | | | | |
| FAS low | 9.0 (5.4)* | 7.6 (5.2) | 11.0 (5.4)* | 9.4 (5.1)* | 8.1 (5.7) | 9.2 (5.2) | 7.4 (5.1) | 7.9 (5.8) | 9.4 (5.3)* | 9.1 (5.3)* | 8.5 (6.2) | 8.7 (5.5)* |
| FAS medium | 7.7 (5.1)* | 7.5 (4.9) | 9.0 (4.6) | 8.3 (5.0)* | 7.5 (5.2) | 8.4 (5.1) | 6.3 (4.7) | 6.8 (5.2) | 8.6 (5.1)* | 8.2 (5.0)* | 6.9 (4.6) | 6.6 (5.0)* |
| FAS high | 6.9 (4.9)* | 7.4 (5.1) | 8.6 (4.6) | 7.8 (4.8)* | 6.9 (5.0)* | 7.5 (4.7) | 6.2 (4.5) | 7.1 (5.5) | 7.8 (4.9)* | 7.5 (4.6)* | 7.1 (5.0) | 5.7 (4.4)* |
| Family level of education | | | | | | | | | | | | |
| Primary education | 9.0 (5.3*) | 9.3 (6.1) | 13.2 (6.7)* | 9.4 (5.3)* | 8.5 (5.4)* | 9.9 (5.2)* | 8.0 (5.2)* | 8.6 (5.6) | 9.6 (5.3)* | 8.8 (5.2)* | 8.5 (5.5) | 8.3 (5.4) |
| Secondary | 7.9 (5.2)* | 7.6 (5.1) | 10.4* (5.0) | 8.3 (4.8)* | 7.3 (5.2)* | 8.8 (5.1) | 6.7 (4.9) | 7.3 (5.6) | 8.6 (5.1) | 8.0 (4.5) | 7.4 (4.8) | 7.6 (5.5) |
| University degree | 6.8 (4.8)* | 6.8 (4.5) | 9.0 (5.0) | 7.5 (4.8)* | 6.7 (5.3)* | 7.6 (4.8) | 5.5 (4.1) | 6.2 (4.9)* | 8.3 (5.0) | 7.3 (4.8) | 6.6 (5.0) | 5.4 (4.2)* |
| KIDSCREEEN-10 <1 SD | | | | | | | | | | | | |
| FAS | | | | | | | | | | | | |
| FAS low | 20.3 | 6.4 | 19.4* | 18.6 | 8.8* | 32.4* | 24.8* | 5.6 | 26.0* | 18.8* | 8.0 | 25.1* |
| FAS medium | 12.8 | 5.9 | 11.7 | 19.0 | 7.7 | 19.1 | 18.5 | 3.4 | 17.7 | 7.0 | 4.9 | 16.7 |
| FAS high | 10.0* | 5.9 | 6.5 | 15.9 | 5.3 | 18.9 | 12.3 | 3.0 | 12.1 | 5.9 | 3.1 | 11.9 |
| Family level of education | | | | | | | | | | | | |
| Primary education | 14.1 | 7.1 | 42.9 | 16.4 | 9.5* | 29.9 | 20.2 | 3.8 | 19.5 | 8.8 | 7.1 | 14.8 |
| Secondary | 12.2 | 4.8 | 14.9 | 17.7 | 5.3 | 21.9 | 20.2 | 3.5 | 20.9 | 10.1 | 4.5 | 16.4 |
| University degree | 13.7 | 9.6 | 13.8 | 17.8 | 8.6 | 22.4 | 17.0 | 3.1 | 18.1 | 9.0 | 4.1 | 14.5 |

The European KIDSCREEN study (2003)

Countries: *AU* Austria, *CZ* Czech Republic, *DE* Germany, *FR* France, *EL* Greece, *HU* Hungary, *NL* The Netherlands, *PL* Poland, *ES* Spain, *CH* Switzerland, *UK* United Kingdom

* Statistically significant at 0.05 level using either Chi-square test or ANOVA and post hoc test

