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RESEARCH ARTICLES

An Analysis of the Barriers Preventing Adolescents From a Nutritious Diet: Processed Food and the Gut Microbiome

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This paper investigates the relationship between processed food consumption and gut microbiome health in adolescents from low- and middle-income communities in the United States. Rising food prices and the widespread availability of ultra-processed foods have shifted dietary patterns, particularly among families facing economic constraints. Drawing from existing literature and original qualitative interviews with parents, this study explores how affordability, convenience, stress, and food accessibility influence adolescent diets and their effects on mood, behavior, and overall well-being. Findings suggest that processed food consumption contributes to gut dysbiosis and may be linked to cognitive and emotional changes during a critical period of development. The paper highlights the urgent need for interventions—including educational outreach, food policy reform, and innovation in food science—to promote access to nutritious foods that support healthy gut microbiota. Addressing these challenges is essential to reducing health disparities and ensuring long-term well-being for adolescents across all income levels.

Introduction

The human gut microbiome—once dismissed as a passive collection of microbes—is now recognized as a critical organ system, teeming with trillions of bacteria, viruses, archaea, and fungi. These microscopic communities outnumber our own human cells and help regulate digestion, immunity, metabolism, and even mood. But in recent years, this fragile ecosystem has come under strain. A sharp rise in food prices across the United States has transformed how families eat, especially in low- and middle-income communities. As fresh, whole foods grow more expensive and less accessible, many households have turned to cheaper, processed alternatives that are high in sugar, fat, and preservatives.

This dietary shift carries hidden risks. According to economist Charles Courtemanche, the widespread consumption of processed foods is not just an economic trend—it's a public health concern (Courtemanche et al., 2016). Over time, diets rich in processed foods can lead to gut dysbiosis: a harmful imbalance in the microbiome's composition that weakens immune defenses, disrupts metabolism, and may even contribute to anxiety, stress, and disease.

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Adolescents are especially vulnerable. Not only are their bodies and brains still developing, but those in marginalized communities are disproportionately exposed to the dietary harms of processed food.

This paper investigates the question: To what extent have processed foods influenced gut microbiome composition in adolescents from low- and middle-income communities in the United States over the past decade? The purpose of this research is to explore how economic barriers, food availability, and dietary habits intersect to affect adolescent gut health. By combining existing literature with original interviews, this study aims to uncover how processed food consumption may be shaping not only adolescent nutrition, but also their physical and emotional well-being—and what can be done to reverse the trend.

Literature Review

The gut microbiome is a crucial part of the human body. The gut has as many as 10^23 living microbes, about as many as cells present in the human body. Parag Vaishampayan, the Division Chief for the Space Biosciences Division at NASA's Ames Research Center, explains that the bacteria in the gut should be viewed as equivalent to an organ, working to carry out metabolic functions that we are unable to perform ourselves (Vaishampayan et al., 2005). Assistant Professor within the Genomic Medicine group at the J. Craig Venter Institute Ramana Madupu explains that gut health is significantly impacted by processed foods, which are often consumed by individuals who are financially constrained. Regular consumption of these foods reduces the diversity of the gut microbiome, a critical factor in maintaining overall health (Madupu et al., 2013).

The gut microbiome consists of communities of microorganisms. A balanced microbiome is one where there's a healthy diversity of microorganisms, where no one bacteria, virus, or fungus dominates. When the microbiome's composition is disrupted, it can lead to a condition known as dysbiosis. Gut dysbiosis means there's a lack of diversity and balance, and it changes how the bacteria function in the body; this can result in impairments in immune and metabolic functions, increasing the risk for chronic diseases and neuropsychological disorders (Madupu et al., 2013). Associate Professor of Food Science and Technology Cheryl Rock expands on this by explaining that because an over-reliance on processed foods throws off the balance of the gut microbiome, it increases the risk of various health conditions such as fatty liver disease, metabolic syndrome, and even cancer (Rock et al., 2020). The connection between the consumption of processed foods and gut dysbiosis highlights the need to address the epidemic of obesity and the underlying causes of processed food consumption.

