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Association Between Bullying and Psychosomatic Problems: A Meta-analysis

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ABSTRACT

CONTEXT. In the last few years, there has been an increasing amount of research showing the concurrent and long-term consequences of bullying and being bullied by peers.

OBJECTIVE. We performed a meta-analysis to quantify the association between involvement in bullying and psychosomatic complaints in the school-aged population.

METHODS. We searched online databases (Embase, Medline, PsychInfo, Scopus) up to March 2008, bibliographies of existing studies, and qualitative reviews for studies that examined the association between involvement in bullying and psychosomatic complaints in children and adolescents. The original search identified 19 studies, of which 11 satisfied prestated inclusion criteria.

RESULTS. Three random-effects meta-analyses were performed for the following 3 groups of children aged between 7 and 16 years: victims, bullies, and bully-victims. Bully-victims, victims, and bullies had a significantly higher risk for psychosomatic problems compared with uninvolved peers.

CONCLUSIONS. The association between involvement in bullying and psychosomatic problems was demonstrated. Given that school bullying is a widespread phenomenon in many countries around the world, the present results suggest that bullying be considered a significant international public health issue. *Pediatrics* 2009;123:1059–1065

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Key Words

bullying, victimization, psychosomatic problems, public health, school

Abbreviations

OR—odds ratio
CI—confidence interval

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BULLYING HAS BEEN defined as a proactive form of aggression repeatedly perpetrated by 1 or more peers toward a weaker peer.¹ Large studies suggest that 20% to 30% of students are involved in bullying as bullies and/or victims.^{2–4} In recent years, medical practitioners, school psychologists, and educators have become increasingly aware of the adverse consequences of bullying among children. Bullying and being bullied represent a risk factor for children's psychological well-being and social adaptation because of the strong stability across time of those experiences.¹ Several studies have shown that bullies are likely to display negative and antisocial behavior (eg, truancy, delinquency, substance abuse) during adolescence and are at risk for psychiatric disorders.^{3,5,6} Frequent victimization is related with low self-esteem and self-worth,^{7–9} with depression,^{7–11} and with suicidal ideation.^{12,13}

In a recent qualitative review, Rigby¹⁴ summarized research results on the consequences of bullying within 4 major categories: (1) low psychological well-being; (2) poor social adjustment; (3) psychological distress; and (4) physical unwellness. However, the author reviewed only 4 studies^{15–18} that reported data supporting the conclusion that victimized children are at risk for health problems. Several important studies have been published since that review. Authors from different countries have investigated the association between bullying and being bullied and the incidence of several symptoms in the somatic sphere, such as headache, backache, abdominal pain, but also sleeping problems, bad appetite, and bed-wetting.^{2,19–22} Given that in such circumstances psychosocial processes seem to act as a major factor affecting children's health, these symptoms are often referred to as "psychosomatic problems."^{2,19–22} To clarify the present state of empirical research, we conducted a quantitative meta-analysis (a technique of summarizing a research literature using established quantitative methods) to test whether children involved in bullying are at increased risk for psychosomatic problems. In particular, 3 separate meta-analyses were performed for the following 3 groups of children: victims, bullies, and bully-victims. To our knowledge, this is the first meta-analysis on this issue.

METHODS

Selection of Studies

Three methods were used to identify relevant studies. First, computer literature searches from the year each database started until March 2008 were conducted using Medline, Embase, and PsychInfo, with the following key words:

“bullying” and “physical health,” “somatic,” “psychosomatic” and “children,” “adolescents,” “pediatric.” Relevant studies were also searched in Scopus. Second, review articles and book chapters regarding correlates or consequences of bullying were reviewed for possible relevant citations. Third, reference sections of the collected articles were searched for relevant earlier references. A list of 19 potentially relevant studies was generated.

Inclusion Criteria

To be included, a study had to meet the following criteria. The most basic requirement was inclusion of measures of school bullying and psychosomatic symptoms. These could include (1) self-report questionnaires, (2) peer’s, parent’s, or teacher’s reports, and (3) a clinical interview that resulted in a clinical rating of behaviors and health problems. Second, the study was required to have reported enough information to calculate effect sizes, for example by reporting comparisons between children involved as bullies or victims (or both) and a control group (ie, a group of uninvolved peers). We excluded studies that did not include a control group; studies that measured psychosomatic symptoms with items included in a larger scale, so that these symptoms could not be clearly distinguished from other psychosocial and/or health problems; studies with duplicated data; studies that did not explicitly report analyses on the variables of interest; studies with adults.