[a] SDQ, Strengths and Difficulties Questionnaire

[b] Family Affluence Scale

**Table 3** Relative index of inequalities [RII, and 95 % confidence interval (95 % CI)] of mental health status [Strengths and Difficulties Questionnaire (SDQ)], and the KIDSCREEN-10 index <1 standard deviation (SD) by the Family Affluence Scale (FAS), higher family level of education and by country

| Total | AU | CZ | FR | DE | EL | HU | NL | PL | ES | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SDQ[a] | | | | | | | | | | | |
| FAS[b] | | | | | | | | | | | |
| **1.30 (1.23–1.37)** | 1.04 (0.97–1.12) | **1.51 (1.42–1.61)** | **1.20 (1.1–1.3)** | **1.26 (1.18–1.35)** | **1.28 (1.18–1.39)** | **1.32 (1.23–1.4)** | 1.05 (0.98–1.12) | **1.24 (1.17–1.32)** | **1.3 (1.19–1.43)** | **1.16 (1.08–1.24)** | **1.53 (1.4–1.67)** |
| Level of education | | | | | | | | | | | |
| **1.45 (1.37–1.53)** | **1.34 (1.23–1.46)** | **1.36 (1.27–1.46)** | **1.44 (1.32–1.57)** | **1.35 (1.26–1.44)** | **1.45 (1.34–1.57)** | **1.66 (1.55–1.77)** | **1.53 (1.43–1.64)** | **1.22 (1.15–1.30)** | **1.37 (1.25–1.49)** | **1.38 (1.28–1.48)** | **2.0 (1.86–2.21)** |
| KIDSCREEEN–10 <1 SD | | | | | | | | | | | |
| FAS[b] | | | | | | | | | | | |
| **2.07 (1.78–2.51)** | 0.97 (0.39–2.43) | **4.43 (2.97–7.43)** | 1.35 (0.7–2.6) | **1.81 (0.85–3.82)** | **2.6 (1.47–4.61)** | **2.36 (1.46–8.83)** | 1.53 (0.53–4.4) | **2.9 (1.77–4.77)** | **4.84 (1.42–16.5)** | **2.93 (1.16–7.38)** | **2.21 (1.07–4.53)** |
| Level of education | | | | | | | | | | | |
| 0.90 (0.69–1.18) | 0.38 (0.13–1.15) | 1.72 (0.90–3.28) | 0.67 (0.34–1.34) | 0.73 (0.32–1.75) | 1.16 (0.64–2.12) | 1.13 (0.70–1.82) | 1.18 (0.42–3.24) | 1.07 (0.66–1.7) | 0.79 (0.3–2.0) | 1.53 (0.58–4.07) | 1.0 (0.49–2.04) |

The European KIDSCREEN study (2003). RII is based on logistic regression (HRQOL index) or Poisson regression (SDQ). All regression models are adjusted by age and sex. The model for the whole sample is adjusted by age, sex and country. Statistically significant differences in RII are shown in bold

Countries: *AU* Austria, *CZ* Czech Republic, *DE* Germany, *FR* France, *EL* Greece, *HU* Hungary, *NL* The Netherlands, *PL* Poland, *ES* Spain, *CH* Switzerland, *UK* United Kingdom

[a] SDQ, Strengths and Difficulties Questionnaire

[b] Family Affluence Scale

more than 10,000 students from four European countries showed that Austrian children reported the highest KINDL-R scores and Polish children the lowest (Stöcklin et al. 2012). Although our results did not show a clear pattern, those countries with a social-democratic tradition (i.e., Austria and the Netherlands) showed fewer statistically significant differences in RII than the remaining countries. Moreover, the present study reinforces those results by using measures of HRQOL and mental health that have demonstrated strong cross-cultural equivalence and reliability and validity across different subgroups instead of using a single item on self-rated health.

On the other hand, our results do not support the 'equalization' hypothesis proposed by some authors (West and Sweeting 2004). They propose that some specific dimensions of health fluctuate during the transition period and would be influenced by young people from different social backgrounds mixing in schools and peer groups or within the youth culture. Thus, inequalities in these dimensions of health would be expected to diminish or disappear during this period. Our results do not support this hypothesis. On the contrary, we assessed physical, psychological and social health using a multidimensional and valid measure of HRQOL as well as mental health and found inequalities across age groups and in almost all of the participating countries. These differences could be related to the measures used to assess SES and health and/or to specific environmental characteristics, such as the school system, urban/rural setting, etc., of the samples analyzed in the different studies.

