
PROMOTION OF UNHEALTHY FOOD AND ITS INFLUENCE ON ANTISOCIAL BEHAVIOR

Željko Bjelajac¹, Lazar Stošić², Aleksandar Filipović³

*Corresponding author E-mail: lazar.stosic@famns.edu.rs

ARTICLE INFO

Review Article

Received: 13 November 2023

Accepted: 06 December 2023

doi:10.59267/ekoPolj23041219B

UDC 613.29:316.624

Keywords:

unhealthy food, ultraprocessed food, nutritional value, antisocial behavior

JEL: I10, I12, I19, L66

ABSTRACT

The goal of this paper is to explore the issue of promoting unhealthy food and its potential impact on antisocial behavior in contemporary society using methods of structural and functional analysis, quantitative and qualitative analysis, comparative analysis, descriptive methods, and survey methods. Unhealthy food with high-calorie, harmful nutritional ingredients, can cause a myriad of health issues, such as obesity, cardiovascular conditions, and diabetes, but in some instances, it can affect the behavior of individuals. The paper investigates how such promotion can affect individuals' eating patterns and health, with a particular focus on the development of antisocial behaviors. It also considers risk factors, including socioeconomic aspects and the influence of the media, that support the promotion of unhealthy food. This paper also discusses potential strategies to reduce the promotion of unhealthy food and promote healthier choices to mitigate the negative effects on antisocial behavior and enhance societal well-being.

Introduction

Contemporary society is confronted with numerous challenges related to health and consumer behavior, with one of the prevailing and significant issues being the marketing of unhealthy food (Afshin et al., 2019). The widespread availability of fast

-
- 1 Željko Đ. Bjelajac, Ph.D. Full Professor, University of Business Academy, Faculty of Law for Commerce and Judiciary, Geri Karolja Street no. 1, 21000 Novi Sad, Republic of Serbia, Phone: +381644628967, E-mail: zdjbjelajac@gmail.com, ORCID ID: (<https://orcid.org/0000-0003-4953-8779>)
 - 2 Lazar Stošić, Ph.D, Associate Professor, University UNION Nikola Tesla, Belgrade, Faculty of Management, Njegoševa street 1a, 21205 Sremski Karlovci Republic of Serbia; Don State Technical University, Gagarina street 1, 344002 Rostov-on-Don. Rostovskaya oblast, Russian Federation, Phone: +381637004281, E-mail: lazar.stosic@famns.edu.rs, ORCID ID (<https://orcid.org/0000-0003-0039-7370>)
 - 3 Aleksandar M. Filipović, Ph.D, Associate Professor, University of Business Academy, Faculty of Law for Commerce and Judiciary, Geri Karolja Street no. 1, 21000 Novi Sad, Republic of Serbia, Phone: +381652607607, E-mail: sasha.filipovic@gmail.com, ORCID ID (<https://orcid.org/0000-0002-1097-2079>)

food, sugary beverages, high-fat and high-sugar snacks, and various other calorie-dense, low-nutrient foods raises substantial concerns regarding their potential impact on individuals' health. Of particular concern is the aggressive promotion of such foods, targeting diverse demographic groups, including children and adolescents.

A study featured in the *Lancet* scientific journal asserts that dietary habits are a primary factor in one out of every five recorded deaths (Afshin et al., 2019). Developed nations are inundated with food items rich in calories, sugar, fat, and sodium while lacking in essential nutrients and dietary fiber. These foods often contain a range of emulsifiers, flavor enhancers, and synthetic additives. The introduction of the NOVA food classification system (Monteiro et al., 2017) has facilitated the identification of food items that meet the specific criteria for ultra-processed foods (Vignola et al., 2021). Substantiated research studies (Global Panel on Agriculture and Food Systems for Nutrition, 2016) have indicated that the eating of ultra-processed foods is associated with a higher prevalence of diseases, disorders, and an elevated risk of mortality. Such risks include the development of cardiovascular diseases (Bonaccio et al., 2022), neurological conditions (Esposito et al., 2023), obesity, diabetes, and respiratory ailments (Li et al., 2023), all linked to the consumption of ultra-processed foods. Additionally, there is substantial evidence suggesting that ultra-processed foods can lead to addictive behaviors (LaFata & Gearhardt, 2022). The consumption of such foods has been found to increase the risk of mental disorders, including symptoms of depression (Lee & Choi, 2023) and anxiety (Werneck et al., 2020), as well as negatively affecting psychosocial functioning in adolescents (Reales-Moreno et al., 2022), often leading to antisocial behaviors.

Consequently, the impact of this unhealthy food on antisocial behavior is gaining acknowledgment among criminologists. It is increasingly being incorporated into discussions concerning risk factors, encompassing family, school, and environmental influences, biological factors including genetics and psychophysiological elements, environmental risk factors, neuropsychological components, and the learning and situational factors typically considered. In light of these findings, there is a growing call for strict regulation and control of the promotion of such unhealthy food. This is essential since numerous research studies emphasize that the advertising of these food products and beverages through media channels popular among children significantly shapes their choices and consumption habits, ultimately resulting in a variety of adverse outcomes related to dietary health (Šapić et al., 2018).

Methodology

This paper used various methods, including structural and functional analysis to assess the impact of specific foods on human health. Descriptive methods clarified effects, and a street-intercept survey collected data on adolescents' dietary choices. Quantitative and qualitative analyses identified modifiable risk factors for strategic integration into prevention and intervention strategies, enhancing societal responses.