Coding of Studies

Two researchers (Dr Gini and Ms Pozzoli) independently reviewed all eligible studies. They coded studies on design (cross-sectional versus prospective), type of bullying measure (self-report questionnaire versus peer/adult reports versus clinical interview), type of psychosomatic symptoms measure, type of sampling procedure, and demographic characteristics of study participants (age, gender, race, socioeconomic status). Disagreements were resolved by discussion. Before the resolution of mismatches, raters coded study characteristics identically 98% of the time. Eight studies were excluded because they did not meet the inclusion criteria. The resulting pool included 11 studies that met our criteria.^{2,17,20–28}

Statistical Analyses

The dependent measure was occurrence of psychosomatic problems. Three studies^{2,20,25} reported a single composite score for psychosomatic complaints, whereas the remaining studies measured from a minimum of 3 to a maximum of 8 different symptoms distinctly (ie, headache, stomachache, backache, abdominal pain, dizziness, sleeping problems, poor appetite, bedwetting, skin problems, vomiting, feeling tired, feeling tense). Because the number and the type of symptoms varied across studies, the odds ratio (OR) for each symptom was extracted and then a pooled OR was computed from each study. The case-groups were formed by victims (that is children who are bullied by peers), by bullies (that is children who bully other school-mates), or by bully-victims (that

is children who both bully and are bullied at school). The control-group was always formed by uninvolved children (that is children who did not report being involved in bullying). All studies included in the meta-analysis reported data for victims of bullying. A subgroup of studies also reported analyses for bullies ($n = 6$) and bully-victims ($n = 5$). Therefore, 3 separate meta-analyses were performed, 1 for each of the 3 independent groups of children participating in bullying. Only 2 studies^{20,24} reported results separately for boys and girls. Therefore, we were not able to compare effect sizes for these 2 groups of children. In such cases, pooled effect sizes were computed.

Analyses were conducted with Comprehensive Meta-analysis 2.2 (Biostat, Englewood, NJ). We extracted ORs and their 95% confidence interval (CI) from each study. Data from individual studies were pooled by using a random-effects model, which provides statistically more conservative estimates than the fixed effects model. In other words, a random-effects model is less likely to show a significant effect than a fixed effects model. Each study was weighted by the inverse of its variance that, under the random-effects model, includes the original (within-studies) variance plus the between-studies variance τ squared (T^2). The z statistic was calculated, and a 2-tailed P value of $<.05$ was considered to indicate statistical significance. Heterogeneity was assessed using the Q statistic to evaluate whether the pooled studies represent a homogeneous distribution of effect sizes. Significant heterogeneity beyond random fluctuation exists if $P < .05$, although the test has low power and important variations may be present even with a non-significant result. For this reason, the random-effects model was used regardless of the test of heterogeneity, because this model assumes a population of true effect sizes (not 1 size) with broader confidence limits adjusted for heterogeneity between studies.

To address the possible “publication bias,” that is the fact that studies with nonsignificant results are less likely to be published, we computed the “fail-safe N ” (N_{fs}) according to the method proposed by Orwin,²⁹ which is more conservative than the traditional Rosenthal’s N_{fs} .^{30,31} Orwin’s N_{fs} determines the number of additional studies in a meta-analysis yielding null effect sizes that would be needed to yield a “trivial” OR of 1.05. Researchers suggest that meta-analysts calculate a tolerance level around a fail-safe N equal to 5 times the number of effects included in the meta-analysis (symbolized by k) plus 10 (the “ $5k + 10$ ” benchmark).^{31,32} Moreover, the association between the standardized effect sizes and the variances of these effects was analyzed by rank correlation with use of the Kendall τ method. If small studies with negative results were less likely to be published, the correlation between variance and effect size would be high. Conversely, lack of significant correlation may be interpreted as absence of publication bias.³³

RESULTS

Table 1 shows the general characteristics of the 11 studies included in this meta-analysis, including sample size

