



## The Link Between Ultra-Processed Food Consumption and Adolescent Mental Health Disorders: A Systematic Review

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### ABSTRACT

**Background:** The increasing prevalence of mental health problems among adolescents underscores the importance of identifying contributing factors, one of which may be dietary patterns, particularly the rising consumption of ultra-processed foods. This study aims to explore the association between ultra-processed food consumption and mental health issues in adolescents.

**Methods:** This study conducted in systematic literature review. A comprehensive search was conducted following PRISMA guidelines, using the Scopus database to identify studies published between 2020 and 2025. Inclusion criteria focused on observational studies involving adolescents aged 10–19 years, examining the relationship between ultra-processed food intake (classified according to the NOVA system) and mental health outcomes.

**Results:** Seven studies (n = 284,507) met the inclusion criteria, with six showing an increased risk of mental health problems linked to higher ultra-processed food consumption. One study revealed a bidirectional relationship, where academic stress was associated with increased fast food consumption.

**Conclusion:** Most included studies indicate that higher ultra-processed food consumption is associated with increased odds or risk of mental health problems among adolescents. In addition, one study reported a possible reverse pathway, suggesting that academic stress may be linked to greater fast-food consumption. Further longitudinal and mechanistic research is needed to clarify the causality and directionality, before specific intervention strategies can be recommended.

**Keywords:** *Adolescent; Depression; Fast Food; Mental Health; Ultra-Processed Food*

### INTRODUCTION

The transition from childhood to adolescence is marked by significant changes in physical development, hormones, and brain.<sup>[1]</sup> This period is crucial for developing healthy social and emotional habits that lay the foundation

for becoming a well-adjusted adult. However, mental health disorders, such as depression, stress, and anxiety, have become a growing global health concern among adolescents. In 2020, 216 million adolescents (16.91%) aged 10-19 were diagnosed with mental health disorders.

This trend has been steadily increasing, with the prevalence rising to 18.61% by 2023.<sup>2</sup> In the long-term, these mental health issues can have a detrimental impact on health status, quality of life, and societal productivity.<sup>[3]</sup>

Unhealthy eating patterns are one of the contributing factors to mental health disorders through mechanisms such as inflammation, mitochondrial dysfunction, neurotransmitter dysregulation, and gut microbiota imbalance.<sup>[4]</sup> Diets high in sugar, saturated fats, and additives, such as those found in ultra-processed foods, have been shown to increase the risk of depression and anxiety symptoms.<sup>[5]</sup> This relationship also works in reverse, as individuals with mental health issues often engage in emotional eating and develop unhealthy eating habits, creating a vicious cycle.<sup>[6]</sup>

In recent decades, there has been a rising trend in ultra-processed food consumption, with a shift from traditional, locally sourced foods to packaged or ultra-processed foods, particularly among adolescents. This phenomenon is occurring globally, in both developed and developing countries.<sup>[7]</sup> Various studies have shown the detrimental effects of ultra-processed food consumption on health, including mental health, with varying results. However, reviews focused on adolescent populations remain limited. Therefore, this study aims to explore the relationship between ultra-processed food consumption and mental health issues among adolescents.

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## METHODS

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This study was conducted using a systematic literature review, with articles sourced from the Scopus database for research published between 2020 and 2025. The article search utilized Boolean operators with keywords "ultra-processed food" OR "ultraprocessed food" OR "processed food" AND "mental health" OR "psychological wellbeing" OR "depression" OR "anxiety" OR "stress"

OR "mood disorder" OR "psychological distress" AND adolescent OR adolescents OR teenager OR youth. The inclusion criteria for studies were: (1) observational study designs; (2) adolescent aged 10–19 years<sup>8</sup>; and (3) studies that investigated the relationship between ultra-processed food consumption based on the NOVA classification and various aspects of mental health disorder.<sup>[9]</sup> In this review, mental health disorders defined as the presence or severity of adverse mental health outcomes among adolescents, consistent with WHO descriptions that mental health conditions include mental disorders and other mental states associated with significant distress and/or impaired functioning.<sup>[10]</sup> Studies that were not observational or did not provide full-text access were excluded from the review.