A critical review of unhealthy food and its impact on mental and physical health

The scope of unhealthy or harmful food can be divided into two categories. In the first group are foods that are unhealthy due to chemical or bacteriological contamination, while the second group consists of food products that meet the primary criteria of safety but contain unauthorized or excessive amounts of harmful substances. According to some recommendations (Karpov, 2020), the list of harmful products includes foods with the following characteristics: Evident signs of poor quality; discrepancy between the actual properties and desired characteristics of the product; products with unknown or expired expiration dates; products not compliant with the prescribed quality requirements; products with incomplete documentation from suppliers or manufacturers that confirm the origin of food products, their quality, safety, and other necessary certificates issued in accordance with established rules.

Unhealthy eating is a global health issue that significantly contributes to the rise of chronic diseases such as obesity, diabetes, and cardiovascular conditions. Investigations exploring the link between unhealthy dietary patterns, characterized by high sugar and fat content, along with processed foods, have shed light on the association between such diets and elevated susceptibility to mental disorders, notably depression and anxiety. The impact of unhealthy eating on children's health and cognitive development is a concerning aspect, given the increased availability of fast food and sweets in modern society. Research findings establish connections between inadequate nutritional intake within one's diet and the initiation of chronic ailments like obesity, type 2 diabetes, and cardiovascular disorders. These medical conditions place significant strains on healthcare systems across the globe. With urbanization and lifestyle changes, people are increasingly turning to fast food, leading to unbalanced diets and a lack of essential nutrients. Unhealthy food is often more affordable than healthy options, which can lead individuals with lower incomes to prefer cheaper but less nutritionally valuable choices. This can contribute to health inequalities. Research shows a connection between unhealthy eating and mental issues such as depression and anxiety.

Aggressive advertising and marketing of unhealthy food often result in increased consumption of such products. This food industry strategy has a global reach and can influence people's diets worldwide. The lack of education on the nutritional value of food and its impact on health contributes to the global problem of unhealthy eating. Increasing perception of the significance of healthy eating can perform a fundamental role in attending to this issue. Here is an overview of the most common and dangerous products falling into the category of unhealthy food can encompass various food categories that may have a negative impact on health:

- **Fast Food:** Fast food restaurants offer high-calorie meals that are often rich in saturated fats, trans fats, salt, and sugars. Typical items include burgers with fries, pizzas, and fried chicken products.
- **Soft Drinks:** These beverages often contain large amounts of added sugars, and other additives. Regular consumption of soft drinks is linked with a greater risk of obesity, diabetes, and heart diseases.

- Sweets and Snacks: These products often have high levels of additives, sugar, salt, and saturated fats. Chips, chocolates, candies, and similar items can contribute to excess calories and poor health.
- Processed Meat: Sausages, ham, hot dogs, and other processed meat products often contain significant amounts of salt and additives linked to an increased risk of cardiovascular diseases.
- Instant Noodles and Ready Meals: These products often have high levels of sodium, saturated fats, and additives. The quick and easy preparation of these meals may attract consumers but often comes at the expense of nutritional value.
- Pastries and Cakes: Cakes, cookies, pies, and similar products often have high levels of sugar, fats, and refined carbohydrates, contributing to obesity and diabetes.
- Instant Soups: Ready-made soups and noodles that come in pouches or cups often contain high levels of sodium, and sometimes trans fats.
- Frozen Ready Meals: Many frozen ready meals are rich in salt, fats, and additives to extend shelf life and improve taste.
- Ice Cream: Besides containing significant sugar content, ice cream can also be high in saturated fats, contributing to an increased overall calorie intake.
- Fried Foods: Crispy foods fried in deep oil frequently contain saturated fats and trans fats, which are tied to an increased susceptibility to cardiovascular ailments.

When considering these food items in comparison to the typical daily diets of many, it becomes evident that unhealthy food is an inseparable aspect of modern life for a significant portion of the population.

The correlation between unhealthy dietary patterns and antisocial behavior

The relationship between the consumption of nutritious food, human physical well-being, and increased longevity remains stable, just as the link between unhealthy dietary habits and the onset of various diseases persists. However, the fast-paced nature of modern life has seemingly led to the underestimation of the importance of making wise and high-quality meal choices, which can significantly impact mental health and brain function. This impact encompasses psychological and behavioral responses that manifest through cognitive processes, emotions, and behaviors, ultimately influencing tendencies toward aggressive and criminal inclinations. Recognizing this connection should serve as an impetus for society to surmount the challenges and diminish the promotion of unhealthy food, with the aim of preventing detrimental outcomes like antisocial behavior, characterized by transgressions of societal norms, self and other neglect, explicit or concealed hostility, and purposeful aggression directed towards others.

If the adage “we are what we eat” holds true, it raises critical questions about the transformations we undergo. The well-established connection between our dietary choices and the escalating problem of obesity is widely acknowledged. Importantly, we must acknowledge that our dietary intake not only influences body weight but also plays a significant role in shaping brain composition (Crawford & Casperd, 1976). Food functions as the primary energy source for brain functions (Leonard & Robertson, 1997) and provides essential components for neurotransmitters (Gómez-Pinilla, 2008) governing interneuronal communication, essentially shaping the brain’s operational environment. Despite the brain constituting only 2% of body mass, it consumes around 20% of available energy (Leonard & Robertson, 1997). Paradoxically, modern dietary patterns have undergone substantial changes in a relatively brief period without a thorough examination of potential impacts on brain function or behavior (Gesch, 2005). What is often overlooked is that established dietary adequacy standards were not originally developed with brain function or behavioral outcomes in mind (op. cit., 2005). Given the presented information, it appears that as a society, we have once again demonstrated the destructive aspect of human nature by neglecting the potential physiological impacts on people’s mental health.

