

Prevalence of psychosomatic and emotional symptoms in European school-aged children and its relationship with childhood adversities: results from the IDEFICS study

Barbara Vanaelst¹⁻², Tineke De Vriendt¹⁻², Wolfgang Ahrens³, Karin Bammann³, Charalambos Hadjigeorgiou⁴, Kenn Konstabel⁵, Lauren Lissner⁶, Nathalie Michels¹, Denes Molnar⁷, Luis Moreno⁸, Lucia Reisch⁹, Alfonso Siani¹⁰, Isabelle Sioen¹⁻², Stefaan De Henauw¹ on behalf of the IDEFICS Consortium

¹ Department of Public Health, Ghent University, UZ-2BlokA De Pintelaan 185, 9000 Ghent, Belgium

² Research Foundation – Flanders (FWO), Egmontstraat 5, 1000 Brussels, Belgium

³ BIPS-Institute for Epidemiology and Prevention GmbH, Achterstr. 30, 28359 Bremen, Germany

⁴ Research & Education Institute of Child Health, 8 Attikis Str, 2027 Strovolos, Cyprus

⁵ National Institute for Health Development, Hiiu 42, 11619 Tallinn, Estonia

⁶ Department of Public Health and Community Medicine, Sahlgrenska Academy, University of Gothenburg, Box 454, 405 30 Göteborg, Sweden

⁷ National Institute of Health Promotion, University of Pécs, Gyermekklinika, József Attila utca 7, 7623 Pécs, Hungary

⁸ GENUD (Growth, Exercise, Nutrition and Development) research group, School of Health Sciences, University of Zaragoza, Domingo Miral s/n, 50.009 Zaragoza, Spain

⁹ Department of Intercultural Communication and Management, Copenhagen Business School, Porcelaenshaven 18A, DK-2000 Frederiksberg, Denmark

¹⁰ Epidemiology & Population Genetics, Institute of Food Sciences, CNR, Via Roma 64, 83100 Avellino, Italy

Correspondence to

Barbara Vanaelst, Department of Public Health, Ghent University, University Hospital, Block A, 2nd floor, De Pintelaan 185, B-9000 Ghent, Belgium, tel: +32 9 332 36 85, fax: +32 9 332 49 94, e-mail address: barbara.vanaelst@ugent.be

1 **Abstract**

2 **Background** The prevalence of childhood stress and psychosomatic and emotional symptoms
3 (PES) have increased in parallel, indicating that adverse, stressful circumstances and PES in
4 children might be associated.

5 **Objectives** This study describes the prevalence of PES in European children, aged 4 to 11
6 years old, and examines the relationship between PES, negative life events and familial or
7 social adversities in the child's life.

8 **Methods** Parent-reported data on childhood adversities and PES was collected for 4066
9 children from 8 European countries who participated in the follow-up survey of IDEFICS
10 (2009-2010), by means of the 'IDEFICS Parental Questionnaire'. A modified version of the
11 'Social Readjustment Rating Scale', the 'KINDL Questionnaire for Measuring Health-Related
12 Quality of Life in Children and Adolescents' and the 'Strengths and Difficulties
13 Questionnaire' were incorporated in this questionnaire, as well as questions on socio-
14 demographics, family lifestyle and health of the child. Chi-square analyses were performed to
15 investigate the prevalence of PES between survey centres, age groups and sex of the child.
16 Odds ratios were calculated to examine childhood adversity exposure between PES-groups
17 and logistic regression analyses were conducted to investigate a) the contribution of the
18 number and b) the specific types of experienced adversities on the occurrence of PES.

19 **Results** 45.7% of the children experienced at least one PES, with low emotional well-being
20 during the last week being most frequently reported (38.2%). No sex differences were shown
21 for the prevalence of PES ($p=0.282$), but prevalence proportions rose with increasing age
22 ($p<0.001$). Children with PES were more frequently exposed to childhood adversities
23 compared to children without PES (e.g. 13.3% and 3.9% of peer problems and 25.4% and
24 17.4% of non-traditional family structure in the PES versus no PES group respectively,
25 $p<0.001$). An increasing number of adversities (regardless of their nature) was found to

26 gradually amplify the risk for PES (OR=2.85, 95% CI=1.98-4.12 for a number of ≥ 3 negative
27 life events), indicating the effect of cumulative stress. Last, a number of specified adversities
28 were identified as apparent risk factors for the occurrence of PES such as. living in a non-
29 traditional family structure (OR=1.52, 95% CI=1.30-1.79), or experiencing peer problems
30 (OR=3.55, 95% CI=2.73-4.61).

31 **Conclusions** Childhood adversities were significantly related to PES prevalence, both
32 quantitatively (i.e. the number of adversities) and qualitatively (i.e. the type of adversity).
33 This study demonstrates the importance and the impact of the child's family and social
34 context on the occurrence of PES in children younger than 12 years old.

35 **Keywords:** child – life events – adversities – psychosomatic and emotional symptoms -
36 epidemiology

1. Introduction

Childhood stressors may originate from multiple events in the child's everyday environment (e.g. school, family, peers) [1]. Chronic exposure to adverse, stressful situations may affect the child's behaviour and personality development and may have consequences on both their physiological and psychological health, with effects potentially persisting into adolescence and adulthood, such as the manifestation of depression, cardiovascular or auto-immune diseases, or psychosomatic complaints [2-6].