The process of article identification, screening, and selection followed PRISMA guidelines, as depicted in Figure 1. All articles obtained from the initial search were first assessed for relevance to the research question. The articles were then screened by title and abstract, followed by a full-text review of those meeting the initial criteria. To minimize potential selection bias, the article selection process and methodological quality assessment were carried out independently by two researchers, with any disagreements resolved through discussion to reach a consensus. The methodological quality of the included studies was evaluated using the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies, developed by the Joanna Briggs Institute.<sup>[11]</sup>

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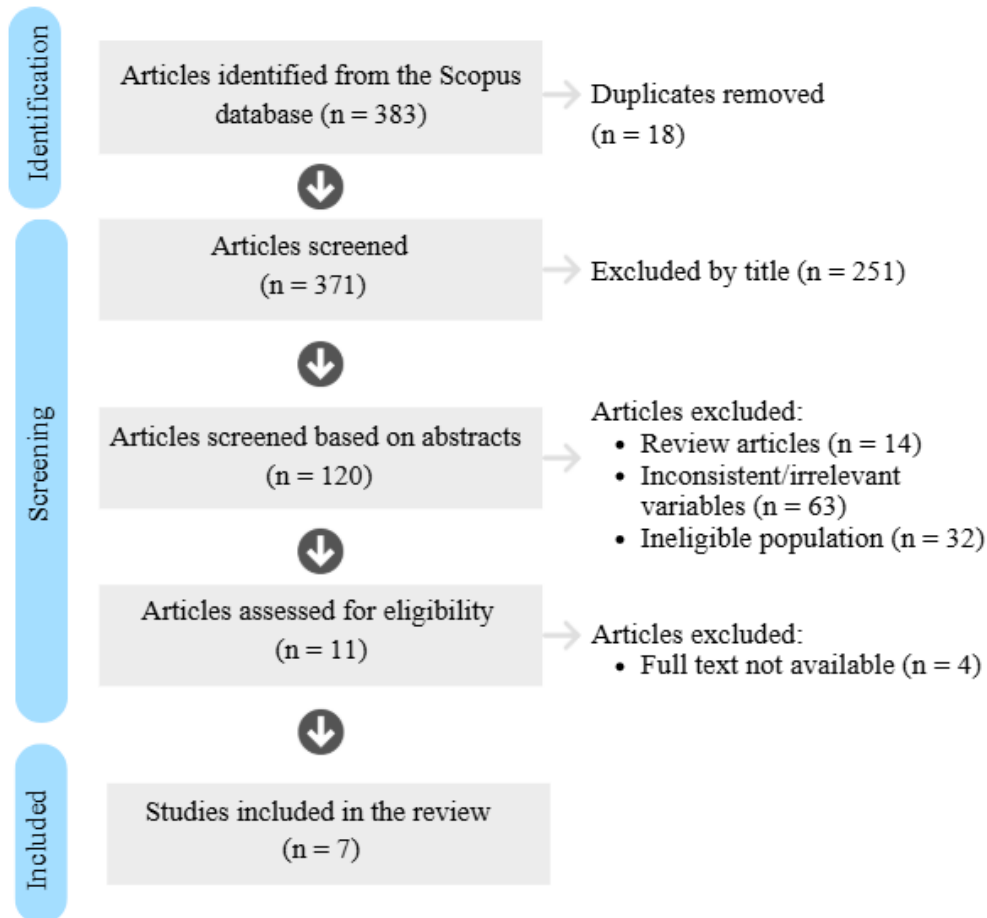
## RESULT

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Based on the identification process using the PRISMA guidelines in Figure 1, a final result of 7 articles was obtained. A total of seven observational studies with 284,507 adolescent participants from Brazil, Iran, Spain, China, and Pakistan

met the inclusion criteria. The characteristics of the selected studies and their main findings, including effect size, are presented in Table 1. All selected studies employed cross-sectional designs. The majority of studies (six out of seven) found a positive association between ultra-processed food consumption and an increased risk of mental health problems in adolescents. Studies by Werneck et al.<sup>[12]</sup> and Mesas et al.<sup>[13]</sup> in Brazil revealed that adolescents consuming ultra-

processed foods had a higher likelihood of experiencing anxiety-induced sleep disturbances and general mental health symptoms, with odds ratios (OR) ranging from 1.4 to 1.6 for both genders. Furthermore, Lane et al.<sup>[14]</sup> in Iran found a significant association between ultra-processed food consumption and an increased risk of insomnia, although no significant relationship was observed with depression or aggression.