TABLE 1 Characteristics of the Studies Included in the Meta-analysis

Authors (Year, Country)	n (Response Rate, %)	Age Range (% of Girls)	Bullying Measure	Symptoms Measure	Adjustment for Confounders	Study Design	Type of Sampling Design
Williams et al ¹⁷ (1996, United Kingdom)	2962 (93.1)	7.6–10 (unknown)	Semistructured interview asking for victimization	Semistructured interview assessing 4 symptoms	Not specified	Observational retrospective cohort study	Cohort sampling
Forero et al ¹⁸ (1999, Australia)	3918 (86)	11–15 (54.3)	1 self-report item for bullying; 1 self-report item for victimization	Self-report scale (8 items, $\alpha = .81$)	Clusters within schools	Cross-sectional school survey	Cluster random sampling (HBSC protocol)
Rigby ²⁰ (1999, Australia)	78 (28.3)	Time 1: 13.8 time 2: 16.7 (44.9)	Time 1: Self-report scale on victimization (5 items, $\alpha = .80$)	Time 2: "Somatic symptoms" subscale (7 items) of the General Health Questionnaire	Not specified	Observational prospective study (3 years)	Convenience
Natvig et al ²³ (2001, Norway)	856 (83.7)	13–15 (50.6)	1 self-report item for bullying One self-report item for victimization	Self-reported frequency of 6 symptoms	Gender, age, school	Cross-sectional school survey	Unknown
Fekkes et al ²¹ (2004, Netherlands)	2766 (100%)	9–12 (50)	1 self-report item for bullying; 1 self-report item for victimization	Self-reported frequency of 8 symptoms	Gender	Observational retrospective cohort study	Unknown
Due et al ²⁴ (2005, 28 countries)	123 227 (>90)	11–15 (51)	1 self-report item for victimization	Self-reported frequency of 7 symptoms	Age, family affluence, country	Cross-sectional school survey	Cluster random sampling (HBSC protocol)
Fekkes et al ²⁵ (2006, Netherlands)	1118 (70)	9–11 (50.3)	1 self-report item for victimization	Self-reported frequency of 7 symptoms ($\alpha = .72$)	Gender, age, having friends	Observational prospective study (6 mo)	Unknown
Schnohr and Niclasen ²⁶ (2006, Greenland)	891 (not specified)	11–15 (unknown)	1 self-report item for bullying; 1 self-report item for victimization	Self-reported frequency of 3 symptoms	Gender, age	Cross-sectional school survey	Cluster random sampling (HBSC protocol)
Srabstein et al ²⁷ (2006, United States)	15 305 (83)	11–15 (53.5)	1 self-report item for bullying; 1 self-report item for victimization	Self-reported frequency of 6 symptoms	Gender, age, race, overweight/obesity, maternal education	Cross-sectional school survey	Cluster random sampling (HBSC protocol)
Kshirsagar et al ²⁸ (2007, India)	500 (100)	8–12 (62.4)	Semistructured interview asking for victimization	Semistructured interview assessing 5 symptoms	Not specified	Observational retrospective cohort study	Simple random sampling
Gini ²² (2008, Italy)	565 (94)	8–11 (52.9)	Self-report scale on victimization (6 items, $\alpha = .83$); self-report scale on bullying (6 items, $\alpha = .75$)	Self-reported frequency of 6 symptoms	Gender, age	Observational retrospective cohort study	Simple random sampling

HBSC indicates Health Behaviour in School-aged Children.



FIGURE 1 Forest plot for random-effect meta-analysis of the association between being bullied and psychosomatic problems. Effect size is expressed as OR. Studies are represented by symbols, the area of which is proportional to the study's weight in the analysis.

and response rate, available details of participants (age range and gender), study design, and study measures. A total of 152 186 children and adolescents between 7 and 16 years of age participated in the 11 studies. Across the 9 studies that provided detailed gender information, 52.2% of participants were girls. Information about ethnicity or race of the participants was not systematically reported in all studies. Overall, the heterogeneity of racial classification within and across studies was such as to preclude any analysis by race or ethnicity.

Only 2 studies used a prospective design. For 78 adolescents, Rigby²⁰ reported data collected at 2 time points: first when participants were 13-year-old and then 3 years later. Fekkes and colleagues²⁵ compared 9- to 11-year-old victims and uninjured children at the beginning of the school year and 6 months later. The remaining studies employed a cross-sectional design.

Association Between Being Bullied and Psychosomatic Problems

Across the 11 samples, victimized children were found to have a higher risk for psychosomatic problems than uninjured peers (OR: 2.00 [95% CI: 1.70–2.35]; $P < .0001$). Figure 1 shows the forest plot for this meta-analysis. Studies were sufficiently homogeneous ($P > .06$). There was no evidence of publication bias. Kendall's τ was 0.13 with 2-tailed $P = .58$. An additional 143 studies with null effect sizes would be needed to attenuate this omnibus effect size to a nonsignificant value (" $5k + 10$ " benchmark = 65).

