



Literature Review: Physical Activity, Diet, and Socioeconomics on Obesity in Elementary Schools

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Abstract

The global obesity rate has doubled since 1980, leading to widespread health concerns. This study analyzes the relationships between physical activity, dietary patterns, and socioeconomic status on obesity in elementary school children. Based on a review of 11 national and international articles published between 2016 and 2020, the study finds that factors contributing to childhood obesity include sedentary behavior, poor dietary habits, genetic predisposition, and environmental influences. Results suggest a strong correlation between reduced physical activity and increased obesity risk, along with a connection between unhealthy dietary patterns and the prevalence of obesity. Additionally, the study highlights the influence of socioeconomic factors on dietary choices, particularly in the context of the availability and affordability of fast food. These findings emphasize the need for comprehensive interventions and awareness campaigns to promote healthy lifestyles and prevent childhood obesity.

Keywords: Physical Activity, Diet, Socioeconomics, Obesity, Literature Review

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A. Introduction

Since 1980, the global obesity rate has doubled. In 2014, it was reported that 1.9 billion adults were overweight, with 600 million of them suffering from obesity. Additionally, 41 million children under the age of 5 were affected by obesity (Surya, 2017). According to WHO data, the highest obesity rates were found in the Americas, while the lowest were in Southeast Asia. Obesity has become an epidemiological issue worldwide, including in Indonesia. Based on the data from WHO in 2016, 28% of the population was found to be obese. With these figures, it's evident that obesity doesn't discriminate based on age.

Obesity is a condition caused by the excessive accumulation of fat in the body (Ariani & AF, 2017). An individual is diagnosed with obesity if they have at least 20%-30% more body weight than the normal weight for their specific height (Walsh et al., 2018). According to (Sigmund et al., 2018), obesity is considered a contributing factor to ailments such as hypertension, coronary heart disease, diabetes mellitus, and respiratory issues. Khomsan's book even asserts that obesity is inversely correlated with longevity. Similarly, as per WHO data, obesity is deemed a primary cause of chronic diseases, second only to smoking. Obesity is a disease influenced by a

sedentary lifestyle, characterized by excessive food intake and minimal energy expenditure, resulting in an imbalance. Consequently, obesity can lead to an increased susceptibility to other chronic ailments.

Due to the fact that obesity is a disease resulting from an imbalance between energy intake and expenditure, there are two logical solutions that can help address this issue. One of them involves adopting a healthy and balanced diet, along with increasing daily physical activity and regularly engaging in exercise (Ariani & AF, 2017). Dietary patterns are considered one of the ways to tackle obesity. According to (Abdullah et al., 2022), dietary patterns refer to the quantity and types of food consumed per day. (Anderson et al., 2017) defines dietary patterns as the selection of various food items, encompassing a range of nutritional content. Physical activity stands as a viable solution to address obesity, as body movements involving skeletal muscles lead to increased energy expenditure (Eisenmann et al., 2020). Physical activity refers to energy-demanding activities such as walking, running, exercising, and more (Nuranisa & Siagian, 2020; Sinulingga et al., 2023). Another perspective defines physical activity as any bodily movement involving skeletal muscles that results in increased energy expenditure, according to

(Pasaribu, 2021). Based on these theories, it is appropriate to consider physical activity as one of the solutions to address the global issue of obesity.

Individual engagement in physical activity is influenced by various factors. The unavailability of adequate facilities and infrastructure diminishes individuals' motivation to engage in physical activity (An et al., 2019). Additionally, media influence impacts children's physical activity. Spending excessive time in front of screens and playing video games can cause children to lose track of time, leading them to engage in sedentary behavior for hours (Turel et al., 2017). Encouraging physical activity in obese children cannot solely rely on the children's active participation; the lifestyle of the mother also influences the pattern of the child's physical activity (Sigmund et al., 2018). Even with the regulation of diet and physical activity, resolving the issue of obesity may not be sufficient if an individual experiences mental or emotional stress due to socioeconomic and environmental factors.

Based on the presentation of facts concerning the global obesity issue, the author deems it necessary to provide an exposition of data analysis results that demonstrate the effectiveness of dietary patterns and physical activity as viable

solutions for this obesity problem. These analytical findings can serve as a foundation for thought and reference for individuals suffering from obesity, and can even be utilized as a guide to prevent obesity from occurring.