**Figure 1.** Flow Diagram of Literature Search Using the PRISMA Method

A study in Spain reinforced these findings by showing a significant association between ultra-processed food consumption and depression symptoms, measured by the Pediatric Symptom Checklist–Youth Self-report (Y-PSC), though no significant link was found with anxiety or behavioral disorders.<sup>[15]</sup> Similar results were reported by Zheng et al.<sup>[16]</sup> in China, who found a significant association between consuming ultra-processed foods

more than six times per week and an increase in psychological symptoms, including emotional, behavioral, and social disturbances (OR = 1.65; 95% CI 1.40–1.94). Meanwhile, Gratao et al.<sup>[17]</sup> in Brazil also found a significant relationship between ultra-processed food consumption and the risk of Common Mental Disorders (CMD), with an OR of 1.20 (95% CI 1.18–1.22).

**Table 1.** Summary of Findings of Articles Included

<b>Author (Country)</b>	<b>Study Population</b>	<b>Outcome</b>	<b>Exposure</b>	<b>Results</b>	<b>Confounders</b>
Werneck et al. <sup>12</sup> (Brazil)	102.072 adolescents (11-19 years)	Anxiety-Induced Sleep Disturbance	UPF consumption (>7x/≤6x)	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Boys: OR (95% CI) = 1,48 (1,30-1,70)*</li> <li>- Girls: OR (95% CI) = 1,46 (1,34-1,60)*</li> </ul>	Age group, ethnicity, food security, area of residence, type of city, and physical activity
Lane et al. <sup>14</sup> (Iran)	733 adolescents (girl) (12-18 years)	Insomnia, depression, and aggression	UPF consumption (Q4/Q1)	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Insomnia: OR (95% CI) = 3.90 (1.81-8.77)*</li> </ul> <p><b>No significant association</b></p> <ul style="list-style-type: none"> <li>- Depression: OR (95% CI) = 1.30 (0.71-2.36)</li> <li>- Aggression: OR (95% CI) = 0.90 (0.54-1.48)</li> </ul>	Age and energy consumption
Reales-Moreno et al. <sup>15</sup> (Spain)	560 adolescents (14-17 years)	Psychosocial function	UPF consumption (Q4/Q1)	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Depression β (95% CI); p-value = 0,107 (0,019-0,166); 0,014*</li> </ul> <p><b>No significant association</b></p> <ul style="list-style-type: none"> <li>- Attention deficit and hyperactivity β (95% CI); p-value = 0,050 (-0,021-0,082); 0,248</li> <li>- Behavioral problem β (95% CI); p-value = 0,074 (-0,006-0,088); 0,087</li> <li>- Anxiety β (95% CI); p-value = 0,013 (-0,032-0,044); 0,760</li> </ul>	Gender, age, physical activity, fruit and vegetable intake