Headaches, stomach pain and tiredness are frequently observed psychosomatic complaints in children [6]. 17%, 23% and 24% of Swedish adolescents (10-18 years old) [7], Swedish schoolchildren (6-13 years old) [8] and Chinese schoolchildren (9-12 years old) [9] experience weekly recurring headaches, respectively. In addition, 12% (5-7 year olds) to 14% (7-17 year olds) of German children exhibited signs of mental health problems [10,11].

The prevalence of childhood stress and psychosomatic and emotional symptoms (PES) have been increasing in parallel over the last decade, indicating that adverse, stressful circumstances may trigger PES in children [6,12-22]. Moreover, multiple simultaneous or sequential stressors may increase the risk for psychosomatic or emotional problems in a cumulative or additive way [13,18,20,21,23-26]. In this context, familial and social adversities require special attention. These stressors are seldom isolated because they tend to cluster or give rise to other unfavourable events (e.g. parental divorce may lead to decreased economic resources, parental strain and a change in family structure).

To our knowledge, there is a lack of large-scale (international) research on the relationship between PES and negative life events and familial and social adversities in young children. The present study aimed to describe the prevalence of PES in children from 8 European countries (N=4066) and to examine the relationship between PES and childhood adversities cross-nationally by investigating the following research questions: Do children with and

26 without PES differ in their exposure to childhood adversities? Does the number of adversities
27 (regardless of the nature of adversities) influence the occurrence of PES? Is the risk for PES
28 in children affected by specific types of experienced adversities?

29 **2. Methods**

30 **2.1. Study design and participants**

31 From September 2009 to May 2010, information on childhood adversities and PES in children
32 was obtained for 4066 children (aged 4 to 11.8 years, mean=7.91, standard deviation
33 (SD)=1.82), 49.7% boys). This was part of the follow-up survey of the IDEFICS study, a
34 Large Integrated Project within the 6th Framework Programme of the European Commission.
35 The IDEFICS project is a multi-centre longitudinal intervention study of pre- and primary
36 school children in 8 European countries (Belgium, Cyprus, Estonia, Germany, Hungary, Italy,
37 Spain and Sweden) investigating the aetiology of diet- and lifestyle-related diseases and
38 disorders in children, in which also community-oriented prevention programmes for primary
39 prevention of obesity are developed and evaluated in a controlled study design (intervention
40 and control regions) [27,28]. The baseline survey started in 2007 with a cohort of 16224
41 children (Figure 1). The intervention programme and more detailed aims and methods have
42 been described elsewhere [27,28]. The study was conducted according to the guidelines of the
43 Declaration of Helsinki and approvals of the Ethical Committees were obtained for each
44 survey centre.

45 Only the control regions of the participating countries were eligible for inclusion in this
46 analysis to rule out intervention-bias on the studied variables (intervention-bias may arise by
47 e.g. the intervention module on creating a family environment that promotes spending time
48 together and a healthy lifestyle) [28,29]. Children younger than 4 years of age and children
49 from whom any information on childhood adversities and PES was missing, were excluded

50 from the analysis (N=2194/6260; 35.05%). This resulted in a total number of 4066 children
51 included in this study (Figure 1).

52 **(Insert Figure 1)**

53 No differences were observed between the included and excluded group for sex (49.7% and
54 50.8% boys respectively) or age (mean=7.91 (SD=1.82) and mean=7.87 (SD=1.90),
55 respectively). However, low parental education (International Standard Classification of
56 Education level <3) [30] was more frequently reported in the excluded group compared to the
57 included group (12.2% versus 6.1% respectively).

58 **2.2. Instruments and variables**

59 In order to obtain information on socio-demographics, family lifestyle, and health and mental
60 well-being of the children, parents were asked to complete the ‘IDEFICS Parental
61 Questionnaire’ and the ‘IDEFICS Questionnaire on Health and Medical History’ at home and
62 to return them to the schools.. All data in this study on childhood adversities and PES
63 originated from these questionnaires, of which the quality and comparability across the survey
64 centres was assured by a translation/back-translation procedure for each local language and by
65 re-administering the parental questionnaire to a convenience sample of study participants
66 [27,31].

67 **2.2.1. Assessment of childhood adversities**

68 The family environment may strongly affect the social, emotional and physical health of
69 children by shaping the context and the opportunities of children’s later lives [32,33]. Parental
70 conflicts or divorce [34], a low supportive or unfavourable family climate [35-38], domestic
71 violence or abuse [39], parental supervisory neglect [40,41], socio-economic disadvantage
72 [16,42-44], serious illness of the child or a family member [45,46] and peer problems or
73 frustrations at school [47-49] have all been shown to emotionally and psychologically affect

74 children. Therefore, parents were asked to complete questions on the life-time occurrence of
75 negative life events and more chronic familial and social situations which may constitute
76 potential childhood adversity, such as ethnicity, education, employment, family structure and
77 family relationships. These childhood adversity variables were all of dichotomous nature
78 (occurrence or no occurrence of event/adversity).

