Obesity and Adverse Childhood Experiences

EVIDENCE OVERVIEW
April 2019

Commissioned by Obesity Action Scotland

Obesity Action Scotland
Healthy weight for all

The link between Adverse Childhood Experiences (ACEs) and obesity: A rapid review of the literature

This evidence overview was commissioned by Obesity Action Scotland and produced by Steve MacGillivray from SiRiuS Systematic Review Services.

Contents

Acknowledgements

Thanks go to Lorraine Tulloch, Obesity Action Scotland, for her guidance in the development of the rapid review protocol and in the process of conducting the review. Thanks also go to Dr Anna Gryka-MacPhail, Obesity Action Scotland, for help in retrieving the full publications of included studies.

The brief

Obesity Action Scotland were interested in collecting and reporting the evidence for the link between Adverse Childhood Experiences and Obesity. They commissioned SiRiuS Systematic Review Services Ltd to conduct a rapid review of the evidence over a 7 day period in March 2019.

Rapid Review Questions

A rapid review of the empirical literature in order to help answer the following research questions:

1. What is the range and nature of the evidence in this area?
    a. What types of studies have been conducted?
    b. Which countries have studies been conducted in?
    c. What is the quality of studies in this area?
    d. Which studies have relevance to the Scottish context?
2. What is the strength of the evidence for the relationship of any Adverse Childhood Experiences and the subsequent onset of obesity or morbid obesity?
3. What is the strength of the evidence for the relationship of obesity on the subsequent onset of Adverse Childhood Experiences?
4. What are the implications of the available evidence for policy?

Methods

This was a rapid evidence synthesis of any reviews or primary studies focussing on understanding the relationship of obesity[1]* and Adverse Childhood Experiences[2]**.

Relevant published literature was identified by searching seven key electronic databases: Medical literature analysis and retrieval system online (Medline+); Psychological Literature (PsycINFO); Cumulative Index to Nursing and Health Literature (CinAHL+); Social Services Abstracts (SSA); Social Care Online (SCO); Sociological abstracts; Applied Social Sciences Index and Abstracts (ASSIA).

Search strings were developed and tested for each database according to the following search architecture:

1. Obesity or synonyms (in the title or abstract)
2. Obesity (mapped to MeSH)
3. 1 OR 2
4. Adverse Childhood Experiences or synonyms (in the title or abstract)
5. Adverse Childhood Experiences (mapped to MeSH)
6. 4 OR 5
7. Limit to published since 2000 and in English language
8. 3 AND 6 AND 7
9. Deduplicate 8

The actual search string used in the EBSCO databases is shown below.

[1] *We define Obesity in childhood as a Body Mass Index at or above the 95th percentile for children and teens of the same age and sex.

[2] **We defined Adverse Childhood Experiences according to the following 9 categories (Felitti & Anda, 2010): 1) recurrent physical abuse; 2) recurrent emotional abuse; 3) contact sexual abuse; 4) an alcohol and/or drug abuser in the household; 5) an incarcerated household member; 6) someone who is chronically depressed, mentally ill, institutionalized, or suicidal; 7) mother treated violently; 8) one or no parents; and 9) emotional or physical neglect.

Table 1: Search strategy implemented via EBSCO

#	Query	Results
S16	Deduplicate	3,121
S15	S12 AND S13 limited to English language and published since 2000	4,279
S14	S12 AND S13	4,779
S13	S7 OR S8 OR S9 OR S10 OR S11	463,591
S12	S1 OR S2 OR S3 OR S4 OR S5 OR S6	341,684
S11	TI obes* OR AB obes*	383,548
S10	TI weight status OR AB weight status	10,250
S9	TI childhood obesity OR AB childhood obesity	15,193
S8	MH "obesity" OR MH "pediatric obesity"	251,689
S7	DE "obesity"	137,452
S6	(DE "early experience" OR DE "child abuse" OR DE "trauma" OR DE "emotional trauma" OR DE "psychological stress" OR DE "chronic stress" OR DE "distress" OR DE "family crises" OR DE "family conflict")	148,027
S5	(MH "child abuse" OR MH "trauma" OR MH "stress" OR MH "stress, psychological" OR MH "family conflict"	210,248
S4	TI childhood trauma* OR AB childhood trauma*	23,261
S3	TI childhood adversit* OR AB childhood adversit*	5,957
S2	TI adverse childhood experience* OR AB adverse childhood experience*	5,612
S1	TI adverse childhood event* OR AB adverse childhood event*	3,241

The search results were de-duplicated and then citations screened according to the following inclusion criteria:

Include if:

- Is a review or study which primarily focuses on the link between ACEs and Obesity
- Is a review which includes empirical studies which evaluate or test the association between any ACE and obesity
- Is a primary empirical study evaluating or testing the association between any ACE and obesity
- Was published in the English Language after 1999

Of those studies or reviews that met inclusion criteria, the range and nature of the evidence they contained was reported.

We adopted the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre, 2010) approach to assessing quality and relevance of studies: EPPI-Centre weight of evidence (WoE) judgments were applied to each of the included reviews or studies. Three components were assessed in order to help derive an overall weighting of evidence score (a. methodological quality; b. methodological relevance; c. topic relevance):

a) Methodological quality: the trustworthiness of the results judged by the quality of the study within the accepted norms for undertaking the particular type of research design used in the study. This involved asking questions related to a study's reporting, context, sample, design, reliability and validity of data-collection and analysis (including appropriate number and range of explanatory variables in the statistical models), ethics, sample size, risk of bias resulting from selection and maintenance of sample, and generalisability.

b) Methodological relevance: the appropriateness of the study design for addressing their particular research question/s

c) Topic relevance: the appropriateness of focus of the research for answering the review question

The following scoring system was used to make assessments for each of the three components assessed: 1 = excellent, 2 = good, 3 = satisfactory, 4 = inadequate.

Judgement of overall weight of evidence (WoE) was made based on the assessments for each of the above criteria and by using the same scoring system. Studies classified as satisfactory overall were still included as they met the inclusion criteria for the review, but less reliance was placed on their results.

Studies were also graded as: A (directly relevant, Scottish based); B (probably relevant, non-Scottish based but apply to other UK settings); C (possibly relevant, non UK but should be interpreted with caution due to strong cultural or institutional differences); D (not relevant, clearly irrelevant due to cultural, institutional or legislative differences).

Results

This rapid review involved conducting a search for reviews in the area and then going on to conduct a search for primary studies. The results section will begin by reporting the main findings from the reviews identified and then go on to report the results of the search for primary literature.

Findings from reviews

The search for reviews resulted in 13 reviews being obtained in full and reported on here. Table 2 below highlights the key findings from the 13 included reviews, whilst Table 3 indicates implications from each of the reviews with regard to policy. Seven of the reviews were published between 2000 and 2011. Six of the reviews were published within the last 5 years, with 2 reviews being published in the last 2 years. Reviews varied with regard to the focus, nature and quality of their approach.

The best available evidence indicates that the odds of those who have suffered ACEs to go on to develop obesity in adulthood are increased somewhere between 13% and 50%. The odds are also similarly increased for individual ACEs. Much of the evidence is based upon retrospective, cross sectional studies. Furthermore the evidence in this area merely indicates “association” of ACEs with subsequent obesity.

Table 2: Characteristics of reviews found (ordered by weight of evidence [WoE])

Study ID	Review type (number of studies)	Main aim	MQ	MR	TR	WoE	Main findings
Danese 2014	Systematic Review with Meta-analysis **(41 studies)**	To examine the association between childhood maltreatment and obesity	2	1	1	2	41 studies (190 285 participants) revealed that childhood maltreatment was associated with elevated risk of developing obesity over the life-course (odds ratio 1.36; 95% confidence Interval 1.26–1.47)
Hemmingsson 2014	**(23 studies)**	Examined the role of childhood abuse (physical, emotional, sexual, general) in child, adolescent and adult obesity.	2	1	1	2	Adults who reported childhood abuse were significantly more likely to be obese (odds ratio [OR]: 1.34, 95% confidence interval [CI]: 1.24–1.45, P < 0.001). All four types of abuse were significantly associated with adult obesity: physical (OR: 1.28, 95% CI: 1.13–1.46), emotional (OR: 1.36, 95% CI: 1.08–1.71), sexual (OR: 1.31, 95% CI: 1.13–1.53) and general abuse (OR: 1.45, 95% CI: 1.25–1.69). Severe abuse (OR: 1.50, 95% CI: 1.27–1.77) was significantly more associated with adult obesity (P = 0.043) compared with light/moderate abuse (OR: 1.13, 95% CI: 0.91–1.41).
Hughes 2017	Systematic review with meta-analysis **(37 studies)**	Examined the risks of health outcomes (substance use, sexual health, mental health, weight and physical exercise, violence, and physical health status and conditions, associated with multiple (at least 4) ACEs.	2	1	2	2	Individuals with at least four ACEs were at increased risk of all outcomes examined. Based upon 8 studies the odds ratio for overweight or obesity was 1·39 (1·13–1·71)
Irish 2010	Systematic review with meta-analysis **(31 studies)**	Compared individuals (form clinical and non-clinical backgrounds) with and without a history of childhood sexual abuse (CSA) on six health outcomes: general health, gastrointestinal (GI) health, gynaecological or reproductive health,	2	2	2	2	Findings from 7 studies indicate that the odds are increased for obesity occurring in later life (ORs ranging from 1.59 to 4.06 [NB: no 95% confidence Intervals reported])