Author (Country)	Study Population	Outcome	Exposure	Results	Confounders
Mesas et al. <sup>13</sup> (Brazil)	94.767 adolescents (13-17years)	Mental health symptoms	UPF consumption (Q3/Q1)	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Boys: <math>\beta</math> (95% CI) = 0,41 (0,14-0,68)</li> <li>- Girls: <math>\beta</math> (95% CI) = 0,62 (0,35-0,89)*</li> </ul>	-
Zheng et al. <sup>16</sup> (China)	14.445 Adolescents (13-18 years)	Psychological symptoms	UPF consumption	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Boys: OR (95% CI) = 1,60 (1,30-1,97)*</li> <li>- Girls: OR (95% CI) = 1,67 (1,28-2,18)*</li> <li>- Total: OR (95% CI) = 1,65 (1,40-1,94)*</li> </ul>	-
Gratão et al. <sup>17</sup> (Brazil)	71.553 adolescents (12-17 years)	Common Mental Disorders (CMD)	UPF consumption (Q4/Q1)	<p>↑ <b>Positive association</b></p> <p>OR (95% CI) = 1,20 (1,18-1,22)*</p>	Living with parents, socioeconomic indicators, and area of residence
Noor et al. <sup>18</sup> (Pakistan)	377 adolescents (14-19 years)	UPF consumption	Academic stress (High/low)	<p>↑ <b>Positive association</b></p> <ul style="list-style-type: none"> <li>- Fast food: OR (95% CI) = 4,49 (1,22-16,56)*</li> </ul> <p><b>No significant associaton</b></p> <ul style="list-style-type: none"> <li>- Sweets: OR (95% CI) = 1,06 (0,49-2,29)</li> <li>- Cookies: OR (95% CI) = 1,09 (0,46-2,57)</li> <li>- Snacks: OR (95% CI) = 0,85 (0,41-1,76)</li> </ul>	Age and economic status

\*significant p-value

Research by Noor et al.<sup>[18]</sup> in Pakistan showed a different direction of association, where academic stress was linked to increased ultra-processed food consumption, particularly fast food, in male adolescents (OR = 4.49; 95% CI 1.22–16.56). This suggests a potential bidirectional relationship between psychological stress and unhealthy eating habits in adolescents. Overall, the findings from all studies suggest that ultra-processed food consumption may contribute to an increased risk of various mental health disorders, including depression, anxiety, sleep disturbances, and psychosocial issues in adolescents. Various confounding factors, such as age, gender, socioeconomic status, physical activity, and energy intake, also influenced the relationship.

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## DISCUSSION

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This study involved 284,507 participants across seven studies that examined the relationship between ultra-processed food consumption and various mental health issues in adolescents. Overall, six studies reported a positive association, suggesting that higher UPF intake was associated with a greater likelihood of mental health problems, although the magnitude and statistical significance varied across different outcomes and study contexts. One study conducted in Pakistan showed a bidirectional relationship. It found that academic stress was associated with an increase in ultra-processed food consumption, particularly fast food, in male adolescents. This aligns with findings by Lane et al.<sup>[5]</sup> which identified a bidirectional association between ultra-processed food consumption and mental health issues across different age groups.

To contextualize these findings, UPFs as defined by the NOVA classification are industrially formulated foods containing five or more ingredients.<sup>[19]</sup> These foods are generally high in energy, sugar, salt, and saturated

fats, while being low in fiber, vitamins, and minerals, thus offering poor nutritional quality.<sup>[20]</sup> The most commonly consumed ultra-processed foods (UPFs) among children and adolescents include sugar-sweetened beverages, fast-food items such as burgers, french fries, and pizza, also sweet or savory snack products.<sup>[21]</sup> Children and adolescents are among the highest consumers of UPF, with UPF calorie contribution reaching 68%. Increasing consumption of these products are associated with higher energy density, blood sugar level spikes, also strongly correlated with fewer consumption of dietary fiber.<sup>[22]</sup>

Given the nutritional profile, UPFs have been widely studied in relation to obesity and non-communicable diseases.<sup>[23]</sup> Some studies also found the relationship between its consumption and micronutrient deficiencies in adolescents.<sup>[24,25]</sup> Beyond those outcomes, emerging evidence links UPF intake with mental health indicators, recent studies also found increased risk for various mental health issues, including depression, anxiety, Anxiety-Induced Sleep Disturbance (AISD), aggression, Common Mental Disorders (CMD), and other psychological symptoms.<sup>[4,26]</sup>