79 *Negative life events (NLE) (once-only)*

80 To assess negative life events ever encountered during the child's life, the parents were asked
81 to complete the following question: "Which of the following events did your child encounter
82 and also report how old your child was at that time (yes/no): parental divorce or separation,
83 addition of a new family member (e.g. step-parent), parental job loss, severe diseases or
84 accidents of the child, serious illness of a family member, child having major frustrations at
85 school, death of the child's parent, sibling, grandparent or pet". These life event-items
86 originate from a modified version of the Social Readjustment Rating Scale, incorporated in
87 the IDEFICS questionnaire [50].

88 *Familial or social adversities (FSA) (chronic)*

89 Next to the above mentioned 'once-only' events, also conditions with a more chronic
90 character were assessed as these may differently impact PES in children. Ethnicity of the
91 family was based on the birth country of the parents and the child. If one of them was born in
92 a foreign country the child was described as 'being immigrant'. Parental education was
93 evaluated for mothers according to the ISCED classification [30]. 'Low maternal education'
94 was determined as an ISCED level of 0, 1 or 2 (pre-primary, primary or lower secondary
95 education). Families were identified as suffering from 'family economic hardship' if one of
96 the parents was unemployed for a year or more, or if on welfare (social assistance). If the
97 child did not live with both his/her parents, the family was defined as a 'non-traditional

98 family' (including single-parent families, stepparent families, living with grandparents or
99 foster-parents or in an institution). Children not living together with any siblings (including
100 step- and half-siblings) were defined as 'only-children'. 'Latchkey care' or parental
101 supervisory neglect was presumed if more than 7 hours a week of after-school self-care. If the
102 age of the mother at child-birth was 19 or younger, the pregnancy was considered a 'teenage
103 pregnancy' [51]. The quality of family climate was assessed using adapted versions of the
104 Family Climate Scale and the Authoritative Parenting Index [52,53]. Each of the 13 questions
105 was rated on a 4-point Likert scale, summed to a total score and reversed to a score on 100.
106 Family climates with a score lower than 50/100 were defined as 'bad family climate'.
107 Furthermore, 'peer problem's were defined as a borderline (4-5/10) or abnormal score (6-
108 10/10) on the Peer Problem Scale of the Strengths and Difficulties Questionnaire (SDQ), a 25-
109 item behavioural screening questionnaire on emotional problems, conduct problems,
110 hyperactivity-inattention behaviour, peer problems, and prosocial behaviour that has been
111 validated for its use in several European countries and which was incorporated in the
112 IDEFICS questionnaire [54-56]. Important to note is that these variables do not constitute
113 *actual* childhood stressors for all children, but should be considered *potential* stressful
114 conditions during childhood. More detailed information on the rationale, methodology and
115 prevalence of these variables were described previously by our research group.

116 **2.2.2. Assessment of psychosomatic and emotional symptoms**

117 PES in children were described by five different variables: emotional well-being and self-
118 esteem of the child during the last week (the week preceding (completion of) the
119 questionnaire), emotional problems and frequent occurrence of headaches, stomach-aches or
120 sickness over the last 6 months, and difficulties falling asleep.

121 Parents were asked to complete the emotional and self-esteem subscales of the ‘KINDL
122 Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents’, a
123 questionnaire which assesses the child’s quality of life in multiple dimensions (physical well-
124 being, emotional well-being, self-esteem, family, friends and everyday functioning subscale)
125 and which was incorporated in the IDEFICS questionnaire [57]. The items of the emotional
126 and self-esteem subscales were scored from 1 (never) to 4 (often or always) with reversals
127 according to the wording of the question, and summed to a total score. These total scores for
128 self-esteem and emotional well-being were transformed to a scale on 100 (mean score on
129 emotional well-being: M=86.93, SD=11.80; mean score on self-esteem: M=86.52, SD=10.75)
130 and dichotomized into ‘low’ or ‘high’ scores using sex- and age-specific cut-off scores from
131 the KINDL manual (emotional well-being cut-offs: boys 82.89, girls 83.11; self-esteem cut-
132 offs: boys 66.52, girls 66.68) [57,58], to obtain a measure of the ‘emotional well-being and
133 self-esteem of the child during the last week’.

134 ‘Emotional problems over the last 6 months’ were assessed using the Emotional Symptoms
135 Scale of the SDQ. Each of the 5 items of the Emotional Symptom Scale (headaches, stomach-
136 aches, sickness; worries; unhappiness; loss of confidence; fears) were scored on a three point
137 scale (0 not true, 1 somewhat true, 2 certainly true). This way a maximum score on 10 could
138 be obtained (M=1.65, SD=1.74), with higher scores indicating more emotional difficulties.
139 Cut-off points have been defined, classifying the results into normal (<6/10), borderline (6/10)
140 or abnormal (>6/10) emotional well-being [54]. Borderline and abnormal scores were taken
141 together to represent emotional problems over the last 6 months. ‘Frequent occurrence of
142 headaches, stomach-aches or sickness’, one of the items of the Emotional Symptom Scale,
143 was examined separately. The children were classified as having frequent headaches,
144 stomach-aches or sickness if the parents indicated the ‘certainly true’-response.

145 Last, the parents reported on the children's general sleeping habits in the 'IDEFICS
146 Questionnaire on Health and Medical History'. The dichotomous variable 'difficulties falling
147 asleep' was used as an indicator of impaired sleep quality.