		pain, cardiopulmonary symptoms, and obesity.					
Palmisano 2016	Systematic review **(70 studies)**	Explores the association between exposure to adverse life experiences and a risk for the development of obesity and Binge Eating Disorder (BED) in adulthood	2	2	2	2	53 studies on relationship between adverse life experiences and obesity. The majority of studies (87%) report that adverse life experiences are a risk factor for developing obesity
Midei 2011	Systematic review of limited number of databases **(36 studies)**	Examined the associations between exposure to interpersonal violence (physical abuse, sexual abuse, witnessing domestic violence, peer bullying, and neighbourhood crime and safety) in childhood and risk for obesity and central adiposity.	2	3	2	3	The majority of studies report positive associations between childhood interpersonal violence and obesity. Does not report actual ORs clearly. Does contain equivocal evidence for obesity in childhood.
Miller 2018	Critical review based upon an unknown search strategy. **(number of studies not reported)**	Examines evidence of associations between early childhood stress and risk for obesity and the mechanisms of association.	3	2	2	3	Early life stress and adverse childhood experiences are associated with obesity and overweight in adults. Evidence is less consistent in children. Studies vary in the nature of the stress examined (e.g., chronic vs. acute), sample characteristics, and study designs.
Selway 2006	Non-systematic review using 1 database **(10 studies)**	Examined the correlation between child maltreatment and adult obesity	4	3	3	3	From Abstract only: Full text not available. Evidence from 10 retrospective cohort studies lends moderate support to associations between self-reported child maltreatment and adult obesity.
Vamosi 2010	Systematic review without pooling **(18 studies)**	Examined associations between psychological factors in childhood and development of obesity in adulthood.	3	2	3	3	Only two studies of abuse in childhood: Having suffered any abuse resulted in an increased risk of adult obesity of 88%. Being often hit and injured during childhood increased the risk of adult obesity by 71% while having suffered sexual abuse, intercourse

							and attempted intercourse increased risk of adult obesity by 42% and 37%. Being in fear of physical abuse during childhood increased the risk of obesity in adulthood by 34%.
Black 2014	Non-systematic discussion of selected literature **(8 studies)**	To find evidence for a link between childhood neglect and obesity NB: Not ACE	4	3	3	4	Findings (based on limited selected evidence) suggest that under some conditions neglect may increase the risk for excessive weight gain, and that high body mass index may be an indicator of possible neglect
Gundersen 2011	Non-systematic discussion of selected literature **(11 studies)**	To find evidence for a link between psychosocial stressors and childhood obesity NB: Not ACE	4	3	3	4	Findings (based on limited evidence) suggest that stress (for example, food insecurity or mothers' stress) are associated with childhood obesity
Halliday 2014	Systematic review without any pooling of data **(21 studies)**	Investigated the relationship between family functioning with overweight and obesity in children or adolescents	3	2	4	4	Of 17 identified cross-sectional and longitudinal studies, 12 reported significant associations between family functioning and childhood overweight and obesity
Tamayo 2010	Systematic review without pooling **(14 studies)**	Reports two reviews – the main one focusing on type 2 diabetes. A second review examines evidence for the role of obesity as a mediator for childhood adversity with diabetes incidence	2	2	4	4	No relevant data for current review

Table 3: Implications for policy from included reviews

Study ID	**Policy implications**
Black 2014	Children from low-income and racial/ethnic minority families are at increased risk for both neglect and obesity, illustrating the early origins of disparities that can compromise health throughout life
Danese 2014	Because childhood psychosocial experiences influence obesity risk, obesity should be seen not only as a clinical problem but also as a societal problem
Gundersen 2011	Policy recommendations emerging from this research include recognizing reductions in childhood obesity as a potential added benefit of social safety net programmes that reduce financial stress among families. In addition, policies and programmes geared towards childhood obesity prevention should focus on helping children build resources and capacities to teach them how to cope effectively with stressor exposure
Halliday 2014	Ecological frameworks of health suggest that obesity is not caused by one single factor, rather it is influenced by a complex interplay of biological, behavioural and environmental factors. The results of this review indicate that family functioning is one such factor linked to obesity; however, more high-level evidence and a greater understanding of the mechanisms behind this relationship is required
Hemmingsson 2014	Measures to prevent obesity need to focus on identifying and minimizing childhood abuse and potentially other adverse life experiences, as opposed to the common approach of improving diet and exercise. Successful obesity prevention and treatment programmes are still lacking

Hughes 2017	Although research into ACEs is far from complete, a compelling case exists for increased international focus on prevention of ACEs, development of programmes to bolster resilience, and implementation of policies that support a sustainable life-course approach to health
Irish 2010	Results highlight the negative long-term physical health consequences of childhood sexual abuse
Midei 2011	Children and adolescents are the most likely to be victimized compared to adults of any age, and they are also the least likely to report exposure to violence. Prevention is the first priority for this high-risk population and has been shown to be effective. Schools initiating anti-bullying practices reported decreases in peer victimization and aggression, and programmes teaching parenting skills reduce physical abuse at home. Schools and police can take a larger role in encouraging victims to report, improving interactions with the criminal justice system, and providing referrals to help victims
Miller 2018	It is essential to address the multiple contexts in which children live by engaging different sectors that shape both child development and parenting (e.g., health care, education, and policy). Community-level changes that address neighbourhood safety, food access, and physical activity opportunities may have the potential to reduce obesity risk for both adults and children. Policy changes related to workforce development, health care, occupational and environmental health, child care, and education may promote positive health outcomes for children, as programming is most effective when components are systemically connected across the home, school, and community
Palmisano 2016	Because childhood adversities are associated with adult obesity, increased attention must be given to the prevention of these adversities
Selway 2006	A more thorough understanding of the complex aetiology of adult obesity is required for the development of future strategies that will optimize obesity prevention and treatment. The prevention, reduction, and treatment of obesity has been identified by the Surgeon General of the United States as a national priority requiring immediate action

Tamayo 2010	Valid results on the association of childhood socio-economic circumstances and future risk of diabetes and obesity would be important to design targeted and more efficient prevention strategies. Diabetes and obesity prevention may not only profit from educational programmes but also from health politics, from interventions for high-risk families, from coping skills training, from empowerment of social networks and from healthy neighbourhoods
Vamosi 2010	Findings suggest that specific psychosocial factors in childhood may act as determinants for developing obesity in adulthood

Findings from the search for primary studies

The search strategy for primary studies resulted in a total of 3,423 citations to be screened (see figure 1). After screening, 3,308 were excluded because they did not meet inclusion criteria. This left 115 citations to be retrieved in full. Of the 115 full texts assessed in this review, 56 were excluded - mainly due to an insufficient focus on ACEs (see table 1 for a list of excluded studies). This left 59 studies to be included.

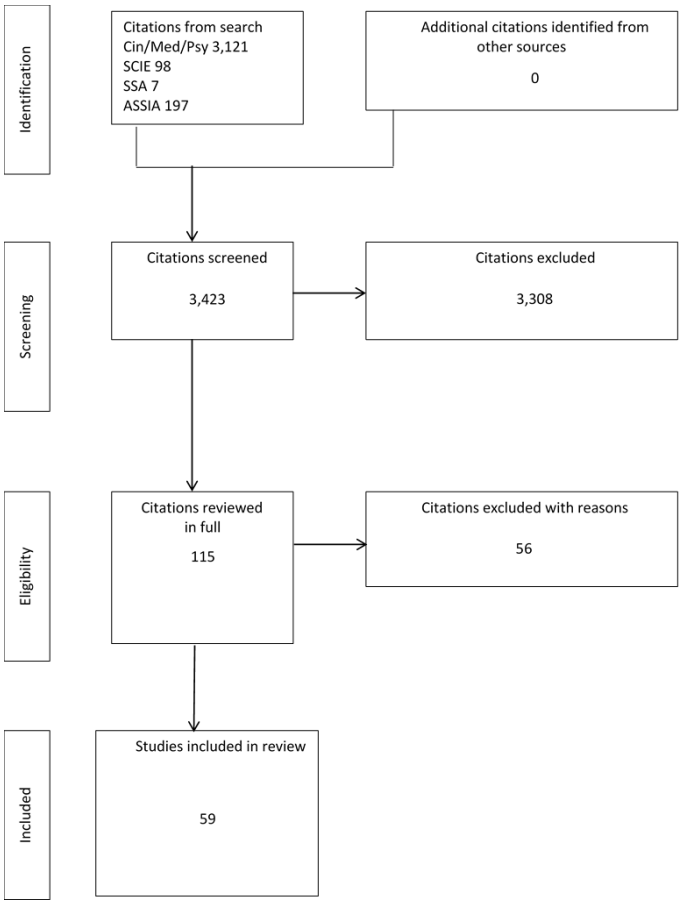


Figure 1: Flow diagram of study selection

Table 4: Full text citations excluded with reasons for exclusion

Citation	Reason for exclusion
DAVIS, 2019	Duplicate study
PEREIRA, 2013	Duplicate study
LECLERC, 2018	Focus on Bipolar Disorder
CÔTÉ-LUSSIER, 2015	Focus on feeling unsafe at school
BROWN, 2017	Focus on impulsivity
MCDONELL, 2018	Focus on interventions
SACKS, 2017	Focus on mediating role of depression
DELPIERRE, 2016	Focus on metabolic syndrome as outcome not obesity
AAS, 2017	Focus on schizophrenia and bipolar disorder
BREWER-SMYTH, 2014	Focus on Traumatic brain injury
BORGES, 2017	Focus on traumatic dental injuries
UDO, 2016	Focus on weight discrimination
HAWTON, 2018	Full text not available
MCKELVEY, 2019	Full text not available
PARK, 2018	Full text not available
ROGER, 2012	Full text not available
BECK, 2017	Not a study
AFIFI, 2013	Not ACEs
ALLEN, 2017	Not ACEs
ALMENARA, 2015	Not ACEs
ALSELAIM, 2012	Not ACEs
APARACIO' 2016	Not ACEs