The notion that our dietary choices affect our mental state has a historical precedent dating back to antiquity. An 1899 article in the *Journal of the American Medical Association* posited that “proper nutrition is our most powerful agent” in addressing conditions like melancholy (Eyman, 1899). In 1954, Dr. George Watson and Andrew L. Comrey conducted a controlled study, published in the *Journal of Psychology*, suggesting that a vitamin-mineral concoction might ameliorate symptoms in individuals with diverse mental disorders (Watson & Comrey, 1954). Despite the limited scientific attention it initially received, this study gained recognition through the media (Powers, 1954). Notably, the renowned actress and fashion designer Gloria Swanson became an ardent proponent of nutritional interventions as preventive measures against juvenile delinquency, referencing the work of these two authors and contending that improper nutrition was the root cause of such behavior (Reynolds, 1958). In 1972, Dr. Watson authored “*Nutrition and Your Mind*,” a book that drew substantial scientific and professional attention (Watson, 1972). Within this context, Dr. Schoenthaler’s work emerges as a prominent contributor. His noteworthy 1980 study, conducted within a juvenile detention facility under the jurisdiction of the Virginia Department of Corrections, involved covertly introducing dietary modifications focused on reducing added sugars, resulting in a remarkable 45% reduction in documented disciplinary actions among juveniles who experienced the altered diet for three months (Schoenthaler, 1982). This study was of modest scale, involving a total of 58 juveniles, of which 24 were exposed to the dietary transition, yet it yielded encouraging results and prompted subsequent research conducted in various correctional facilities (Logan & Schoenthaler, 2023). By 1985, Schoenthaler and his collaborators expanded their research to 12 correctional institutions and observed a 47% decrease in documented infractions and other indicators of antisocial behavior as a consequence of dietary

adjustments aimed at reducing sugar and fat content (Schoenthaler, 1984; Schoenthaler & Bier, 1985). Considering the high prevalence of ultra-processed food consumption in Western industrialized societies, where individuals are frequently consuming diets predominantly comprised of 80% ultra-processed foods, researchers have embarked on explorations into the physiological, metabolic, and craving-related effects of these dietary choices. Dr. Chris van Tulleken's book "Ultra-Processed People" and a study conducted under the supervision of Dr. Tim Spector at King's College London, involving participants placed on an ultra-processed diet for two weeks, highlight the cognitive repercussions associated with the habitual intake of such foods (Logan & Schoenthaler, 2023; Van Tulleken, 2023; Kingston, 2023; Luković et al., 2023). In alignment with the aforementioned, the testimony of Dr. Martin Blinder, a distinguished professor of forensic psychiatry, who served as the defense psychiatrist in the trial of Dan White, stands as a compelling reference. Dr. Blinder, in response to inquiries, underscored the substantial body of evidence indicating that the excessive consumption of what is often characterized as unhealthy food, replete with high sugar and preservatives, has the potential to induce antisocial and even violent behavior. He cited studies in which individuals predisposed to react to these deleterious stimuli exhibit a profound transformation and engage in conduct they would not typically display (Linder, n.d). Within this framework, a multitude of indicators reaffirm the correlation between the consumption of unhealthy dietary items and their influence on psychological responses, which can lead to shifts in mood and contribute to violent actions and antisocial conduct. The hypothesis posits a connection between food types, nutritional impact, and psychological-behavioral responses with potential implications for reducing crime rates. Nutritional impact assumes a pivotal role in brain function and neurotransmitter production, thereby exerting influence over behavior and mood. A well-rounded diet that incorporates micronutrient-rich foods, such as fish, has been associated with decreased instances of aggressive behavior. Conversely, diets high in fats and sugars can perturb brain neural pathways, giving rise to potential withdrawal symptoms and behavioral alterations. Food insecurity, especially during childhood, amplifies the risk of falling into poverty and unemployment, thereby elevating the propensity for criminal activity. Furthermore, a study examining the interplay between work conditions and food choice strategies among employed parents, notably working mothers, revealed that workplace conditions significantly influence the selection between nutritious meals and fast food options, with potential ramifications for the mental well-being of the entire family. It's worth noting that meal preparation times have dwindled, leading to increased consumption of meals outside the home, particularly fast food and take-out options (Blisard et al., 2020; Heidari et al., 2023). The presented information implies that recent studies pertaining to both healthy and unhealthy dietary patterns should not be considered in isolation from the domain of mental health. The substitution of ultra-processed foods characterized by elevated sugar and fat content, inclusive of additives – substances incorporated into food to modify its sensory properties – with wholesome dietary paradigms, bears the potential to exert influence over neuropsychiatric outcomes, resulting in the amelioration of depressive and anxious symptomatology

and an enhancement in overall quality of life. The implementation of such interventions on a global scale holds the promise of significant contributions to public health and the potential to yield substantial cost savings within the healthcare sector. Nevertheless, the resistance and neglect of scientific advancements within this sphere, particularly those exploring the nexus between dietary patterns, antisocial conduct, and the mechanisms of the criminal justice system, are likely underpinned by economic interests advocating for the flourishing multinational conglomerates operating in the realm of sugar and ultra-processed food and beverage industries.

