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ORIGINAL ARTICLE

Physical and psychological symptoms and learning difficulties in children of women exposed and non-exposed to violence: a population-based study

Niclas Olofsson · Kent Lindqvist · Katja Gillander Gådin · Lennart Bråbäck · Ingela Danielsson

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Abstract
Objectives To analyse the association between violence against mothers and the health of their children as reported by the mothers.
Methods The data originate from a multistage sampling health-questionnaire survey, distributed to a representative sample of women in Sweden. The health of 283 children (aged 0–18 years), as reported by women who had been exposed to violence at home or outside home during the past 12 months, was compared with that of 4,664 children of non-exposed mothers.
Results Odds ratios regarding most registered physical symptoms showed that children of violence-exposed mothers had a significant higher risk of ill health than children of non-exposed mothers. Regarding psychological symptoms and learning difficulties, the odds were raised for girls for most symptoms, but not for boys. A twofold increase in health-care utilisation and an overall general increase in the risk of pharmaceutical consumption were shown for both girls and boys of exposed mothers.
Conclusions This population-based study shows an increased risk of poorer health amongst boys and girls aged 0–18 years, as reported by mothers exposed to violence.

Keywords Violence · Children · Physical health · Population based

N. Olofsson · K. Lindqvist
Division of Social Medicine and Public Health Science, Department of Medicine and Health, Linköping University, Linköping, Sweden

K. G. Gådin
Department of Health Sciences, Mid-Sweden University, Sundsvall, Sweden

L. Bråbäck
Department of Clinical Science, Pediatrics, Umeå University, Umeå, Sweden

L. Bråbäck · I. Danielsson
Department of Research and Development, Västernorrland County Council, Sundsvall, Sweden

I. Danielsson
Department of Clinical Science, Obstetrics and Gynaecology, Umeå University, Umeå, Sweden

N. Olofsson (✉)
County Council of Västernorrland, 871 85 Härnösand, Sweden
e-mail: niclas.olofsson@lvn.se

Introduction

Violence against women has severe health consequences both for victims as well as their children (Howard et al. 2002) and is a very urgent public health issue (Garcia-Moreno et al. 2006).

A great number of studies have addressed exposure to domestic violence during childhood and the related mental health problems. The physical health consequences of exposure to domestic violence during childhood are less documented (Bair-Merritt et al. 2006). In addition, to our knowledge, no studies exist that describe the health effects in children whose mothers suffered violence outside their intimate relationship. This study will address both shortcomings.

Children can be affected by domestic violence in several ways, such as witnessing violence, hearing it, being used as a tool of the perpetrator and being abused by the violent parent (Koverola et al. 2005; Schnitzer and Ewigman

2005). In case of mothers suffering violence outside their intimate relationship, it is less probable that children are affected in such a way (Campbell and Lewandowski 1997; Graham-Bermann and Seng 2005).

The mental health problems of children affected by domestic violence have been documented extensively (Bair-Merritt et al. 2006). Children who suffer violence themselves are likely to develop PTSD and other psychological symptoms (Graham-Bermann and Seng 2005). Also, longtime effects on the health-care utilisation of these children have been found (Rivara et al. 2007).

It has also been shown that the merely witnessing domestic violence affects children's physical and mental health as much as being subjected to it themselves (Hornor 2005). Externalised and internalised behavioural problems have been related to witnessing domestic violence. Externalised behavioural problems refer to rule breaking and aggression. Internalised behaviour problems are defined as affective and somatic symptoms, poorer cognitive functioning and traumatic stress symptoms (Edleson 1999; Hazen et al. 2006).

Violence against women may also have indirect negative effects on their children. Women exposed to violence or threats experience physical and mental health impacts and depression (Danielsson et al. 2005; Garcia-Moreno et al. 2006; Mahony and Campbell 1998). Maternal depression may have negative health effects on children, including increased illness (Goodwin et al. 2007), increases in health-care utilisation (Flynn et al. 2004; Minkovitz et al. 2005), poorer health status (Casey et al. 2004) and greater risk of mental health problems (Weissman et al. 2006). It is likely that these negative health effects are not restricted to children suffering from domestic violence. Probably, such indirect health effects can also be found in children of mothers who suffer violence outside their intimate partner relationship. However, no studies exist to show such effects.

