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The difference in chronic inflammation between individuals with officially documented and self-reported adverse childhood experiences is maintained until older middle-age

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Dear Editor,

Previous studies have revealed associations between the systemic inflammation and retrospective reports of adverse childhood experiences (ACEs), including a low socioeconomic status, maltreatment, and maladaptive early family environments (Chen & Lacey, 2018; Slopen, Kubzansky, McLaughlin, & Koenen, 2013). So far, only Osborn and Widom (2019) in their article 'Do documented records and retrospective reports of childhood maltreatment similarly predict chronic inflammation?' have reported a difference in chronic inflammation between individuals with documented and retrospectively self-reported ACEs. They compared the levels of C-reactive protein (CRP) between teenagers and young adults whose ACEs were officially documented and those whose ACEs were only retrospectively self-reported. Individuals with documented histories of childhood maltreatment were found to be at increased risk of chronic inflammation, whereas self-reported retrospective measures of child maltreatment did not associate with elevated CRP.

Osborn and Widom (2019) focused on three subtypes of ACE: physical abuse, sexual abuse, and neglect. Their participants were rather young, the mean age being 23.4 years. In the current correspondence, we aimed to replicate their findings in a Finnish sample of aging men, investigating whether the findings of Osborn and Widom could be observed in settings with a substantially longer follow-up period. We defined ACEs as childhood experiences of poverty, paternal alcohol problems, or parental divorce that were either documented in records or retrospectively self-reported.

We had documented records and retrospective self-reports on the ACEs of 792 participants. Of these, 30 had high-sensitivity CRP (hs-CRP) levels higher than 10 mg/L and were therefore excluded from the current analysis, leaving a final sample of 762. Blood test results and retrospective self-reported data were collected during baseline investigations (1984–1986) as a part of the Finnish 'Kuopio Ischemic Heart Disease Risk Factor' (KIHD) study. The mean age of the participants was 50.9 years (S.D. 5.88). The documented ACEs were retrieved from school health records taken by school nurses from the 1930s to the 1950s. The nurses followed-up on the health and behavior of pupils, conducted home visits, and were familiar with the family background and home conditions of the pupils (Kauhanen, Lakka, Lynch, & Kauhanen, 2006). All participants provided written informed consent. The KIHD study was approved by the Research Ethics Committee of Kuopio University. All procedures involving the participants complied with the 1964 Declaration of Helsinki and its later amendments.

In order to compare hs-CRP levels between participants with documented ACEs and those with retrospective self-reports of ACEs, we constructed two variables. The variable 'documented ACEs' was compiled utilizing information from school health records concerning (1) paternal alcohol problems (yes/no), (2) poverty (yes/no), and (3) parental divorce (yes/no). The variable 'retrospective self-reported ACEs' was respectively based on responses to the following three questions: (1) What kind of person was your father? Responses were provided on a Likert scale from 0 = teetotaller to 5 = drank a lot of alcohol. We recoded the question into a categorical variable (0–4 = no alcohol problem; 5 = alcohol problem). (2) What was your childhood home like when you were about 10 years old? Responses were provided on a Likert scale from 0 = wealthy to 5 = poor. We recoded the question into a categorical variable (0–4 = not poor; 5 = poor). (3) Did your parents separate or divorce when you were under 10 years old? (yes/no). Both documented ACEs and retrospectively self-reported ACEs had a minimum score of 0, indicating no history of ACEs, and a maximum score of 3, indicating that the subject had experienced all three types of ACEs.

Table 1. Linear regression models for the likelihood of having elevated hs-CRP levels

	Documented records of ACE			Retrospectively self-reported ACE		
	β^a	t	p value	β^a	t	p value
Model 1	0.110	3.062	0.002	0.024	0.620	0.535
Model 2	0.124	3.245	0.001	0.043	1.076	0.282
Model 3	0.107	2.996	0.003	0.017	0.442	0.659
Model 4	0.110	3.047	0.002	0.021	0.560	0.576

Model 1: Adjusted for age.
Model 2: Adjusted for age and smoking.
Model 3: Adjusted for age and alcohol consumption.
Model 4. Adjusted for age and HPL Depression Scale scores.
[a]Standardized coefficients.

To increase the comparability of the results with those of Osborn and Widom (2019), we used, whenever possible, the same variables for adjustments to the multivariate models. Because our sample consisted of white Caucasian males, we performed no adjustments for sex or race. To avoid multicollinearity, we did not adjust our results for parental occupational status, as childhood poverty is highly dependent on the occupation of the parents. Similarly to Osborn and Widom (2019), we adjusted our results for age in years at the time of data collection, for smoking (yes/no) and alcohol use (g/week), and for the Human Population Laboratory (HPL) Depression Scale scores (Tolmunen et al., 2004). A participant was defined as a smoker if he had ever smoked on a regular basis (Salonen et al., 1992). Alcohol consumption, measured in g per week, was assessed by using a structured quantity-frequency method involving a drinking behavior questionnaire covering the previous 12 months (Ihanainen, Salonen, Salonen, & Seppänen, 1989).

hs-CRP was measured with an immunometric assay, the Immulite High Sensitivity CRP Assay (Diagnostic Products Corporation, Los Angeles, California, USA), which has been standardized against the World Health Organization (WHO) International Reference Standard for CRP Immunoassay 85/506. At the level of 3.2 mg/L, the within-run coefficient of variation was 2.8% and the total coefficient of variation was 3.1%. Participants were requested to fast overnight, abstain from smoking for 12 h, and avoid alcohol use for 3 days before obtaining blood samples. Copper-free needles and tubes were used to collect and store blood. The participants rested in a supine position for 30 min before blood sampling.