In practical terms, the impact of the degree of inequalities observed here can be substantial. For example, in the whole European sample the mental health of 1.2 million children and adolescents could be improved by the minimally important difference (MID that represents a threshold for some meaningful improvement) on the SDQ (effect size of 0.26) if they achieved the same mental health status as children from families in the highest educational category. These figures could range from 200,000 children in Spain, 180,000 in the UK, 140,000 in France, 103,000 in Germany and 85,000 in Poland, to 3,000 in Switzerland and 2,000 in the Czech Republic. In this sense, the multifactorial etiology of mental disorders in children and adolescents is widely accepted. Nevertheless, for some specific problems, greater importance is attached to genetic, neurological and/or biological factors (Castellanos et al. 2002), although there is no general consensus in this respect (Tizón-García 2006). Previous longitudinal studies have demonstrated that psychosocial adversity during childhood can predict physical and biological adversities later in adulthood (Power et al. 2012). One of the few international studies on inequalities in mental health was carried out in two cohorts from the UK and the Netherlands

**Table 4** Relative index of inequalities [RII, and 95 % confidence interval (95 % CI)] of mental health status [Strengths and Difficulties Questionnaire (SDQ)] and the KIDSCREEN-10 index <1 standard deviation (SD) by the Family Affluence Scale (FAS), higher family level of education, age and country

| | Total | AU | CZ | FR | DE | EL | HU | NL | PL | ES | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDQ[a] | | | | | | | | | | | | |
| FAS[b] (years) | | | | | | | | | | | | |
| 8–11 | **1.27 (1.16–1.39)** | 1.24 (0.99–1.56) | **1.32 (1.12–1.56)** | 1.2 (0.94–1.54) | **1.42 (1.14–1.76)** | – | **1.37 (1.13–1.66)** | 1.01 (0.79–1.29) | 1.18 (0.97–1.44) | 1.2 (0.93–1.54) | 1.17 (0.93–1.46) | **1.32 (1.04–1.66)** |
| 12–15 | **1.25 (1.15–1.37)** | 0.91 (0.75–1.1) | **1.5 (1.28–1.75)** | 1.17 (0.93–1.46) | 1.09 (0.89–1.33) | **1.24 (1.04–1.49)** | **1.24 (1.0–1.54)** | 0.98 (0.8–1.2) | **1.22 (1.04–1.44)** | **1.37 (1.08–1.74)** | 1.19 (0.99–1.44) | **1.7 (1.26–2.29)** |
| 16–18 | **1.45 (1.29–1.63)** | 1.06 (0.75–1.49) | **1.77 (1.46–2.15)** | **1.46 (1.1–1.94)** | **1.41 (1.06–1.86)** | **1.35 (1.06–1.72)** | **1.37 (1.06–1.77)** | 1.14 (0.85–1.53) | **1.3 (1.04–1.62)** | **1.47 (1.02–2.12)** | **1.7 (0.87–7.82** | **2.22 (1.4–3.52)** |
| Level of education (years) | | | | | | | | | | | | |
| 8–11 | **1.51 (1.37–1.66)** | 1.33 (0.99–1.79) | **1.41 (1.16–1.71)** | **1.71 (1.34–2.19)** | **1.42 (1.13–1.8)** | – | **1.4 (1.16–1,68)** | **1.68 (1.34–2.11)** | 1.13 (0.92–1.38) | **1.39 (1.06–1.8)** | 1.22 (0.98–1.52) | **1.96 (1.58–2.44)** |
| 12–15 | **1.47 (1.34–1.61)** | **1.35 (1.08–1.69)** | 1.3 (0.8–1.56) | **1.32 (1.05–1.65)** | 1.17 (0.96–1.43) | **1.37 (1.15–1.63)** | **1.95 (1.59–2.38)** | **1.35 (1.09–1.67)** | **1.3 (1.11–1.52)** | **1.46 (1.13–1.88)** | **1.82 (1.49–2.22)** | **2.46 (1.85–3.24)** |
| 16–18 | **1.31 (1.16–1.47)** | 1.36 (0.96–1.32) | **1.39 (1.12–1.72)** | 1.33 (0.99–1.71) | 1.44 (0.7–1.94) | **1.63 (1.3–2.04)** | **1.89 (1.48–2.31)** | **1.63 (1.25–2.12)** | 1.18 (0.96–1.45) | 1.15 (0.83–1.59) | 0.82 (0.58–1.15) | 1.32 (0.84–2.08) |
| KIDSCREEEN-10 <1 SD | | | | | | | | | | | | |
| FAS[b] (years) | | | | | | | | | | | | |
| 8–11 | **1.87 (1.01–3.48)** | 0.5 (0.05–4.88) | **9.24 (2.32–36.7)** | 0.52 (0.09–2.7) | **12.7 (1.4–80.1)** | – | 1.68 (0.64–5.18) | 9.12 (0.71–90.1). | 2.98 (0.75–11.7) | **2.53 (1.43–4.48)** | 0.51 (0.02–11.7) | **1.43 (0.51–3.98)** |
| 12–15 | **1.8 (1.22–2.67)** | 2.31 (0.66–8.06) | **3.9 (1.6–9.11)** | 1.23 (0.45–3.05) | 0.93 (0.6–2.67) | 1.91 (0.9–4.0) | **4.0 (1.98–8.08)** | 1.66 (0.39–7.0) | **2.25 (1.09–4.63)** | **9.3 (1.7.–49.2)** | **6.8 (1.89–24.5)** | **1.64 (0.53–5.2)** |
| 16–18 | **2.92 (1.86–4.6)** | 0.42 (0.08–2.18) | **3.92 (1.45–10.5)** | 2.55 (0.77–8.3) | 2.33 (0.6–8.07) | **4.14 (1.7–4.88)** | 1.51 (0.67–3.4) | 0.65 (0.12–3.3) | **4.4 (2.0–9.6)** | **2.49 (0.47–12.0)** | 1.7 (0.37–7.82) | **7.12 (1.46–34.6)** |
| Level of education (years) | | | | | | | | | | | | |
| 8–11 | 1.26 (0.68–2.33) | 0.07 (0.01–0.99) | 4.31 (0.76–24.4) | 0.39 (0.06–2.31) | 4.18 (0.55–31.2) | – | 1.0 (0.34–2.92) | 25.6 (3.11–212.1) | 1.16 (0.84–3.89) | 0.05 (0.00–3.86) | 0.65 (0.03–13.7) | 1.49 (0.49–4.54) |
| 12–15 | 0.77 (0.55–1.14) | 0.36 (0.08–1.48) | 1.99 (0.75–5.28) | 0.66 (0.26–1.7) | 0.39 (0.11–1.32) | 1.25 (0.55–2.84) | 1.34 (0.66–1.72) | 0.33 (0.05–2.13) | 0.76 (0.38–1.51) | 2.12 (0.52–8.59) | 2.32 (0.61–8.7) | 0.7 (0.24–2.05) |
| 16–18 | 0.98 (0.63–1.53) | 0.89 (0.1–7.65) | 1.01 (0.36–2.86) | 0.73 (0.21–2.45) | 0.89 (0.23–3.36) | 1.22 (0.52–2.85) | 1.0 (0.45–2.12) | 0.83 (0.2–3–39) | 1.39 (0.63–3.05) | 0.28 (0.07–1.07) | 0.99 (0.17–5.62) | 1.42 (0.33–6.89) |