Gut microbiome composition doesn't just affect digestion and immunity; it can even impact brain function. Award-winning freelance science writer Charles Schmidt demonstrated the gut-brain connection through studies in mice. When Bifidobacterium infantis, which is a bacteria strain that promotes a healthy digestive tract, was introduced to these mice, they responded with

more normalized hormonal responses to stress in comparison to mice without B. infantis (Schmidt & Schnorr, 2015). Schmidt argues that "Scientists are increasingly convinced that the vast assemblage of microfauna in our intestines may have a major impact on our state of mind" (2015). Although such studies in animals suggest a strong link, further research in humans is needed to prove these findings. It is very important to understand the exact connections between the composition of the gut and mental health because it can help lead the way for treatments to potential mental health conditions, such as anxiety and depression. If an exact connection is proven, interventions that support a healthier gut microbiome through dietary and probiotic interventions can help improve the psychological well-being of adults and adolescents, especially those who live in areas exposed to more processed foods. Washington University radiologist Manu Goyal investigates this further by explaining that gnotobiotic animal models, which are research tools where the microbial environment of an animal is known and controlled, can be used to study the gut microbiota and diets of human subjects with extreme differences in microbiota maturity and brain imaging biomarkers (Goyal et al., 2015). This approach helps determine a causal link between microbiota and brain development, as well as uncover the underlying mechanisms.

The trend of increased processed food consumption among children and adolescents has brought a lot of concern regarding their long-term health. Childhood obesity rates in the United States have more than tripled since the 1960s (U.S. Department of Health and Human Services, 2001). The overconsumption of processed foods, largely due to their affordability and availability, has led to disruptions in the gut microbiome among adolescents. Laura Blanton, who works at the Center for Genome Sciences and Systems Biology at the Washington University School of Medicine, explains that, because adolescents are especially vulnerable to dietary influences on the microbiome during the developmental stages of their life, this trend poses a serious public health challenge (Blanton et al., 2016). With a major increase in processed foods and consequently skyrocketing rates of obesity and poor gut health, adolescents are at a heightened risk of disease and negative physiological effects as they go through crucial developmental stages of their life.

The prices of food greatly influence consumers. According to Courtemanch et al. (2016), processed foods, which are often affordable, are more accessible than healthier options, which tend to be costlier. Furthermore, these foods take little to no time to prepare, which is beneficial for individuals and families that have less time to prepare meals. This economic divide and ease that comes with purchasing and preparing processed foods, consequently, leads to health disparities. Lisa Powell, a Professor and Director in the Division Health Policy, explains that many individuals who live in lower-income areas that lack access to healthier options, are more likely to be overweight and have an unbalanced gut

microbiome (Powell et al., 2013). Disadvantaged populations' unequal access to fresh foods is a cause for concern because of the potential harm it could cause in the gut microbiome, especially among adolescents as disruptions during growth can have more severe consequences (Blanton et al., 2016).

Access to nutritious food is limited in low-income urban neighborhoods, where fast-food and convenience stores are seen everywhere while supermarkets are scarce. This phenomenon, referred to as "food oppression," refers to the overabundance of fast food and lack of access to healthier foods that creates health disparities among race, gender, and class lines (Freeman, 2007). Andrea Freeman, Law Professor at the University of Hawai'i at Mānoa, suggests that communities of color are disproportionately affected by this phenomenon, creating a cycle of poor gut health and adverse health outcomes (2007). Freeman describes West Oakland, California, a neighborhood of 30,000 people populated primarily by African Americans and Latinos, which has one supermarket and 36 liquor and convenience stores. The supermarket is not accessible on foot to most of the area's residents and charges twice as much for food as the convenience stores. The abundance of processed foods is a sharp contrast to the limited selection of affordable, healthy options. This lack of access to fresh foods in areas like Oakland, California, may be linked to higher rates of diet-related diseases among African American and Latino populations. This suggests the need to implement measures that address food insecurity in marginalized communities, typically populated by minorities, where the population experiences unequal access to healthier options compared to other areas, specifically areas lacking minority populations. Dr. Greaves-Peters, a Ph.D. in Behavioral Nutrition from Teachers College, Columbia University, builds on this by stating that "children living in environments where the majority of their food is ultra-processed will have less colonized guts" (N. Greaves-Peters, personal communication, December 5, 2024). Disadvantaged communities with a lack of healthy foods like West Oakland, California, will likely have a greater number of adolescents with unbalanced gut microbiomes compared to communities with greater access to nutritious foods, leading to a higher prevalence of health issues.

