

## Pediatric ACE Screening Clinical Workflow

1. **Registration** or **clinical staff** reviews patient's record to determine if PEARLS screen indicated during visit.\* Staff provides PEARLS tool to caregiver (0-19 years) and/or patient (12-19 years) in private setting.

2. **Caregiver** (0-9 years) and/or **patient** completes PEARLS.

2a. If screen is incomplete: Provider provides education about how practices and interventions can affect health and offers patient opportunity to discuss and/or complete PEARLS screen. Once complete, provider moves to step 3.

2b. If screen is complete, provider moves to step 3.

3. Provider or Medical Assistant transcribes ACE score (top box of PEARLS tool) into EMR.

4. Provider reviews screen with patient and follows appropriate risk assessment algorithm: incomplete or at low, intermediate, or high risk for toxic stress.

5. Provider documents ACE score, billing code<sup>†</sup>, treatment plan, and follow-up in visit note.

6. Provider reviews ACE score, treatment plan, and follow-up prior to next visit; updates as needed.

\*PEARLS to be completed once per year, and no less often than every 3 years

<sup>†</sup>Healthcare Common Procedure System (HCPCS) billing codes for ACE scores:

**G9919:** ACE score  $\geq 4$ , high risk for toxic stress

**G9920:** ACE score of 0 – 3, lower risk for toxic stress. For purposes of coding, scores of 1-3 with ACE-associated health conditions should be coded as G9920, even though patient falls into the high-risk category of the clinical algorithm.

|  | <u>Low Risk</u>  | <u>Intermediate Risk</u>  | <u>High Risk</u>  | <u>High Risk</u>  | <u>Unknown Risk</u>  |
|--|--|---|---|---|--|
| <b>ACE screen (top box)</b>                    | Score of 0   | Score of 1-3  | Score of 1-3  | Score of 4+   | Score unknown (incomplete)   |
| <b>Assess for associated health conditions</b> | ↓  | ↓   | ↓   | ↓   | ↓  |
| <b>Determine response and follow-up</b>        | ↓  | ↓   | ↓   | ↓   | ↓  |
|  | Provide education, anticipatory guidance on ACEs, toxic stress, and buffering factors. | Provide education, anticipatory guidance on ACEs, toxic stress, and buffering factors.<br><br>Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate. | Provide education about toxic stress, its likely role in patient's health condition(s), and buffering.<br><br>Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate. | Provide education about toxic stress, its likely role in patient's health condition(s), and buffering.<br><br>Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate. | Provide education on ACEs, toxic stress, and buffering factors. Re-offer at next physical. |

**This algorithm pertains to the ACE score (top box of PEARLS), whose associations with health conditions are most precisely known.** Social determinants of health (bottom box) may also increase risk for a toxic stress response and should be addressed with appropriate services, but should NOT be added to the ACE score for this algorithm. Partial completion may indicate discomfort or lack of understanding. If partial response indicates patient is at intermediate or high risk, follow the guidelines for that category.

If the ACE score is 0, the patient is at "low risk" for toxic stress. The provider should offer education on the impact of ACEs and other adversities on health and development as well as on buffering factors and interventions. If the ACE score is 1-3 without ACE-associated health conditions, the patient is at "intermediate risk" for toxic stress. If the ACE score is 1-3 and the patient has at least one ACE-associated condition, or if the ACE score is 4 or higher, the patient is at "high risk" for toxic stress. In both cases, the provider should offer education on how ACEs may lead to toxic stress and associated health conditions, as well as practices and interventions demonstrated to buffer the toxic stress response, such as sleep, exercise, nutrition, mindfulness, mental health, and healthy relationships. The provider should also assess for protective factors, jointly formulate a treatment plan, and link to supportive services and interventions, as appropriate.