In conclusion, studies on children exposed to domestic violence most often focus on mental health problems, and insights into physical health problems are scarce. Also, it is not known how children are affected by their mother being exposed to violence outside their intimate relationship. The aim of this study is therefore to analyse both physical and psychological health of children (0–18 years divided into three age groups) living with mothers, who had been exposed to violence or threats either within or outside intimate relationships during the past 12 months. The authors used a Swedish population-based study to evaluate whether women who reported exposure to violence over the past 12 months also reported more physical and psychological symptoms in their children as compared to women who did not report any exposure to violence.

Methods

The data used for this study were from the Life and Health Survey, a multistage sampling survey that was carried out in Sweden in 1997 and addressed individual men and women. The four northern county councils constituted the geographically defined primary sampling units (PSUs). These PSUs were stratified according to age and municipality. The individuals were selected with a probability proportional to the population size within the stratum. The questionnaires were sent by mail to 11,073 women, with a total response rate of 69% ($n = 7{,}590$).

Of these 7,590 participants, those living with their own or their spouses' children ($n = 2{,}137$) were asked to answer supplementary questions on their children. The response rate in this sub-sample was 71%. The final study sample consisted of a total of 2,137 women aged 18–64 years and living with 4,947 children aged between 0 and 18 years. The sampling procedure is similar to other national health surveys in Sweden and a thorough technical report of the sampling procedures has been published by Statistics Sweden (Statistics Sweden 2006).

All participants in the Life and Health Survey were informed about the study and asked to answer the questions as instructed in a cover letter enclosed with the questionnaire. Answering the questionnaire was regarded as consenting to take part in the study. The ethics committee at Umeå University gave its approval for the survey.

In the questionnaire, a total of 70 questions were addressed to all the women, covering their health, living conditions, socioeconomic factors and work. Under the heading 'Security', there were two questions about violence, with the following wording: 'During the past 12 months, have you been exposed to physical violence?' and 'During the past 12 months, have you been exposed to threats of violence so severe that you felt afraid?' Connected to the questions about violence were questions about where the violence had happened: in your own apartment, someone else's apartment, at work/in school, at a public place/restaurant/night club. Four background questions covered the women's socioeconomic status (education, economic situation, employment) and marital status. Another question was related to daily smoking. The women's financial margin was evaluated through the question, 'If you suddenly needed 14,000 kronor (approximately €1,500), could you manage to get it in 1 week?'

The specific question answered by the women living with children contained a further ten items about their children's health and behaviour: 'During the past 3 months, has your child had any of the following symptoms: (1) headache, (2) eating problems, (3) stomach ache, (4) pain anywhere in the body, (5) allergy/asthma, (6) inability to concentrate, (7) anxiety, (8) difficulty in

keeping/finding friends, (9) need for extra support at school, or (10) reading/writing difficulties?' An additional question, regarding health-care utilisation, was also used: 'During the past 12 months, has your child visited a physician or nurse?' (alternative health-care sources were available but not relevant.) Six items focused on the use of different pharmaceuticals: 'During the past 12 months, has your child received any of the following medications: (1) cough mixture, (2) nose drops, (3) asthma medication, (4) allergy medication, (5) antibiotics, or (6) analgesics?'

All the questions had binary response alternatives (yes/no). The phrasing of the questions was taken from the Living Conditions Survey, an annual national survey conducted by Statistics Sweden (Statistics Sweden 2006).