However, as most studies were observational, shared determinants of diet and mental health must be considered. Age and pubertal stage are linked to changes in emotional regulation and stress exposure, and dietary choices may also shift across adolescence. Adolescence has been described as a period of heightened sensitivity to stress and shifting exposure to stressors, as ongoing brain and social development can increase vulnerability to stress-related mental health problems. At the same time, dietary behaviors are not static during this life stage.<sup>[27]</sup> Adolescents typically gain greater autonomy and agency over food choices while navigating multiple food environments (home, school, peers, and broader community settings), which can contribute

to shifts in eating patterns across adolescence.<sup>[28]</sup>

Gender differences are also relevant, dietary patterns and coping-related eating behaviors may differ by sex. Evidence from the UK National Diet and Nutrition Survey shows that UPFs account for a large share of adolescents' energy intake and that higher UPF intake (g/day) is associated with being male. This result is concordant with Reales-Moreno et al.<sup>[15]</sup> who stated that Spanish male adolescents have higher consumption rather than females. In contrast, recent data indicate no significant differences in the percentage of calories from UPFs between males and females among youth, highlighting that sex differences in UPF intake may vary across contexts.<sup>[21]</sup> At the same time, susceptibility and outcome profiles may differ, female adolescents tend to report higher levels of internalizing symptoms, as shown in Mesas et al.<sup>[13]</sup> and Zheng et al.<sup>[16]</sup>. A large meta-analysis also shows that the gender gap in depression peaks during adolescence, with girls exhibiting higher levels of depressive symptoms/diagnoses during this developmental period.<sup>[29]</sup> Coping-related eating behaviors such as emotional eating are reported more frequently among adolescent girls than boys, which possibly could further shape sex-specific links between UPF intake and mental health.<sup>[6]</sup>

In addition to gender, socioeconomic and lifestyle factors may further confound observed associations. Socioeconomic status (SES) may further confound the association because lower SES can limit access to healthier foods and is independently associated with higher psychosocial stress and mental health burden.<sup>[30,31]</sup> Physical activity may also confound observed associations, as it is generally protective for mental health and often clusters with healthier dietary patterns. Therefore, inadequate adjustment for activity could inflate apparent diet-mental health associations.<sup>[32]</sup>

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## CONCLUSION

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Overall, the findings suggest that higher UPF consumption may be associated with poorer mental health outcomes in adolescents. Given that most included studies were observational, the current evidence cannot establish causality or temporal ordering between UPF consumption and mental health outcomes.

Future studies, particularly prospective cohorts, are needed to clarify directionality and examine determinants of UPF intake among adolescents with mental health symptoms, to better inform future prevention and research priorities.

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## REFERENCES

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1. Pfeifer JH, Allen NB. Puberty Initiates Cascading Relationships Between Neurodevelopmental, Social, and Internalizing Processes Across Adolescence. *Biological Psychiatry*. Elsevier Inc.; 2021. p. 99–108. doi:10.1016/j.biopsych.2020.09.002 PubMed PMID: 33334434.
2. Institute for Health Metrics and Evaluation. <https://vizhub.healthdata.org/gbd-results/>. 2025. Global Burden Disease (GBD).
3. Schlack R, Peerenboom N, Neuperdt L, Junker S, Beyer AK. The effects of mental health problems in childhood and adolescence in young adults: Results of the KiGGS cohort. *Journal of Health Monitoring*. 2021;6(4):3–19. doi:10.25646/8863 PubMed PMID: 35146318.
4. Marx W, Lane M, Hockey M, Aslam H, Berk M, Walder K, et al. Diet and depression: exploring the biological mechanisms of action. *Molecular Psychiatry*. Springer Nature; 2021. p. 134–50. doi:10.1038/s41380-020-00925-x PubMed PMID: 33144709.
5. Lane MM, Gamage E, Travica N, Dissanayaka T, Ashtree DN, Gauci S, et al. Ultra-Processed Food Consumption and Mental Health: A