Destructive role of mass media in promoting unhealthy food

The analysis of media content reveals a substantial prevalence of advertisements for unhealthy food in mass media, with companies producing such food often sponsoring popular media events. Mass media exert their influence generally through their programming content and advertising content (see more: Bjelajac & Filipović, 2020). Mass media performs a crucial role in promoting unhealthy food through aggressive marketing strategies, leading to increased consumption of such food. Media advertisements for unhealthy food often employ manipulative techniques to capture the target audience's attention, potentially resulting in uncontrolled calorie intake and poor dietary habits. Mass media creates a false perception of unhealthy food, portraying it as attractive, delicious, and desirable. Children are particularly vulnerable to media influence regarding unhealthy food, as they are frequently the target of aggressive marketing campaigns. Media platforms often neglect their responsibility to consumers when it comes to promoting unhealthy food, creating an atmosphere in which fast and unhealthy meals are accepted and normalized. Mass media frequently collaborate with the food industry, perpetuating unhealthy food products through various media formats, including films, television, and social networks. Unethical marketing practices in promoting unhealthy food through mass media can lead to serious health consequences for consumers, including an increased risk of heart disease, diabetes, and other chronic illnesses. Educational campaigns and media literacy must become essential elements in the fight against the destructive role of mass media in promoting unhealthy food. Regulatory measures and control of marketing activities related to unhealthy food on media platforms are necessary to reduce the negative impact of mass media on dietary habits and public health.

Aggressive marketing campaigns and advertisements often portray unhealthy meals in a way that makes them appealing and desirable. Regular depictions of fast food, sweets, and sugary drinks create a subconscious impression that these products are an integral part of everyday life. Media content often reflects societal trends. If unhealthy food is frequently featured in movies, television shows, or on social media, it easily becomes part of the cultural norm. Media companies often collaborate with food brands, promoting their unhealthy food products through sponsorships, competitions, or other events. Children are especially susceptible to media influence. If characters that children admire are shown consuming unhealthy food, children may perceive

these products as desirable and tasty. The lack of education on healthy eating in media content can result in insufficient consumer recognition of the benefits of healthy food and the dangers of consuming unhealthy meals. Media sometimes creates a false perception that healthy food is less tasty or less appealing. This can encourage people to turn to unhealthy options under the belief that they are more delicious or satisfying. Normalizing unhealthy meals through media often has serious consequences for public health, fueling the obesity epidemic and related diseases. Education, regulatory measures, and media literacy are key factors in combating this negative influence.

Manipulating consumer emotions is a successful strategy in media promotion of unhealthy food. This approach to marketing campaigns is often used to construct an emotional connection between consumers and products. Advertisements for unhealthy food often focus on creating feelings of joy, enjoyment, and satisfaction. Depictions of happy people enjoying food generate positive emotions, connecting those emotions with the product. Colors, music, and slogans are carefully used to evoke specific emotional reactions. Warm colors and cheerful music can stimulate feelings of warmth and comfort. Campaigns often attempt to establish a false connection between the product and the consumer's identity. Advertisements suggest that consuming a specific food will make a person modern, successful, or desirable in society. Using positive and likable characters in ads can establish an emotional link between consumers and the product. Characters who appear happy and content while consuming the product can encourage others to seek the same experience. Emotional storytelling is often used in marketing campaigns to elicit emotional reactions. Emotional stories can create a deeper connection between consumers and the product. Visual elements such as juicy and enticing food displays can trigger strong emotional reactions. The portrayal of people who are happy and successful after consuming the product creates the illusion that this food is associated with personal success and happiness. Manipulating emotions in media promotion of unhealthy food often leads consumers to make decisions based on emotional impulses rather than rational considerations. Education about these marketing tactics can be crucial in developing consumer media literacy.

In an effort to familiarize consumers with unhealthy food, media often promote so-called "social pressure" and peer influence. Peers often serve as behavior models, and if they frequently consume unhealthy food, it can encourage others to follow the same pattern. If it is common among peers to consume fast food or high-sugar snacks, individuals may feel pressured to conform to those norms to feel accepted. If someone speaks positively about a particular unhealthy meal or snack, it can influence others' decisions to try it. Eating often serves as a social event. Consuming unhealthy food during shared meals can strengthen social bonds among peers. Peers often enjoy eating together at fast-food restaurants. Group dynamics can encourage individuals to adopt food choices that are common in their group. Fear of exclusion or stigmatization can motivate individuals to conform to the dietary norms of their group. If images and posts about unhealthy meals are frequent among peers, it can reinforce the desire of others to try the same. Education about healthy dietary options, the development of media

literacy, and the promotion of positive peer influences can be crucial in combating this social pressure to consume unhealthy food.

Given the serious public health consequences arising from the destructive impact of the media on dietary habits, there is a strong need for regulations and education regarding the role of media in promoting unhealthy food. Limiting false or deceptive marketing messages can help inform consumers. Regulations may include strict rules that ban marketing activities for unhealthy food targeted at children, as children are particularly susceptible to media influence. Establishing standards of transparency and ethical practices in media campaigns can reduce emotional manipulation and false product representation. Rules that restrict advertising of unhealthy food during children's programs or on platforms popular among children can help reduce the influence of media on the dietary habits of the youngest consumers.