Statistical methods

Multilevel logistic regression analyses were selected to analyse the dichotomous dependent variables. In this material, the sampling structure introduced multilevel relationships between the observations, i.e. associations within families. Level 1 included children about whom information was reported and level 2 included the mothers who answered the questions about these children. The relationships are mainly caused by interdependence (economic, social or biological) amongst the family members. Chi-square statistics were used to test the difference between demographic characteristics of violence-exposed mothers and their non-exposed counterparts. Student's t test was used to analyse average differences in physical symptoms and the average sums of pharmaceutical usage. Since a model-based approach with multilevel analyses was chosen for analysing the data, the analyses were made using unweighted data. SPSS 13.0 was used to produce the frequencies and for t and Chi-square tests, whilst hierarchical linear and non-linear modelling (HLM 6.02) was used for the multilevel analyses.

Results

As much as 6% of the mothers (138/2,137) answered that they had been exposed to violence and/or threats of violence during the past 12 months. Of the exposed women, 45% had experienced violence at home or at somebody else's home, 24% at their work or in an educational environment and 19% in a public place/restaurant or nightclub. The mean age of the mothers exposed to violence/threats was 27 years (range 18–55), whilst the mean age of those not exposed was 34 years (range 18–64). The age difference between the exposed and non-exposed mothers was statistically significant, ($p < 0.001$). The number of children whose mothers had suffered violence was 283 (6%), and 4,664 children lived with non-exposed mothers. To distinguish between developmental differences in the sample of children, three age categories were chosen (0–6, 7–12 and 13–18 years). Generally, the children of exposed mothers were younger than those of non-exposed mothers ($p < 0.005$) (Table 1).

Table 1 Number and age distribution of the children of mothers exposed to violence/threats during the past 12 months compared with those of unexposed mothers

Age group	Children of exposed mothers n (%)	Children of unexposed mothers n (%)
0–6		
Female	71 (25.0)	893 (19.2)
Male	65 (23.0)	915 (19.6)
7–12		
Female	21 (7.4)	793 (17.0)
Male	76 (26.9)	757 (16.2)
13–18		
Female	22 (7.8)	598 (12.8)
Male	28 (9.9)	708 (15.2)
Total	283 (100)	4,664 (100)

The socioeconomic characteristics of the mothers are given in Table 2. Women who had experienced violence were more likely to have a more difficult economic situation, to be daily smokers, to have a lower education level and to be unemployed. They were also more frequently single parents.

Table 3 shows the odds ratios (OR) for maternally reported physical symptoms amongst the children of exposed mothers, compared with the children of unexposed mothers. The crude ORs were adjusted for mother's sociodemographic characteristics (economic situation, education, employment situation and marital status) and smoking. Maternal age did not affect the odds ratios and was consequently left out of the analysis. Odds ratios regarding all registered physical symptoms (with the exception of allergy/asthma in the youngest age groups) showed that children of violence-exposed mothers had a significant higher risk of ill health than those of non-exposed mothers.

The children of the mothers who had experienced violence had a significantly higher average number of reported symptoms across all age groups. The mean number of physical symptoms amongst the children of mothers exposed to violence was 1.4, 2.2 and 2.1, from the youngest to the oldest age group, compared with 1.0, 1.2 and 1.2 for the children living with unexposed mothers ($p < 0.001$).

In all the reported psychological outcomes, the girls of exposed mothers had a higher reported risk than those in families of unexposed mothers (Table 3). With regard to the boys, only the risk of having suffered from anxiety was

Table 2 Socioeconomic characteristics of mothers who had been exposed to violence compared with unexposed mothers

Characteristics	Exposed mothers ($N = 138$) n (%)	Unexposed mothers ($N = 1{,}999$) n (%)	Exposed versus unexposed p value
Insufficient financial margin	49 (35.5)	366 (18.3)	<0.000
Daily smoker	38 (27.5)	230 (11.5)	<0.000
Education			
Upper secondary school <3 years	63 (45.7)	1,083 (54.2)	<0.000
Upper secondary school 3–4 years	59 (42.8)	440 (22.0)	<0.000
University	16 (11.6)	476 (23.8)	<0.000
Unemployed	27 (19.6)	250 (12.5)	<0.000
Single	78 (56.5)	756 (37.8)	<0.000

moderately elevated in boys of violence-exposed mothers. The risk of suffering from difficulties in keeping/finding friends and writing/reading difficulties was equal amongst boys of exposed and non-exposed mothers, whilst inability to concentrate and the need of extra support at school showed an even lower risk for boys of non-exposed mothers (Table 4). No distinct pattern could be distinguished in terms of age.

