Burden of adverse childhood experiences in children attending paediatric clinics in South Western Sydney, Australia: a retrospective audit

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ABSTRACT

Objectives Adverse childhood experiences (ACE) are associated with poor short, medium and long-term health outcomes. South Western Sydney (SWS) has a large culturally diverse population, including many disadvantaged population groups. Our aims were to determine the burden of ACE in children attending community paediatric (CP) clinics using a purposefully developed ACE checklist, and explore any association with developmental health of children.

Methods We trialled the ACE checklist in all CP clinics including child development (CD) and vulnerable child (VC) clinics between February 2017 and August 2017. Data were collated from completed ACE checklists and relevant clinical information from CP clinics. Statistical analysis was performed using SPSS and MedCalc software.

Results Of 279 children seen in CP clinics with checklists completed for the period, 167 (60%) attended CD clinics and 112 (40%) attended VC clinics. Seventy-eight (28%) had ACE ≥4 and 178 (64%) had ACE ≥1. Of those attending CD clinics, 8 (5%) had ACE ≥4 compared with 70 (63%) attending VC clinics (p<0.001). Of all age groups, children ≥10 years of age had the highest proportion of children with ACE ≥4 (65%); significant association between age group and ACE ≥4 (p<0.001). There was a significant association between cultural background and ACE ≥4 (p<0.001); indigenous children had the highest proportion of ACE ≥4 (n=21; 64%), followed by Anglo-Australian children (55%). On logistic regression analysis, only attending VC clinics was significantly associated with ACE ≥4. There was no significant association between ACE ≥4 and developmental health.

Conclusion Among children attending CP clinics in SWS, more than a quarter had a significant burden of ACE; those attending specialised clinics for vulnerable children, those from particular ethnic groups and from older age groups, had the highest burden of ACE. Our findings support the need for specialised pathways for paediatric assessment for vulnerable, at-risk children.

BACKGROUND

Adverse childhood experiences (ACE) have been associated with poor health outcomes in adulthood and long-term consequences including early morbidity and mortality.[1–4] The definition of ACE is complex, encompassing emotional, sexual and physical abuse, as well as physical and psychological neglect.[5 6] The term maltreatment has been used interchangeably with ACE, as it refers to abuse and neglect; however, the full spectrum of ACE incorporates the elements of family dysfunction and social and economic influences.[5 6] In Australia, ACEs are of growing clinical and public health concern, with the state of New South Wales (NSW) reporting the highest number of child protection notifications in 2015–2016; these notifications identify children at risk of being abused, neglected or otherwise harmed.[7]

Adverse experiences in childhood are thought to produce effects on health through prolonged activation of allostatic systems—the human body's physiological stress response.[3 8–10] Chronic health issues and behaviours associated with ACE include:

respiratory disease; mental illness; disability; cardiovascular heart disease; stroke; diabetes; smoking; substance abuse; suicide; and impacts on children's and adolescent's developmental health.[1 3 4 10–17] ACEs have also been linked to antisocial and delinquent behaviour as well as lower educational status.[18] Furthermore, children as young as 12 years of age with exposure to ACE have reported adverse health outcomes and somatic complaints.[19] Studies on ACE in urban cohorts have also demonstrated the impact of poverty and social class on the trajectory of a child's health and development.[16 20] Early identification of ACE is therefore critical, as the long-term health effects of ACE can be numerous and diverse.[1 3] Through early identification, clinicians can advocate for and implement specific family and social supports. Additionally, ACEs have been shown to have a graded response, with increasing number of ACEs exhibiting a linear relationship to physical health conditions and risk factors in adulthood.[1 2 4 21 22] A dose–response to cumulative adversities in childhood has been demonstrated in many studies, such that an ACE score of ≥4 has been associated with significantly greater risks for a range of morbidities,[1 3 18 23] emphasising the need for early identification of ACE, to reduce the long-term health consequences for children at risk.