- Systematic Review and Meta-Analysis of Observational Studies. *Nutrients*. MDPI; 2022. doi:10.3390/nu14132568 PubMed PMID: 35807749.
6. Joseph PL, Gonçalves C, Fleary SA. Psychosocial correlates in patterns of adolescent emotional eating and dietary consumption. *PLoS One*. 2023 May 1;18(5 May). doi:10.1371/journal.pone.0285446 PubMed PMID: 37224099.
  7. Li L, Sun N, Zhang L, Xu G, Liu J, Hu J, et al. Fast food consumption among young adolescents aged 12–15 years in 54 low- and middle-income countries. *Glob Health Action*. 2020 Dec 31;13(1). doi:10.1080/16549716.2020.1795438 PubMed PMID: 32762333.
  8. World Health Organization. [https://www.who.int/health-topics/adolescent-health#tab=tab\\_1](https://www.who.int/health-topics/adolescent-health#tab=tab_1). 2025. Adolescent health.
  9. Monteiro CA, Cannon G, Lawrence M, Laura Da Costa Louzada M, Machado PP. Ultra-processed foods, diet quality, and health using the NOVA classification system Prepared by [Internet]. Available from: <http://www.wipo.int/amc/en/mediation/rules>
  10. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response>. 2026. Mental health.
  11. Moola S, Munn Z, Tufanaru C, Aromataris E. Checklist for Analytical Cross Sectional Studies Critical Appraisal Checklist for Analytical Cross Sectional Studies [Internet]. 2017. Report. Available from: <http://joannabriggs.org/research/critical-appraisal-tools.html> [www.joannabriggs.org](http://www.joannabriggs.org)
  12. Werneck AO, Hoare E, Silva DR. Do TV viewing and frequency of ultra-processed food consumption share mediators in relation to adolescent anxiety-induced sleep disturbance? *Public Health Nutr*. 2021 Nov 1;24(16):5491–7. doi:10.1017/S1368980021000379 PubMed PMID: 33500011.
  13. Mesas AE, González AD, de Andrade SM, Martínez-Vizcaíno V, López-Gil JF, Jiménez-López E. Increased Consumption of Ultra-Processed Food Is Associated with Poor Mental Health in a Nationally Representative Sample of Adolescent Students in Brazil. *Nutrients*. 2022 Dec 1;14(24). doi:10.3390/nu14245207 PubMed PMID: 36558369.
  14. Lane KE, Davies IG, Darabi Z, Ghayour-Mobarhan M, Khayyat-zadeh SS, Mazidi M. The Association between Ultra-Processed Foods, Quality of Life and Insomnia among Adolescent Girls in Northeastern Iran. *Int J Environ Res Public Health*. 2022 May 1;19(10). doi:10.3390/ijerph19106338 PubMed PMID: 35627875.
  15. Reales-Moreno M, Tonini P, Escorihuela RM, Solanas M, Fernández-Barrés S, Romaguera D, et al. Ultra-Processed Foods and Drinks Consumption Is Associated with Psychosocial Functioning in Adolescents. *Nutrients*. 2022 Nov 1;14(22). doi:10.3390/nu14224831
  16. Zheng W, Xiong J, Huang B, Kong Q. Associations between ultra-processed food consumption and duration of exercise with psychological symptoms in Chinese adolescents: a nationwide cross-sectional survey. *Front Nutr*. 2025;12. doi:10.3389/fnut.2025.1591909
  17. Grato LHA, da Silva TPR, Rocha LL, Jardim MZ, de Oliveira TRPR, de Freitas Cunha C, et al. Common mental disorders in Brazilian adolescents: association with school characteristics, consumption of ultra-processed foods and waist-to-height ratio. *Cad Saude Publica*. 2025;40(4). doi:10.1590/0102-311XEN068423 PubMed PMID: 38775572.