BERGE, 2017	Not ACEs
BZOSTEK, 2011	Not ACEs
CHAMBERS, 2019	Not ACEs
DARLING, 2019	Not ACEs
GIBSON, 2017	Not ACEs
GIBSON, 2007	Not ACEs
GUNSTADT, 2006	Not ACEs
HELTON, 2014	Not ACEs
KOCH, 2008	Not ACEs
RAMASUBRAMANI, 2013	Not ACEs
SCHNEIDERMAN, 2013	Not ACEs
TAKIZAWA, 2015	Not ACEs
TANENBAUM, 2017	Not ACEs
BERCOVICH, 2014	Not ACEs and obesity
SALWEN, 2014	Not link between ACEs and obesity
AFIFI, 2016	Not obesity
BAKALAR, 2018	Not obesity
BEATTEY, 2018	Not obesity
MARIE-MITCHELL, 2013	Not obesity
BLACK, 2014	Review already included in reviews part of report
DANESE, 2014	Review already included in reviews part of report
GUNDERSEN, 2011	Review already included in reviews part of report
HALLIDAY, 2014	Review already included in reviews part of report
HEMMINGSSON,	Review already included in reviews part of report

2014	
HEMMINGSSON, 2018	Review already included in reviews part of report
HUGHES, 2017	Review already included in reviews part of report
IRISH, 2010	Review already included in reviews part of report
MIDEI, 2011	Review already included in reviews part of report
MILLER, 2018	Review already included in reviews part of report
PALMISANO, 2016	Review already included in reviews part of report
SELWAY, 2006	Review already included in reviews part of report
TAMAYO, 2010	Review already included in reviews part of report
VÁMOSI, 2010	Review already included in reviews part of report

Included primary studies

A total of 59 individual studies were included (see Table 5 for characteristics of the included studies).

Regarding age when obesity was assessed, 9 studies provided data for children, 11 for adolescents, 10 for young adults, and 38 for adults. The vast majority of studies involved community based samples.

The majority, 39 studies were set in USA and only 3 in the UK. Regarding relevance, 3 studies were graded as (B probably relevant, non-Scottish based but apply to other UK settings); 49 studies were graded as (C possibly relevant, non UK but should be interpreted with caution due to strong cultural or institutional differences); and 7 studies as (D not relevant, clearly irrelevant due to cultural, institutional or legislative differences).

Regarding methodological quality (MQ): 2 studies (ELSENBURG, 2017; BENTLEY, 2009) were graded as (1 excellent); 34 studies graded as (2 good); and 23 studies graded as (3 satisfactory). All studies were graded as either (1 excellent) or (2 good) with regard to the topic relevance (TR) (i.e. the appropriateness of focus of the research for answering the review question).

A relatively large number of studies received a rating of (2 good) with regard to the weight of evidence (WoE). No studies received a WoE rating of (1 excellent).

In the sections below that report the findings from studies, consideration will be given as to the relative weighting of evidence and this will be reported.

Table 5: Characteristics of included studies: Ordered by Age when Obesity was assessed (n=59)

Study	Country	Population	Adversity type/s	Age Obesity Assessed	Relevance	Method Quality	Method Relevance	Topic Relevance	Weight of Evidence
BENNETT, 2010.	USA	Community	Neglect	Child	C	2	2	2	2
ELSENBURG, 2017	Netherlands	Community	ACEs	Child; Adolescent; Adult (young)	C	1	1	1	2
HEERMAN, 2016	USA	Community	ACEs	Child; Adolescent	C	2	2	1	2
KNUTSON, 2010	USA	Community	Neglect or physical abuse	Child	C	3	3	1	3
NOLL, 2007	USA	Community	Sexual abuse	Child, Adolescent; Adult (young)	C	3	3	1	3
PINHAS-HAMIEL, 2009	USA	Clinical Paediatric endocrine unit	Sexual abuse	Child	C	3	2	1	3
POWER, 2015	UK	Community	Neglect Physical abuse; Psychological abuse; Sexual abuse	Child ; Adolescent; Adult (young); Adult	B	2	2	1	2
SUGLIA, 2012	USA	Community	ACEs (not sexual or physical abuse)	Child	C	2	2	2	2
WHITAKER, 2007	USA	Community	Neglect, Corporal punishment, psychological aggression	Child	C	3	3	2	3
DAVIS, 2018	USA	Community	ACEs	Adolescent	C	2	2	1	2
GOODING, 2015	USA	Community	ACEs	Adolescent	C	2	2	1	2
HICKSWHITE, 2018	USA	Clinical	ACEs	Adolescent	C	2	3	2	3

		Eating disorder clinic							
ISOHOOKANA, 2016	Finland	Clinical Psychiatric hopsital	ACEs	Adolescent	C	2	2	2	2
SCHNEIDERMAN, 2015	USA	Community	ACEs	Adolescent	C	2	2	1	2
SCHNEIDERMAN, 2012	USA	Clinical (child welfare)	ACEs	Adolescent	C	2	2	1	2
ZELLER, 2015	USA	Clinical Bariatric surgery candidates	ACEs	Adolescent	C	3	4	2	4
BALDWIN, 2016	UK	Community	Bullying	Adult (young)	B	2	2	1	2
FUEMMELER, 2009	USA	Community	ACEs	Adult (young)	C	2	2	1	2
MAMUN, 2007	USA	Community	Sexual abuse	Adult (young)	C	2	2	1	2
PELTZER, 2014	LMICs (n=22)	University /college students	Physical abuse; Sexual abuse	Adult (young)	D	3	4	2	4
REHKOPF, 2016	USA	Community	Physical abuse	Adult (young); Adult	C	2	2	1	2
SHIN, 2012	USA	Community	ACEs	Adult (young)	C	2	2	1	2
WINDLE, 2018	USA	University / college students	ACEs	Adult (young)	C	3	3	2	3
AARON, 2007	USA	Community	Sexual abuse	Adult	C	2	2	1	2
ABAJOBIR, 2017	Australia	Community	ACEs	Adult	C	2	2	1	2
ALCIATI, 2017	Italy	Clinical Bariatric surgery candidates	Parental death; Separation	Adult	C	3	3	2	3

ALCIATI, 2013	Italy	Clinical Bariatric surgery candidates	Bereavement	Adult	C	3	3	1	3
ALLISON, 2007	Canada	Community	Childhood trauma	Adult	C	3	3	2	3
ALMUNEEF, 2017	Saudi Arabia	Community	ACEs (4+)	Adult	D	2	2	2	2
ALMUNEEF, 2016	Saudi Arabia	Community	ACEs (1,2, 3, 4+)	Adult	D	2	2	2	2
ALVAREZ, 2007	USA	Community	ACEs	Adult	C	2	2	1	2
AMIANTO, 2018	Italy	Clinical Obese patients	ACEs	Adult	C	3	3	1	3
BELLIS, 2014	UK	Community	ACEs (4+)	Adult	B	2	2	2	2
BENTLEY, 2009	USA	Community	Sexual abuse; Neglect	Adult	C	1	1	1	2
BOYNTON-JARRETT, 2012.	USA	Community	Sexual abuse; physical abuse	Adult	C	2	2	2	2
BREWER-SMYTH, 2016	USA	Prisoners	Sexual abuse	Adult	C	3	2	2	3
BURKE, 2011	USA	Community	ACEs	Adult	C	3	3	1	3
CAMPBELL, 2016	USA	Community	ACEs (4+)	Adult	C	2	2	2	2
CHARTIER, 2009	Canada	Community	Sexual abuse; physical abuse	Adult	C	2	2	2	2
CLEMENS, 2018	Germany	Community	ACEs	Adult	C	2	2	2	2
CURTIS, 2016	USA	Community	ACEs	Adult	C	2	2	1	2
D'ARGENIO	Italy	Clinical Bariatric surgery	ACEs	Adult	C	3	3	1	3

		candidates and Community							
DAVIS, 2014	USA	Community	ACEs	Adult	C	2	2	1	2
DIESEL, 2016	USA	Women (Pregnant)	ACEs	Adult	C	3	2	2	2
DOWNEY, 2017	USA	Community	ACEs	Adult	C	2	2	1	2
El MHAMDI, 2018	Tunisia	Community	Violence	Adult	D	3	3	2	3
Font, 2016	USA	Community	ACEs	Adult	C	2	2	2	2
FRANCIS, 2015	USA	Community	Physical abuse	Adult	C	2	2	1	2
FRIEDMAN, 2015	USA	Community	ACEs	Adult	C	2	2	2	2
GJELSVIK, 2013	USA	Community	Incarceration of family member	Adult	C	3	2	1	3
GOEDECKE, 2013	South Africa	Community	ACEs	Adult	C	3	3	2	3
GRILO, 2005	USA	Clinical Bariatric surgery candidates	ACEs	Adult	C	3	3	2	3
HAYES, 2017	USA	Community	ACEs	Adult	C	2	3	2	3
MCLEOD, 2018	New Zealand	Community	Physical abuse; sexual abuse	Adult	D	3	3	1	3
MIN, 2013	USA	Women (history of substance misuse in preganancy)	ACEs	Adult	D	3	3	1	3
MUTLU, 2016	Turkey	Community	ACEs	Adult	D	3	3	1	3
NISHIDA,	USA	Clinical	ACEs	Adult	C	2	2	2	2

2016		Primary care patients							
O'NEILL, 2018	USA	Community	ACEs	Adult	C	2	2	2	2
WILLIAMSON, 2002	USA	Community	Physical abuse; Sexual abuse	Adult	C	3	3	1	3

In Table 6 below data is reported from the included primary studies under the heading of age range examined (i.e. Child; Adolescent; Young adult; Adult). The types of ACEs studied are also identified and a summary of the main findings provided. An assessment of the weighting of evidence is outlined below and any UK based studies identified.