Children of violence-exposed mothers demonstrated a higher utilisation of the health-care system as reported by the mothers, with almost twice the risk in overall terms of having visited a physician during the past 12 months and an adjusted OR for boys of 1.4 (95% CI 0.9–2.0), 2.0 (95% CI 1.5–2.6) and 2.4 (95% CI 1.8–3.3) for the youngest to the oldest age group. The corresponding figures for girls were 1.2 (95% CI 0.9–1.6), 1.4 (95% CI 1.1–1.9) and 1.6 (95% 1.3–2.1), respectively. The equivalent figures for visiting a nurse were 2.0 (95% CI 1.4–2.8), 2.1 (95% CI 1.6–2.6) and 2.4 (95% CI 1.9–3.0) for boys and 2.2 (95% CI 1.7–2.9), 1.9 (95% CI 1.0–3.5) and 1.9 (95% CI 1.1–3.3) for girls. There was a general increase in the overall risk of pharmaceutical consumption of children living in a household where mothers had reported being exposed to violence (Fig. 1). No clear gender differences or age-related patterns were found.

Additionally, children of mothers who had suffered violence at home were compared with those whose mother had suffered violence elsewhere. Differences regarding health outcomes, health-care utilisation and pharmaceutical use were small.

Discussion

This study is based on questionnaires answered by a representative sample of women in northern Sweden. Women who reported exposure to physical violence and/or threats during the past 12 months also reported more signs of poor physical health of their children in all age groups and both genders, as compared to women who did not report any exposure to violence. Generally, both boys and girls were more likely to suffer from physical symptoms if their mother had been exposed to violence. But only girls (and not boys) were more likely to suffer from psychological symptoms if their mother had been exposed to violence. Further, higher medical health-care utilisation and a higher use of various medicines were reported for both girls and boys of exposed mothers. The results remained stable, irrespective of the mother's economic situation, age, smoking habits, education, employment or civil status.

The findings show that children of women who have been exposed to violence have more negative health outcomes, independently of the socioeconomic status. There are at least three possible reasons for this finding: the children were exposed to violence themselves; the children witnessed violence; the children had indirect negative effects because their mothers suffered from poor mental health and/or depression.

Children, who live in families where the mother suffers domestic violence, are frequently abused themselves (Campbell and Lewandowski 1997; Levendosky et al. 2006). Being abused themselves or witnessing violence, particularly involving family members, may be sufficient to produce post-traumatic stress reactions in children (Jaffe et al. 1990; Silvern and Kaersvang 1989). Post-traumatic stress is a possible biological mechanism of negative physical and psychological health outcomes in children (Friedman 1995; Graham-Bermann and Seng 2005; Seng et al. 2005). Thus, one explanation for the results in this study is that children of violence-exposed mothers suffer from post-traumatic stress and are therefore at higher risk for ill health.

However, our findings also suggest that violence against women has negative effects on their children, even if this violence does not happen within the household. This is remarkable and the authors are not aware of any other

Table 3 Adjusted odds ratios (OR) with 95% confidence intervals for different physical and psychological outcomes and learning difficulties over the past 3 months of children living with mothers exposed to violence compared with those living with unexposed mothers