There has been little published research about ACE in the Australian context. South Western Sydney (SWS) has the largest child and youth population in NSW and is one of the most ethnically and linguistically diverse regions in the state.[24] The district is home to many disadvantaged and vulnerable subpopulations including a large newly arrived refugee population and a small but significantly disadvantaged indigenous population. The Department of Community Paediatrics in SWS runs a range of community paediatric (CP) clinics to respond to the needs of the population, including child development (CD) clinics and specialised clinics for children at risk of life adversities, collectively termed vulnerable child (VC) clinics. CD clinics are diagnostic assessment clinics for children with specific developmental concerns or developmental delay, while VC clinics include specialised clinics for children with care and protection risks, children in out-of-home care (OOHC), children of parents with substance use or psychopathology, as well as clinics for indigenous and refugee children. Our aim was to determine the burden of ACE in children and young people presenting to publicly funded community clinics in a diverse, urban setting, and to describe the developmental and health problems they experience. We also wanted to explore any association between significant ACE scores and developmental and chronic health conditions.

METHODS
The study population were children attending all CP clinics in SWS from 1 February 2017 to 31 August 2017.

The ACE checklist used in CP clinics is a modified version of the validated checklist, trialled previously in CD clinics in SWS in 2012.[25] We have described the use of the ACE checklist as a clinical indicator in another paper.[26] The checklist was filled in by clinicians at the end of a clinic based on routinely collected clinical information accessed from a variety of sources, including referral information from clinicians, social welfare and education sources, parent/carer history and previous medical reports. No consent was required for the use of the ACE checklist, as no new information was sought.

Clinical reports were used to identify children's demographic data, and diagnoses and chronic health conditions. Children were categorised into having a primary or secondary diagnosis, an existing chronic condition, or having ≥2 chronic conditions. Primary and secondary diagnoses were determined based on the diagnoses recorded in the clinical report from each CD or VC clinic appointment. A chronic condition was defined as a condition acknowledged by clinicians to be chronic in nature, however, which may not necessarily have required immediate intervention at the time of consultation. Therefore, at the time of presentation to a CP clinic, a child may have had a primary diagnosis and secondary diagnosis, in addition to a chronic condition; or may have had a primary diagnosis and one or more chronic conditions, without necessarily having a secondary diagnosis recorded. Primary and secondary diagnoses included mental health issues, developmental issues and medical conditions. Chronic medical conditions included ear, nose and throat issues, respiratory issues, chromosomal/genetic abnormalities and nutritional issues.

ACEs were reported as both the total number of ACEs experienced and ACE above the cut-off ≥4, responding to literature indicating a greater risk of morbidity above this cut-off. Statistical analysis was conducted using SPSS software (V.25) and significant associations between categorical variables were tested using Pearson's X^2 test. MedCalc software was used for logistic regression analysis with ACE categories as a dependent variable.

Patient and public involvement (PPI)
Patients were not directly involved in the design of this study.

RESULTS
During the data collection period, 189 children were seen in CD clinics for whom 167 ACE checklists were completed. Of 112 children seen in VC clinics during this period, all 112 checklists were completed. Following data collection and cleaning, a total of 279 checklists were included in the final analysis.

Of 279 children seen in CP clinics, the majority (189, 68%) were male, mean age was 5.5 years, 178 (64%) had at least one ACE recorded and 78 (28%) had ≥4 ACEs.

Table 1 lists the characteristics of children attending CP clinics. The population attending CD and VC clinics was distinctly different in their demographic details. Children

Table 1 Characteristics of children attending child development (CD) and vulnerable child (VC) clinics

	Child development n=167 (%)	Vulnerable child n=112 (%)	P value
Gender			
Male	121 (72)	68 (61)	0.04
Female	46 (28)	44 (39)	
Age group (years)			
0 to <5	130 (78)	50 (45)	<0.001
5 to <10	31 (18)	37 (33)	
≥10	6 (4)	25 (22)	
Cultural background			
Asian	45 (27)	9 (8)	<0.001*
Middle Eastern	28 (17)	23 (21)	
Anglo-Australian	14 (8)	30 (27)	
Indigenous	7 (4)	26 (23)	
Other	24 (15)	16 (14)	
Unknown	49 (29)	8 (7)	
ACE score			
0	100 (60)	1 (1)	<0.001
1–3	59 (35)	41 (37)	
≥4	8 (5)	70 (62)	

Other category in cultural background includes: European, African, North American, South American, Pacific and Mixed.
*P value for 'Cultural background' calculated excluding category of 'Unknown'.
ACE, adverse childhood experience.