The European KIDSCREEN study (2003). RII is based on logistic regression (HRQOL index) or Poisson regression (SDQ). All regression models are adjusted by sex. The model for the whole sample is adjusted by sex and country. Statistically significant differences in RII are shown in bold

Countries: *AU* Austria, *CZ* Czech Republic, *DE* Germany, *FR* France, *EL* Greece, *HU* Hungary, *NL* The Netherlands, *PL* Poland, *ES* Spain, *CH* Switzerland, *UK* United Kingdom

[a] SDQ, Strengths and Difficulties Questionnaire

[b] Family Affluence Scale

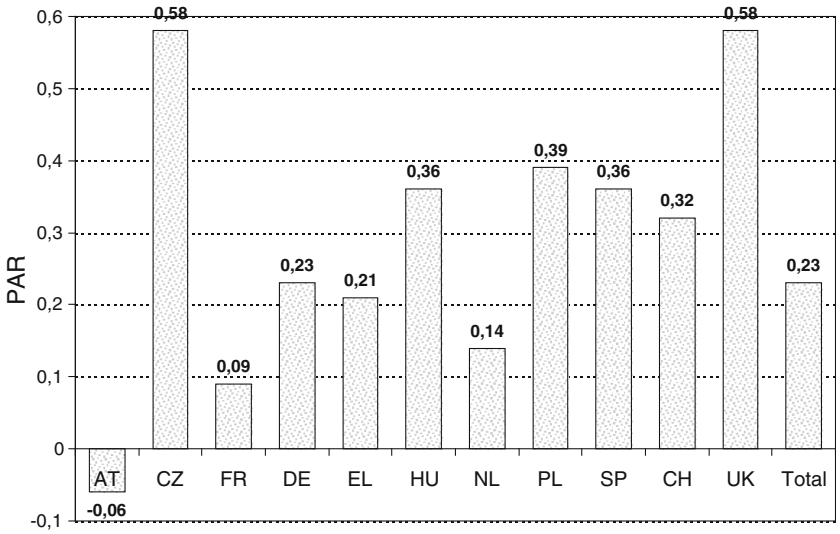


**Fig. 1** Population attributable risk (PAR) for health-related quality of life (HRQOL, KIDSCREEN-10 <1 SD) according to the Family Affluence Scale (FAS). The European KIDSCREEN study (2003)