The cumulative meta-analysis revealed no shift in effect size as smaller studies were included. The effect size after addition of the 2 largest studies^{24,27} was 1.96 (95% CI: 1.82–2.12), and the effect size after all the studies were included was 2.00. Because the overall effect size is well within the 95% CI for that of the largest studies, there is no evidence of a "small study effect."³⁴ We also performed a sensitivity analysis by excluding the 2 studies^{17,28} that employed semistructured interviews,

instead of questionnaires, to assess bullying and health problems. The resulting OR and confidence interval were 1.95 and 1.61 to 2.36, respectively.

Finally, another sensitivity analysis was based on quality of the studies. Quality was assessed through 2 criteria (above those required as inclusion criteria): (1) use of a randomized sampling design, and (2) a good response rate (>80%). Six of the studies^{2,17,21,22,27,28} met these criteria. We then performed a separate meta-analysis on these studies, and the resulting OR and confidence interval were 1.90 and 1.57 to 2.31, respectively.

Association Between Active Bullying and Psychosomatic Problems

Six studies provided data for bullying children. Overall, bullies had a higher risk for psychosomatic problems than uninjured children (OR: 1.65 [95% CI: 1.34–2.04]; $P < .0001$). The forest plot depicting this result is presented in Fig 2. All studies were highly homogeneous ($P = .96$). Kendall's τ was 0.07 with 2-tailed $P = .85$. According to Orwin's fail-safe N , to reverse this result it would be necessary to add 56 more studies with null effect sizes to the existing pool (" $5k + 10$ " benchmark = 40). Also in this case, there was no evidence of a "small study effect." The effect size after addition of the 2 largest studies^{2,27} was 1.64 (95% CI: 1.25–2.16), and the effect size after all the studies were included was 1.65.

Among the studies identified as having high quality three^{22,26,27} reported data for bullies. The separate analysis performed on these studies yielded the following results: OR: 1.64 (95% CI: 1.27–2.10).

Association Between Both Being Bullied and Bully Others and Psychosomatic Problems

Finally, a meta-analysis was performed on the 5 data sets that compared bully-victims with uninjured peers. Bully-victims were found to have a significantly higher risk for psychosomatic problems than uninjured peers (OR:

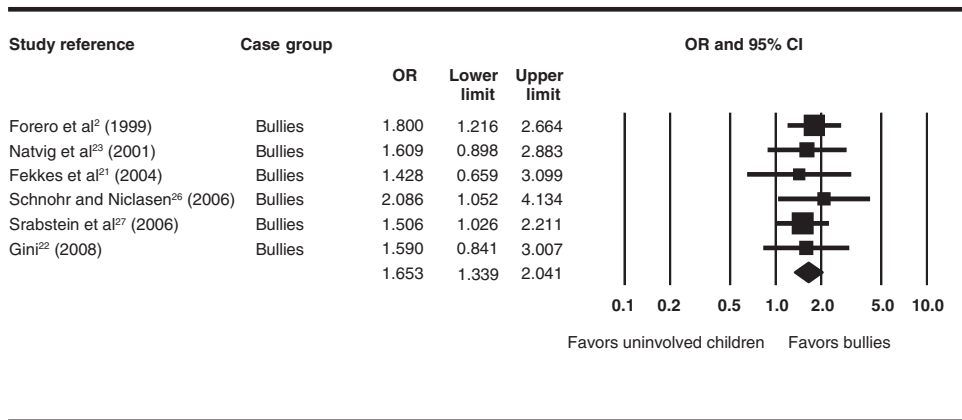


FIGURE 2 Forest plot for random-effect meta-analysis of the association between active bullying and psychosomatic problems. Effect size is expressed as OR. Studies are represented by symbols, the area of which is proportional to the study's weight in the analysis.

2.22 [95% CI: 1.77–2.77]; $P < .0001$). Figure 3 presents the forest plot for this meta-analysis. Also in this case, studies were highly homogeneous ($P = .72$), and there was no evidence of publication bias. Kendall's τ was 0.20 with 2-tailed $P = .62$. An additional 77 studies with null effect sizes would be needed to attenuate this omnibus effect size to a nonsignificant value ("5k + 10" benchmark = 35). In the cumulative meta-analysis with studies sorted from largest to smallest sample size, the effect size after addition of the 2 largest studies^{2,27} was 2.24 (95% CI: 1.68–2.99), and the effect size after all the studies were included was 2.22.

Among the studies identified as having high quality three^{22,26,27} reported data for bully-victims. The resulting OR and 95% CI were 2.34 and 1.74 to 2.87, respectively.