148 **2.3. Statistical procedures**

149 Statistical analyses were performed with PASW Statistics Program version 19.0.0 (SPSS Inc,
150 IBM, IL, USA). The prevalence of the children's PES was compared between countries, age
151 groups and sex using a χ^2 test. Each year of age was considered as one age group except the
152 children of 10 and 11 years old were grouped together because of the low number of 11-year-
153 olds (N=35). Since the prevalence differed significantly between survey centres, all further
154 analyses were adjusted for survey centre.

155 To study the difference in childhood adversity exposure between children with and without
156 PES, the children were divided into two groups: those having no PES (sum equal to 0) and
157 those having at least one PES. Independent sample t-tests and odds ratios (OR) were
158 calculated to study age differences and childhood adversity differences between these two
159 groups, respectively.

160 Logistic regression analyses (OR and 95% confidence intervals (CIs)) were calculated to
161 investigate the contribution of the number of adversities on the occurrence of each PES, and
162 these models were adjusted for survey centre, age and sex of the child, and the sum of FSAs
163 (5 categories) or NLEs (4 categories) as predictors respectively. Because of the low number of
164 children with a sum of NLEs ≥ 4 (N=23), these children were grouped together in the ≥ 3 NLEs
165 category.

166 Further logistic regression analyses were conducted to investigate the independent
167 explanatory value of specific types of adversities as predictors for the occurrence of PES,
168 adjusting for all other adversities, age, sex and survey centre and by using a backward
169 stepwise regression procedure. For each PES, the analyses started with a full model including

170 all adversities, after which the non-significant adversities were eliminated from the model in
171 an iterative process (probability for entry=0.05, probability for removal=0.10). This way, only
172 those predictors with a significant contribution ($p < 0.05$) to the model were reported.
173 Results from all logistic analyses mentioned above (with adjustments for survey centre) were
174 confirmed by multilevel analyses, more specifically with Generalized Linear Models
175 (Generalized Estimating Equations). P-values < 0.05 were considered statistically significant
176 for all tests.

177 **3. Results**

178 **3.1. Prevalence of PES**

179 Table 1 presents percentages of children's PES for each survey centre, age group and sex
180 separately. 45.7% of the children experienced at least one PES. While the prevalence of most
181 PES was rather rare (percentages below 10%), low emotional well-being in the last week
182 (week preceding completion of the questionnaire) was reported for 38.2% of the children. No
183 sex differences in PES were found. There was a trend for increasing PES prevalence with
184 increasing age, except for difficulties falling asleep which was rather constant across age
185 groups. Additionally, large variations in the prevalence of PES were observed between the
186 survey centres.

187 **(Insert Table 1)**

188 **3.2. PES and its relation to childhood adversity**

189 *Differences in exposure to childhood adversity between children with and without PES*

190 Table 2 demonstrates a significantly higher prevalence of childhood adversities in children
191 with PES compared to children without PES, with up to two- or three-fold differences in
192 prevalence. More specifically, the following adversities were more frequent in the case of

193 PES (OR > 2): maternal teenage pregnancy, bad family climate, peer problems and major
194 frustrations at school. Still, 25.4% of the children with any form of PES did not yet experience
195 any FSA or NLE (results not shown in table).

196 **(Insert Table 2)**

197 *Contribution of the number of adversities to the occurrence of PES*

198 Except for difficulties falling asleep, the risk for all PES gradually increased with the number
199 of experienced FSAs or NLEs, regardless of the nature of the adversity (Table 3).

200 **(Insert Table 3)**

201 The number of FSAs or NLEs had the largest impact on emotional problems over the last 6
202 months, as indicated by the largest ORs. Even though of the occurrence of 3 or 4 adversities
203 resulted in more pronounced increases in the risk for PES, also children experiencing only one
204 FSA or NLE were already two times more likely to experience emotional problems or
205 frequent headaches, stomach-aches or sickness, respectively. The number of FSAs contributed
206 more strongly to the risk for PES compared to the number of NLEs, except for frequent
207 headaches, stomach-aches and sickness for which it was the other way around.

208 11.8% of the children experiencing ≥ 4 FSAs did however not exhibit any PES (results not
209 shown in table).

210 *Contribution of specific types of experienced adversities to the occurrence of PES in* 211 *children*

212 Table 4 presents the differential contributions of specific adversities on the risk for PES. The
213 importance of specific FSAs or NLEs as predictors for the occurrence of PES depended on the
214 type of PES (e.g. family economic hardship and teenage pregnancy were only positive
215 predictors for the occurrence of low emotional well-being and low self-esteem in last week
216 respectively, without significant contribution to the occurrence of other PES). In general,
217 living in a non-traditional family structure or in a bad family climate, experiencing peer

218 problems and having major frustrations at school were independent predictors for all studied
219 PES, as demonstrated by sometimes large ORs.

220 **(Insert Table 4)**

221 While most of the adversities increased the risk for PES, family economic hardship and
222 latchkey care were negatively associated with difficulties falling asleep. Age was a positive
223 predictor for all PES except for difficulties falling asleep (results not shown).