18. Noor Z, Khaliq M, Khan AU, Ali MA, Tahir SK, Khaliq K. Academic stress and adolescent health: Exploring eating patterns, dietary preferences, and sleep duration in Pakistan's youth. *Appetite*. 2025 May 1;209. doi:10.1016/j.appet.2025.107962  
PubMed PMID: 40058607.
19. Gibney MJ. Ultra-processed foods: Definitions and policy issues. *Curr Dev Nutr*. 2019 Feb 1;3(2). doi:10.1093/cdn/nzy077
20. Luiten CM, Steenhuis IHM, Eyles H, Mhurchu CN, Waterlander WE. Ultra-processed foods have the worst nutrient profile, yet they are the most available packaged products in a sample of New Zealand supermarkets. *Public Health Nutr*. 2016 Feb 1;19(3):530–8. doi:10.1017/S1368980015002177  
PubMed PMID: 26222226.
21. Williams AM, Couch CA, Emmerich SD, Ogburn DF. Key findings Data from the National Health and Nutrition Examination Survey [Internet]. 2021. Report. Available from: <https://www.cdc.gov/nchs/products/index.htm>.
22. Neri D, Steele EM, Khandpur N, Cediel G, Zapata ME, Rauber F, et al. Ultraprocessed food consumption and dietary nutrient profiles associated with obesity: A multicountry study of children and adolescents. *Obesity Reviews*. 2022 Jan 1;23(S1). doi:10.1111/obr.13387  
PubMed PMID: 34889015.
23. Mescoloto SB, Pongiluppi G, Domene SMÁ. Ultra-processed food consumption and children and adolescents' health. *Jornal de Pediatria*. Elsevier Editora Ltda; 2024. p. S18–30. doi:10.1016/j.jped.2023.09.006  
PubMed PMID: 37866398.
24. de Arruda Falcão RCTM, de Oliveira Lyra C, Márcia Medeiros de Moraes C, Galvão Bacurau Pinheiro L, Fátima Campos Pedrosa L, Carla Vieira Cunha Lima S, et al. Processed and ultra-processed foods are associated with high prevalence of inadequate selenium intake and low prevalence of vitamin B1 and zinc inadequacy in adolescents from public schools in an urban area of northeastern Brazil. *PLoS One*. 2019 Dec 1;14(12). doi:10.1371/journal.pone.0224984  
PubMed PMID: 31800573.
25. Morais R, Rodrigues M, Ferreira F, Barros R, Padrão P, Ortigão M, et al. Ultra-Processed Foods and Nutritional Intake of Children and Adolescents from Cantagalo, São Tomé and Príncipe. *Children*. 2024 Sep 1;11(9). doi:10.3390/children11091089
26. Whitaker KM, Sharpe PA, Wilcox S, Hutto BE. Depressive symptoms are associated with dietary intake but not physical activity among overweight and obese women from disadvantaged neighborhoods. 2014;34(4):294–301. doi:10.1016/j.nutres.2014.01.007  
PubMed PMID: 24774065.
27. Vijayakumar N, Youssef G, Bereznicki H, Dehestani N, Silk TJ, Whittle S. The Social Determinants of Emotional and Behavioral Problems in Adolescents Experiencing Early Puberty. *Journal of Adolescent Health*. 2024 Apr 1;74(4):674–81. doi:10.1016/j.jadohealth.2023.06.025  
PubMed PMID: 37665306.
28. Neufeld LM, Andrade EB, Ballonoff Suleiman A, Barker M, Beal T, Blum LS, et al. Food choice in transition: adolescent autonomy, agency, and the food environment. *The Lancet*. Elsevier B.V.; 2022. p. 185–97. doi:10.1016/S0140-6736(21)01687-1  
PubMed PMID: 34856191.
29. Salk RH, Hyde JS, Abramson LY. Gender Differences in Depression in Representative National Samples: Meta-Analyses of Diagnoses and Symptoms. *Psychol Bull*. 2017;143(8):783–822. doi:10.1037/bul0000102.supp

30. Desbouys L, Méjean C, De Henauw S, Castetbon K. Socio-economic and cultural disparities in diet among adolescents and young adults: A systematic review. *Public Health Nutrition*. Cambridge University Press; 2020. p. 843–60. doi:10.1017/S1368980019002362  
PubMed PMID: 31466544.
31. Reiss F, Meyrose AK, Otto C, Lampert T, Klasen F, Ravens-Sieberer U. Socioeconomic status, stressful life situations and mental health problems in children and adolescents: Results of the German BELLA cohort-study. *PLoS One*. 2019 Mar 1;14(3). doi:10.1371/journal.pone.0213700  
PubMed PMID: 30865713.
32. Recchia F, Bernal JDK, Fong DY, Wong SHS, Chung PK, Chan DKC, et al. Physical Activity Interventions to Alleviate Depressive Symptoms in Children and Adolescents: A Systematic Review and Meta-analysis. *JAMA Pediatr* [Internet]. 2023 Jan 3 [cited 2026 Mar 6];177(2):132–40. Available from: doi:10.1001/jamapediatrics.2022.5090