Linear regression (method: enter) was used for multivariate analysis with hs-CRP as the dependent variable. Due to the non-normal distribution of hs-CRP, we log-transformed the values. All statistical analyses were conducted with SPSS 25.0, and p values lower than 0.05 were considered statistically significant.

Altogether, 66.9% of the participating men had no ACEs, while 3.2% had only documented ACEs and 26.2% had only retrospectively self-reported ACEs. A total of 3.7% had both documented and retrospectively self-reported ACEs. The agreement between documented and retrospectively self-reported ACEs was low: Cohen's κ was 0.135 for paternal alcohol problems ($p < 0.001$), 0.001 for poverty ($p = 0.935$), and 0.202 for parental divorce ($p < 0.001$). In regression analysis, documented records of ACEs predicted elevated hs-CRP, whereas retrospectively self-reported ACEs displayed no associations with hs-CRP (Table 1). The results for documented ACEs remained significant following adjustments for smoking, alcohol use, and HPL Depression Scale scores.

Similarly to Osborn and Widom (2019), we found that documented records of ACEs were associated with elevated levels of hs-CRP, while retrospective self-reports of ACEs were not. Based on the previous literature, Osborn and Widom (2019) offered two possible explanations for their results: (1) those ACEs that are only self-reported are not as severe as the experiences documented in official reports; and (2) the process of undergoing investigation by child protective services (CPS) may in itself be traumatizing. In light of our results, the second explanation may not explain the differences we observed. In our data, the school nurse recorded the situation in child's home, but no CPS investigations were carried out. Furthermore, school nurses did not specifically ask about possible ACEs, but noted down everything that they noticed or that was brought to their attention. Therefore, in compliance with the first hypothesis of Osborn and Widom (2019), it is possible that less severe cases were not recorded.

A variety of factors may bias retrospective self-reports of ACEs. According to a recent meta-analysis, only 48% of individuals with documented records of childhood maltreatment report it retrospectively when interviewed in adulthood (Baldwin, Reuben, Newbury, & Danese, 2019) due to forgetting, infantile amnesia, subsequent life events, or the quality of the questionnaire or interview (Newbury et al., 2018). Retrospective reports are also to some degree reliant on what other people have told the self-reporting individual, thus introducing an additional source of both error and bias (Hardt & Rutter, 2004). Newbury et al. (2018) noted that prospectively documented and retrospectively self-reported measures capture largely non-overlapping groups: prospective measures miss individuals whose maltreatment was not known or reported during childhood, whereas retrospective self-report measures miss individuals who have forgotten or choose not to disclose their ACEs. Furthermore, Ghetti et al. (2006) noted that males and individuals who had experienced more severe childhood sexual abuse were more likely to report forgetting what had happened.

Osborn and Widom (2019) observed that in the case of early physical and sexual abuse and neglect, only objective records of ACEs predicted increased levels of CRP in young adulthood. According to our results, the same differential effect of officially documented *v.* retrospectively self-reported ACEs on hs-CRP levels also exists for more subtle forms of ACE, namely adversities in the childhood environment such as poverty, parental alcohol problems, and divorce. Furthermore, based on our research, this effect appears to persist beyond young adulthood.

Similarly to the findings of Reuben et al. (2016), we found that parental separation was more often retrospectively self-reported

than prospectively documented. Reuben et al. (2016), however, found high agreement ($k = 0.83$) between documented and retrospectively self-reported separation from parents (including separation, divorce, death, or removal from home), whereas in our data the agreement was low ($k = 0.20$). We assume that the reason for this discrepancy may partly lie in the historical context of data collection. During our prospective data collection (1930s to 1950s), the official divorce rate in Finland was very low (Bulletin of Statistics, 1963) and divorces were not viewed favorably. Furthermore, according to the Marriage Act (234/1929), which regulated divorce procedures in Finland at the time, one of the reasons for divorce could be separation that had lasted at for least a year, which the participants may have retrospectively reported as 'separation or divorce'. It is possible that the school nurses' awareness of the family situation was, due to social stigma, not as high as that of the adult respondents, who had a more direct view to their childhood family situation. On the other hand, it is also possible that the low agreement between documented and retrospectively self-reported parental separation is related to the time frames utilized when collecting data on parental separation. School nurses worked with children from 7 to 13 years of age. In the retrospective questionnaire, the question about parental separation focused on the time period before the age of 10. Furthermore, our sample size was not sufficient to analyze different ACEs separately. In the future, however, it would be important to investigate the separate effects of parental divorce, parental alcohol problems, and poverty on the levels of low-grade inflammation in adulthood with larger sample sizes.

Both our results and those of Osborn and Widom (2019) underline the importance of acknowledging the possible effect of the source of the trauma information on the results. Whenever possible, it would be recommendable to simultaneously investigate both subjective and objective measures of ACEs. Nevertheless, these findings should be confirmed in larger samples containing both male and female participants.

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Conflict of interest. None.

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