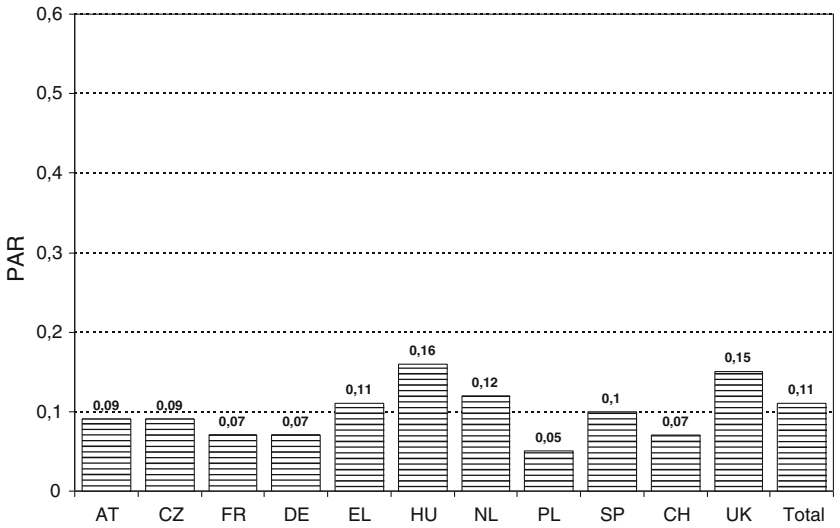


**Fig. 2** Population attributable risk (PAR) for mental health [Strengths and Difficulties Questionnaire (SDQ)] according to the level of education. The European KIDSCREEN study (2003)

(Huisman et al. 2012). However, the authors failed to demonstrate that greater cognitive ability mitigates the adverse effects of lower educational level on mental health. On the other hand, they did find a strong association between maternal level of education and internalizing problems, and household income and internalizing and externalizing problems in these cohorts of adolescents.

In summary, socioeconomic inequalities in mental health in youths were found consistently across Europe according to the degree of family affluence and higher family levels of education, while less consistent results were found in socioeconomic inequalities in HRQOL. The consistency of the results observed on mental health appears to contradict the equalization hypothesis proposed by some authors. At least this hypothesis should be interpreted cautiously and depending on the SES measure analyzed and the outcome assessment. Future research should aim to clarify, through more in-depth analysis of results from longitudinal studies, the causes of these inequalities and should provide a basis for initiatives to prevent them continuing into adulthood (Danese et al. 2009). Although initiatives such as the Commission on Social Determinants of Health (Irwing et al. 2007) and recent remarks from this commission (Marmot et al. 2012) emphasize reducing inequalities during early child development and are very promising, the results of the present study suggest that there is also a need for further research and policies to understand and ameliorate the inequalities observed in the older age groups studied here.

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**Conflict of interest** All authors have no conflict of interest. Luis Rajmil had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

## Appendix

Austria: Wolfgang Duer, Kristina Fuerth; Czech Republic: Ladislav Czerny; France: Pascal Auquier, Marie-Claude Simeoni, Stephane Robitail; Germany: Ulrike Ravens-Sieberer (international coordinator in chief), Michael Erhart, Jennifer Nickel, Bärbel-Maria Kurth, Angela Gosch, Ursula von Rüden; Greece: Yannis Tountas, Christina Dimitrakakis; Hungary: Agnes Czimbalmos, Anna Aszman; Ireland: Jean Kilroe, Celia Keenaghan; The Netherlands: Jeanet Bruil, Symone Detmar, Mariska Klein Velderman, Eric Verrips; Poland: Joanna Mazur, Ewa Mierzejeswka; Spain: Luis Rajmil, Silvina Berra, Cristian Tebé, Michael Herdman, Jordi Alonso; Sweden: Curt Hagquist; Switzerland: Thomas Abel, Corinna Bisegger, Bernhard Cloetta, Claudia Farley; United Kingdom: Mick Power, Clare Atherton, Katy Phillips.

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