Evidence from studies on obesity childhood (0-12years).

Nine studies provided evidence with regard to obesity in childhood (see Table 6 below).

Table 6: Findings form studies on obesity in childhood

Study (setting)	**ACE**	**Findings** **Weight of Evidence (WoE)**
Community sample		
BENNETT, 2010 (C)	Neglect	Neglected and comparison children were found to have similar BMIs (WoE 2)
POWER, 2015 (B) UK study	Abuse or neglect	Pre-adolescent BMI, i.e. at 7 and 11y, was not elevated in association with abuse or neglect. (WoE 2)
SUGLIA, 2012 (C)	Intimate partner violence, food insecurity, housing insecurity, maternal depressive symptoms, maternal substance use, and father's incarceration	Seventeen percent of children were obese at age 5 years, and 57% had at least 1 social risk factor. Adjusting for sociodemographic factors, girls experiencing high cumulative social risk (>2 factors) at age 1 year only (odds ratio [OR]: 2.1 [95% confidence interval [CI]: 1.1–4.1]) or at 3 years only (OR: 2.2 [95% CI: 1.2–4.2]) were at increased odds of being obese compared with girls with no risk factors at either time point. Those experiencing high cumulative risk at age 1 and 3 years were not at statistically significant odds of being obese (OR: 1.9 [95% CI: 0.9–4.0]). No significant associations were noted among boys. (WoE 2)
ELSENBURG, 2017 (C)	Hospital admission of the child; physical or mental illness of father or mother; death of a family member, friend, or loved one; parental divorce; and out-of-home placement.	No relationships were found between adverse life events with BMI in children. (WoE 2)
HEERMAN, 2016 (C)	Divorce/separation of parent; parent served time in jail; witness to domestic violence; lived with someone who was mentally ill or suicidal, and; lived with someone	The prevalence of obesity among children experiencing ≥2 ACEs was 20.4%, when compared with 12.5% among children with 0 ACEs. (WoE 2)

	with alcohol/drug problem.	
KNUTSON, 2010 (C)	Care neglect; supervisory neglect	Fifteen percent of children were overweight and 16.3% were obese. Care neglect significantly correlated with child BMI for younger but not older children, while supervisory neglect significantly correlated with child BMI for older but not younger children (WoE 3)
WHITAKER, 2007 (C)	Neglect; corporal punishment; psychological aggression	Eighteen percent of the children were obese, and the prevalence of any episode of neglect, corporal punishment, and psychological aggression was 11%, 84%, and 93%, respectively. The odds of obesity were increased in children who had experienced neglect (odds ratio 1.56, 95% confidence interval, 1.14–2.14), after controlling for the income and number of children in the household, the mothers' race/ethnicity, education, marital status, body mass index, prenatal smoking, and age, and the children's sex and birth weight. Neither the frequency of corporal punishment nor psychological aggression was associated with an increased risk of obesity. (WoE 3)
NOLL, 2007	Sexual abuse	Obesity rates were not different across groups (girls abused compared with non-abused girls) in childhood. (WoE 3)
Clinical sample		
PINHAS-HAMIEL, 2009	Physical, emotional and sexual abuse.	Abused girls were significantly more obese than the remainder of the patients (BMIZ 4.76 ± 1.34 vs. 3.39 ± 1.28 p = 0.02). Forty-two of all girls had BMI Z scores ≥4, and of these four (9.5%) had been abused. (WoE 3)

Summary statement of the evidence

The link between ACEs and Obesity in childhood (9 studies): The evidence suggests an association between some, but not all, ACEs and increased risk of obesity in childhood. The evidence is stronger for girls than for boys and for an increased risk for older rather than younger children. The available studies are heterogeneous in terms of the types of ACEs that they include. Only one study is based in the UK.

Evidence from studies on obesity in adolescence (13-18 years)

Eleven studies provided evidence with regard to obesity in adolescence.

Table 7: Findings from studies of obesity in adolescence

Study (setting)	**ACE**	**Findings Weight of Evidence (WoE)**
Community sample		
ELSENBURG, 2017 (C)	Hospital admission of the child; physical or mental illness of father or mother; death of a family member, friend, or loved one; parental divorce; and out-of-home placement.	No relationships were found between adverse life events with BMI in adolescents. (WoE 2)
HEERMAN, 2016 (C)	Divorce/separation of parent; parent served time in jail; witness to domestic violence; lived with someone who was mentally ill or suicidal, and; lived with someone with alcohol/drug problem.	The prevalence of obesity among children experiencing ≥2 ACEs was 20.4%, when compared with 12.5% among children with 0 ACEs. (WoE 2)
NOLL, 2007 (C)	Sexual abuse	Obesity rates were not different across groups (girls abused compared with non-abused girls) in adolescence. (WoE 3)
POWER, 2015 (B) UK study	Abuse or neglect	Adolescent BMI was slightly elevated in association with abuse or neglect. (WoE 2)
DAVIS, 2018 (C)	Psychological abuse, physical abuse, sexual abuse, familial substance abuse, domestic violence, parental incarceration.	Adolescents with more ACEs were more likely to have overweight, obesity, and severe obesity than adolescents with no ACEs. Adolescents who reported an ACE were 1.2, 1.4, and 1.5 times as likely to have overweight, obesity, and severe obesity, respectively, compared with their peers with no ACEs. (WoE 2)
GOODING, 2015 (C)	Maltreatment, abuse, peer victimization, or witness to community or domestic violence	Adolescents with a history of sexual abuse, emotional abuse, or peer victimization did not have significantly different BMI z-scores than those without exposure ($p > 0.05$ for all comparisons). BMI z-scores were higher in adolescents who had experienced physical abuse (ˇ = 0.50, 95% CI 0.12–0.91) or witnessed domestic violence (ˇ = 0.85, 95% CI 0.30–1.40). Participants who witnessed domestic violence had almost 6 times the odds of being over- weight or obese (95% CI: 1.09–30.7), even after adjustment for potential confounders. (WoE 2)
SCHNEIDERMAN, 2015	Physical, sexual, emotional abuse, negelct	BMI growth trajectories of sexually abused girls and neglected girls were significantly different from comparison girls.

(C)		Comparison girls had a growth trajectory that reached its apex at 15 years and then began to decline, whereas sexually abused girls and neglected girls had lower BMI than comparison girls until age 16–17 years when their BMI was higher than comparison girls. (WoE 2)
Clinical sample		
HICKSWHITE, 2018 (C)	Trauma, bullying, death/loss, sexual abuse	Of adolescents presenting at an outpatient eating disorder treatment facility 35% of the sample reported experiencing one or more traumatic events during their lifetime. Bullying was the most prevalent type of trauma (10%), followed by significant death/loss (9%), and sexual abuse (8%). Adolescents with any trauma exposure had higher body mass index (BMI) (WoE 2)
ISOHOOKANA, 2016 (C)	Psychological abuse, physical abuse, sexual abuse, familial substance abuse, domestic violence, parental incarceration	Of adolescents admitted to an acute psychiatric hospital unit, girls who experienced sexual abuse were more likely to be obese (OR: 2.6; 95% CI: 1.1–6.4) (WoE 2)
SCHNEIDERMAN, 2012 (C)	Maltreatment: physical abuse, sexual abuse, neglect	Of referrals from a child welfare department compared to controls, maltreatment was related to slightly lower odds of obesity for boys but was unrelated to high weight for girls (WoE 2)
ZELLER, 2015 (C)	Psychological abuse, physical abuse, sexual abuse, familial substance abuse, domestic violence, parental incarceration	Of adolescents with severe obesity undergoing weight loss surgery compared to controls, ACEs prevalence (females: 29%; males: 12%) was similar to national adolescent base rates. (WoE 4)

Summary statement of the evidence

The link between ACEs and Obesity in adolescence (11 studies): The evidence suggests an association between some, but not all, ACEs and increased risk of obesity in adolescence. The evidence is stronger for girls rather than boys. In one study maltreatment was related to slightly lower odds of obesity for boys only. The identified studies are heterogeneous in terms of the types of ACEs that they included. Only one study was based in the UK.

Evidence from studies on obesity in Young adulthood (18-27 years)

Ten studies provided evidence with regard to obesity in young adulthood.