(Ishak et al., 2019) demonstrates a correlation between dietary patterns and physical activity with childhood obesity. However, the parents' economic status does not seem to have any influence on childhood obesity whatsoever. (Hong et al., 2016) obtained data from 1,640 children aged 3-15 years. Physical activity was negatively associated with a 95% obesity risk, indicating that physical activity significantly influences obesity occurrence. Although obese and overweight children are more likely to have functional limitations, their participation in physical activities does not significantly differ from that of the healthy-weight group. Based on these findings, it can be concluded that physical activity plays a role in reducing the risk of obesity. Children experiencing obesity have functional limitations compared to those with a healthy weight, yet both groups enjoy physical activities equally.

Rokhman's study (2018:13) revealed that various factors, such as fat intake, energy intake, meal frequency, food types, and physical activity, influence obesity

among students at Banjar Public Elementary School 3. Among these factors, fat intake was identified as the primary cause of obesity. Meanwhile, genetic factors had no influence on the occurrence of obesity in Banjar Public Elementary School 3. (Ishak et al., 2019) concluded that the results of the study were similar to several other similar studies conducted by different researchers. The study suggests that school- or community-based physical activity and diet interventions are effective methods in treating obesity or overweight issues in children.

In the research by (Suryadinata & Sukarno, 2019), it was found that the physical activity of obese adults was classified as low (59.8%), whereas the majority of non-obese adults engaged in moderate-intensity physical activity. This indicates a difference in the intensity of physical activity between the obese and non-obese adult groups, leading to the conclusion that reduced physical activity can increase the risk of obesity in adults. (Brown et al., 2019) stated that strategies for managing dietary patterns and physical activity are effective ways to prevent obesity in children. According to (Alam et al., 2020), short playtime, excessive TV-watching duration, and excessive consumption of fast food are the main risk factors for obesity among adolescents and

children in Dhaka city, necessitating interventions for obesity sufferers in Dhaka city.

Given the aforementioned background, the author is interested in conducting a literature review study focusing on the relationship or influence of "Physical Activity, Dietary Patterns, and Socioeconomic Status on Obesity."

B. Methods

This article review is based on secondary data sources. The secondary data refers to the findings of research on the relationship between physical activity and dietary patterns and obesity, which have been published as articles. For this article review, the author utilized articles published within the last five years, from 2016 to 2020. The author collected articles concerning physical activity and dietary patterns in relation to obesity through a search conducted on Google Scholar, ERIC Journal, NCBI Journal, and Wiley Online Library.

The online search was conducted to identify articles relevant to the title of this article review. To determine the keywords, the author employed the PICO/PECO method, which stands for:

P = Population/ Patient

I/E = Intervention/ Exposure

C = Comparison/ Control/ Alternative

O = Outcome/ Health risk

The following are the keywords used by the author to find relevant articles based on the PICO procedure.

Table 1. Article Search Keywords

<i>Population</i>	<i>Student of Elementary School</i>
<i>Intervention</i>	<i>(Physical Activity, Diet, Socioeconomic)</i>
<i>Outcome</i>	<i>Obesity</i>

In this article review, the author utilized articles published within the last five years, specifically those released between 2016 and 2020. The articles were chosen based on a consistent data collection method. The focus of this article review was on research articles utilizing a correlational research method, with primary subjects being elementary school students or children aged 7-12 years. The selected articles employed measurement instruments such as BMI, physical activity, questionnaires, interviews, and food recall. These articles were sourced from journals indexed in SINTA S1-S6 for national journals or Scimago Q1-Q4 for international journals. The author underwent a series of steps in the filtration process to determine suitable articles for review. This process involved the use of specific keywords in the search and the application of specific criteria for evaluating the articles.

During the national article eligibility filtration process, the author conducted an initial search using Google Scholar and Mendeley databases, yielding 338 articles.

After identifying duplicate documents and filtering based on the year, 40 articles were deemed eligible. Further exclusion based on variables and abstracts resulted in 8 articles that met the data inclusion criteria.

Simultaneously, in the international article eligibility filtration process, the author used databases such as ERIC Journal, Wiley Online Library, and NCBI Journal, resulting in a total of 2620 articles. After identifying duplicate documents and filtering based on the year, variables, abstracts, and credibility of journal publications, 3 articles met the data inclusion criteria.