While there is substantial data on how diet affects gut microbiome health and how gut health is linked to physical and mental health, there is limited research that focuses specifically on adolescents in the US, a group that is particularly vulnerable to the impacts of food affordability. These adolescents function differently than adults because their bodies and minds are developing, which may lead to increased susceptibility to poor gut health. Furthermore, while there is substantial data on processed food trends in lower-income communities, there are limited studies that investigate middle-income communities and adolescent exposure to junk food. In my research, I want to explore the factors that lead to a diet that consists of excess processed food among adolescents. Understanding changes in food prices over the past few years and processed food availability in different communities will help

me to understand specifically how adolescents are impacted. I hypothesize that adolescent processed food consumption may lead to noticeable cognitive changes. Additionally, I speculate that highly processed food will be prevalent not just in lower-income communities, but also middle-income communities. Since middle-income families represent nearly half of the U.S. population (Kochhar, 2024), addressing this gap is essential to understanding how dietary interventions influence adolescent gut health. This insight can guide policymakers in developing effective public health strategies that reduce food insecurity and support both the physical and mental well-being of adolescents.

Methods

In order to investigate the cause-and-effect relationship between gut health and economic stability, I used correlational research techniques. By reviewing existing studies, I developed interview questions to research the correlation between diet and the gut microbiome. This method helped me draw conclusions about the behavior and physical well-being of adolescents living in different communities.

Manu S. Goyal, Associate Professor of Radiology and Principal Investigator in the Neuroimaging Labs Research Center for Mallinckrodt Institute of Radiology, analyzed research to determine the link between nutrition, the gut microbiome, and brain development. His paper serves to learn how to optimize nutritional recommendations that promote healthy brain development and function. This study asked, "how persistent cognitive abnormalities seen in children with undernutrition are related to their persistent gut microbiota immaturity" (Goyal et al., 2015). A line of questioning I adapted in my own research to ask parents, "What foods have you noticed that have a positive impact on your child's mood? a negative impact?" This question helps determine the correlation between the diet of these children and noticeable changes in their behavior and development. If a child's diet consists mainly of processed foods and their behavior and emotional state have been thrown off, it indicates a possible correlation between gut health and brain development.

Chief Investment Officer Lamm McFall, PhD investigated the dynamic of food inflation. The purpose of his paper is to investigate how the inflation of food products has led to an increase in the availability of processed foods in the U.S. (McFall, 1979). The study asks specifically how food price inflation leads to higher prices of raw agricultural commodities and leaves processed foods cheaper and readily available (McFall, 1979). I adapted interview questions to mirror this study and explore the economic trends of the food industry in the past few years: "Over the past year, how has your grocery shopping been affected by inflation?" and "Have changes in food prices affected your consumption of processed foods?" These interview questions will be asked to families across varying socioeconomic communities and will help determine trends in food prices and the availability of processed foods.