224 **4. Discussion**

225 **4.1. Prevalence of PES**

226 In total, 45.7% of the children experienced at least one PES, with low emotional well-being
227 during the last week being the most frequently reported PES. Prevalence proportions of other
228 PES were lower, but rose with increasing age. The latter finding is in line with previous
229 research [8,14,15,59] and may be due to a higher incidence of stressful life events with
230 increasing age [25,60], or to a different perception of reality as the ability to understand,
231 perceive and react to external events increases in children growing older [1]. We did not
232 observe general sex differences in the incidence of PES. Despite possible gender differences
233 in the biological and psychological reaction to stressors [61-64], the literature has yielded
234 inconclusive results concerning a distinctive prevalence of PES between boys and girls
235 [7,8,20,56,65-68]. The type of the studied stressor and PES and the age of the children may
236 account for these contradictory findings.

237 The present study demonstrated differences in the prevalence of PES between the survey
238 centres. Despite of the fact that investigating country differences was not the main objective
239 of this study (as the selected communities may not necessarily be representative for each
240 country), differences in the prevalence of PES (more specifically mental health problems)
241 across countries have been shown before [56]. Additionally, our results match findings of

242 Elberling et al. and Heiervang et al. [65,69]; that is lower percentages for PES in more
243 northern countries (see results for Sweden in Table 1). Heiervang and colleagues attributed
244 this finding to under-reporting or under-recognition of emotional symptoms by parents from
245 the north due to their more ‘normalizing’ view when filling out questionnaires, rather than
246 representing a real (mental) health advantage for the north. Therefore, cross-cultural
247 differences on psychosomatics and psychopathology based on questionnaires may be
248 misleading [69].

249 The mean scores on the self-esteem and emotional well-being subscale of the KINDL
250 questionnaire in this study (mean=86.52, SD=10.75 and mean=86.93, SD=11.80 respectively)
251 were higher compared to those of other studies in children of the same age [58,59,68,70,71].
252 Consequently, only a small percentage of children in this study were categorized as having a
253 low self-esteem (3%). The mean score for the emotional well-being over the last 6 months
254 (SDQ questionnaire) (mean=1.65, SD=1.74) was in accordance to data from different
255 population studies [54,72,73]; as were our findings on difficulties falling asleep, although
256 some studies show prevalence percentages up to 20 or 30% [15,74-76]. However, this PES
257 behaved quite differently compared to the other PES (e.g. no increasing prevalence with
258 increasing age (Table 1), no influence of cumulative stressor exposure (Table 3)), so
259 difficulties falling asleep (or its current way of assessment) may therefore be less suitable as a
260 psychosomatic outcome in the context of childhood stress research

261 **4.2. PES and its relation to childhood adversity**

262 This study confirmed the previously observed relationship between childhood adversities and
263 PES in school-aged children [13-21]. First, children with PES were more frequently exposed
264 to childhood adversities compared to children without PES. Second, an increasing number of
265 adversities gradually amplified the risk for PES, supporting literature on cumulative stress and
266 PES [12,13,18,20,21,24-26]. Last, a number of specified adversities were emphasized as

267 apparent risk factors for the occurrence of PES. So, both quantitative (i.e. the number of
268 adversities) and qualitative effects (i.e. the type of adversities) were observed to be related to
269 PES (although no firm conclusions on causality or directionality of this association can be
270 made).

271 Even though the exposure to only one FSA/NLE already increased the likelihood of PES, the
272 accumulation of multiple adversities in the child's life more substantially increased the risk
273 for PES. More specifically, the transition from three to four FSAs was associated with a
274 substantial increase in ORs (Table 3), as previously suggested by Forehand et al. [21]. Benjet
275 and colleagues hypothesized a 'ceiling effect' of the number of adversities on PES, meaning
276 that once a certain number of adversities is reached, the impact of any additional adversity on
277 PES may be considerably less [13].

278 Apart from the quantitative effects, the type of experienced adversities was also found to be of
279 importance in the relationship between childhood adversity and PES ('qualitative effect').
280 This study identified the following familial and social characteristics as apparent predictors
281 for PES: a non-traditional family structure, a bad family climate, peer problems and major
282 frustrations at school. Particularly a bad family climate impacted very strongly on the
283 occurrence of PES (ORs up to 22). However, the low prevalence of this adversity (N=51,
284 1.2%) may possibly have distorted this relationship. The importance of parental and peer
285 social support, family structure and socio-economic factors in the mental and physical health
286 of children has been shown before [13-17,25,56,65,67,77], although there may be some
287 disagreement on the role of e.g. immigrant status, low parental education, household income
288 and maternal teenage pregnancy on the risk for PES [13,16,65,67].

289 Concerning the effects of parental divorce and a non-traditional family structure on PES, both
290 stressors increased the risk for all PES (except difficulties falling asleep), although low self-
291 esteem was not affected by parental divorce. It is thus likely that self-esteem is more affected

292 by the ‘chronic’, continuing change of family structure than by the event of parental divorce
293 itself.

294 In general, the more consistent or stronger effect of certain specific types of adversities on
295 PES may be due to their higher stressfulness, to their more chronic character, or to their larger
296 impact on behaviour or feelings of self-worth and safety, as previously stated by Benjet et al.
297 [13].

298 A final remark on the independent effects of each adversity on the occurrence of PES is that
299 they should be interpreted in the context of the interrelatedness and clustering of events and
300 adversities [13,24], and by realizing that the occurrence of PES may not be determined by the
301 sole, pure effects of each separate adversity. Instead, all events and adversities together shape
302 the child’s living conditions and may contribute to PES as a whole.