Consequently, through the conducted filtration process, the author successfully identified a total of 11 articles suitable for review, comprising 8 articles from national sources and 3 articles from international sources, based on the predetermined criteria.

C. Result and Discussion

Result

Based on article analysis, 8 national

articles and 3 international articles were articles are as follow:
 obtained for review. The 8 national journal

Tabel 1. Literature Review Results

Title	Author & Year	Subject	Result
Relationship between Physical Activity and Body Mass Index (BMI) of Malang City Elementary School Students	Nia Lukita Ariani & Swaidatul Masluhiya AF (2017)	Students in grades 4-6 of SD Sriwedari Malang and SDN Klojen Malang	Most of the students had higher physical activity than their energy intake. Statistical tests showed no relationship between nutrient intake and BMI while there was a moderately strong relationship between physical activity and BMI.
The Relationship of Diet, Media Exposure and Heredity to Overweight Elementary School Students	Syamsopyan Ishak, Herman and Hatta dan Anto in J. Hadi (2019)	All students in grades 1 to 6 who are registered and active at Rama Integrated Islamic Elementary School Makassar City.	The study found that diet is associated with overweight elementary school students, and media exposure is associated with overweight elementary school students and heredity is associated with overweight elementary school students.
Consumption patterns of school snacks can increase the risk of overweight / obesity in children	Aulia Jauharun Nisak dan Trias Mahmudiono (2017)	All students in grades III, IV and V of SD Negeri Ploso I-172 Tambaksari Surabaya District in the 2016/2017 school year.	The study found that there is a relationship between the consumption pattern of snacks and the incidence of overweight/obesity in school children. Children who consume snacks in daily frequency are more at risk of overweight/obesity than children who consume snacks in weekly/monthly frequency.
Relationship between Physical Activity and Obesity in Children of State Elementary School 1 Bengkulu 2017	Nuranisa dan Albiner Siagian (2020)	Fifth and sixth grade students of Sekolah Dasar Negeri 1 Bengkulu Kabupaten Bengkulu 2017	The study found that there was a relationship between physical activity and obesity in State Elementary School Children 1 Bengkulu in 2017.
Fast Food Consumption Patterns, Physical Activity and Hereditary Factors on the Incidence of Obesity (Case Study on Students of SD Negeri 01 Tonjong, Tonjong District, Brebes Regency)	Riswanti Septiani dan Bambang Budi Raharjo (2017)	Students of SD Negeri 01 Tonjong who are in grades IV, V and VI.	The study found that there is a significant relationship between fast food consumption patterns and obesity, there is a relationship between physical activity and the incidence of obesity and there is a relationship between heredity and the incidence of obesity.
Factors Associated with the Incidence of Obesity in Children at State Elementary School 54 Banda Aceh	Ruri Widyasari dan Chalida Aulia Putri (2018)	Fourth and fifth grade students at SDN 54 Banda Aceh	The study found that there was a relationship between fiber intake, fast food consumption habits, physical activity and sleep duration with the incidence of obesity in children at SDN 54 Banda Aceh.
Relationship between Dietary Behavior and the Incidence of Childhood Obesity	Ifni Wilda dan Desmariyenti (2020)	All students in SD Negeri 42 Pekanbaru 2019	The study found that there was a relationship between diet and the incidence of obese children at SD Negeri 42 Pekanbaru.
Relationship between Socioeconomic Status and Lifestyle with the Incidence of Obesity in Students of SD Negeri 08 Alang	Cici Octari dan Nur Indrawaty Liputo (2018)	All students in grades I to V at SD N 08 Alang Lawas, Padang	The study found that there was a significant relationship between the incidence of obesity in children with physical activity and there was no significant relationship with the level of education of the father and mother, the level of income of the parents, and diet.