Laura Laski, who holds a Master's in Public Health from the University of California, Berkeley, aims to understand the factors behind the health and well-being of adolescents. Laski's underlying research purpose is to investigate the capabilities required for a productive, healthy, and satisfying life to ensure a healthy transition from adolescence into adulthood (Laski, 2015). Laski posed the following questions in her study: "What are the key health challenges faced by adolescents and youth in different regions?" (Laski, 2015). I adapted my research question to ask parents with children aged 10-19, "How far is your nearest grocery store?" and "How often do you consume fresh fruits and vegetables each week?" These questions will help me determine a connection between socioeconomic factors and nutritious food availability and identify potential barriers to a nutritious diet.

Ana Valdes, PhD from the University of California at Berkeley investigates specific strategies for modulating the gut microbiota through diet and probiotics by taking external factors into account. Valdes asks, "What is the relationship between external stressors and the gut microbiota?" (2018). Based on her methods and line of questioning, I have crafted the following interview questions: "Have you faced any serious problems in your environment that made you feel unwell? If yes, what were they and how did that change your stress levels? How did that change your eating patterns? How has that affected how easy it is for you to get fresh fruits and vegetables?" These interview questions will help to investigate how external factors that induce stress can lead to changes in dietary patterns and possibly lead to changes in gut health.

The methods employed in these referenced studies helped provide a framework for my research. I developed targeted interview questions based on existing literature to examine the correlations between diet and gut microbiota within different socioeconomic communities. By asking about food prices, dietary habits, stress, and the availability of fresh produce within different communities, I aim to understand how these factors impact the physical and cognitive health of adolescents. Ultimately, I will be interviewing parents and using their responses to gain insights into the links between nutrition, economic conditions, and the overall well-being of their children.

Data Analysis

The following data was collected over the course of five virtual Google Meet interviews with five participants total, each of whom is a parent. Mr. Meder, Ms. Herbert, and Ms. Buba live on the East Coast in areas where the median household income is well above average in the United States. Ms. Grantner lives outside a major city in the Southern United States where the median household income is about average in the United States. Through convenience sampling, I contacted each participant with the assistance of my teacher and family friend connection. These interviews largely supported my hypothesis: Adolescents living in lower and middle-income communities are more likely to be exposed to highly processed foods which can disrupt their gut microbiomes. Also, adolescent processed food consumption may lead to

noticeable physical and mental health changes. After collecting qualitative data from my interviews, I found that participants living in lower and middle-income areas were exposed to large amounts of processed foods because of affordability and convenience. Additionally, many participants claimed noticeable changes in their child's behavior when eating processed foods versus healthier, nutritious foods.

Convenience

Despite varying income levels and plentiful access to healthier options among all my participants, the main struggle families faced was convenience. Ms. Herbert argues, "I think where choice becomes limited is with time. It comes down to what is fast and easy. Health doesn't always match up with that." This quote demonstrates that, because time is often heavily limited for families, parents feel no other option but to purchase ready-to-eat processed foods or eat out rather than purchase healthier foods that take time to prep and cook. Ms. Buba builds on this convenience trend by stating, "Just the time that it takes to prepare fresh produce also has a big impact, and time is money in essence." Her comment highlights that the time investment required to prepare fresh produce significantly affects food choices. Anne Grantner, who is a single mother, also struggles with finding the time to cook, saying, "Most of the time I'm not cooking because I'm too busy." Her perspective underscores the challenges that single parents face in balancing time and healthy eating. Similarly, Mr. Meder explains, "While we enjoy fast food, we recognize that convenience comes at a cost. Regularly eating fast food is less healthy, so we invest time in preparing better food despite the effort required." His statement reflects the trade-offs families make between convenience and health. The collective perspectives from these participants highlight that time constraints have a major influence on families' food choices, often leading them to opt for more convenient but less healthy options, despite having access to healthier alternatives.