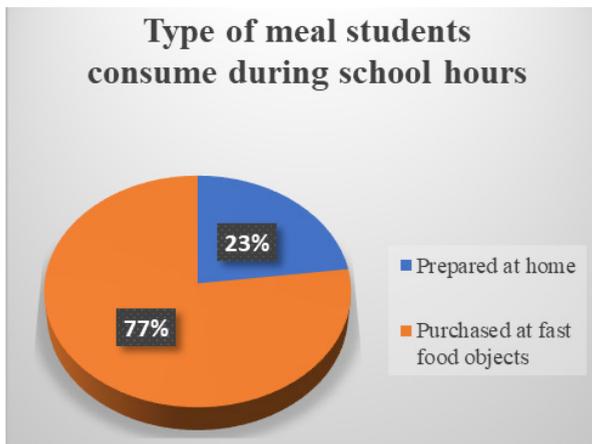
Results and discussion

During adolescence, nutritional vulnerability rises as a result of increased nutritional needs, but the quality of diets among this age group frequently declines markedly (Heslin & McNulty, 2023). A study within the “Teži ravnoteži (in English: Striving for Balance)” project, a national campaign initiated by the Serbian Chamber of Commerce in support of the National Program for Obesity Prevention started by the Ministry of Health of the Republic of Serbia, sheds light on the eating habits of Serbian citizens. The results of an online survey within this project in October 2023 provide intriguing insights. The primary conclusion of this study is that the majority of citizens, 68% of them, moderately pay attention to their diet, while 17% of the respondents are very mindful of their nutrition. Alarming, 15% of respondents do not pay attention to their diet at all (Teži ravnoteži, 2023). Furthermore, the study reveals that most citizens inform themselves about the nutritional values of products by reading nutritional labels on items, with 41% of respondents choosing this option, while 28% obtain information from the media (magazines, websites, and television) (op. cit., 2023). The research also indicates that 45% of citizens gather information about nutritional values through content on social media (op. cit., 2023), which highlights certain inconsistencies in the results. As the research questions asked were not provided in the report of the results, it can be concluded that respondents were separately asked about their use of social media. The research methodology, conducted online, imposes certain limitations on the sample and, consequently, the results. It somewhat guides the results towards those respondents who, broadly speaking, pay attention to their nutrition. Hence, the actual results are likely slightly less favorable than those presented. Nevertheless, the presented results are illustrative and provide insights into citizens' perception of healthy nutrition and the impact of both traditional and new media on shaping their views and, consequently, dietary habits.

Below, we provide details of our research conducted for the “Origins of Criminal Behavior” monograph by Željko Bjelajac, which did not make it into the final manuscript due to the tragic events in May of this year (2023) that interrupted the school year, and

consequently, our research. We resumed the research at the beginning of the new school year and concluded it on November 1, 2023. The research aimed to investigate the number of students regularly consuming ultra-processed food and sugary, unhealthy beverages using random sampling, conducted on the streets near elementary and high schools in Belgrade and Novi Sad. The research was conducted from March 1, 2023, to May 1, 2023, and then resumed on September 1, and concluded on November 1, 2023. The target group of the research comprised students in higher grades of elementary and high schools in Belgrade and Novi Sad. Over the four months, a total of 1043 respondents were contacted, of which 310 declined to answer the questions, while 733 did, constituting our research sample. The research was conducted by the authors of this text along with collaborators. The sample selection was done through street-intercept random sampling near said elementary and high schools. Respondent selection was made on the day of the survey using random sampling. The research technique was a personal, face-to-face technique, and the research instrument was the questionnaire. Based on the methodology established during the research, the sample encompassed the following respondent categories: gender structure – 54% females and 46% males; age structure – 44% aged 11-15 and 56% aged 16-19. In terms of education/profession, the sample consisted of 9% - elementary school 5th graders, 9% - 6th graders, 13% - 7th graders, 13% - 8th graders, 12% - high school 1st graders, 15% - high school 2nd graders, 14% - high school 3rd graders, and 15% - high school 4th graders. The questionnaire consisted of two research questions: whether, during school breaks, they bring food from home or purchase food from nearby catering establishments, and how often, on a weekly basis, they consume energy drinks or carbonated beverages. For the first question, of the 733 respondents who answered the survey, 169 or 23% responded that they bring pre-prepared food to school from home, while 564 or 77% reported that they purchase meals during school hours from catering establishments near the school, meaning they are consuming fast food.

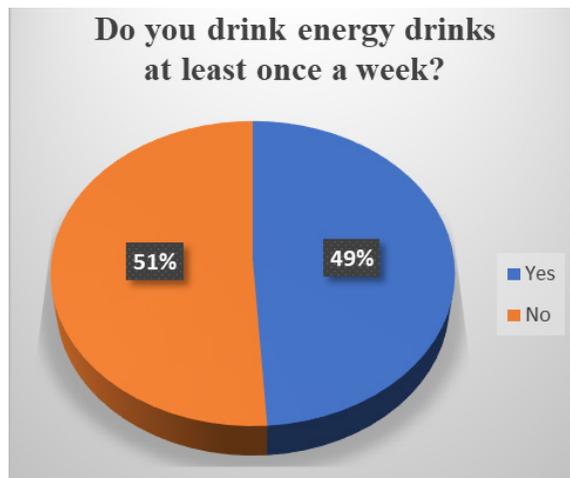
Figure 1. Type of meal students consume during school hours



Source: Authors' research

As for the second question regarding how often students consume energy drinks and carbonated beverages on a weekly basis, the results show some overlap, with the majority of respondents who consume energy drinks also consuming carbonated beverages. When we look at the students who drink energy drinks at least once a week, out of the 733 respondents, 359, or 49%, answered affirmatively. As for the number of respondents who reported consuming carbonated beverages at least once a week, 616 respondents answered affirmatively, which makes up 84% of the total number of respondents. Interestingly, the percentage of elementary and high school students who consume energy drinks at least once a week differs by one percentage point from a similar study we published in 2021. In that research, the percentage of students who consumed energy drinks at least once a week was 48% (Bjelajac, Filipović & Banović, 2021).