Table 2 Demographic and clinical correlates with ACE scores of children attending CP clinics

	Total n=279 (%)	ACE ≥4 n=78 (%)	P value*
Gender			
Male	189 (68)	49 (26)	0.273
Female	90 (32)	29 (32)	
Age group (years)			
0 to <5	180 (65)	34 (19)	<0.001
5 to <10	68 (24)	24 (35)	
≥10	31 (11)	20 (65)	
Cultural background			<0.001
Asian	54 (19)	7 (13)	
Middle Eastern	51 (18)	8 (16)	
Anglo-Australian	44 (16)	24 (55)	
Indigenous	33 (12)	21 (64)	
Other	40 (14)	8 (20)	
Unknown	57 (21)	10 (18)	
Clinical conditions			
Primary diagnosis	274 (98)	77 (28)	NA
Secondary diagnosis	224 (80)	59 (26)	0.224
Existing chronic conditions	163 (58)	40 (25)	0.132
Chronic conditions ≥2	79 (28)	20 (25)	0.537

A child could have one or more diagnoses as well as a chronic condition; or one diagnosis with a chronic condition.
NA denotes χ^2 test not carried out as more than 1 expected cell count <5.
*P value comparing ACE ≥4 group and different clinical/demographic categories.
ACE, adverse childhood experience; CP, community paediatric.

attending CD clinics were more likely to be male, of Asian background and in the youngest age group. Of children attending VC clinics, 63% had ACE ≥4, compared with 5% of children attending CD clinics with ACE ≥4. There was a significant association between ACE ≥4 and the type of CP clinic attended (p<0.001).

Table 2 presents the associations between ACE score ≥4 and demographic and clinical factors. There was no association between gender and ACE ≥4 (p=0.273). There was a significant association between age group and ACE ≥4 (p<0.001). Children ≥10 years of age had the highest proportion of ACE ≥4 (65%), followed by children aged 5 to <10 years. There was a significant association between cultural background and ACE ≥4 (p<0.001). Children identified as being of indigenous background had the highest ACE score ≥4 (n=21; 64%), followed by children with Anglo-Australian cultural background (n=24; 55%). There was no significant association between ACE ≥4 and having a primary, secondary diagnosis or chronic condition.

Of all children seen in CP clinics, 274 (98%) had a primary diagnosis, 224 (80%) had a secondary diagnosis and 163 (58%) had an existing chronic medical condition. Of 163 children with an existing chronic condition, 79 (48%) had ≥2 chronic conditions.

The most commonly experienced ACE risk category was having one or no parents and/or experiencing parental separation or divorce (n=102; 37%). This was also the most commonly experienced risk category among children with ACE ≥4. Child sexual abuse was the least identified risk exposure among children attending CP clinics (n=5; 2%), see table 3.

In logistic regression analysis taking ACE ≥4 as dependent variable and variables that were significant in univariate analyses as independent variables, only clinic type came out as significant. Children attending VC clinics had OR of 3.3 (95% CI 1.5 to 7.6, p<0.0001).

DISCUSSION

We believe this is the first study exploring the burden of exposure to childhood adversities in a community clinic sample in Australia. Almost two-thirds of the children attending CP clinics in SWS had at least one ACE and close to 30% had ≥4 ACEs. Our study found that children in SWS at risk of significant exposure to childhood adversity were from the most vulnerable subpopulations,

Table 3 Proportion of clinic attendees experiencing each ACE category

ACE categories	Total n=279 (%)	ACE ≥4 n=78 (%)	CD n=167 (%)	VC n=112 (%)
One or no parents, parental separation or divorce	102 (37)	60 (77)	41 (25)	61 (54)
Parental mental health issues	93 (33)	48 (62)	34 (20)	59 (53)
Family and community service (FACS) or other child protection services involvement	70 (25)	57 (73)	7 (4)	63 (56)
Parental drug abuse	67 (24)	52 (67)	4 (2)	63 (56)
Exposure to traumatic life event in the past	57 (20)	27 (35)	20 (12)	37 (33)
Neglect	51 (18)	44 (56)	6 (4)	45 (40)
Domestic violence	51 (18)	48 (62)	2 (1)	49 (44)
Housing instability	51 (18)	34 (44)	9 (5)	42 (38)
Foster care system (history or current)	39 (14)	35 (45)	5 (3)	34 (30)
Parental incarceration	27 (10)	24 (31)	3 (2)	24 (21)
Physical abuse	22 (8)	21 (27)	2 (1)	20 (18)
Emotional abuse	22 (8)	21 (27)	0 (0)	22 (20)
Intrauterine drug exposure/neonatal abstinence syndrome	21 (8)	18 (23)	2 (1)	19 (17)
Child sexual abuse	5 (2)	5 (6)	0 (0)	5 (4)