Table 8: Findings form studies of obesity in young adults

Study (setting)	**ACE**	**Findings Weight of Evidence (WoE)**
All community samples (*2 studies university/college students)		
ELSENBURG, 2017 (C)	Hospital admission of the child; physical or mental illness of father or mother; death of a family member, friend, or loved one; parental divorce; and out-of-home placement.	Adverse relationship and victimhood events in their recent past were related to a lower BMI in young adults, whereas adverse health events during childhood were related to a higher BMI in young adults. (WoE 2)
NOLL, 2007 (C)	Sexual abuse	Of girls abused compared with non-abused girls, by young adulthood (ages 20 –27), abused female subjects were significantly more likely to be obese (42.25%) than were comparison female subjects (28.40%). (WoE 3)
POWER, 2015 (B) UK study	Abuse or neglect	BMI became elevated by mid-adulthood following a faster rate of gain over the intervening period. (WoE 2)
BALDWIN, 2016 (B) UK study	Bullying	Bullied children were more likely to be overweight than non-bullied children at age 18, and this association was strongest in chronically bullied children (OR=1.69, 95% CI=1.21–2.35) (WoE 2)
FUEMMELER, 2009 (C)	Physical abuse, sexual abuse, neglect	Men with a history of childhood sexual abuse (CSA) were at increased risk of overweight and obesity. No association between childhood abuse and obesity or overweight was observed for women. (WoE 2)
MAMUN, 2007 (C)	Sexual abuse	Young women's BMI and the prevalence of overweight at age 21 were greater in those who experienced penetrative Childhood Sexual Abuse (CSA). This association was robust to adjustment for a variety of potential confounders. However, there was no association between non-penetrative CSA and BMI in women and no association between either category of CSA and BMI in men. (WoE 2)
REHKOPF, 2016 (C)	Physical abuse, household alcohol abuse and household mental illness	Physical abuse was significantly associated with obesity at age 25 (WoE 2)
SHIN, 2012 (C)	Physical abuse, sexual abuse, neglect	Individuals with a history of childhood neglect had a greater rate of increase in BMI over time compared to those with no-CM experience. (WoE 2)

*PELTZER, 2014 (C)	Physical abuse	Physical abuse in childhood was one of a number of factors associated with obesity in young adulthood for both males and females (WoE 4)
*WINDLE, 2018 (C)	Physical and sexual abuse, parental neglect, parental alcoholism, parental divorce)	Higher ACE scores significantly predicted higher BMI (WoE 3)

Summary statement of the evidence

The link between ACEs and Obesity in young adulthood (10 studies): The evidence suggests an association between some, but not all, ACEs and increased risk of obesity in young adulthood. The evidence is stronger for the effect of sexual abuse than other ACEs. There is also evidence that more severe forms of abuse may be more likely to result in obesity in young adulthood. The available studies are heterogeneous in terms of the types of ACEs that they include. Two studies are based in the UK.

Evidence from studies on obesity in Adulthood (25 years plus)

Thirty-eight studies provided evidence with regard to obesity in adulthood.

Given that there are a large number of studies and that this is a rapid review, it is out with the scope of the review to report in detail the findings of each individual study. Rather, a summary statement of the main findings will be made.

Summary statement of the evidence

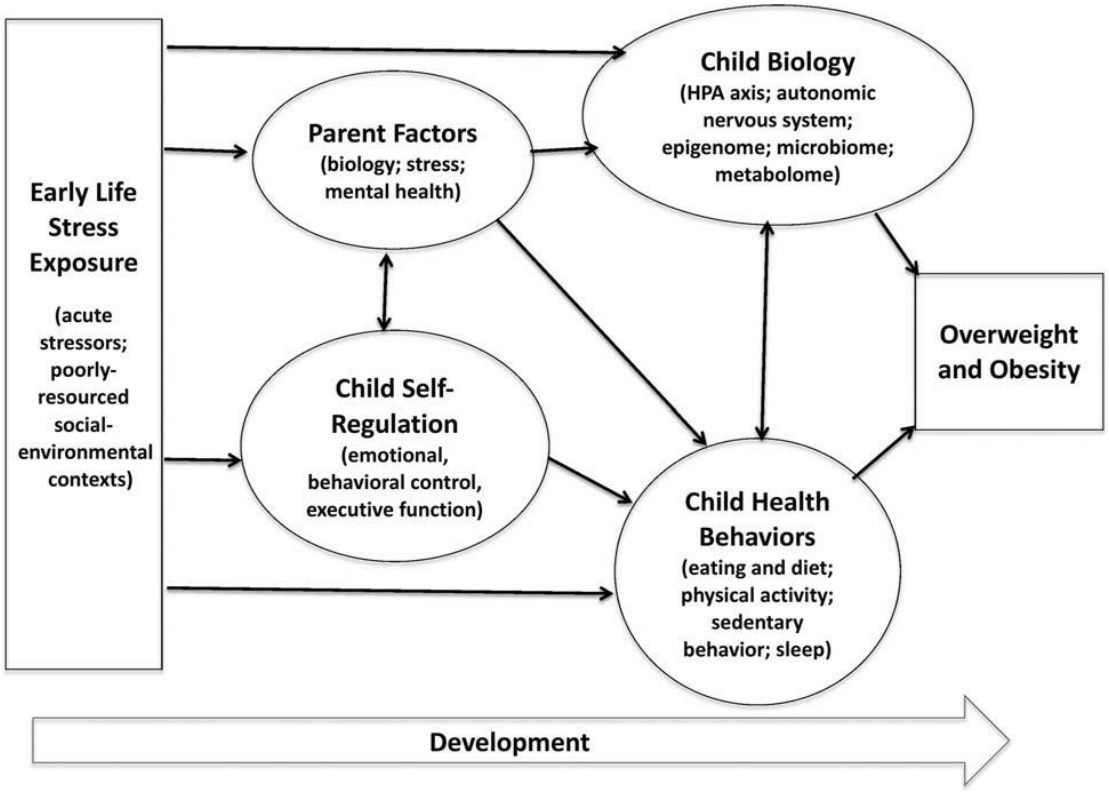
The link between ACEs and Obesity in adults (38 studies): Whilst studies vary with regard to the magnitude and direction of the effect, there is compelling evidence for the effect of ACEs on subsequent obesity in adulthood. Furthermore, there is evidence that the severity of the nature of any ACEs, and of the increasing number of ACEs, is correlated with an increased risk of obesity and severe obesity in adulthood. The available studies are heterogeneous in terms of the types of ACEs and the populations that they include. Two studies are based in the UK.

Main points

The following was observed:

- There is a relatively large literature in this area
- Most studies are based in the USA, with only few UK studies, none of which are based in Scotland
- Studies differ with regard to the number and type of ACEs that they study. This can range from focussing only on, for example, bullying, to focussing on many different types of ACEs. The most commonly studied ACEs appear to be sexual abuse, psychological abuse, and physical abuse, with sexual abuse being the most prevalent of these
- Studies differ with regard to weight related outcomes that they measure and the definitions of obesity they apply
- Most of the studies in this area are observational rather than experimental (with good reason) but this does mean that it is merely an association rather than causation can be inferred
- Many studies include a wide range of outcomes they are interested in, with overweight/obesity being one of many. However, there are many studies that focus primarily or solely on obesity
- Most studies are cross-sectional rather than longitudinal and retrospective rather than prospective. Longitudinal studies are needed, as the effects of early life stress exposure may not emerge until later in the life-span. Prospective studies are methodologically stronger than retrospective studies
- Studies varied too in the methods that they use to elicit the presence of an ACEs
- Fewer studies focus on childhood obesity – most on adult obesity after childhood adverse experiences
- Evidence is clearer for a link to adult obesity. Evidence is less clear for childhood obesity, although there is some evidence that there may be a delayed response. Some studies that found non-significant associations included boys and girls between the ages of 3 and 5. This period of the life course may be too early to detect the onset of an obesity trajectory (Midei, 2011)
- There is also evidence of higher odds of having obesity later in life when the adverse experiences are more severe rather than less severe
- Studies with clinical or otherwise selected populations, tended to have higher rates of ACEs than general population studies
- Overall, the evidence suggests that individual risk factors in childhood do not solely determine individual obesity related outcomes in adulthood, but that the accumulation of multiple risk factors in childhood greatly increases the odds of a range of poor outcomes (Marie-Mitchell, 2013)
- Obesity should be seen not only as a clinical problem but also as a societal problem because childhood psychosocial experiences influence obesity risk (Danese, 2014)
- Main implication for policy from the included systematic reviews is that measures to prevent obesity should also focus on minimising ACEs

The following model has been hypothesised as a pathway (from Miller, 2018):



Strengths and weaknesses of the rapid review

This was a rapid review conducted over a seven day period. The review involved a search strategy limited to only seven research databases and to studies published since 1999. A more comprehensive search would doubtless find many more studies. However, the review did include 13 previously published reviews in the area, many of which included studies prior to 1999. The review is further limited because it was not possible to consider the evidence in depth due to time constraint. Individual studies do contain relevant and interesting data, however this could only have been reported in more detail had more time and resource been available to do so. Furthermore, because of the rapidity of the review, it was only possible to provide global estimates of the nature and quality of the available evidence. Such an approach to the assessment of methodological quality and weight of evidence, whilst a useful shorthand guide, is limited. Full assessment of aspects of methodological quality and risk of bias is required before statements can be made about the true nature if the evidence.

Despite the limitations of the review, it has been possible to gather a large body of highly relevant evidence in this area together in a very short space of time.

References

AARON, D. J. & HUGHES, T. L. 2007. Association of childhood sexual abuse with obesity in a community sample of lesbians. Obesity, 15, 1023-1028.

AAS, M., DIESET, I., HOPE, S., HOSETH, E., MØRCH, R., REPONEN, E., STEEN, N. E., LASKEMOEN, J. F., UELAND, T., AUKRUST, P., AGARTZ, I., ANDREASSEN, O. A. & MELLE, I. 2017. Childhood maltreatment severity is associated with elevated C-reactive protein and body mass index in adults with schizophrenia and bipolar diagnoses. Brain, Behavior, And Immunity, 65, 342-349.

ABAJOBIR, A. A., KISELY, S., WILLIAMS, G., STRATHEARN, L. & NAJMAN, J. M. 2017. Childhood maltreatment and high dietary fat intake behaviors in adulthood: A birth cohort study. Child Abuse & Neglect, 72, 147-153.