Title	Author & Year	Subject	Result
Lawas Padang			
The Effect of Body Mass Index on Physical Activity Level in Children between 10- 11 Years of Age	Gokmen Kilincarslan (2019)	Students studying and teaching in Gazi Primary School in Yenimahalle district. The study included 271 students between 10-11 years of age and their PA levels are generally active. 11 who voluntarily participated.	There was a significant difference between the two groups. There was found to be negatively correlation with PA whereas a significant correlation was found between BMI level. A significant correlation was found between BMI and PA level. As a result, it can be said that the body mass indexes of children between 10-11 years of age are in good level and their PA levels are generally active.
Relationship Between Physical Activity and Overweight Obesity in Children: Findings From the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survei	Hong, I., Coker-Bolt, P., and Anderson, K. R., Lee, D., & Velozo, C. A.(2016)	Children ages 3–15 years.	Physical activity was negatively associated with risk of obesity (odds ratio [OR] 5 0.93; 95% confidence interval [CI] [0.87, 0.98]). Although children who were obese and overweight were more likely to have functional limitations (ORs 5 1.58–1.61), their enjoyment of physical activity participation was not significantly different from that of the healthy-weight group.
Physical activity and obesity in children	Andrew P Hills, Lars Bo Andersen, Nuala M Byrne (2017)	Children ages 9–15 years.	Without appropriate activity engagement there is an increased likelihood that children will live less healthy lives than their parents. Owing to the high risk of overweight adolescents becoming obese adults, the engagement of children and adolescents in physical activity and sport is a fundamental goal of obesity prevention.

Source: research processing data

Discussion

Based on the problem formulation regarding the relationship between physical activity, dietary patterns, and socioeconomic status in relation to obesity, the following is a presentation of the relationships between these variables from the 12 aforementioned articles.

Obesity is a condition of excess body weight caused by fat accumulation, which can potentially lead to other chronic diseases and complications. Reviewing 8 national and 3 international articles, several factors affecting obesity in elementary school children have been identified.

According to the research by (Ishak et al., 2019), the causes of overweight and obesity in children include excessive consumption of processed instant foods, soft drinks, and fast food snacks. A person's level of nutritional knowledge influences their attitude and behavior in food selection, ultimately affecting their nutritional status. Higher nutritional knowledge is expected to correlate with better nutritional status. Low physical activity in children often leads to irregular eating patterns, increasing the risk of obesity compared to children with lower media activity. Additionally, genetic factors play a significant role in overweight

and obesity. Children with both obese parents have an 80% risk of obesity, while the risk is 40% if only one parent is obese, and 7% if both parents have a lean physique.

(Ariani & AF, 2017) reveals that socioeconomic factors, demographics, residential location, lifestyle, nutrient intake, and eating habits are among the causes of obesity in children. They also note the interrelated nature of obesity risk factors. Most elementary school students have a normal BMI due to higher physical activity compared to energy intake. This study emphasizes the influence of physical activity on BMI and the constraints of time allocation for physical activity in a child's daily routine, providing essential insights into the factors contributing to obesity.

Similarly, (Nisak & Mahmudiono, 2017) suggest that obesity in schoolchildren results from incorrect dietary consumption, such as a preference for high-fat and high-sugar snacks, as well as excessive energy and fat intake combined with inadequate physical activity. This aligns with Nuranisa and (Nuranisa & Siagian, 2020), which asserts that children's physical activity can influence the occurrence of obesity. Formerly, children engaged in physical games that required running, jumping, or other movements, but these have been replaced by sedentary electronic games, computers, the internet, and television.

(Septiani & Raharjo, 2018) indicates that the causes of obesity are influenced by environmental and genetic factors, wherein parents with a history of obesity are more likely to have obese children. Their findings suggest that frequent consumption of fast food can lead to obesity during growth. Moreover, the suboptimal energy expenditure for health due to activities such as gadget use and prolonged television watching contributes to this trend.

(Wilda & Desmariyenti, 2020) suggests genetic factors, health factors, psychological factors, lack of exercise, environmental factors, and dietary patterns as contributors to obesity. Overeating, consuming high-energy, high-fat, high-carbohydrate foods, and low-fiber diets, as well as the habit of choosing packaged foods and soft drinks, contribute to obesity. (An et al., 2019) states that physical inactivity, frequent consumption of fast food, prolonged television and computer usage, and consuming high-calorie foods over a period can be critical factors influencing overweight and fat in children. This statement is supported by (Eisenmann et al., 2020), which highlights the complex interaction between diet, physical activity, metabolism, and genetics complicating obesity. Environmental factors that promote high-energy food consumption and hinder energy expenditure are also implicated as causes of obesity. Overall, the

review of both national and international articles suggests that factors influencing obesity in elementary school children include physical activity, dietary consumption, socioeconomic status, genetics, environment, and lifestyle.