Age group (years)	Physical symptoms					Psychological symptoms and learning difficulties				
	Headache	Eating problems	Stomach ache	Diffuse physical pain	Allergy/asthma	Inability to concentrate	Anxiety	Difficulty finding/keeping friends	In need of extra support at school	Reading/writing difficulties
Girls										
0–6	**2.2 (1.2–4.3)**	**7.1 (5.9–8.5)**	**2.4 (1.9–3.1)**	**2.6 (2.0–3.4)**	1.0 (0.8–1.4)	**2.2 (1.8–2.7)**	**6.2 (5.2–7.4)**	**1.9 (1.5–2.3)**	**3.6 (3.0–4.2)**	n.a.
7–12	**1.4 (1.0–1.8)**	**3.6 (3.0–4.3)**	**1.9 (1.4–2.4)**	**1.9 (1.5–2.5)**	**1.9 (1.5–2.4)**	**4.1 (3.5–4.8)**	**6.2 (5.1–7.5)**	**1.8 (1.5–2.3)**	**5.2 (4.4–6.2)**	**4.3 (3.6–5.1)**
13–18	**2.1 (1.6–2.6)**	**4.0 (3.4–4.7)**	**2.2 (1.7–2.8)**	**2.2 (1.7–2.8)**	**2.1 (1.7–2.6)**	**2.6 (2.2–3.2)**	**5.8 (4.9–6.8)**	**3.4 (2.9–4.0)**	**2.3 (1.9–2.8)**	**1.3 (1.0–1.6)**
Boys										
0–6	**2.3 (1.6–3.3)**	**5.5 (4.4–6.8)**	**3.0 (2.2–4.1)**	**1.7 (1.2–2.3)**	0.9 (0.6–1.1)	0.5 (0.3–0.9)	**2.7 (2.1–3.4)**	0.9 (0.6–1.2)	0.5 (0.3–0.8)	n.a.
7–12	1.2 (0.9–1.5)	**2.9 (2.4–3.4)**	**2.5 (1.9–3.1)**	1.2 (0.9–1.6)	**1.7 (1.4–2.2)**	0.8 (0.5–1.3)	**2.5 (2.0–3.0)**	1.1 (0.8–1.4)	0.6 (0.4–0.9)	1.0 (0.9–1.1)
13–18	**1.3 (1.0–1.7)**	**3.0 (2.5–3.6)**	**2.6 (2.0–3.3)**	**1.3 (1.0–1.6)**	**2.0 (1.6–2.6)**	0.6 (0.4–0.9)	**2.2 (1.8–2.7)**	**1.6 (1.2–2.1)**	0.3 (0.2–0.4)	**1.6 (1.3–1.8)**

Adjusted for socioeconomic factors (civil status, economic situation, employment and education) and smoking of the mother. Significant raised OR are in bold print ($\alpha < 0.05$)

studies that describe this association. Most probably, the effects of domestic violence on children are worse, but there are no data in our study to confirm that.

All of our results can therefore not be explained by children suffering from PTSD. The indirect effects of poor maternal physical and mental health on the children (Casey et al. 2004; Weissman et al. 2006; Graham-Bermann and Seng 2005) and the effect of childhood maltreatment by the mothers due to mothers' ill health (Casey et al. 2004; Grassi-Oliveira and Stein 2008) are possibly some of the reasons for our findings. More research is needed to explain the effects.

Minor age and gender effects were found, with younger children and girls seeming to be more affected. Age influences the way children make sense of their experiences, and children are more likely to express their fears in physical symptoms at a younger age (Mullender 1996; Mullender et al. 2002). Another explanation for the higher health risks in younger children is that the younger the child, the more dependent he is on the mother for his well-being (Levendosky et al. 2006). It is also possible that children of younger ages are more often exposed to adverse family environments, as they spend more time at home (Seng et al. 2005).

Both boys and girls of violence-exposed mothers showed a higher risk of suffering from anxiety. This is in accordance with studies on domestic violence reporting that witnessing violence in the family strongly relates to anxiety in both genders (Johnson et al. 2002; Mahony and Campbell 1998). With regard to all other psychological variables, living with a violence-exposed mother affected girls but not boys. This is consistent with findings from other studies on domestic violence that behavioural problems differ between boys and girls and also between ages (Bogat et al. 2006; Cummings et al. 1999). One explanation for the differences between boys and girls is that, especially, girls apart from witnessing violence may also experience other forms of victimisation (Seng et al. 2005). The unexpected finding that boys of violence-exposed mothers did not show higher risk of psychological symptoms could perhaps be understood by the fact that boys living with a violence-exposed mother are often reported to display more internalising problems. For this reason, when it comes to typical externalising symptoms, such as inability to concentrate (Hazen et al. 2006; Howard et al. 2002; Levendosky et al. 2006), these are less frequently reported. To sum up, all research so far concerning gender differences in the health effects of children of violence-exposed mothers are generated from studies on domestic violence. It remains to be shown that these differences are true also for violence against mothers outside their intimate partner relationship.