DISCUSSION

To our knowledge, this article presented the first meta-analysis of the bullying-health problems literature. The pattern of results indicated that children who are target of peer aggression (victims and bully-victims) are at significantly higher risk for a variety of psychosomatic problems if compared with uninjured peers. Similarities between victims and bully-victims in several do-

main, such as low emotional adjustment, poor relationships with classmates, and health problems, are commonly found in large survey studies across the world.³⁵ Also bullies were found at significantly higher risk for psychosomatic problems than uninjured peers. In this meta-analysis, the largest effect sizes were for victims and bully-victims, whereas bullies were at lower risk for psychosomatic problems than the former 2 groups. This result confirms the fact that, among all children involved in the bullying phenomenon, bullies tend to manifest the fewest number of adjustment problems.²² Differences between the different groups of children are worthy of comment. Literature on the psychosocial adjustment of children involved in bullying has shown both similarities and differences between bullies and victims. For example, both groups of children are characterized by academic problems.³⁶ In contrast, whereas victims often report low self-esteem, loneliness, depression, and anxiety,^{20,37–40} bullies show externalizing problems, poor school adjustment, and frequent alcohol and drug use.^{6,20,35} Finally, bully-victims have been described as poorly socially adjusted,^{35,39,40} isolated,¹ anxious,^{4,11} hyperactive,²² and with disturbed personalities.⁴

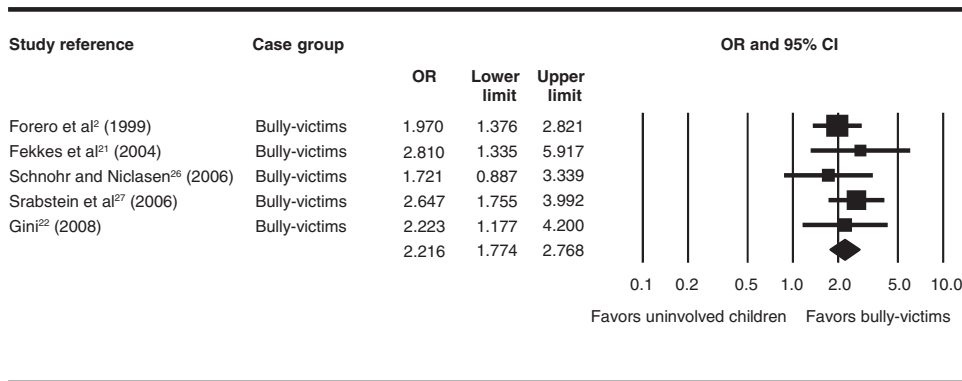


FIGURE 3 Forest plot for random-effect meta-analysis of the association between both active bullying and being bullied and psychosomatic problems. Effect size is expressed as OR. Studies are represented by symbols, the area of which is proportional to the study's weight in the analysis.

Strengths, Limitations, and Implications for Future Research

Meta-analysis is an invaluable tool to integrate previous research, illuminate research gaps, and define priorities for future research. The strengths of this meta-analysis include the large number of children and adolescents who have participated in the studies and the geographic distribution of the samples, which were derived from different countries around the world (ie, United States, European Union, East Asia, and Australia). Furthermore, almost all the studies included in our meta-analysis presented data from regional or national representative samples. Finally, we did not find evidence of publication bias that may have led to overestimate the association between bullying and psychosomatic problems.

Although the current findings seem to be relatively consistent and robust, some limitations in the studies included in the meta-analysis need to be addressed. First, 2 studies used clinical interviews to collect information on bullying and health. All others studies used self-report questionnaires, both for bullying and for children's health complaints. In some cases, these measures were reduced to a single-item questionnaire. Self-report measures are very common in bullying research and they are considered valid and reliable.⁴⁰ However, 1 possible problem of this methodology is that it requires a good level of respondents' self-consciousness. Moreover, some bullied children may tend to deny their condition, whereas children who bully may be reluctant to identify themselves as those who actually bully. Finally, correlations among data derived from the same source (ie, when both bullying experiences and health problems are self-reported by children) might be inflated by the common method variance. For these reasons, future studies should collect information through multiple independent informants, such as children themselves, their peers within the class, and their teachers or parents. Also the assessment of children's physical health needs to be improved. For example, none of the studies included independent information, such as children's school absenteeism extracted from the school attendance records.