AFIFI, T. O., MACMILLAN, H. L., BOYLE, M., CHEUNG, K., TAILLIEU, T., TURNER, S. & SAREEN, J. 2016. Child abuse and physical health in adulthood. Health Reports, 27, 10-18.

AFIFI, T. O., MOTA, N., MACMILLAN, H. L. & SAREEN, J. 2013. Harsh physical punishment in childhood and adult physical health. Pediatrics, 132, e333-e340.

ALCIATI, A., CALDIROLA, D., GRASSI, M., FOSCHI, D. & PERNA, G. 2017. Mediation effect of recent loss events on weight gain in obese people who experienced childhood parental death or separation. Journal of Health Psychology, 22, 101-110.

ALCIATI, A., GESUELE, F., CASAZZA, G. & FOSCHI, D. 2013. The relationship between childhood parental loss and metabolic syndrome in obese subjects. Stress and Health: Journal of the International Society for the Investigation of Stress, 29, 5-13.

ALLEN, K., ZUBRICK, S., BYRNE, S., GIBSON, L., BLAIR, E., DAVIS, E., GIBSON, L. Y., ALLEN, K. L., ZUBRICK, S. R. & BYRNE, S. M. 2017. The psychosocial burden of childhood overweight and obesity: evidence for persisting difficulties in boys and girls. European Journal of Pediatrics, 176, 925-933.

ALLISON, K. C., GRILO, C. M., MASHEB, R. M. & STUNKARD, A. J. 2007. High self-reported rates of neglect and emotional abuse, by persons with binge eating disorder and night eating syndrome. Behaviour Research and Therapy, 45, 2874-2883.

ALMENARA, C. A. & JEŽEK, S. 2015. The source and impact of appearance teasing: an examination by sex and weight status among early adolescents from the Czech Republic. The Journal Of School Health, 85, 163-170.

ALMUNEEF, M., ELCHOUEIRY, N., SALEHEEN, H. N. & AL-EISSA, M. 2017. Gender-based disparities in the impact of adverse childhood experiences on adult health: findings from a national study in the Kingdom of Saudi Arabia. International Journal For Equity In Health, 16, 90-90.

ALMUNEEF, M., HOLLINSHEAD, D., SALEHEEN, H., ALMADANI, S., DERKASH, B., ALBUHAIRAN, F., AL-EISSA, M. & FLUKE, J. 2016. Adverse childhood experiences and association with health, mental health, and risky behavior in the kingdom of Saudi Arabia. Child Abuse & Neglect, 60, 10-17.

ALSELAIM, N., MALAEKAH, H., SAADE, M., HUSSEIN, M., ALTOKHAIS, T., ALBEDAH, K. & ZAMAKHSHARY, M. 2012. Does obesity impact the pattern and outcome of trauma in children? Journal Of Pediatric Surgery, 47, 1404-1409.

ALVAREZ, J., PAVAO, J., BAUMRIND, N. & KIMERLING, R. 2007. The relationship between child abuse and adult obesity among California women. American Journal of Preventive Medicine, 33, 28-33.

AMIANTO, F., SPALATRO, A. V., RAINIS, M., ANDRIULLI, C., LAVAGNINO, L., ABBATE-DAGA, G. & FASSINO, S. 2018. Childhood emotional abuse and neglect in obese patients with and without binge eating disorder: Personality and psychopathology correlates in adulthood. Psychiatry Research, 269, 692-699.

APARICIO, E., CANALS, J., ARIJA, V., DE HENAUW, S. & MICHELS, N. 2016. The role of emotion regulation in childhood obesity: implications for prevention and treatment. Nutrition Research Reviews, 29, 17-29.

BAKALAR, J. L., BARMINE, M., DRUSKIN, L., OLSEN, C. H., QUINLAN, J., SBROCCO, T. & TANOFSKY-KRAFF, M. 2018. Childhood adverse life events, disordered eating, and body mass index in US Military service members. The International Journal Of Eating Disorders, 51, 465-469.

BALDWIN, J. R., ARSENEAULT, L., ODGERS, C., BELSKY, D. W., MATTHEWS, T., AMBLER, A., CASPI, A., MOFFITT, T. E. & DANESE, A. 2016. Childhood Bullying Victimization and Overweight in Young Adulthood: A Cohort Study. Psychosomatic Medicine, 78, 1094-1103.

BEATTEY, R. A., JR. 2018. The long-term consequences of child abuse and neglect in men. 79, ProQuest Information & Learning.

BECK, A. R. 2016. Psychosocial Aspects of Obesity. NASN School Nurse (Print), 31, 23-27.

BELLIS, M. A., LOWEY, H., LECKENBY, N., HUGHES, K. & HARRISON, D. 2014. Adverse childhood experiences: retrospective study to determine their impact on adult health behaviours and health outcomes in a UK population. Journal Of Public Health (Oxford, England), 36, 81-91.

BENNETT, D. S., SULLIVAN, M. W., THOMPSON, S. M. & LEWIS, M. 2010. Early child neglect: Does it predict obesity or underweight in later childhood? Child Maltreatment, 15, 250-254.

BENTLEY, T. & WIDOM, C. S. 2009. A 30-year follow-up of the effects of child abuse and neglect on obesity in adulthood. Obesity, 17, 1900-1905.

BERCOVICH, E., KEINAN-BOKER, L. & SHASHA, S. M. 2014. Long-term health effects in adults born during the Holocaust. The Israel Medical Association Journal: IMAJ, 16, 203-207.

BERGE, J. M., TROFHOLZ, A., TATE, A. D., BEEBE, M., FERTIG, A., MINER, M. H., CROW, S., CULHANE-PERA, K. A., PERGAMENT, S. & NEUMARK-SZTAINER, D. 2017. Examining unanswered questions about the home environment and childhood obesity disparities using an incremental, mixed-methods, longitudinal study design: The Family Matters study. Contemporary Clinical Trials, 62, 61-76.

BLACK, M. M. & DRENNEN, C. R. 2014. Nutritional and growth issues related to child neglect. Pediatric Annals, 43, e266-e270.

BORGES, T. S., CHAFFEE, B. W., KRAMER, P. F., FELDENS, E. G., VÍTOLO, M. R. & FELDENS, C. A. 2017. Relationship between overweight/obesity in the first year of age and traumatic dental injuries in early

childhood: Findings from a birth cohort study. Dental Traumatology: Official Publication Of International Association For Dental Traumatology, 33, 465-471.

BOYNTON-JARRETT, R., ROSENBERG, L., PALMER, J. R., BOGGS, D. A. & WISE, L. A. 2012. Child and adolescent abuse in relation to obesity in adulthood: The Black Women's Health Study. Pediatrics, 130, 245-253.

BREWER-SMYTH, K. 2014. Obesity, traumatic brain injury, childhood abuse, and suicide attempts in females at risk. Rehabilitation Nursing: The Official Journal Of The Association Of Rehabilitation Nurses, 39, 183-191.

BREWER-SMYTH, K., CORNELIUS, M. & POHLIG, R. T. 2016. Childhood adversity and mental health correlates of obesity in a population at risk. Journal of Correctional Health Care, 22, 367-382.

BROWN, S., MITCHELL, T. B., FITE, P. J. & BORTOLATO, M. 2017. Impulsivity as a moderator of the associations between child maltreatment types and body mass index. Child Abuse & Neglect, 67, 137-146.

BURKE, N. J., HELLMAN, J. L., SCOTT, B. G., WEEMS, C. F. & CARRION, V. G. 2011. The impact of adverse childhood experiences on an urban pediatric population. Child Abuse & Neglect, 35, 408-413.

BZOSTEK, S. H. & BECK, A. N. 2011. Familial instability and young children's physical health. Social Science & Medicine (1982), 73, 282-292.

CAMPBELL, J. A., WALKER, R. J. & EGEDE, L. E. 2016. Associations between adverse childhood experiences, high-risk behaviors, and morbidity in adulthood. American Journal of Preventive Medicine, 50, 344-352.

CHAMBERS, E. C., DUARTE, C. S. & YANG, F. M. 2009. Household instability, area poverty, and obesity in urban mothers and their children. Journal Of Health Care For The Poor And Underserved, 20, 122-133.

CHARTIER, M. J., WALKER, J. R. & NAIMARK, B. 2009. Health risk behaviors and mental health problems as mediators of the relationship between childhood abuse and adult health. American Journal of Public Health, 99, 847-854.

CLEMENS, V., HUBER-LANG, M., PLENER, P. L., BRÄHLER, E., BROWN, R. C. & FEGERT, J. M. 2018. Association of child maltreatment subtypes and long-term physical health in a German representative sample. European Journal Of Psychotraumatology, 9, 1510278-1510278.

CÔTÉ-LUSSIER, C., FITZPATRICK, C., SÉGUIN, L. & BARNETT, T. A. 2015. Poor, Unsafe, and Overweight: The Role of Feeling Unsafe at School in Mediating the Association Among Poverty Exposure, Youth Screen Time, Physical Activity, and Weight Status. American Journal Of Epidemiology, 182, 67-79.

CURTIS, D. S., FULLER-ROWELL, T. E., DOAN, S. N., ZGIERSKA, A. E. & RYFF, C. D. 2016. Racial and socioeconomic disparities in body mass index among college students: Understanding the role of early life adversity. Journal of Behavioral Medicine, 39, 866-875.

DA SILVA, S. S. P. & DA COSTA MAIA, A. 2013. The stability of self-reported adverse experiences in childhood: a longitudinal study on obesity. Journal Of Interpersonal Violence, 28, 1989-2004.