Quality of Food and Emotional Well-Being

When adolescents consume more processed foods, there is a noticeable negative effect on their mood. Conversely, when they consume healthier meals, they tend to exhibit longer-lasting energy and a positive mood. Ms. Grantner claims, "Sugar, the red dye crap, and processed food in general" has a negative impact on her child's health and mood. This correlation is supported by Ms. Alvarez's observations of her son. She notes, "If he eats a lot of junk food, he's very apathetic. He's less likely to want to go do things outside. He will play video games versus, if he has a better meal, he'll go outside and play basketball." This behavior change suggests a potential link between processed food and long-term energy levels. Ms. Herbert, however, observes a slightly different impact on her kids' moods when they eat healthier foods: "It's less about them being energetic, but they're less moody. They have a good disposition. They smile more. You know, they are happier, those sorts of feelings. Just generally good to be

around." This exemplifies an increase in positive mood changes when eating nourishing foods rather than processed options. Mr. Meder also notes that healthier foods affect his children's overall well-being rather than their moods. He states, "They certainly feel and act better when they have more real food. And certainly, when they get more greens, more vegetables, more fruits, you can tell they feel a little bit better. You know, their skin is a little clearer." In contrast, Ms. Buba claims she doesn't observe significant changes in her child's mood based on diet, highlighting the variability in individual responses to food. Despite some variability, the majority of these observations provide insight that there is a strong connection between diet quality and emotional well-being but underscores the need for further research on the impact of processed foods on the gut microbiome and mood in adolescents. This demonstrates the research gap regarding limited health information among adolescents and emphasizes the importance of promoting healthier eating habits.

Affordability and Food Choices

Individuals with lower income levels, especially with the influence of rising food prices, tend to have limited choices when food shopping and often are forced to resort to cheaper, processed options. Ms. Grantner shares, "I can't afford to be healthy" and feels that the increase in food prices seen in organic products is "ridiculous" (Grantner). Her concern expresses the challenge individuals face in balancing affordability and health. Despite the convenience of having a grocery store nearby, the high cost of healthy options remains a significant obstacle. In a similar position, Ms. Alvarez adds, "I've had to become more creative with our meals due to the skyrocketing prices, especially of items like eggs. Even shopping at Costco, I find myself spending $200 on just a few items. The change has been noticeable every time I go to the grocery store." Ms. Alvarez's experience highlights the costliness of grocery shopping. Mr. Meder adds that, while food prices aren't an issue for him and his family, he acknowledges that there have been significant increases in healthier produce over the past few years, and it has affected many people living in his area. He describes the process of constantly making meals for the whole family: "We try to make big meals on weekends that will last several lunches... It's hard. It takes time" (Meder). This perspective demonstrates that, even when affordability isn't a challenge, there have been noticeable increases in food prices, and convenience still serves as a major limiting factor because of the extensive time it takes to prepare and cook healthy meals for a family. Ms. Buba expands on this perspective by explaining that, for her family, increases in prices haven't affected her consumption of processed foods. She reiterates that time is the biggest factor, reporting that "to cook broccoli or brussels sprouts, which I personally enjoy, it takes at least an hour the way that I make it. To actually enjoy it, it takes time. Sometimes you don't have that. It's challenging" (Buba). She emphasizes how people struggle to make time to prepare and enjoy meals, highlighting a crucial aspect often overlooked in public health discourse. To conclude,

affordability and convenience of food choices significantly influence dietary habits, especially among individuals with lower income levels. Even when affordability isn't a primary issue, as Mr. Meder points out, the time required to prepare healthy meals remains a major barrier. Addressing these challenges is essential to support adolescents' gut microbiome health and overall well-being. By understanding and mitigating the financial and time constraints families face, public health initiatives can promote healthier eating habits and reduce health disparities among young people.