# ACE-Associated Health Conditions: Pediatrics

| Symptom or Health Condition  | For $\geq X$ ACEs (compared to 0) | Odds Ratio |
|--|-----------------------------------|------------|
| Asthma <sup>26, 33</sup>   | 4                                 | 1.7 - 2.8  |
| Allergies <sup>33</sup>  | 4                                 | 2.5        |
| Dermatitis and eczema <sup>39</sup>  | 3*                                | 2.0        |
| Urticaria <sup>39</sup>  | 3*                                | 2.2        |
| Increased incidence of chronic disease, impaired management <sup>25</sup>                                    | 3                                 | 2.3        |
| Any unexplained somatic symptoms <sup>25</sup><br>(eg, nausea/vomiting, dizziness, constipation, headaches)  | 3                                 | 9.3        |
| Headaches <sup>33</sup>  | 4                                 | 3.0        |
| Enuresis; encopresis <sup>5</sup>  | --                                | --         |
| Overweight and obesity <sup>3</sup>  | 4                                 | 2.0        |
| Failure to thrive; poor growth; psychosocial dwarfism <sup>5, 2, 41</sup>                                    | --                                | --         |
| Poor dental health <sup>16, 22</sup>   | 4                                 | 2.8        |
| Increased infections <sup>39</sup> (viral, URIs, LRTIs and pneumonia, AOM, UTIs, conjunctivitis, intestinal) | 3*                                | 1.4 - 2.4  |
| Later menarche <sup>40</sup> ( $\geq 14$ years)  | 2*                                | 2.3        |
| Sleep disturbances <sup>5, 31</sup>  | 5**                               | PR 3.1     |
| Developmental delay <sup>30</sup>  | 3                                 | 1.9        |
| Learning and/or behavior problems <sup>3</sup>   | 4                                 | 32.6       |

\*Odds ratio represents at least one ACE, but also includes other adversities

\*\*Prevalence ratio represents at least one ACE, but also includes other adversities

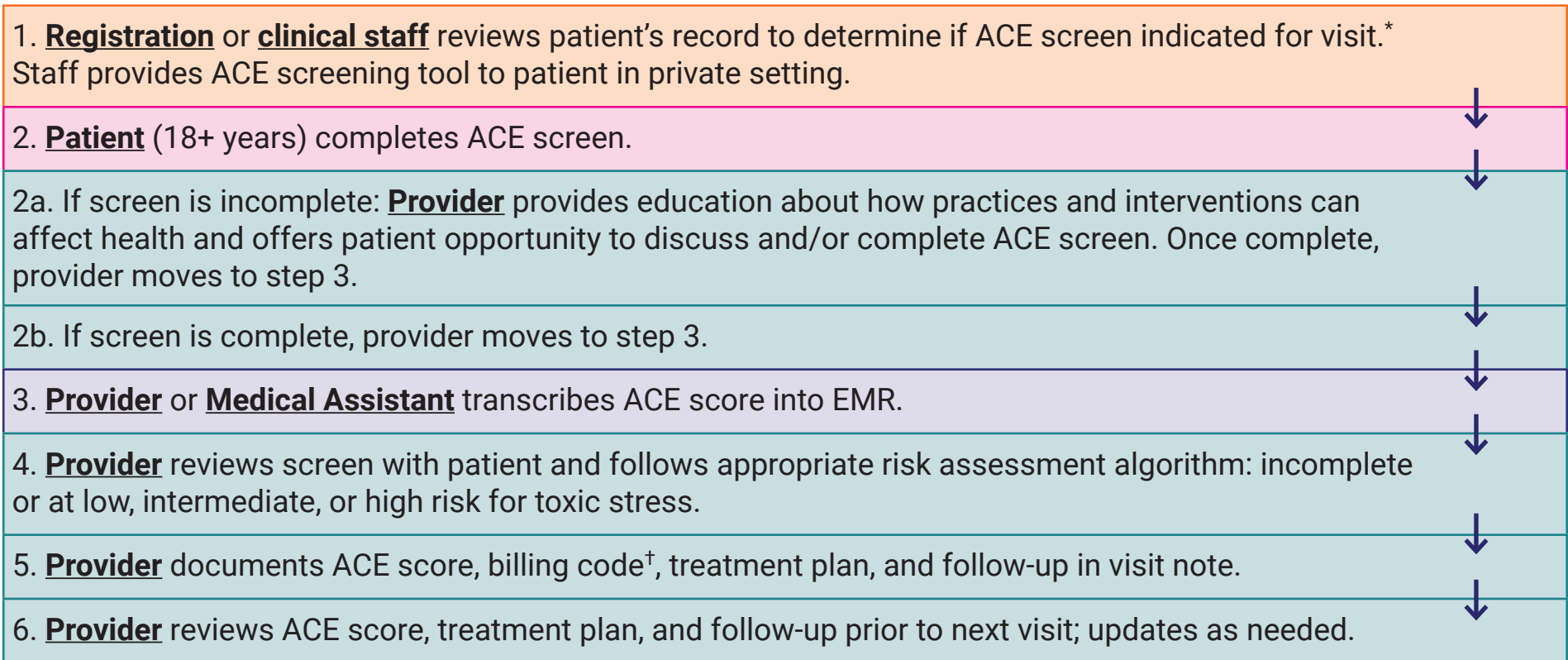
## ACE-Associated Health Conditions: Pediatrics