Physical activity involves any bodily movement that engages skeletal muscles and results in energy expenditure. Individuals can adjust the intensity of their physical activity according to their body's capabilities, ranging from low to moderate to high intensity. (Ariani & AF, 2017) demonstrates children with obesity tend to be less active compared to those with a normal BMI. Physical activity is known to play a role in body fat distribution by utilizing fat from the abdominal area, leading to the redistribution of adipose tissue. Inadequate physical activity contributes to the accumulation of body fat, leading to obesity in children.

Similar findings are highlighted in the research by (Nuranisa & Siagian, 2020), which asserts a statistical correlation between physical activity and obesity. In this study, children are driven to and from school by their parents, spending their time at home engaged in sedentary activities such as resting, watching TV, and religious practices, with minimal physical activity, including only one hour of sports activities weekly during school time. This

demonstrates the low level of physical activity among elementary school children.

Furthermore, the study conducted by (Septiani & Raharjo, 2018) indicates a significant correlation between physical activity and the occurrence of obesity. Obese children spend 2.7 more hours engaged in light activities compared to children with normal weight, while for moderate activities, children with normal weight spend more time (1.0 hour) than obese children (0.5 hours). Additionally, during school days, physical activities (exercise) are only conducted at school during physical education classes (0.9 hours). This study suggests that increased engagement in light activities correlates with increased body weight, as light activities expend less energy compared to moderate and intense activities.

(Widyasari & Putri, 2018) reports a implying a relationship between physical activity and obesity among children at SDN 54 Banda Aceh in 2018. Obesity in children is attributed to excessive food intake and low physical activity, resulting in a lack of energy expenditure in the body.

Similarly, Kilincarslan's study (2019) reveals a significant negative correlation between Body Mass Index and the level of physical activity ($r=0.817$) with $p < 0.01$. This indicates that as the Body Mass Index of children increases, their level of physical

activity decreases. Consistent with these findings, (Hong et al., 2016) demonstrate a negative association between physical activity and the risk of obesity (odds ratio [OR] 5 0.93; 95% confidence interval). These results conclude that physical activity influences the reduction of obesity risk. Research by (Alam et al., 2020) also suggests that children and adolescents with higher levels of physical activity have lower body fat levels compared to their less active counterparts, with most children and adolescents not meeting the recommended physical activity guidelines.

Based on the above explanations, there is a correlation between physical activity and obesity in elementary school children. Physical activity can lead to increased energy expenditure or body metabolism (Walsh et al., 2018). With a faster metabolism, more calories are burned, resulting in weight loss. Adequate physical activity can reduce the storage of fat in adipose tissue, while insufficient physical activity leads to the accumulation of excess energy as fat, thereby contributing to obesity.

Dietary patterns involve the process of individuals selecting the types, components, and frequency of food necessary for the body, tailored to daily energy expenditure. Based on the research conducted by (Ishak et al., 2019) excessive dietary patterns can contribute to

overweight and obesity. The circulation of high-fat, oil, and carbohydrate-rich foods without balanced physical activity can result in fat accumulation.

Similarly, the findings of Nisak and Mahmudiono's study (2017) indicate a significant correlation between the consumption of snack foods, including biscuits, fruit syrups, chocolate, sweetened condensed milk, fried foods, processed fish cakes and sausages, snack bars, and sugar, with the occurrence of overweight/obesity in school children. Children who have snacking habits are at a 7 times higher risk of experiencing overweight/obesity compared to those who do not have such habits. A well-balanced dietary consumption has a positive impact on an individual's health, aiding in the prevention or treatment of diseases. However, poor dietary consumption, such as the consumption of high-calorie, high-fat, and high-sugar snack foods, often referred to as energy-dense, can contribute to the occurrence of overweight/obesity. Similar research conducted by (Septiani & Raharjo, 2018) demonstrates a significant association between fast food consumption and obesity with a p-value of 0.036. The study indicates that obese children (69.4%) consume fast food more than twice a week, while normal-weight children (50.0%) consume it 1-2 times a week. Since many fast foods are high in calories, excessive

consumption can lead to obesity issues.