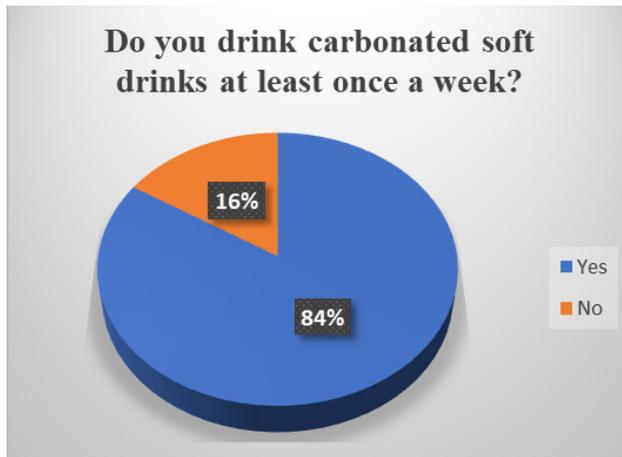
Figure 2. Percentage of respondents who drink energy drinks at least once a week



Source: Authors' research

This information is indeed concerning. Even though the number of respondents who consume energy drinks has increased by one percentage point over the past two years, practically half of the elementary and high school students consume energy drinks at least once a week, which is one of the unhealthiest dietary choices due to enormous level of sugar.

Figure 3. Percentage of respondents who drink carbonated soft drinks at least once a week



Source: Authors' research

The fact that 84% of the respondents consume carbonated drinks at least once a week is also alarming, as it implies the intake of an exceptionally high amount of sugar and other unhealthy ingredients, such as artificial colors, flavor enhancers, etc. It's not surprising that the Ministry of Health of the Republic of Serbia has initiated the National Program for Obesity Prevention. It's worth noting that such programs also serve to prevent the onset and development of diseases related to excessive consumption of unhealthy ingredients, food, and beverages, such as diabetes, cardiovascular diseases, and others. We specifically chosen to research the dietary and nutritional habits of adolescents, as they remain globally overlooked in nutritional strategies and policies worldwide (see more: Hargreaves et al., 2022). Additionally, clearer guidelines and campaigns to address nutritional confusion and misinformation are needed, as well as limited approvals for unhealthy food outlets near schools to discourage obesogenic environments (Luković & Šilc, 2021; Božić & Milošević, 2021; Uhlmann et al., 2023). Implement stricter regulations on the marketing of unhealthy drinks and foods. Improve food labeling to ensure people of all ages can make well-informed decisions. Conducting similar research annually and tracking the results of government efforts would be interesting and useful to assess whether they yield the expected outcomes or if efforts to increase the share of healthy food in the overall diet need to be synergized with other stakeholders in the healthy eating chain.

Conclusions

The connection between unhealthy dietary choices and antisocial behavior lacks clarity in scientific understanding. Nevertheless, numerous studies underscore the link between eating habits and behavioral patterns, highlighting the prevalence of unhealthy diets in both daily life and media. Influential corporations, backed by substantial financial resources, shape consumer demand and awareness through their

impact on the media landscape, resulting in a cascade of effects on individuals and society. Resolving this intricate issue demands an interdisciplinary approach, with education playing a pivotal role. Society needs to be informed about the advantages of a healthy diet and the detrimental effects of unhealthy choices. Developing media literacy, particularly among young people, is crucial for comprehending and critically evaluating advertising. Integrating education on this matter into school curricula and public campaigns is crucial, emphasizing the importance of balanced diets and the repercussions of excessive consumption. Responsible media practices and educational initiatives featuring real-life health consequences contribute to fostering awareness in society. Ultimately, a comprehensive strategy involving both regulatory measures and educational efforts is essential to counteract the adverse influence of the media on eating behavior and promote well-informed decision-making.

Conflict of interests

The authors declare no conflict of interest.

References

1. Afshin, A., Sur, P. J., Fay, K., Cornaby, L., Ferrara, G., Salama, J., Mullany, E. C., Abate, K. H., Abbafati, C., Zegeye, A., Afarideh, M., Aggarwal, A., Agrawal, S., Akinyemiju, T., Alahdab, F., Bacha, U., Bachman, V. F., Badali, H., Badawi, A., . . . Murray, C. J. L. (2019). Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184), 1958–1972. [https://doi.org/10.1016/s0140-6736\(19\)30041-8](https://doi.org/10.1016/s0140-6736(19)30041-8)
2. Bjelajac, Ž., & Filipović, A. (2020b). The role of the media in the affirmation of the culture of food safety. *Ekonomika Poljoprivrede (1979)*, 67(2), 609–622. <https://doi.org/10.5937/ekopolj2002609b>
3. Bjelajac, Ž., Filipović, A., & Banović, B. (2021). Instruments of support in promotion of healthy food and food safety culture. *Ekonomika Poljoprivrede (1979)*, 68(1), 241–255. <https://doi.org/10.5937/ekopolj2101241b>
4. Blisard, N., Lin, B., Cromartie, J., & Ballenger, N. (2002). America's Changing Appetite: Food consumption and spending to 2020. *Food Review: The Magazine of Food Economics*, 25(1), 2–9. <https://doi.org/10.22004/ag.econ.266240>
5. Bonaccio, M., Costanzo, S., Di Castelnuovo, A., Persichillo, M., Magnacca, S., De Curtis, A., Cerletti, C., Donati, M. B., De Gaetano, G., & Iacoviello, L. (2021). Ultra-processed food intake and all-cause and cause-specific mortality in individuals with cardiovascular disease: the Moli-sani Study. *European Heart Journal*, 43(3), 213–224. <https://doi.org/10.1093/eurheartj/ehab783>
6. Božić, A., & Milošević, S. . (2021). Critical success factors for new dishes in gastronomic offer of Belgrade restaurants. *Hotel and Tourism Management*, 9(2), 51–62. <https://doi.org/10.5937/menhottur2102051B>