| Symptom or Health Condition  | For ≥ X ACEs (compared to 0) | Odds Ratio |
|--|------------------------------|------------|
| Repeating a grade <sup>15</sup>  | 4                            | 2.8        |
| Not completing homework <sup>15</sup>                                      | 4                            | 4.0        |
| High school absenteeism <sup>33</sup>                                      | 4                            | 7.2        |
| Graduating from high school <sup>29</sup>                                  | 4                            | 0.4        |
| Aggression; physical fighting <sup>28</sup>                                | For each additional ACE      | 1.9        |
| Depression <sup>29</sup>   | 4                            | 3.9        |
| ADHD <sup>42</sup>   | 4                            | 5.0        |
| Any of: ADHD, depression, anxiety, conduct/behavior disorder <sup>30</sup> | 3                            | 4.5        |
| Suicidal ideation <sup>28</sup>  | For each additional ACE      | 1.9        |
| Suicide attempts <sup>28</sup>   | For each additional ACE      | 1.9 - 2.1  |
| Self-harm <sup>28</sup>  | For each additional ACE      | 1.8        |
| First use of alcohol at < 14 years <sup>7</sup>                            | 4                            | 6.2        |
| First use of illicit drugs at < 14 years <sup>10</sup>                     | 5                            | 9.1        |
| Early sexual debut <sup>21</sup> (<15-17 y)                                | 4                            | 3.7        |
| Teenage pregnancy <sup>21</sup>  | 4                            | 4.2        |

\*Odds ratio represents at least one ACE, but also includes other adversities

\*\*Prevalence ratio represents at least one ACE, but also includes other adversities

## Adult ACE Screening Clinical Workflow



\***ACE tool to be completed** once per adult per lifetime

<sup>†</sup>**Healthcare Common Procedure System (HCPCS) billing codes for ACE scores:**

**G9919:** ACE score  $\geq 4$ , at high risk for toxic stress.

**G9920:** ACE score of 0 – 3, at lower risk for toxic stress (on algorithm, at either low or intermediate risk).

# Adverse Childhood Experiences (ACEs) and Toxic Stress Risk Assessment Algorithm

Adults

|   | <u>Low Risk</u>  | <u>Intermediate Risk</u>  | <u>High Risk</u>  | <u>Unknown Risk</u>   |
|---|--|---|---|---|
| ACE screen (top box)                    | Score of 0-3<br>↓  | Score of 1-3<br>↓   | Score of 4+<br>↓  | Score unknown (incomplete)<br>↓   |
| Assess for associated health conditions | <b>Without</b> associated health conditions<br>↓   | <b>With</b> associated health conditions<br>↓   | <b>With or without</b> associated health conditions<br>↓  | ↓   |
| Determine response and follow-up        | Provide education about ACEs, toxic stress, and resilience. Assess for protective factors. | Provide education about toxic stress, its likely role in patient's health condition(s), and resilience. Assess for protective factors and jointly formulate treatment plan. Link to support services and treatment, as appropriate. | Provide education about toxic stress, its likely role in patient's health condition(s), and resilience. Assess for protective factors and jointly formulate treatment plan. Link to support services and treatment, as appropriate. | Provide education on ACEs/ toxic stress and buffering/ resilience. Re-offer at next physical. |

Partial completion may indicate discomfort or lack of understanding. If partial response indicates patient is at intermediate or high risk, follow the guidelines for that category.

If the **ACE score is 0-3** without ACE-associated health conditions, the patient is at “low risk” for toxic stress physiology. The provider should offer education on the impact of ACEs and other adversities on health (including reviewing patient’s self-assessment of ACEs’ impact on health), buffering/protective factors, and interventions that can mitigate health risks. If the **ACE score is 1-3** with ACE-associated health conditions, the patient is at “intermediate risk.” If the **score is 4 or higher**, even without ACE-associated health conditions, the patient is at “high risk” for toxic stress physiology. In both cases, the provider should offer education on how ACEs may lead to a toxic stress response and associated health conditions, as well as practices and interventions demonstrated to buffer the toxic stress response, such as sleep, exercise, nutrition, mindfulness, mental health, and healthy relationships. The provider should also assess for protective factors, jointly formulate a treatment plan and link to supportive services and interventions, as appropriate.