Second, the studies included in the meta-analysis did not measure different forms of victimization separately (ie, physical and relational victimization), or did not report separate analyses for different forms of victimization. Of course, the 2 forms of peer victimization are not independent types of experience in children's and adolescents' lives. Rather, they are 2 partially overlapping forms of harassment, as demonstrated by their moderate to high intercorrelations commonly found with both self-report and peer nomination measures of victimization.^{41,42} Despite this overlapping, however, recent research has demonstrated the importance of distinguishing the 2 forms of victimization because they may be differentially related to personal adjustment.^{39,43} Future studies should additionally analyze the negative health consequences of physical and relational, or indirect, victimization experiences.

Third, all but 2 studies used a cross-sectional design, thus limiting the possibility to infer causal relationships between the variables. In other words, although studies concluded that victimized children have higher chance of showing psychosomatic problems, they did not ad-

dress the question whether the opposite hypothesis could be true, that is that ill children are more bullied than healthy children. A first answer to this question was provided by Fekkes and colleagues²⁵ in their short-term prospective study with a sample of 1118 Dutch elementary school-aged children. Their results clearly showed that children who were bullied at the beginning of the school year had significantly higher chances of developing psychosomatic problems later in the same school year compared with nonvictimized children. In contrast, Fekkes and colleagues' data did not support the hypothesis that health symptoms preceded victimization. Nonetheless, additional research is needed to assess the developmental paths that link involvement in bullying to its long-term health consequences.

Fourth, our meta-analysis shares the same limitations of all meta-analyses of observational studies. Because individuals cannot be allocated randomly to case groups, the influence of confounding variables cannot be fully evaluated. In most of the studies, OR adjusted for potentially relevant confounders were available. However, studies did not adjust for the same confounders. They generally failed to account for 1 or more personal or psychosocial factors (eg, ethnicity, family environment, social support, number and quality of friendships, psychological distress) that may have an impact on children's and adolescents' health. Finally, we suggest that there is some value in designing studies that will address the issues of comorbidity and of peer victimization within specific pediatric populations (ie, children with communication disorders, type 1 diabetes, craniofacial anomalies, cognitive impairment).

CONCLUSIONS

With these limitations in mind, the studies reviewed supported the fact that children frequently involved in bullying, particularly victims and bully-victims, suffer from psychosomatic problems. The evidence seems to suggest that these problems occur among children of both genders, of different age groups, and from different countries around the world. Conclusions such as these have been drawn before from single empirical studies or in qualitative review papers. In this article, they are clearly demonstrated in aggregated quantitative effects. Moreover, this meta-analysis significantly adds to the body of research that documents poor personal adjustment among children involved in bullying, summarized in another meta-analysis on the psychosocial consequences of peer victimization.³⁷ Taken together, these results have significant implications for pediatricians, psychologists, and other health care professionals. It is very important that these professionals be able to identify children who are at risk of being involved in school bullying because the potential negative health, psychological, and educational consequences are far-reaching. To this respect, we agree with Storch and colleagues'⁴² suggestion that clinicians ask brief questions to children and their parents to assess emotional functioning and peer experiences. Overall, given that bullying is a widespread phenomenon in many schools around the world, the present results suggest that bullying be considered a significant international public health issue.

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significant to non-significant (behavior problems, transportation as a reason for unmet medical needs, and dentist didn't know how to provide care and no dental insurance as reasons for unmet dental needs), and an OR incorrectly listed as significant in the prior version is now correctly listed as non-significant (for needs/uses prescription medication). For multiracial children, there were only minor changes in a few ORs.

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Renzetti G, Silvestre G, D'Amario C, Bottini E, Gloria-Bottini F, Bottini N, Auais A, Perez MK, and Piedimonte G. Less Air Pollution Leads to Rapid Reduction of Airway Inflammation and Improved Airway Function in Asthmatic Children. *Pediatrics*. 2009;123(3):1051–1058

An error appeared in this article by Renzetti et al (doi:10.1542/peds.2008-1153). On page 1055, left column, second paragraph, in the phrase “On the other hand, recent studies in adults (28) suggest that the magnitude of the changes measured in our end points would be much larger in patients with more severe asthma and more compromised airway function,” the (28) is a reference and should be written in apex.

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Gini G and Pozzoli T. Association Between Bullying and Psychosomatic Problems: A Meta-analysis. *Pediatrics*. 2009;123(3):1059–1065

An error appeared in this Review Article by Gini and Pozzoli (doi:10.1542/peds.2008-1215). On page 1062, left column, second paragraph of the section headed “Association between being bullied and psychosomatic problems”, the right references for the two largest studies are 24 and 27, and not 27, 28, and 34 as indicated in the article.

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