DANESE, A. & TAN, M. 2014. Childhood maltreatment and obesity: Systematic review and meta-analysis. Molecular Psychiatry, 19, 544-554.

D'ARGENIO, A., MAZZI, C., PECCHIOLI, L., DI LORENZO, G., SIRACUSANO, A. & TROISI, A. 2009. Early trauma and adult obesity: Is psychological dysfunction the mediating mechanism? Physiology & Behavior, 98, 543-546.

DARLING, K. E., RUZICKA, E. B., FAHRENKAMP, A. J. & SATO, A. F. 2019. Perceived stress and obesity-promoting eating behaviors in adolescence: The role of parent-adolescent conflict. Families, Systems, & Health.

DAVIS, C. R., DEARING, E., USHER, N., TRIFILETTI, S., ZAICHENKO, L., OLLEN, E., BRINKOETTER, M. T., CROWELL-DOOM, C., JOUNG, K., PARK, K. H., MANTZOROS, C. S. & CROWELL, J. A. 2014. Detailed assessments of childhood adversity enhance prediction of central obesity independent of gender, race, adult psychosocial risk and health behaviors. Metabolism: Clinical And Experimental, 63, 199-206.

DAVIS, L., BARNES, A. J., GROSS, A. C., RYDER, J. R. & SHLAFER, R. J. 2018. Adverse Childhood Experiences and Weight Status among Adolescents. The Journal Of Pediatrics.

DAVIS, L., BARNES, A. J., GROSS, A. C., RYDER, J. R. & SHLAFER, R. J. 2019. Adverse Childhood Experiences and Weight Status among Adolescents. Journal of Pediatrics, 204, 71-71.

DELPIERRE, C., FANTIN, R., BARBOZA-SOLIS, C., LEPAGE, B., DARNAUDÉRY, M. & KELLY-IRVING, M. 2016. The early life nutritional environment and early life stress as potential pathways towards the metabolic syndrome in mid-life? A lifecourse analysis using the 1958 British Birth cohort. BMC Public Health, 16, 815-815.

DIESEL, J. C., BODNAR, L. M., DAY, N. L. & LARKBY, C. A. 2016. Childhood maltreatment and the risk of pre-pregnancy obesity and excessive gestational weight gain. Maternal & Child Nutrition, 12, 558-568.

DOWNEY, J. C., GUDMUNSON, C. G., PANG, Y. C. & LEE, K. 2017. Adverse childhood experiences affect health risk behaviors and chronic health of Iowans. Journal of Family Violence, 32, 557-564.

EL MHAMDI, S., LEMIEUX, A., ABROUG, H., BEN SALAH, A., BOUANENE, I., BEN SALEM, K. & AL'ABSI, M. 2018. Childhood exposure to violence is associated with risk for mental disorders and adult's weight status: a community-based study in Tunisia. Journal Of Public Health (Oxford, England).

ELSENBURG, L. K., SMIDT, N. & LIEFBROER, A. C. 2017. The longitudinal relation between accumulation of adverse life events and body mass index from early adolescence to young adulthood. Psychosomatic Medicine, 79, 365-373.

FELITTI, V. J. and ANDA, R. F. The relationship of adverse childhood experiences to adult health, wellbeing, social function and healthcare. In: Lanius, R.; Vermetten, E.; Pain, C., editors. The hidden epidemic: The impact of early life trauma on health and disease. Cambridge University Press; 2010.

FONT, S. A. & MAGUIRE-JACK, K. 2016. Pathways from childhood abuse and other adversities to adult health risks: The role of adult socioeconomic conditions. Child Abuse & Neglect, 51, 390-399.

FRANCIS, M. M., NIKULINA, V. & WIDOM, C. S. 2015. A prospective examination of the mechanisms linking childhood physical abuse to body mass index in adulthood. Child Maltreatment, 20, 203-213.

FRIEDMAN, E. M., MONTEZ, J. K., SHEEHAN, C. M., GUENEWALD, T. L. & SEEMAN, T. E. 2015. Childhood adversities and adult cardiometabolic health: Does the quantity, timing, and type of adversity matter? Journal of Aging and Health, 27, 1311-1338.

FUEMMELER, B. F., DEDERT, E., MCCLERNON, F. J. & BECKHAM, J. C. 2009. Adverse childhood events are associated with obesity and disordered eating: Results from a US Population-based survey of young adults. Journal of Traumatic Stress, 22, 329-333.

GIBSON, L. Y., ALLEN, K. L., DAVIS, E., BLAIR, E., ZUBRICK, S. R. & BYRNE, S. M. 2017. The psychosocial burden of childhood overweight and obesity: evidence for persisting difficulties in boys and girls. European Journal Of Pediatrics, 176, 925-933.

GIBSON, L. Y., BYRNE, S. M., DAVIS, E. A., BLAIR, E., JACOBY, P. & ZUBRICK, S. R. 2007. The role of family and maternal factors in childhood obesity. The Medical Journal Of Australia, 186, 591-595.

GJELSVIK, A., DUMONT, D. M. & NUNN, A. 2013. Incarceration of a household member and Hispanic health disparities: childhood exposure and adult chronic disease risk behaviors. Preventing Chronic Disease, 10, E69-E69.

GOEDECKE, J. H., FORBES, J. & STEIN, D. J. 2013. Differences in the association between childhood trauma and BMI in Black and White South African women. African Journal of Psychiatry, 16, 201-205.

GOODING, H. C., MILLIREN, C., AUSTIN, S. B., SHERIDAN, M. A. & MCLAUGHLIN, K. A. 2015. Exposure to violence in childhood is associated with higher body mass index in adolescence. Child Abuse & Neglect, 50, 151-158.

GRILO, C. M., MASHEB, R. M., BRODY, M., TOTH, C., BURKE-MARTINDALE, C. H. & ROTHSCHILD, B. S. 2005. Childhood Maltreatment in Extremely Obese Male and Female Bariatric Surgery Candidates. Obesity Research, 13, 123-130.

GUNDERSEN, C., MAHATMYA, D., GARASKY, S. & LOHMAN, B. 2011. Linking psychosocial stressors and childhood obesity. Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 12, e54-e63.

GUNSTAD, J., PAUL, R. H., SPITZNAGEL, M. B., COHEN, R. A., WILLIAMS, L. M., KOHN, M. & GORDON, E. 2006. Exposure to early life trauma is associated with adult obesity. Psychiatry Research, 142, 31-37.

HALLIDAY, J. A., PALMA, C. L., MELLOR, D., GREEN, J. & RENZAHO, A. M. N. 2014. The relationship between family functioning and child and adolescent overweight and obesity: A systematic review. International Journal of Obesity, 38, 480-493.

HAWTON, K., NORRIS, T., CRAWLEY, E. & SHIELD, J. P. H. 2018. Is child abuse associated with adolescent obesity? A population cohort study. Childhood Obesity, 14, 106-113.

HAYES, D., REMIGIO-BAKER, R. & REYES-SALVAIL, F. 2017. The Relationship of Adverse Childhood Events to Smoking, Overweight, Obesity and Binge Drinking Among Women in Hawaii. Maternal & Child Health Journal, 21, 315-325.

HEERMAN, W. J., KRISHNASWAMI, S., BARKIN, S. L. & MCPHEETERS, M. 2016. Adverse family experiences during childhood and adolescent obesity. Obesity, 24, 696-702.

HELTON, J. J. & LIECHTY, J. M. 2014. Obesity prevalence among youth investigated for maltreatment in the United States. Child Abuse & Neglect, 38, 768-775.

HEMMINGSSON, E. 2018. Early Childhood Obesity Risk Factors: Socioeconomic Adversity, Family Dysfunction, Offspring Distress, and Junk Food Self-Medication. Current Obesity Reports, 7, 204-209.

HEMMINGSSON, E., JOHANSSON, K. & REYNISDOTTIR, S. 2014. Effects of childhood abuse on adult obesity: a systematic review and meta-analysis. Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 15, 882-893.

HICKS WHITE, A. A., PRATT, K. J. & COTTRILL, C. 2018. The relationship between trauma and weight status among adolescents in eating disorder treatment. Appetite, 129, 62-69.

HUGHES, K., BELLIS, M. A., HARDCASTLE, K. A., SETHI, D., BUTCHART, A., MIKTON, C., JONES, L. & DUNNE, M. P. 2017. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. The Lancet. Public Health, 2, e356-e366.

IRISH, L., KOBAYASHI, I. & DELAHANTY, D. L. 2010. Long-term physical health consequences of childhood sexual abuse: A meta-analytic review. Journal of Pediatric Psychology, 35, 450-461.

ISOHOOKANA, R., MARTTUNEN, M., HAKKO, H., RIIPINEN, P. & RIALA, K. 2016. The impact of adverse childhood experiences on obesity and unhealthy weight control behaviors among adolescents. Comprehensive Psychiatry, 71, 17-24.

KNUTSON, J. F., TABER, S. M., MURRAY, A. J., VALLES, N.-L. & KOEPPL, G. 2010. The role of care neglect and supervisory neglect in childhood obesity in a disadvantaged sample. Journal of Pediatric Psychology, 35, 523-532.

KOCH, F.-S., SEPA, A. & LUDVIGSSON, J. 2008. Psychological stress and obesity. The Journal of Pediatrics, 153, 839-844.

LECLERC, E., MANSUR, R. B., GRASSI-OLIVEIRA, R., CORDEIRO, Q., KAPCZINSKI, F., MCINTYRE, R. S. & BRIETZKE, E. 2018. The differential association between history of childhood sexual abuse and body mass index in early and late stages of bipolar disorder. Journal of Affective Disorders, 227, 214-218.