## ACE-Associated Health Conditions: Adults

| Symptom or Health Condition   | Odds Ratio (excluding outliers) |
|---|---------------------------------|
| Cardiovascular disease <sup>21</sup> (CAD, MI, ischemic heart disease)          | 2.1                             |
| Tachycardia <sup>37</sup>   | ≥ 1 ACE: 1.4                    |
| Stroke <sup>20</sup>  | 2.0                             |
| Chronic obstructive pulmonary disease (emphysema, bronchitis) <sup>21</sup>     | 3.1                             |
| Asthma <sup>43</sup>  | 2.2                             |
| Diabetes <sup>21</sup>  | 1.4                             |
| Obesity <sup>20</sup>   | 2.1                             |
| Hepatitis or jaundice <sup>1</sup>  | 2.4                             |
| Cancer, any <sup>21</sup>   | 2.3                             |
| Arthritis <sup>32,7</sup> (self-reported)                                       | 3 ACEs, HR: 1.5<br>≥ 1 ACE: 1.3 |
| Memory impairment <sup>20</sup> (all causes, including dementias)               | 4.9                             |
| Kidney disease <sup>43</sup>  | 1.7                             |
| Headaches <sup>11</sup>   | ≥ 5 ACEs: 2.1                   |
| Chronic pain, any <sup>38</sup> (using trauma z-score)                          | 1.2                             |
| Chronic back pain <sup>38</sup> (using trauma z-score)                          | 1.3                             |
| Fibromyalgia <sup>37</sup>  | ≥ 1 ACE: 1.8                    |
| Unexplained somatic symptoms, including somatic pain, headaches <sup>20,2</sup> | 2.0 - 2.7                       |
| Skeletal fracture <sup>1</sup>  | 1.6 - 2.6 <sup>20</sup>         |
| Physical disability requiring assistive equipment <sup>23</sup>                 | 1.8                             |

Odds ratios compare outcomes in individuals with > 4 ACEs to those with 0 ACEs, except where specified

## ACE-Associated Health Conditions: Adults

| Symptom or Health Condition  | Odds Ratio (excluding outliers) |
|--|---------------------------------|
| Depression <sup>21</sup>   | 4.7                             |
| Suicide attempts <sup>21</sup>   | 37.5                            |
| Suicidal ideation <sup>20</sup>  | 10.5                            |
| Sleep disturbance <sup>20</sup>  | 1.6                             |
| Anxiety <sup>21</sup>  | 3.7                             |
| Panic and anxiety <sup>20</sup>  |                                 |
| Post-traumatic stress disorder <sup>37</sup>                                     | 4.5                             |
| Illicit drug use <sup>21</sup> (any)   | 5.2                             |
| Injected drug, crack cocaine, or heroin use <sup>21</sup>                        | 10.2                            |
| Alcohol use <sup>21</sup>  | 6.9                             |
| Cigarettes or e-cigarettes use <sup>35</sup>                                     | 6.1                             |
| Cannabis use <sup>35</sup>   | 11.0                            |
| Teen pregnancy <sup>21</sup>   | 4.2                             |
| Sexually transmitted infections, lifetime <sup>21</sup>                          | 5.9                             |
| Violence victimization <sup>21</sup> (intimate partner violence, sexual assault) | 7.5                             |
| Violence perpetration <sup>21</sup>  | 8.1                             |

Odds Ratios for individuals with > 4 ACEs, except where specified otherwise, all compared to 0 ACEs