ACE, adverse childhood experience; CD, child development; VC, vulnerable child.

as they attended clinics specifically set up for vulnerable children and youth. Children and young people attending community clinics in SWS also carried a significant developmental and chronic health burden, with over half having comorbid chronic health conditions. This supports the need for early identification of ACE and health/developmental concerns in these priority groups, particularly in indigenous children.

Nearly 30% of children in our study were identified as having ACE ≥4, which is significantly higher compared with prevalence rates in other studies conducted on similar urban cohorts.[16 18] Burke's study population was from an urban clinic cohort from California, 12% of that cohort had ACE scores ≥4.[16] Another study using data from the Chicago Longitudinal Study, comprising urban disadvantaged populations with African-Americans comprising 95% of the cohort, found that 13% had ACE ≥4.[18] While these studies may have involved larger study populations, in our study, the high prevalence of ACE ≥4 from data collected over a short period of time, within a single defined geographical area, indicates a significant ACE burden and certainly warrants concern. This supports the need for enhanced public health approaches and programmes for identifying childhood adversity, and facilitating health promotion and protection of children and adolescents in the community.

In our clinic population, univariate analysis revealed significant differences between children attending the two clinic types, and children with the highest burden of ACE were indigenous children, Anglo-Australian children, children of older age groups and children attending specialised clinics for vulnerable children. The disadvantage faced by indigenous children and families in Australia is well documented, however, progress in child health indicators has been slow.[27] The proportion of indigenous children attending our clinics was 12%, which is significantly higher than the NSW state population of 2.5%.[28] We know that indigenous children are over-represented in child protection and OOHC statistics in Australia,[29 30] pathways that intersect with our VC clinics. In contrast, while more than half of Anglo-Australian children had ACE ≥4, this group was under-represented in our clinic population. Also of note was that Asian children in our clinic sample had the lowest burden of ACE. This compares well with Caballero *et al*'s study using The National Survey of Children's Health from the USA, which also found children in immigrant families to have significantly lower odds of ACE exposure despite higher prevalence of poverty.[31] This information is important for planning effective service delivery, including adequate access and resources for children at risk of ACE.

While the majority of children seen in the various CP clinics are in the younger age group, our study showed that children 10 years or older had the highest proportion of ACE ≥4. It is vital that we recognise adolescents and youth as a priority group, due to the fact that they suffer a high burden of disease from preventable causes.[32 33] A previous study of Aboriginal children in OOHC from SWS also highlighted the significant burden of developmental and mental health conditions in older children.[29] From the recent systematic review and meta-analysis of exposure to childhood adversities, we know that the outcomes most strongly associated with multiple ACEs, such as violence, mental illness and substance use, represent risks for subsequent generations.[34] If improving morbidity and mortality can be achieved through reducing harmful exposures and improving lifestyle behaviours, identifying ACE in adolescents presents a window of opportunity

to prevent further adversity and to positively impact on their long-term health and well-being.[32 33]

Previous research on ACE has reported an association between ACE and a diverse range of health conditions, and a linear gradient between ACE and health conditions in adulthood.[1 2 21] In our study, categories of diagnoses and chronic conditions were extracted from clinical reports and as there was no formal method of categorisation, we proceeded with caution, using count of diagnoses rather than categories for our analyses. While our study was unable to determine a significant association between ACE ≥4 and having a developmental or chronic health condition, nearly all children had a developmental/health concern and more than a quarter of children with a significant ACE score had two or more chronic conditions, indicating a high burden of developmental and chronic health conditions in this clinic population. It is important to note that children attending CD clinics were brought in with a specific developmental concern, whereas those attending VC clinics did not necessarily present for health or developmental concerns. These findings demonstrate the significant burden of childhood developmental and chronic health problems in SWS, particularly in children younger than 5 years of age, as they were the major proportion of clinic attendees. This emphasises the need for intervention before signs of developmental or health concerns are manifest, and suggests practical use of information about ACE for appropriate management and support.