MAMUN, A. A., LAWLOR, D. A., O'CALLAGHAN, M. J., BOR, W., WILLIAMS, G. M. & NAJMAN, J. M. 2007. Does childhood sexual abuse predict young adult's BMI? A birth cohort study. Obesity, 15, 2103-2110.

MARIE-MITCHELL, A. & O'CONNOR, T. G. 2013. Adverse childhood experiences: translating knowledge into identification of children at risk for poor outcomes. Academic Pediatrics, 13, 14-19.

MCDONNELL, C. J. & GARBERS, S. V. 2018. Adverse childhood experiences and obesity: Systematic review of behavioral interventions for women. Psychological Trauma: Theory, Research, Practice, and Policy, 10, 387-395.

MCKELVEY, L. M., SACCENTE, J. E. & SWINDLE, T. M. 2019. Adverse Childhood Experiences in Infancy and Toddlerhood Predict Obesity and Health Outcomes in Middle Childhood. Childhood Obesity (Print).

MCLEOD, G. F., FERGUSSON, D. M., HORWOOD, L. J., BODEN, J. M. & CARTER, F. A. 2018. Childhood predictors of adult adiposity: findings from a longitudinal study. The New Zealand Medical Journal, 131, 10-20.

MIDEI, A. J. & MATTHEWS, K. A. 2011. Interpersonal violence in childhood as a risk factor for obesity: a systematic review of the literature and proposed pathways. Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 12, e159-e172.

MILLER, A. L. & LUMENG, J. C. 2018. Pathways of Association from Stress to Obesity in Early Childhood. Obesity (Silver Spring, Md.), 26, 1117-1124.

MIN, M. O., MINNES, S., KIM, H. & SINGER, L. T. 2013. Pathways linking childhood maltreatment and adult physical health. Child Abuse & Neglect, 37, 361-373.

MUTLU, H., BILGIÇ, V., ERTEN, S., ARAS, Ş. & TAYFUR, M. 2016. Evaluation of the Relationship between Childhood Traumas and Adulthood Obesity Development. Ecology Of Food And Nutrition, 55, 390-401.

NISHIDA, H. 2016. Adverse childhood experiences and obesity in adulthood. 77, ProQuest Information & Learning.

NOLL, J. G., ZELLER, M. H., TRICKETT, P. K. & PUTNAM, F. W. 2007. Obesity risk for female victims of childhood sexual abuse: a prospective study. Pediatrics, 120, e61-e67.

O'NEILL, A., BECK, K., CHAE, D., DYER, T., HE, X. & LEE, S. 2018. The pathway from childhood maltreatment to adulthood obesity: The role of mediation by adolescent depressive symptoms and BMI. Journal of Adolescence, 67, 22-30.

PALMISANO, G. L., INNAMORATI, M. & VANDERLINDEN, J. 2016. Life adverse experiences in relation with obesity and binge eating disorder: A systematic review. Journal of Behavioral Addictions, 5, 11-31.

PARK, H. 2018. Assessing the relationship between adverse childhood experiences and body mass index trajectory of children and adolescents. 78, ProQuest Information & Learning.

PELTZER, K., PENGPID, S., SAMUELS, T. A., ÖZCAN, N. K., MANTILLA, C., RAHAMEFY, O. H., WONG, M. L. & GASPARISHVILI, A. 2014. Prevalence of overweight/obesity and its associated factors among university students from 22 countries. International Journal Of Environmental Research And Public Health, 11, 7425-7441.

PEREIRA DA SILVA, S. S. & DA COSTA MAIA, Â. 2013. The stability of self-reported adverse experiences in childhood: A longitudinal study on obesity. Journal of Interpersonal Violence, 28, 1989-2004.

PINHAS-HAMIEL, O., MODAN-MOSES, D., HERMAN-RAZ, M. & REICHMAN, B. 2009. Obesity in girls and penetrative sexual abuse in childhood. Acta Paediatrica, 98, 144-147.

POWER, C., PINTO PEREIRA, S. M. & LI, L. 2015. Childhood maltreatment and BMI trajectories to mid-adult life: follow-up to age 50 y in a British birth cohort. Plos One, 10, e0119985-e0119985.

RAMASUBRAMANIAN, L., LANE, S. & RAHMAN, A. 2013. The association between maternal serious psychological distress and child obesity at 3 years: A cross-sectional analysis of the UK Millennium Cohort data. Child: Care, Health and Development, 39, 134-140.

REHKOPF, D. H., HEADEN, I., HUBBARD, A., DEARDORFF, J., KESAVAN, Y., COHEN, A. K., PATIL, D., RITCHIE, L. D. & ABRAMS, B. 2016. Adverse childhood experiences and later life adult obesity and smoking in the United States. Annals Of Epidemiology, 26, 488-492.e5.

ROGER, M., JOANNA, S., SAMANTHA, L., HANNA, W., ELISA, B., JAY, N., MOHAMMED, A., DAVID, M., VALERIE, T., DANIELLE, C. & SIDNEY, K. 2012. The Association between Childhood Adversity and Components of Metabolic Syndrome in Adults with Mood Disorders: Results from the International Mood Disorders Collaborative Project. International Journal of Psychiatry in Medicine, 43, 165-177.

SACKS, R. M., TAKEMOTO, E., ANDREA, S., DIECKMANN, N. F., BAUER, K. W. & BOONE-HEINONEN, J. 2017. Childhood maltreatment and BMI trajectory: The mediating role of depression. American Journal of Preventive Medicine, 53, 625-633.

SALWEN, J. K., HYMOWITZ, G. F., VIVIAN, D. & O'LEARY, K. D. 2014. Childhood abuse, adult interpersonal abuse, and depression in individuals with extreme obesity. Child Abuse & Neglect, 38, 425-433.

SCHNEIDERMAN, J. U., MENNEN, F. E., NEGRIFF, S. & TRICKETT, P. K. 2012. Overweight and obesity among maltreated young adolescents. Child Abuse & Neglect, 36, 370-378.

SCHNEIDERMAN, J. U., NEGRIFF, S., PECKINS, M., MENNEN, F. E. & TRICKETT, P. K. 2015. Body mass index trajectory throughout adolescence: a comparison of maltreated adolescents by maltreatment type to a community sample. Pediatric Obesity, 10, 296-304.

SCHNEIDERMAN, J. U., SMITH, C., ARNOLD-CLARK, J. S., FUENTES, J., DUAN, L. & PALINKAS, L. A. 2013. Overweight and obesity among Hispanic children entering foster care: A preliminary examination of polyvictimization. Child Maltreatment, 18, 264-273.

SELWAY, J. S. 2006. Childhood maltreatment and adult obesity. Bariatric Nursing and Surgical Patient Care, 1, 273-282.

SHIN, S. H. & MILLER, D. P. 2012. A longitudinal examination of childhood maltreatment and adolescent obesity: Results from the National Longitudinal Study of Adolescent Health (AddHealth) Study. Child Abuse & Neglect, 36, 84-94.

SUGLIA, S. F., DUARTE, C. S., CHAMBERS, E. C. & BOYNTON-JARRETT, R. 2012. Cumulative social risk and obesity in early childhood. Pediatrics, 129, e1173-e1179.

TAKIZAWA, R., DANESE, A., MAUGHAN, B. & ARSENEAULT, L. 2015. Bullying victimization in childhood predicts inflammation and obesity at mid-life: A five-decade birth cohort study. Psychological Medicine, 45, 2705-2715.

TAMAYO, T., CHRISTIAN, H. & RATHMANN, W. 2010. Impact of early psychosocial factors (childhood socioeconomic factors and adversities) on future risk of type 2 diabetes, metabolic disturbances and obesity: a systematic review. BMC Public Health, 10, 525-525.

TANENBAUM, H. C., LI, Y., FELICITAS-PERKINS, J. Q., ZHANG, M., PALMER, P., JOHNSON, C. A. & XIE, B. 2017. A longitudinal analysis of the impact of childhood stress on weight status among Chinese youth. International Journal Of Obesity (2005), 41, 820-823.

UDO, T. & GRILO, C. M. 2016. Perceived weight discrimination, childhood maltreatment, and weight gain in U S adults with overweight/obesity. Obesity, 24, 1366-1372.

VÁMOSI, M., HEITMANN, B. L. & KYVIK, K. O. 2010. The relation between an adverse psychological and social environment in childhood and the development of adult obesity: a systematic literature review.

Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 11, 177-184.

WHITAKER, R. C., PHILLIPS, S. M., ORZOL, S. M. & BURDETTE, H. L. 2007. The association between maltreatment and obesity among preschool children. Child Abuse & Neglect, 31, 1187-1199.

WILLIAMSON, D. F., THOMPSON, T. J., ANDA, R. F., DIETZ, W. H. & FELITTI, V. 2002. Body weight and obesity in adults and self-reported abuse in childhood. International Journal of Obesity, 26, 1075-1082.

WINDLE, M., HAARDÖRFER, R., GETACHEW, B., SHAH, J., PAYNE, J., PILLAI, D. & BERG, C. J. 2018. A multivariate analysis of adverse childhood experiences and health behaviors and outcomes among college students. Journal Of American College Health: J Of ACH, 66, 246-251.

ZELLER, M. H., NOLL, J. G., SARWER, D. B., REITER-PURTILL, J., ROFEY, D. L., BAUGHCUM, A. E., PEUGH, J., COURCOULAS, A. P., MICHALSKY, M. P., JENKINS, T. M. & BECNEL, J. N. 2015. Child maltreatment and the adolescent patient with severe obesity: Implications for clinical care. Journal of Pediatric Psychology, 40, 640-648.