Our study also demonstrated an increased risk for asthma and allergy in the children of victimised mothers.

Table 4 Adjusted odds ratios (OR) for pharmaceutical use amongst children living with mothers exposed to violence compared with those living with non-victimised mothers

Age group (years)	Cough mixture	Nose drops	Asthma medication	Allergy medication	Antibiotics	Analgesics
Girls						
0–6	**2.4 (1.8–3.2)**	**1.7 (1.3–2.2)**	**1.6 (1.3–2.0)**	1.2 (0.9–1.5)	**1.3 (1.0–1.4)**	**1.6 (1.2–2.1)**
7–12	**3.4 (2.6–4.5)**	1.2 (0.9–1.5)	**1.8 (1.5–2.3)**	1.1 (0.8–1.4)	**1.8 (1.4–2.3)**	1.2 (0.9–1.6)
13–18	**2.4 (1.9–3.0)**	1.2 (0.9–1.6)	**2.2 (1.8–2.6)**	**1.4 (1.1–1.8)**	**1.2 (1.0–1.6)**	**1.4 (1.1–1.8)**
Boys						
0–6	**1.5 (1.0–2.1)**	**2.1 (1.4–3.0)**	1.0 (0.7–1.5)	**1.6 (1.2–2.2)**	**1.5 (1.1–2.1)**	1.2 (0.8–1.6)
7–12	**2.2 (1.7–2.9)**	**1.5 (1.2–2.0)**	**1.3 (1.0–1.7)**	**1.4 (1.1–1.9)**	**2.0 (1.6–2.0)**	0.9 (0.7–1.2)
13–18	**1.8 (1.4–2.3)**	**1.4 (1.1–1.9)**	**1.5 (1.1–1.9)**	**1.7 (1.3–2.2)**	**1.6 (1.3–1.6)**	0.9 (0.7–1.3)

Adjusted for socioeconomic factors (civil status, economic situation, employment and education) and smoking of the mother. Significantly raised OR are in bold print ($\alpha < 0.05$)

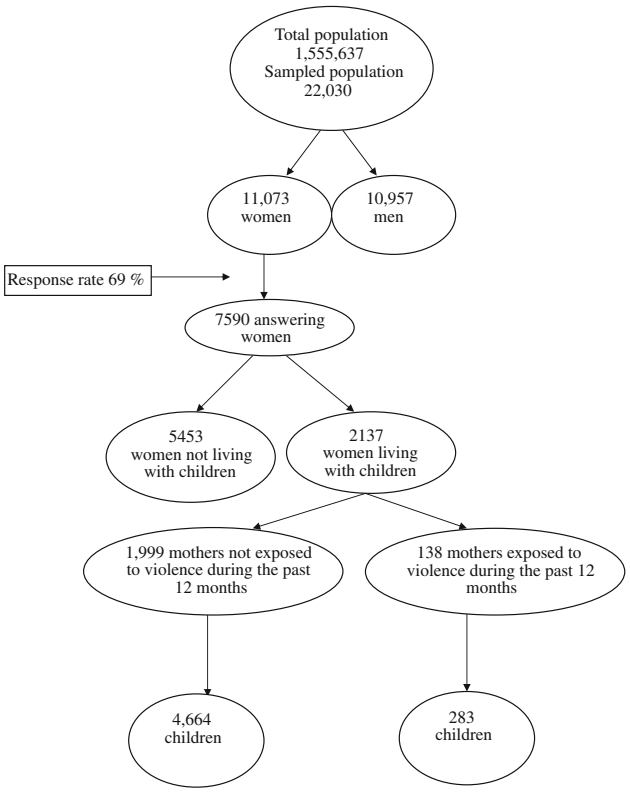

Fig. 1 Flowchart showing the number of participants and available population in the Life and Health Survey