7. Crawford, M., Casperd, N., & Sinclair, A. J. (1976). The long chain metabolites of linoleic and linolenic acids in liver and brain in herbivores and carnivores. *Comparative Biochemistry and Physiology. B. Comparative Biochemistry*, 54(3), 395–401. [https://doi.org/10.1016/0305-0491\(76\)90264-9](https://doi.org/10.1016/0305-0491(76)90264-9)
8. Esposito, S., Bonaccio, M., Ruggiero, E., Costanzo, S., Di Castelnuovo, A., Gialluisi, A., Esposito, V., Innocenzi, G., Paolini, S., Cerletti, C., Donati, M. B., De Gaetano, G., & Iacoviello, L. (2023). Food processing and risk of central nervous system tumours: A preliminary case–control analysis from the Mediterranean Diet in relation to Cancer of brain (MEDICEA) study. *Clinical Nutrition*, 42(2), 93–101. <https://doi.org/10.1016/j.clnu.2022.11.016>
9. Eyman, H. C. (1899). The Neurotic's Diet. *JAMA*, XXXIII(9), 515. <https://doi.org/10.1001/jama.1899.92450610001001e>
10. Gesch, C. B. (2005). The potential of nutrition to promote physical and behavioral well-being. In: Huppert F.A., Baylis N, Keverne B (eds) *The Science of Well-being*. Proceedings of the Royal Society (Chapter 7, pp. 171-214). Oxford University Press, <https://doi.org/10.1093/acprof:oso/9780198567523.003.0007>
11. Global Panel on Agriculture and Food Systems for Nutrition (2016). *Food Systems and Diets: Facing the Challenges of the 21st Century*. Global Panel on Agriculture and Food Systems for Nutrition, <http://glopan.org/sites/default/files/ForesightReport.pdf>
12. Gómez-Pinilla, F. (2008). Brain foods: the effects of nutrients on brain function. *Nature Reviews Neuroscience*, 9(7), 568–578. <https://doi.org/10.1038/nrn2421>
13. Hargreaves, D., Mates, E., Menon, P., Alderman, H., Devakumar, D., Fawzi, W., Greenfield, G., Hammoudeh, W., He, S., Lahiri, A., Liu, Z., Nguyen, P. H., Sethi, V., Wang, H., Neufeld, L. M., & Patton, G. C. (2022). Strategies and interventions for healthy adolescent growth, nutrition, and development. *The Lancet*, 399(10320), 198–210. [https://doi.org/10.1016/s0140-6736\(21\)01593-2](https://doi.org/10.1016/s0140-6736(21)01593-2)
14. Heidari, M., Jekar, Y. K., Madani, S. H., Shahi, S., Shahi, M. S., & Goli, M. (2023). Influence of food type on human Psychological–Behavioral responses and crime reduction. *Nutrients*, 15(17), 3715. <https://doi.org/10.3390/nu15173715>
15. Heslin, A. M., & McNulty, B. (2023). Adolescent nutrition and health: characteristics, risk factors and opportunities of an overlooked life stage. *Proceedings of the Nutrition Society*, 82(2), 142–156. <https://doi.org/10.1017/s0029665123002689>
16. Карпов, О. (2020, December 10). *Вредные продукты питания, список. Классы опасности продукции. Классификация вредных и безопасных пищевых продуктов*. FoodbayBlog: Онлайн-журнал О Пищевой Индустрии, Сельскохозяйственной Промышленности, Производстве Продуктов И Оборудования [in English: Karpov, O. (2020, December 10). Harmful food products, list. Hazard classes of products. Classification of harmful and safe food products. FoodbayBlog: An online journal about the food industry, agricultural industry, and the production of food products and equipment], https://foodbay.com/wiki/it_is_interesting/2017/04/19/klassy-opasnosti-produkzii/