Most existing studies on ACE have used retrospective recall of ACE in adult study populations, and therefore have the potential to impact internal validity, given the risk of recall bias.[2 4 14] While our current study does not differentiate between past and current adverse exposures, the risk of recall bias is likely reduced, considering that most children seen were between 0 and 5 years of age, and therefore adverse exposures would have been relatively, if not very recent. The cross-sectional nature of the study does not, however, allow for causal inference but provides information on association only. Furthermore, due to the unique sociodemographic composition of the SWS population, our results may not be generalisable to children in other communities within NSW, or nationally. However, these findings may be transferable to other culturally diverse and disadvantaged settings.

Our findings demonstrate a high burden of ACE among the most VC subpopulations in SWS and a significant burden of developmental and chronic health conditions in these young people. This study was conducted in a socioeconomically disadvantaged and culturally diverse region of Sydney; for vulnerable groups already at risk of ACE, living in this region may further compound this risk. Without specialised paediatric clinics specifically targeting at-risk populations as in our VC clinics, it is likely that these children would fall through the gaps of a complex and sometimes inequitable healthcare system. By identifying the most common ACE risks in our population, clinicians and healthcare workers can better understand the ways in which adversity can be reduced and children can be supported. It is only through understanding the ways in which children can be protected that we can design and implement appropriate interventions.[35]

The findings from our study thus provide us with evidence to advocate for early identification of ACE and developmental/health concerns, particularly in the most at-risk subpopulations. We acknowledge the usefulness of identifying ACE at population level; nevertheless, we would strongly suggest that screening in the clinical setting specifically allows for active intervention and support. In this urban setting, the population at risk are children attending specialised VC and youth clinics, a cohort that includes substantial numbers of indigenous children. Findings from our study reinforce the need for proactive and specialised pathways for vulnerable children and youth. There needs to be ongoing advocacy for engagement and early intervention for vulnerable young people, given the short-term and long-lasting effects of ACE on their overall health, development and well-being.

REFERENCES

1. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med* 1998;14:245–58.
2. Bright MA, Knapp C, Hinojosa MS, et al. The comorbidity of physical, mental, and developmental conditions associated with childhood adversity: a population based study. *Matern Child Health J* 2016;20:843–53.
3. Campbell JA, Walker RJ, Egede LE. Associations between adverse childhood experiences, high-risk behaviors, and morbidity in adulthood. *Am J Prev Med* 2016;50:344–52.
4. Mersky JP, Topitzes J, Reynolds AJ. Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: a cohort study of an urban, minority sample in the U.S. *Child Abuse Negl* 2013;37:917–25.
5. Kalmakis KA, Chandler GE. Adverse childhood experiences: towards a clear conceptual meaning. *J Adv Nurs* 2014;70:1489–501.
6. Gilbert R, Widom CS, Browne K, et al. Burden and consequences of child maltreatment in high-income countries. *Lancet* 2009;373:68–81.

7. AIHW. *Child protection Australia 2015–16*. Canberra: Australian Institute of Health and Welfare, 2017.

8. McEwen BS. Brain on stress: how the social environment gets under the skin. *Proc Natl Acad Sci U S A* 2012;109:17180–5.

9. Lanier P, Jonson-Reid M, Stahlschmidt MJ, *et al*. Child maltreatment and pediatric health outcomes: a longitudinal study of low-income children. *J Pediatr Psychol* 2010;35:511–22.

10. Danese A, McEwen BS. Adverse childhood experiences, allostasis, allostatic load, and age-related disease. *Physiol Behav* 2012;106:29–39.

11. Anda RF, Felitti VJ, Bremner JD, *et al*. The enduring effects of abuse and related adverse experiences in childhood. *Eur Arch Psychiatry Clin Neurosci* 2006;256:174–86.

12. Dube SR, Anda RF, Felitti VJ, *et al*. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the adverse childhood experiences study. *JAMA* 2001;286:3089–96.