303 Despite the observed relationship between PES and childhood adversity, this study identified
304 children experiencing adversities without exhibiting any PES (i.e. 11.8% of children with ≥ 4
305 FSAs), which may be due to the fact that children perceive, evaluate and cope with these
306 adversities in different ways. In short, childhood adversity clearly increases the risk for PES
307 in children but other factors such as coping styles and social support could be involved in this
308 complex relationship [78].

309 **4.3. Strengths and limitations**

310 The strength of this study is its large, international sample comprising 8 European countries,
311 allowing studying childhood adversities and PES in a larger context than has previously been
312 done. In addition, the fieldwork in the survey centres was performed at the same time using
313 the same standardized protocol. Nevertheless, there were some specific methodological
314 issues. First, the dichotomous nature of the variables may not consider the complexity of
315 certain events (e.g. family structure). Moreover, this study only assessed a limited number of
316 adversities and psychosomatic and emotional outcomes, which were exclusively parent-

317 reported and did not take into account children's perspectives. Unfortunately, we could not
318 examine the severity of the adversities as the 'IDEFICS Parental Questionnaire' was
319 inapplicable to obtain this objective, although Schilling et al. have advised to consider the
320 stressor severity together with the number of adversities in studying cumulative childhood
321 adversity [24]. Also, a selection or non-participation bias related to education or income-level,
322 as well as a response bias cannot be ruled out and may thus have influenced prevalence results
323 in both directions [27]. Finally, this study did not allow investigating causality or
324 directionality in the relationship between adversities and PES.

325

326 **5. Conclusions**

327 This study described the prevalence of PES in children younger than 12 years old in 8
328 European countries. We indicated the significance and impact of both quantitative (i.e. the
329 number of adversities) and qualitative (i.e. the type of adversities) effects of negative life
330 events and the child's family and social environment on the occurrence of PES in this cross-
331 national sample of young children. More specifically, an increasing number of adversities
332 gradually amplified the risk for PES. Moreover, children living in a non-traditional family
333 structure or a bad family climate and children experiencing peer problems or major
334 frustrations at school, were more likely to go through PES. These findings emphasize the
335 importance of the child's everyday familial and social environment on its (mental) well-being.