Stress and Diet

Stressful experiences and external pressures can alter eating patterns and lead to an increased consumption of processed foods as a coping mechanism. Mr. Meder explains that work stress, especially for adults with families to take care of, could cause temporary diet changes: "Stress at work might make me grab chips because they're easy, but overall, we haven't had many bad instances like that." This demonstrates that common external stressors can alter an individual's mood and cause them to eat based on convenience rather than with positive nutritional intentions. Ms. Herbert agrees with Mr. Meder's experience by claiming that not only does her work stress impact her diet but so do other external pressures: "When I was stressed during the divorce, my diet fell by the wayside—I ate for convenience, which made things more stressful because I wasn't feeling my best" (Herbert). Ms. Herbert's experience offers an example of how major life events, like divorce, can significantly impact eating habits. Unlike Mr. Meder's occasional work stress, these prolonged emotionally taxing situations led to a shift toward convenience foods, creating a cycle of poor eating and feeling worse. Ms. Buba encompasses both of these experiences by explaining that "There are so many factors that can influence stress and diet, like work-life balance and family challenges." Her broad outlook on a variety of stressors and how they can impact an individual's eating habits shows that dietary choices are shaped by a complex interplay of personal, professional, and family-related stressors. This perspective highlights the importance of considering multiple dimensions of stress when addressing dietary behaviors, particularly in efforts to improve adolescent health and bridge gaps in nutrition education. Understanding these factors can lead to more comprehensive public health strategies that account for diverse stress-related influences on diet.

How Informed Individuals Feel about Nutrition

There is a general drive toward being well-informed about food health, though confidence levels vary. While some participants are proactive and confident in their nutritional knowledge, others remain skeptical or frustrated by the complexity and sometimes misleading nature of food marketing. Ms. Grantner shares, "Sometimes I feel lied to... It's up to us to do our own research," while Mr. Meder relays, "I think I'm pretty informed as far as animal welfare and how foods impact your body and long-term health. I did a deep dive over the years on these topics." The uncertainty contrasted with

the confidence about food health and ethics shows the varying perspectives despite these individuals living in similar communities. Additionally, Ms Buba claims to be "part of a couple of programs for health and wellness." Overall, there seems to be an agreement among respondents that advocating for oneself is necessary, elucidating that the facts are not always clear and it is important to self-educate on health and nutrition. Ms. Herbert adds, "I feel somewhat informed, but there's still so much I don't fully understand, like organic definitions, plant-based health and environmental impacts, and the inconsistency of labels. It affects what I buy, even though I try to shop locally and read labels when I can." Her experience highlights that there is nuance in the trendy and marketing health phrases like "organic" and "plant-based," making it challenging for individuals to select foods that are healthy for their children. Ms Alvarez amplifies this idea:

> "You definitely have to be more proactive in looking at things. As with anything, the facts won't really be in your face. It's a twofold kind of responsibility. I think it's the responsibility of the companies that are selling you items for them to make them more available to you, but it's also on the consumer's end in which we should be responsible enough to look at things and make better judgment about what we're putting in our bodies." (Alvarez)

This understanding demonstrates the responsibility of individuals to do their own research and the producers to ensure transparency and accessibility in the foods that they sell. To conclude, to bridge the gap in nutritional knowledge, it is crucial to make health information clearer and more accessible while encouraging individuals to take responsibility for staying informed about nutrition.

Limitations

Due to my small sample size, I wasn't able to identify any significant links between diet and disease, as the data was limited in scope and variation. Furthermore, my interviewees were all similar in demographic groups, and I was unable to interview large sample sizes from different income groups. Therefore, it was difficult to prove a link between lower income levels and increased processed food consumption. Another challenge was that all of my participants lived in close proximity to grocery stores with plentiful supplies of healthier options. As a result, I wasn't able to observe the effect of a lack of grocery stores or other sources of fresh produce on the diet and health of families. Additionally, mood changes in kids may not be accurate because they are purely observational and can be influenced by observational bias. External influences such as school, friends, or other life events, could also play a role in affecting the mood of children, complicating the interpretation of results. This study did not control for these external factors, which limits the reliability of the findings related to mood changes.

Solutions and Recommendations

One method to address the extensive time it can take to prepare and cook healthier options is by promoting information on how to meal prep under a budget. This can be done through free virtual information sessions and social media posts that teach parents how to continue providing nutritious meals without spending too much time and money. These changes will help support healthy diets among adolescents, but they depend on the willingness of individuals to take time out of their day and some individuals simply don't have the time to do so. It is also challenging to fund a free service like a parent information session or promote social media and distribute it equally to everyone.