## 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. **Am J Prev Med**; : 14.
2. Anda RF, Felitti VJ, Bremner JD, et al. The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. **European Archives of Psychiatry and Clinical Neuroscience** 2006; 256: 174–86.
3. Burke NJ, Hellman JL, Scott BG, Weems CF, Carrion VG. The impact of adverse childhood experiences on an urban pediatric population. **Child Abuse & Neglect** 2011; 35: 408–13.
4. Burke Harris N. *The Deepest Well: Healing the Long-Term Effects of Childhood Adversity*. Boston: Houghton Mifflin Harcourt, 2018.
5. Burke Harris N, Renschler T. Center for Youth Wellness ACE-Questionnaire (CYW ACE-Q Child, Teen, Teen SR). 2015; Purewal SK, Bucci M, Wang LG, et al. Screening for Adverse Childhood Experiences (ACEs) in an Integrated Pediatric Care Model. **ZERO TO THREE** 2016; 36: 10–7.
6. Chapman DP, Liu Y, Presley-Cantrell LR, et al. Adverse childhood experiences and frequent insufficient sleep in 5 U.S. States, 2009: a retrospective cohort study. **BMC Public Health** 2013; 13. DOI:10.1186/1471-2458-13-3.
7. Dube SR, Miller JW, Brown DW, et al. Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. **Journal of Adolescent Health** 2006; 38: 444.e1-444.e10.
8. Hillis SD, Anda RF, Felitti VJ, Nordenberg D, Marchbanks PA. Adverse childhood experiences and sexually transmitted diseases in men and women: a retrospective study. **Pediatrics** 2000; 106: e11–e11.
9. Dube SR, Felitti VJ, Dong M, Giles WH, Anda RF. The impact of adverse childhood experiences on health problems: evidence from four birth cohorts dating back to 1900. **Preventive Medicine** 2003; 37: 268–77.
10. Dube SR, Felitti VJ, Dong M, Chapman DP, Giles WH, Anda RF. Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: the adverse childhood experiences study. **Pediatrics** 2003; 111: 564–72.

## References

11. Anda R, Tietjen G, Schulman E, Felitti V, Croft J. Adverse childhood experiences and frequent headaches in adults. **Headache: The Journal of Head and Face Pain** 2010; 50: 1473–81.
12. Oh DL, Jerman P, Silvério Marques S, et al. Systematic review of pediatric health outcomes associated with childhood adversity. **BMC Pediatrics** 2018; 18. DOI:10.1186/s12887-018-1037-7.
13. Bucci M, Marques SS, Oh D, Harris NB. Toxic Stress in Children and Adolescents. **Advances in Pediatrics** 2016; 63: 403–28.
14. Garner AS, Shonkoff JP, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, Section on Developmental and Behavioral Pediatrics, et al. Early childhood adversity, toxic stress, and the role of the pediatrician: translating developmental science into lifelong health. **Pediatrics** 2012; 129: e224–31.
15. Robles A, Gjelsvik A, Hirway P, Vivier PM, High P. Adverse Childhood Experiences and Protective Factors With School Engagement. **Pediatrics** 2019; 144: e20182945.
16. Bright MA, Alford SM, Hinojosa MS, Knapp C, Fernandez-Baca DE. Adverse childhood experiences and dental health in children and adolescents. **Community Dentistry and Oral Epidemiology** 2015; 43: 193–9.
17. Shonkoff JP, Garner AS, Dobbins MI, et al. The lifelong effects of early childhood adversity and toxic stress. **Pediatrics** 2012; 129: e232–46.
18. Anda RF, Brown DW, Dube SR, Bremner JD, Felitti VJ, Giles WH. Adverse childhood experiences and chronic obstructive pulmonary disease in adults. **American Journal of Preventive Medicine** 2008; 34: 396–403.
19. Kalmakis KA, Chandler GE. Health consequences of adverse childhood experiences: a systematic review. **J Am Assoc Nurse Pract** 2015; 27: 457–65.
20. Petruccelli K, Davis J, Berman T. Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. **Child Abuse & Neglect** 2019; 97: 104127.
21. Hughes K, Bellis MA, Hardcastle KA, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. **The Lancet Public Health** 2017; 2: e356–66.