336

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Figure 1: Study flowchart

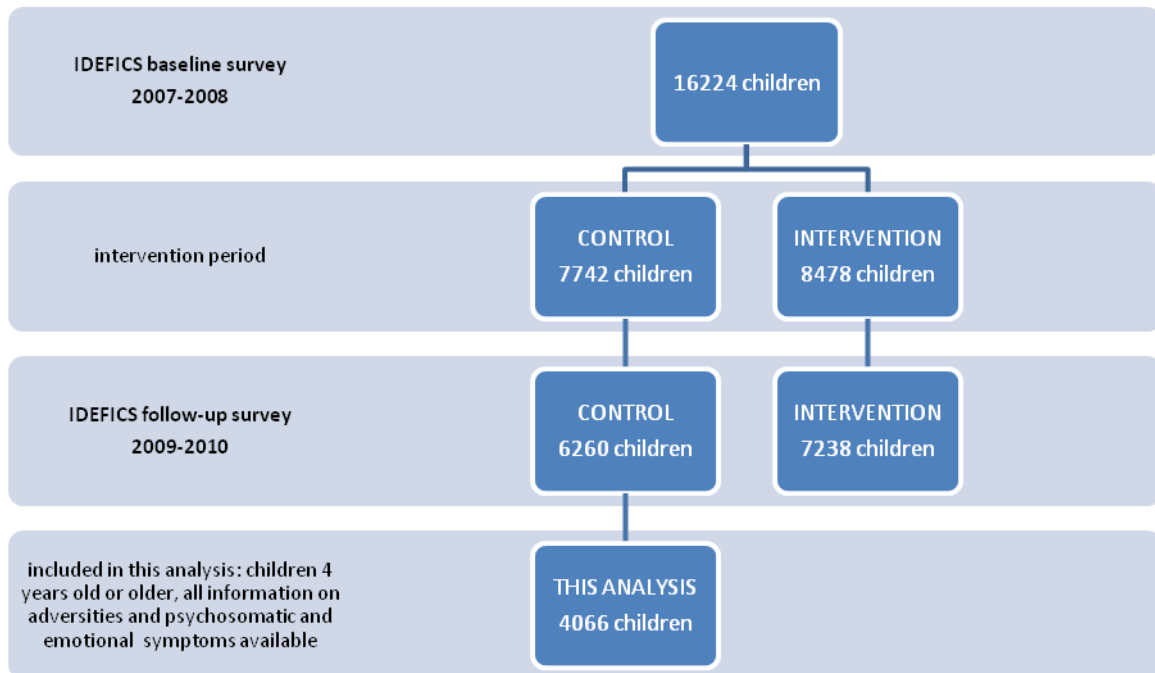


Table 1: Prevalence of psychosomatic and emotional symptoms in children

		KINDL			SDQ		medical questionnaire
		at least one psychosomatic or emotional symptom	low self-esteem last week	low emotional well-being last week	emotional problems last 6 months	headaches, stomach-aches or sickness	difficulties falling asleep
survey centers	<i>N of children</i>	<i>% of children</i>					
Belgium	343	42.6	0.6	32.7	7.3	7.3	14
Cyprus	469	42.9	6.4	34.8	3.8	5.8	5.8
Estonia	763	55.8	1.7	48.9	3.5	3	13.9
Germany	337	43.6	1.8	32	3.3	6.8	11.9
Hungary	643	40.3	3.3	34.7	3	2.8	5.1
Italy	520	50.2	3.3	44.2	2.7	4.8	9
Spain	472	49.8	5.7	42.4	4.4	6.8	5.7
Sweden	519	35.5	1	27.9	1.5	3.5	9.6
<i>p-values</i> χ^2		<0.001*	<0.001*	<0.001*	0.001*	<0.001*	<0.001*
age groups	<i>N of children</i>	<i>% of children</i>					
4	237	38.4	2.1	29.1	0.8	2.5	10.5
5	511	39.3	1.4	30.9	2.9	3.7	10.6
6	640	37.5	1.4	30.8	3.1	3.4	9.1
7	518	43.4	3.3	35.1	2.3	4.1	9.5
8	631	45.2	3.5	36.9	4.4	7.3	8.9
9	991	53.3	4.1	46.6	4.2	4.7	8.1
10+11	538	53.7	3.7	47	4.5	5.6	10.4
<i>p-values</i> χ^2		<0.001*	0.009*	<0.001*	0.052	0.01*	0.655
sex	<i>N of children</i>	<i>% of children</i>					
male	2019	44.9	3.1	38.1	3.4	4.1	9.2
female	2047	46.6	2.8	38.3	3.6	5.3	9.4
<i>p-values</i> χ^2		0.282	0.59	0.864	0.732	0.057	0.771
total	<i>N of children</i>	<i>% of children</i>					
	4066	45.7	3	38.2	3.5	4.7	9.3

KINDL: KINDL Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents; SDQ: Strengths and Difficulties Questionnaire

* statistically significant results

Table 2: Difference in exposure to childhood adversities between children with and without psychosomatic and emotional symptoms

	no psychosomatic and emotional symptoms (N=2207)	at least one psychosomatic or emotional symptom (N= 1859)		
	<i>% of children within 'no psychosomatic and emotional symptoms'</i>	<i>% of children within 'at least one psychosomatic or emotional symptom'</i>	<i>unadjusted OR (95% CI)</i>	<i>p-value χ^2</i>
Familial and social adversity				
being immigrant	12.2	13.1	1.08 (0.90-1.30)	0,423
low maternal education	10.1	13.2	1.36 (1.12-1.65)*	0,002*
family economic hardship	3.4	5.3	1.58 (1.16-2.15)*	0,003*
non-traditional family structure	17.4	25.4	1.62 (1.39-1.88)*	<0,001*
being only-child	15.3	19	1.30 (1.10-1.53)*	0,002*
latchkey care	4.3	8.1	1.93 (1.48-2.51)*	<0,001*
bad family climate	0.1	2.6	29.84 (7.25-122.90)*	<0,001*
teenage pregnancy	1.4	3.1	2.15 (1.39-3.33)*	<0,001*
peer problems	3.9	13.3	3.83 (2.97-4.94)*	<0,001*
Negative life events				
parental divorce/separation	9.8	17.1	1.90 (1.57-2.28)*	<0,001*
addition of a new family member	11.2	14.4	1.33 (1.10-1.59)*	0,003*
parental job loss	7.5	11.4	1.59 (1.28-1.96)*	<0,001*
major frustration at school	4.6	10.7	2.47 (1.93-3.17)*	<0,001*
severe diseases/accidents of the child	6.7	8.2	1.26 (0.99-1.59)	0,056
serious illness of family member	1.9	1.7	0.88 (0.56-1.40)	0,592
death of a parent	0.5	0.9	1.91 (0.86-4.21)	0,104
death of a sibling	0.5	0.6	1.31 (0.55-3.09)	0,539
death of a grandparent	4.7	4.9	1.05 (0.79-1.40)	0,734
death of a pet	0.8	0.5	0.59 (0.27-1.32)	0,195

* statistically significant results

Table 3: Contribution of the number of adversities to the occurrence of psychosomatic and emotional symptoms in children