Government intervention is a method to address the concern of food insecurity. Ashkan Afshin, a Professor in the Department of Nutrition at Harvard School of Public Health, argues that lobbying for subsidies on fruits, vegetables, and whole grains could lower prices, making these foods more accessible to low-income families (2013). Additionally, incentivizing food manufacturers to decrease the level of processing in their products could lead to healthier consumption patterns among all income groups. (Rao et al., 2013). Increasing the availability and affordability of healthier options may help to reduce poor gut health among adolescents and its adverse effects. Furthermore, requiring food corporations to make their food labeling clearer to emphasize their true health impact and effect on gut health can help ensure product transparency and inform consumers what foods best fit their needs. However, requiring companies to implement strict labeling, reduce processing levels, and implementing government subsidies on nutritious foods is no easy feat and will likely require extensive government lobbying which may face pushback from food corporations.

Another way to mitigate obesity and poor gut health is through advancements in food design, which aim to make affordable, nutrient-dense foods that support the microbiome. Professor of Microbiology Danilo Ercolini and food scientist Vincenzo Fogliano at the University of Naples explain that food scientists can alter and increase nutrient content in foods to help restore microbiome health (2018). In addition, increasing the supply of affordable probiotic foods, such as yogurt, helps to support gut health by promoting beneficial bacteria (Ercolini & Fogliano, 2018). Professor of Nutritional Biochemistry El-Sohaimy explains that fermented milk products and plant-based alternatives, which include strains of Lactobacillus rhamnosus and Bifidobacteria, have been increasingly shown to boost gut health and provide additional benefits like immune system support (El-Sohaimy, 2023). This dietary approach could be implemented in not only communities that lack access to inexpensive, probiotic-rich and nutrient-rich foods, but in all communities to help lessen the harmful effects of a diet that consists largely of processed foods. While food products with enhanced nutrient and probiotic content are already on the market, expanding these innovative products could be an effective long-term solution to help families

have access to food that promotes healthy gut microbiota. However, implementing these foods on a scale large enough for them to be effective may take many years. Moreover, some of these enhanced food products may temporarily become more expensive than traditional, less nutritious foods because they aren't being mass-produced initially, which may lead to further economic disparities.

Conclusion

This study examined the extent to which processed food consumption impacts the gut microbiome in adolescents from low and middle-income communities. Interview data largely supported the hypothesis that these adolescents are exposed to processed foods due to factors such as affordability, time constraints, and limited access to nutritious options. Participants consistently reported that processed foods negatively affected mood and behavior, suggesting a link between diet quality and adolescent emotional well-being.

These findings strengthen growing evidence that processed food consumption contributes to gut dysbiosis and may influence both physical and cognitive development during adolescence. While the sample size and demographic range of this study were limited, the patterns suggest a need for strategic interventions, including public health education, food policy reform, and innovation in food design.

Addressing these issues is urgent. Middle-income families—who make up nearly half the U.S. population—are increasingly affected by the same barriers once associated mainly with low-income communities. Processed foods now dominate the American diet across all socioeconomic lines, putting adolescent health at risk nationwide.

The early years of the microbiome where the microbiome is developing from virtually zero to what will become the adult microbiome is a particularly vulnerable period, and it is likely that insults to the microbiome during this time may set the groundwork for disease later in life. The importance of maintaining a diverse gut microbiome throughout adolescence cannot be understated. Dr. Greaves-Peters shares deep concern about the fact that ultra-processed foods make up 60% of people's diet in the US (N. Greaves-Peters, personal communication, December 5, 2024). If we are to build a healthier future where every child can thrive, we must focus on addressing families from all income groups to reduce processed food consumption and promote healthy gut microbiota and overall well-being. The state of our guts reflect the state of our society – and right now they are both in need of healing.

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