## References

22. Crouch E, Radcliff E, Nelson J, Strompolis M, Martin A. The experience of adverse childhood experiences and dental care in childhood. **Community Dentistry and Oral Epidemiology** 2018; 46: 442–8.
23. Schüssler-Fiorenza Rose SM, Xie D, Stineman M. Adverse Childhood Experiences and Disability in U.S. Adults. **PM&R** 2014; 6: 670–80.
24. Lanier P, Maguire-Jack K, Lombardi B, Frey J, Rose RA. Adverse Childhood Experiences and Child Health Outcomes: Comparing Cumulative Risk and Latent Class Approaches. **Matern Child Health J** 2018; 22: 288–97.
25. Flaherty EG, Thompson R, Dubowitz H, et al. Adverse childhood experiences and child health in early adolescence. **JAMA Pediatrics** 2013; 167: 622.
26. Wing R, Gjelsvik A, Nocera M, McQuaid EL. Association between adverse childhood experiences in the home and pediatric asthma. **Annals of Allergy, Asthma & Immunology** 2015; 114: 379–84.
27. Schilling EA, Aseltine RH, Gore S. Adverse childhood experiences and mental health in young adults: a longitudinal survey. **BMC Public Health** 2007; 7. DOI:10.1186/1471-2458-7-30.
28. Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent Violence Perpetration: Associations With Multiple Types of Adverse Childhood Experiences. **Pediatrics** 2010; 125: e778–86.
29. Giovanelli A, Reynolds AJ, Mondri CF, Ou S-R. Adverse childhood experiences and adult well-being in a low-income, urban cohort. **Pediatrics** 2016; 137: e20154016–e20154016.
30. Bright MA, Knapp C, Hinojosa MS, Alford S, Bonner B. The Comorbidity of Physical, Mental, and Developmental Conditions Associated with Childhood Adversity: A Population Based Study. **Maternal and Child Health Journal** 2016; 20: 843–53.
31. Wang Y, Raffeld MR, Slopen N, Hale L, Dunn EC. Childhood adversity and insomnia in adolescence. **Sleep Medicine** 2016; 21: 12–8.
32. Von Korff M, Alonso J, Ormel J, et al. Childhood psychosocial stressors and adult onset arthritis: broad spectrum risk factors and allostatic load. **Pain** 2009; 143: 76–83.

## References

33. Bellis MA, Hughes K, Ford K, et al. Adverse childhood experiences and sources of childhood resilience: a retrospective study of their combined relationships with child health and educational attendance. **BMC Public Health** 2018; 18. DOI:10.1186/s12889-018-5699-8.
34. Gilbert LK, Breiding MJ, Merrick MT, et al. Childhood Adversity and Adult Chronic Disease. **American Journal of Preventive Medicine** 2015; 48: 345–9.
35. Bellis M, Ashton K, Hughes K, Ford K, Bishop J, Paranjothy S. Adverse childhood experiences and their impact on health-harming behaviours in the Welsh adult population. Cardiff: **Public Health Wales; 2015**. Cardiff, 2015.
36. Chapman DP, Liu Y, Presley-Cantrell LR, et al. Adverse childhood experiences and frequent insufficient sleep in 5 U.S. States, 2009: a retrospective cohort study. **BMC Public Health** 2013; 13. DOI:10.1186/1471-2458-13-3.
37. Rhee TG, Barry LC, Kuchel GA, Steffens DC, Wilkinson ST. Associations of Adverse Childhood Experiences with Past-Year DSM-5 Psychiatric and Substance Use Disorders in Older Adults. **J Am Geriatr Soc** 2019; 67: 2085–93.
38. You DS, Albu S, Lisenbardt H, Meagher MW. Cumulative Childhood Adversity as a Risk Factor for Common Chronic Pain Conditions in Young Adults. **Pain Med** 2019; 20: 486–94.
39. Karlen J, Ludvigsson J, Hedmark M, Faresjo A, Theodorsson E, Faresjo T. Early Psychosocial Exposures, Hair Cortisol Levels, and Disease Risk. **Pediatrics** 2015; 135: e1450–7.
40. Boynton-Jarrett R, Harville EW. A prospective study of childhood social hardships and age at menarche. **Annals of Epidemiology** 2012; 22: 731–7.
41. Muñoz-Hoyos A, Molina-Carballo A, Augustin-Morales M, et al. Psychosocial dwarfism: Psychopathological aspects and putative neuroendocrine markers. **Psychiatry Research** 2011; 188: 96–101.
42. Brown NM, Brown SN, Briggs RD, Germán M, Belamarich PF, Oyeku SO. Associations Between Adverse Childhood Experiences and ADHD Diagnosis and Severity. **Academic Pediatrics** 2017; 17: 349–55.
43. Merrick MT, Ford DC, Ports KA, et al. Vital Signs: Estimated Proportion of Adult Health Problems Attributable to Adverse Childhood Experiences and Implications for Prevention—25 States, 2015–2017. **MMWR Morb Mortal Wkly Rep** 2019; 68. DOI:10.15585/mmwr.mm6844e1.