		KINDL						SDQ				medical
		at least one psychosomatic or emotional symptom		low self-esteem last week		low emotional well-being last week		emotional problems over the last 6 months		headaches, stomach-aches or sickness		difficulties
number of familial and social adversities	N of children	<i>adjusted OR (95% CI)^a, p-value</i>										
1	1326	1.30 (1.12-1.51)	0.001*	1.48 (0.93-2.37)	0.098*	1.27 (1.09-1.48)	0.003*	2.17 (1.41-3.34)	<0.001*	1.61 (1.13-2.32)	0.009*	1.28 (1-1.4)
2	597	1.81 (1.49-2.20)	<0.001*	2.11 (1.21-3.66)	0.008*	1.81 (1.49-2.21)	<0.001*	2.50 (1.46-4.31)	0.001*	2.21 (1.43-3.41)	<0.001*	1.43 (1.04-1.96)
3	214	3.07 (2.25-4.19)	<0.001*	4.32 (2.30-8.14)	<0.001*	3.28 (2.42-4.45)	<0.001*	5.56 (3.06-10.11)	<0.001*	2.45 (1.36-4.41)	0.003*	0.98 (0.58-1.64)
≥4	60	7.42 (3.70-14.88)	<0.001*	8.25 (3.37-20.19)	<0.001*	6.98 (3.74-13.02)	<0.001*	10.99 (4.87-24.77)	<0.001*	2.75 (1.04-7.27)	0.042*	1.82 (0.87-3.82)
number of negative life events	N of children	<i>adjusted OR (95% CI)^{b,c}, p-value</i>										
1	1110	1.39 (1.20-1.61)	<0.001*	1.35 (0.87-2.10)	0.182	1.35 (1.16-1.57)	<0.001*	1.39 (0.92-2.09)	0.118	2.14 (1.53-3.01)	<0.001*	1.10 (0.86-1.41)
2	401	1.88 (1.51-2.35)	<0.001*	2.04 (1.10-3.78)	0.024*	1.72 (1.37-2.15)	<0.001*	2.06 (1.21-3.50)	0.008*	2.64 (1.65-4.21)	<0.001*	1.31 (0.93-1.85)
≥3	143	2.85 (1.98-4.12)	<0.001*	5.60 (2.84-11)	<0.001*	2.74 (1.92-3.91)	<0.001*	5.47 (3.09-9.66)	<0.001*	4.79 (2.68-8.57)	<0.001*	1.91 (1.18-3.07)

KINDL: KINDL Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents; SDQ: Strengths and Difficulties Questionnaire

^a Odds ratios (OR) for psychosomatic and emotional symptoms adjusted for age and sex of the child and survey centre; children with no familial and social adversities were taken as reference group (N=1869)

^b Odds ratios (OR) for psychosomatic and emotional symptoms adjusted for age and sex of the child and survey centre children with no negative life events were taken as reference group (N=2412)

^c Female sex was a significant predictor for 'headaches, stomach-aches or sickness' if adjusted for the number of NLEs, survey centre and age (OR=1.36; 95%CI=1.01-1.83; p=0.043; boys as reference category)

* statistically significant results

Table 4: Contribution of specific types of experienced adversities to the occurrence of psychosomatic and emotional symptoms in children

		KINDL				SDQ				medical questionn		
		at least one psychosomatic or emotional symptom		low self-esteem last week	low emotional well-being last week	emotional problems over last 6 months		headaches, stomach-aches or sickness		difficulties falling a		
Familial and social adversities	<i>N of children</i>	<i>adjusted OR (95%CI)-p-values^a</i>										
family economic hardship	173				1.49 (1.08-2.06)	0.015						0.43 (0.21-0.89)
non-traditional family structure	858	1.52 (1.30-1.79)	<0.001	1.69 (1.11-2.58)	0.015	1.39 (1.18-1.64)	<0.001	1.91 (1.30-2.80)	0.001	1.77 (1.27-2.47)	0.001	
latchkey care	246					1.38 (1.02-1.86)	0.038					0.37 (0.21-0.65)
bad family climate	51	22.77 (5.46-95.02)	<0.001	8.84 (4.15-18.81)	<0.001	22.12 (6.76-72.42)	<0.001	8.2 (4.03-16.71)	<0.001	3.79 (1.78-8.04)	0.001	4.51 (2.40-8.47)
teenage pregnancy	89			2.95 (1.27-6.85)	0.012							
peer problems	332	3.55 (2.73-4.61)	<0.001	2.86 (1.80-4.55)	<0.001	3.20 (2.51-4.09)	<0.001	6.34 (4.33-9.29)	<0.001	2.23 (1.49-3.36)	<0.001	1.64 (1.16-2.32)
being immigrant	513											
low maternal education	467											
being only child	690											
Negative life events	<i>N of children</i>	<i>adjusted OR (95%CI)-p-values^{a,b}</i>										
parental divorce/separation	533	1.72 (1.41-2.09)	<0.001			1.72 (1.42-2.09)	<0.001	1.90 (1.24-2.90)	0.003	1.66 (1.09-2.52)	0.018	
addition of a new family member	515			2.07 (1.25-3.43)	0.005					1.63 (1.08-2.46)	0.021	
parental job loss	376	1.43 (1.14-1.78)	0.002	1.98 (1.19-3.30)	0.009	1.34 (1.07-1.67)	0.011					
severe diseases/accidents of the child	300									2.18 (1.38-3.42)	0.001	
serious illness of a family member	75			3.02 (1.15-7.97)	0.025							
major frustration at school	301	2.26 (1.75-2.91)	<0.001	1.76 (1.00-3.11)	0.05	2.08 (1.62-2.66)	<0.001	3.87 (2.53-5.92)	<0.001	2.41 (1.59-3.64)	<0.001	1.59 (1.21-2.26)
death of a parent	26							5.57 (1.78-17.43)	0.003			
death of a sibling	21											
death of a grandparent	194											
death of a pet	27											

KINDL: KINDL Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents; SDQ: Strengths and Difficulties Questionnaire

^a Odds ratios (OR) for psychosomatic complaints adjusted for age and sex of the child and country; children that did not experience the specific adversity were taken as reference group. As backward regression analyses were performed, only the predictors with a significant contribution are retained and reported.

^b Female sex was a significant predictor for 'headaches, stomach-aches or sickness' if adjusted for NLE occurrence, survey centre and age (OR=1.38; 95%CI=1.02-1.86; p=0.035; boys as reference category)