13. Anda RF, Croft JB, Felitti VJ, *et al*. Adverse childhood experiences and smoking during adolescence and adulthood. *JAMA* 1999;282:1652–8.

14. Dube SR, Felitti VJ, Dong M, *et al*. Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: the adverse childhood experiences study. *Pediatrics* 2003;111:564–72.

15. Austin A, Herrick H, Proescholdbell S, *et al*. Disability and exposure to high levels of adverse childhood experiences: effect on health and risk behavior. *N C Med J* 2016;77:30–6.

16. Burke NJ, Hellman JL, Scott BG, *et al*. The impact of adverse childhood experiences on an urban pediatric population. *Child Abuse Negl* 2011;35:408–13.

17. Widom CS, Czaja SJ, Bentley T, *et al*. A prospective investigation of physical health outcomes in abused and neglected children: new findings from a 30-year follow-up. *Am J Public Health* 2012;102:1135–44.

18. Giovanelli A, Reynolds AJ, Mondi CF, *et al*. Adverse childhood experiences and adult well-being in a low-income, urban cohort. *Pediatrics* 2016;137:e20154016.

19. Flaherty EG, Thompson R, Litrownik AJ, *et al*. Adverse childhood exposures and reported child health at age 12. *Acad Pediatr* 2009;9:150–6.

20. Wade R, Cronholm PF, Fein JA, *et al*. Household and community-level adverse childhood experiences and adult health outcomes in a diverse urban population. *Child Abuse Negl* 2016;52:135–45.

21. Gilbert LK, Breiding MJ, Merrick MT, *et al*. Childhood adversity and adult chronic disease: an update from ten states and the District of Columbia, 2010. *Am J Prev Med* 2015;48:345–9.

22. Flaherty EG, Thompson R, Dubowitz H, *et al*. Adverse childhood experiences and child health in early adolescence. *JAMA Pediatr* 2013;167:622–9.

23. Flaherty EG, Thompson R, Litrownik AJ, *et al*. Effect of early childhood adversity on child health. *Arch Pediatr Adolesc Med* 2006;160:1232–8.

24. South Western Sydney Local Health District (SWSLHD). *South western sydney local health district: year in review 2016/17*. Liverpool: SWSLHD, 2017.

25. Jain K, Raman S, Hurwitz R, *et al*. *Improving the identification of adverse childhood exposures in developmental clinics: does it make a difference? International congress of pediatrics*. Melbourne: International Pediatric Association, 2013.

26. Raman S, Wickramasinghe Y, Hurwitz R, *et al*. *The Adverse Childhood Experiences (ACE) checklist: can it serve as a clinical and quality indicator? xxii congress of international society for prevention of child abuse and neglect (ISPCAN)*. Prague: ISPCAN, 2018.

27. Anderson I, Crengle S, Kamaka ML, *et al*. Indigenous health in Australia, New Zealand, and the Pacific. *Lancet* 2006;367:1775–85.

28. South Western Sydney Local Health District (SWSLHD). *Child and family health indicators report: south western Sydney 2013*. New South Wales, Australia: SWSLHD Department of Community Paediatrics, 2013.

29. Raman S, Reynolds S, Khan R. Addressing the well-being of aboriginal children in out-of-home care: are we there yet? *J Paediatr Child Health* 2011;47:806–11.

30. Berlyn C, Bromfield L, Lamont A. *Child protection and aboriginal and torres strait islander children*. Melbourne, Australia: Australian Institute of Family Studies, 2011.

31. Caballero TM, Johnson SB, Buchanan CRM, *et al*. Adverse childhood experiences among hispanic children in immigrant families versus US-native families. *Pediatrics* 2017;140:e20170297.

32. World Health Organization (WHO). *Global Accelerated Action for the Health of Adolescents (AA-HA!): guidance to support country implementation. Summary*: World Health Organization (WHO), 2017.

33. Patton GC, Olsson CA, Skirbekk V, *et al*. Adolescence and the next generation. *Nature* 2018;554:458–66.

34. Hughes K, Bellis MA, Hardcastle KA, *et al*. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *Lancet Public Health* 2017;2:e356–66.

35. Soleimanpour S, Geierstanger S, Brindis CD. Adverse childhood experiences and resilience: addressing the unique needs of adolescents. *Acad Pediatr* 2017;17:S108–14.