17. Kingston, A. (2023, June 28). I ate Ultra-Processed foods, my twin didn't. the results were shocking. *Newsweek*. <https://www.newsweek.com/ultra-processed-food-health-study-1808647>
18. LaFata, E. M., & Gearhardt, A. N. (2022). Ultra-Processed food addiction: an epidemic? *Psychotherapy and Psychosomatics*, 91(6), 363–372. <https://doi.org/10.1159/000527322>
19. Lee, S., & Choi, M. (2023). Ultra-Processed Food Intakes Are Associated with Depression in the General Population: The Korea National Health and Nutrition Examination Survey. *Nutrients*, 15(9), 2169. <https://doi.org/10.3390/nu15092169>
20. Leonard, W. R., & Robertson, M. L. (1997). Comparative primate energetics and hominid evolution. *American Journal of Physical Anthropology*, 102(2), 265–281. [https://doi.org/10.1002/\(sici\)1096-8644\(199702\)102:2](https://doi.org/10.1002/(sici)1096-8644(199702)102:2)
21. Li, H., Li, S., Yang, H., Zhang, Y., Ma, Y., Hou, Y., Zhang, X., Sun, L., Borné, Y., & Wang, Y. (2023). Association of Ultra-Processed Food Intake with Cardiovascular and Respiratory Disease Multimorbidity: A Prospective Cohort Study. *Molecular Nutrition & Food Research*, 67(11). <https://doi.org/10.1002/mnfr.202200628>
22. Linder, D. O. (n.d). The Trial of Dan White: Trial Testimony of Dr. Martin Blinder (Defense Psychiatrist). *Famous Trials, University of Missouri-Kansas City School of Law*. <https://www.famous-trials.com/danwhite/601-blindertestimony>
23. Logan, A. C., & Schoenthaler, S. J. (2023). Nutrition, Behavior, and the Criminal Justice System: What Took so Long? An Interview with Dr. Stephen J. Schoenthaler. *Challenges*, 14(3), 37. <https://doi.org/10.3390/challe14030037>
24. Logan, A. C., & Schoenthaler, S. J. (2023). Nutrition, Behavior, and the Criminal Justice System: What Took so Long? An Interview with Dr. Stephen J. Schoenthaler. *Challenges*, 14(3), 37. <https://doi.org/10.3390/challe14030037>
25. Luković, M., Pantović, D., Kostić, M., Veljović, S., Bugarčić, J. (2023), Food plant diversity in cultural ecosystem services perspective: edible plants as a driver for improving the offer of gastro-tourism, *Ecologica*, 30 (110), 201-208, <https://doi.org/10.18485/ecologica.2023.30.110.5>
26. Luković, M., & Šilc, U. (2021). Management of continental saline ecosystems in the Republic of Serbia – Are these ecosystems suitable for nature-based tourism?. *Hotel and Tourism Management*, 9(2), 37–49. <https://doi.org/10.5937/menhottur2102037L>.
27. Monteiro, C. A., Cannon, G., Moubarac, J., Levy, R. B., Da Costa Louzada, M. L., & Jaime, P. C. (2017). The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. *Public Health Nutrition*, 21(1), 5–17. <https://doi.org/10.1017/s1368980017000234>
28. Powers, J. (1954, October 13). New, simple method of treating mental illness. *Fort Worth Star-Telegram*, 22.

29. Reales-Moreno, M., Tonini, P., Escorihuela, R. M., Solanas, M., Fernández-Barrés, S., Romaguera, D., & Contreras-Rodríguez, O. (2022). Ultra-Processed Foods and Drinks Consumption Is Associated with Psychosocial Functioning in Adolescents. *Nutrients*, 14(22), 4831. <https://doi.org/10.3390/nu14224831>
30. Reynolds, D. D. (1958, April 15). Miss Swanson packs a lunch and fashionably comes to call. *News and Record*, 6.
31. Schoenthaler, S. J. (1982). The effect of sugar on the treatment and control of antisocial behavior: A double-blind study of an incarcerated juvenile population. *International Journal of Biosocial Research*, 3(1), 1–9.
32. Schoenthaler, S. J. (1984). Diet Crime and Delinquency-A Review of the 1983 and 1984 Studies. *International Journal for Biosocial Research*, 6(2), 141-153.
33. Schoenthaler, S. J., & Bier, I. D. (1985). Diet and delinquency: Empirical testing of seven theories. *International Journal of Biosocial Research*, 7(2), 108-131.
34. Šapić, S., Furtula, S., & Durkalić, D. (2018). Prestige and national identity as predictors of food products purchase. *Economics of Agriculture*, 65(2), 643-657., doi:10.5937/ekoPolj1802643S
35. Teži ravnoteži. (2023, October 11). *Predstavljene rezultati istraživanja u okviru nacionalne kampanje "Teži ravnoteži"*. Teži ravnoteži. [in English: Striving for Balance (2023, October 11). Research results from the national campaign "Striving for Balance" presented. Striving for Balance] <https://teziravnotezi.rs/2023/10/11/1029/>
36. Uhlmann, K., Ross, H., Buckley, L., & Lin, B. B. (2023). Food in my life: How Australian adolescents perceive and experience their foodscape. *Appetite*, 190, 107034. <https://doi.org/10.1016/j.appet.2023.107034>
37. Van Tulleken, C. (2023). *Ultra-Processed People: The Science Behind the Food That Isn't Food*; W.W. Norton.
38. Vignola, E., Nazmi, A., & Freudenberg, N. (2021). What Makes Ultra-Processed Food Appealing? A critical scan and conceptual model. *World Nutrition*, 12(4), 136–175. <https://doi.org/10.26596/wn.202112483-135>
39. Watson, G. (1972). *Nutrition and Your Mind*, Harper and Row.
40. Watson, G., & Comrey, A. L. (1954). Nutritional replacement for mental illness. *The Journal of Psychology*, 38(2), 251–264. <https://doi.org/10.1080/00223980.1954.9712934>
41. Werneck, A. O., Vancampfort, D., Oyeyemi, A. L., Stubbs, B., & Silva, D. (2020). Joint association of ultra-processed food and sedentary behavior with anxiety-induced sleep disturbance among Brazilian adolescents. *Journal of Affective Disorders*, 266, 135–142. <https://doi.org/10.1016/j.jad.2020.01.104>