This is consistent with findings from India, where a large, recent population-based study reported an increased risk of asthma in children and also in other family members in households where mothers experienced partner violence (Subramanian et al. 2007). In a US study, violence-exposed preschool children with post-traumatic stress were shown to have a fourfold risk of asthma, as well as gastrointestinal symptoms (Graham-Bermann and Seng 2005). The increased risk for asthma could also be explained by an increased risk for infections in general as reported by Lien et al. 2007 (Lien et al. 2007).

In a recently published review of health outcomes of childhood exposure to intimate partner violence, contradictory results were presented concerning the frequency of health-care visits by exposed children. Minimal data and/or study limitations were put forward as an explanation for the diverse results of the reviewed studies (Bair-Merritt et al. 2006). In our population-based study, the odds ratios for health-care visits were considerably higher for children of women exposed to violence, compared with children of unexposed mothers. However the health-care visits were not reported as increased for the youngest age group, which may be explained by the fact that almost all children in Sweden visit a children's clinic very frequently during their first few years of life.

Limitations of the study

There are several shortcomings in this study, the main one being the study design. Retrospective studies always have several clear shortcomings. However, when it comes to reported exposure to violence and the association between violence and ill health, they have so far been almost the only method used (Bair-Merritt et al. 2006; Hazen et al. 2006; Krug et al. 2002; Subramanian et al. 2007).

Another shortcoming is that the wordings of the two questions about violence were short and not phrased specifically to include different forms of physical and psychological violence, or any form of sexual violence. Most probably, these short questions imply an underestimation of violence, which may explain the proportionately low prevalence of violence amongst women (Lundgren et al. 2002; Wijma et al. 2003). Also, the frequency of exposure to violence is not considered in the response alternatives (Campbell and Lewandowski 1997). Researchers have pointed out the importance of detailed and distinct questions

about different forms of violence when trying to measure violence (Gaskin-Laniyan and Candice 2009; Wijma et al. 2003). Further, there were no questions about the perpetrator.

Another problem was that the mothers were the sole sources of data relating to the children's health. However, (Graham-Bermann and Seng 2005) showed that comparison of children's health as rated by the mother with that rated by the teachers had good inter-rater reliability. (Svedin et al. 2005) also reported that mothers rated their children's health as better than the children did. As discussed earlier, children who live in families with domestic violence are often themselves abused by the perpetrator (Edleson 1999; Hornor 2005). There is no information about this in our study.

Despite these limitations, the results of our study underline an important problem, namely, the strong association between a mother's reported experiences of violence, regardless of whether she has been exposed to violence in the home or somewhere else, and both ill health in her children and an increase in the children's use of medical health care and medicines. We describe a strong actual relationship and the data came from a big population-based study, where the mothers answering the questions about their children's health did not do so because they had specifically been exposed to violence, but because they were answering a questionnaire about 'Life and Health'. In studies where specifically violence-exposed mothers were interviewed about their children's health, there may have been a greater bias from the situation. However, it is impossible to determine the nature or mechanism of this association with any certainty with this study.

The study supports the importance of discussing screening for maternal domestic violence (MDV) in paediatric settings, or even of discussing 'mere' maternal exposure to violence (Holtrop et al. 2004). In 2004, a review of the evidence of screening for family violence was undertaken to evaluate the advantages and disadvantages of screening (Nygren et al. 2004). The conclusion was that several large randomised studies were needed before it would be possible to relate the effects of screening on the health of abused women and their children.

In conclusion, this population-based study revealed an increased risk of poor physical health amongst both boys and girls of all ages, as reported by their mothers, if the mother had been exposed to violence during the past 12 months. There was also a heightened risk for psychological and behavioural problems, principally amongst girls. More studies that confirm the results and disentangle the main explanations found in the study, taking into account the presented limitations, are needed.

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