Furthermore, (Widyasari & Putri, 2018) also reveals similar findings, with a statistically significant p-value of $0.013 < 0.05$. Consequently, H_0 is rejected, and H_a is accepted, indicating a relationship between fast food consumption habits and the occurrence of obesity among children at SDN 54 Banda Aceh in 2018. The prevalence of clinically obese children and the school's proximity to shopping centers and fast-food restaurants, along with the availability of fast food items in the school canteen, make it easier for children to consume such food. Research by (Wilda & Desmariyenti, 2020) also reveals a relationship between dietary patterns and the occurrence of obesity in children, with a p-value of $0.000 < \alpha (0.05)$. Obesity, in terms of health, is considered one of the most critical nutrition-related disorders, resulting from food consumption far exceeding the body's requirements.

Based on the above explanations, there is a correlation between dietary patterns and obesity in elementary school children. Obesity occurs due to higher energy intake compared to energy expenditure. High energy intake is a result of consuming high-energy and high-fat food sources. Therefore, assessing food consumption is crucial, not only to prevent obesity but also to determine an individual's nutritional

status. Through food consumption assessment, deficiencies or excesses of specific nutrients in an individual can be detected. Poor dietary patterns, such as the habit of consuming fast food, which tends to be high in fat, protein, and carbohydrates, can lead to obesity in children. To determine one's dietary pattern, individuals must understand what their bodies require and adjust it to their physical activity to burn excess energy in the body, preventing it from being stored as fat and leading to overweight or obesity.

Socioeconomic status refers to an individual's position in society, determined by the type of economic activity and income. According to the findings of the research conducted by (Nuranisa & Siagian, 2020), the parents' income level does not affect the occurrence of obesity in children. This is because obesity occurs across all socioeconomic levels.

According to (Sokolovskaya et al., 2020), socioeconomic factors influence food purchasing power and nutritional intake. Improvements in living standards drive towards a more modern lifestyle. This shift is accompanied by an increase in the purchasing power of the community and the consumption patterns of children. This development has contributed to the proliferation of fast-food restaurants and the increasing variety of snacks available in

elementary schools. The perception that consuming these foods elevates one's social status to that of a modern society has led to an increase in their consumption. Coupled with the growing accessibility of fast food or junk food at affordable prices for the public, these factors contribute to the increasing prevalence of obesity in children.

On the other hand, individuals with low and moderate socioeconomic status do not pay much attention to the food they consume. They tend to eat foods that fill their stomachs without considering whether the food is healthy, as long as it is affordable and satiating. However, poor dietary intake, such as the habit of consuming foods that are high in fat, protein, and carbohydrates, can lead to obesity in children. According to (Hita, 2020), in developed countries, obesity is often found in communities with low socioeconomic status, whereas in developing countries, obesity is more prevalent in communities with higher socioeconomic status.

D. Conclusion

The results of the literature review on the effects of physical activity, dietary patterns, and socioeconomic status on obesity in elementary school-aged children indicate several key findings. First, there are various factors that influence the occurrence of

obesity in this group, including physical activity, consumption patterns, socioeconomic factors, genetic factors, environment, and lifestyle. Furthermore, the research shows a relationship between physical activity and obesity, where lower levels of physical activity in children are associated with a higher likelihood of obesity. Conversely, there is a positive correlation between dietary patterns and obesity, indicating that higher consumption or quantity of food consumed is associated with an increased risk of obesity in elementary school-aged children. However, the research also indicates that there is no significant relationship between socioeconomic factors and the occurrence of obesity in this group. Although socioeconomic factors can influence dietary patterns and nutritional intake, field observations show that obesity occurs across all socioeconomic strata. In developed countries, obesity tends to be found among individuals with lower socioeconomic status, while in developing countries, the prevalence of obesity is higher among those with higher socioeconomic status. Thus, the conclusion of this review underscores the importance of understanding the role of these factors in designing effective intervention and prevention programs for obesity in elementary school-aged children. The significance of this review underscores the

importance of understanding the roles of these factors in designing effective intervention and prevention programs for obesity in elementary school-aged children. Recommendations involve promoting physical activity in schools, educating about healthy lifestyles, conducting further research to comprehend the complex dynamics among these factors, and designing targeted interventions in accordance with specific socioeconomic contexts.

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F. Conflict of Interest

No conflict of interest.

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