

## Nationwide Study

# Overweight Risk Factors Among Adolescents in Indonesia Based on Economic Level Disparities: A Nationwide Study

Purwo Setiyo Nugroho<sup>1</sup>, Ayu Khoirotul Umaroh<sup>2</sup>, Faron Hattapradit<sup>3</sup>

<sup>1</sup>Faculty of Public Health, Universitas Muhammadiyah Kalimantan Timur, Indonesia

<sup>2</sup>Department of Public Health, Universitas Muhammadiyah Surakarta, Indonesia

<sup>3</sup>Sirindhorn College of Public Health, Trang Province, Faculty of Public Health and Allied Health Sciences, Praboromarajchanok Institute, Thailand

## ABSTRACT

**Introduction:** *Overweight among adolescents in Indonesia is a growing public health issue, influenced by socioeconomic and lifestyle factors. Urbanization and economic disparities have contributed to increased consumption of calorie-dense foods and sedentary behaviors, particularly among adolescents from higher-income families. However, the role of economic status in shaping overweight risk remains underexplored.*

**Objective:** *Examining socioeconomic disparities may influence the determinants of overweight in this population*

**Method:** *This cross-sectional study utilized secondary data from the Global School-based Student Health Survey (GSHS), encompassing 9,977 Indonesian students aged 11–18. The analysis included descriptive statistics, bivariate tests, and binary logistic regression to identify associations between behavioral, demographic, and socioeconomic variables and overweight status. The analysis was stratified by economic level, using hunger frequency as a proxy indicator.*

**Result:** *Overall, 14.7% of adolescents were overweight. Sedentary behavior was significantly associated with overweight in both low and high economic groups. Among adolescents from higher economic backgrounds, junior high school students had a higher risk of being overweight compared to senior high school students. In contrast, no significant associations were found between overweight and other behavioral factors in the low economic group, except for sedentary habits.*

**Conclusion:** *Sedentary behavior is a key risk factor for adolescent overweight across economic strata, while school level influences overweight risk in wealthier adolescents. These findings highlight the need for targeted interventions that address lifestyle behaviors and consider socioeconomic disparities to effectively combat adolescent overweight in Indonesia.*

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## CONTACT



Purwo Setiyo Nugroho

[purwo.skm@umkt.ac.id](mailto:purwo.skm@umkt.ac.id)

Department of Public Health,  
Faculty of Public Health,  
Universitas Muhammadiyah  
Kalimantan Timur, Samarinda,  
Indonesia

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## INTRODUCTION

The prevalence of overweight among adolescents in Indonesia is an escalating public health concern, driven by a complex interplay of lifestyle, socioeconomic, and demographic factors. Recent observational studies highlight that urbanization significantly correlates with increased rates of overweight in adolescents. For instance, a nation-wide survey indicated that adolescents residing in urban areas are more likely to consume fast foods and engage in less physical activity compared to their rural counterparts, a trend observed in various low- and middle-income countries (LMICs) (Amrita et al., 2021; Hanandita & Tampubolon, 2015; Maehara et al., 2019).

Specifically, the overweight prevalence among Indonesian adolescents has shown considerable variation. A study conducted in East Java reported that 11.4% of adolescent girls aged 16-18 were overweight, while a more recent analysis suggests the prevalence among late teens could be as high as 16.5%, particularly influenced by urban lifestyles (Adams et al., 2019; Pradigdo et al., 2023; Sholichah et al., 2020). Moreover, sex-specific differences have been noted; studies reveal that overweight prevalence is generally higher among adolescent females than males, a trend consistent with findings in the adult population as well (Oddo et al., 2019; Sarintohe et al., 2022).

The relationship between economic status and overweight prevalence in adolescents has garnered increasing attention, particularly in the context of Indonesia, where rapid economic changes have influenced dietary habits and lifestyle choices. Research indicates that higher household wealth significantly increases the likelihood of being overweight among adolescents, as seen in a study where the odds ratio for being overweight associated with higher economic status was found to be 1.93 (95% CI: 1.27–2.97) (Maehara et al., 2019). This trend suggests that families with greater resources may afford more calorie-dense foods and engage less in physical activity, ultimately contributing to a higher incidence of overweight among their children (Niswah et al., 2021).

Moreover, socio-economic factors play a significant role in the nutritional status of adolescents, illustrated by a study that assessed dietary and exercise behaviors in relation to body image perceptions. This research found that adolescents from higher social strata often had access to more unhealthy food options and subsequently exhibited a higher prevalence of overweight (Niswah et al., 2021). Furthermore, the complexities of malnutrition are evident, as many adolescents in economically stable households encounter a dual burden, facing both undernutrition and obesity—a phenomenon termed the triple burden of malnutrition, which characterizes the nutritional challenges present in Indonesian youth (Maria & Evagelia, 2009; Rah et al., 2021).

Numerous previous studies have explored the significant risk factors associated with overweight status among adolescents (Di Cesare et al., 2019; Duncan et al., 2011; Gong et al., 2020; Piryani et al., 2016). However, the majority of this research has not sufficiently accounted for variations in socioeconomic status, particularly economic level. As a result, the differential risk of overweight across economic strata remains underexplored, presenting a notable gap in the existing literature. Addressing this gap, the present study aims to investigate and compare the key risk factors contributing to overweight among Indonesian adolescents, with a specific focus on contrasting those from lower versus higher economic backgrounds. By stratifying the analysis based on economic level, this study seeks to provide a more nuanced understanding of how socioeconomic disparities may influence the determinants of overweight in this population.

## METHOD

### Study design

This cross-sectional study employed secondary data derived from the Global School-based Student Health Survey (GSHS), a collaborative initiative between the Indonesian Ministry of Health and the World Health Organization (WHO). The GSHS is designed to assess behavioral risk factors that contribute to health challenges among adolescents. Data were collected from a representative sample of 75 junior and senior high schools located across Sumatra, Java, and other Indonesian provinces.

Given the analytical constraints inherent in secondary data—particularly those involving large-scale international datasets such as those provided by the GSHS and WHO—drawing causal inferences requires a rigorous methodological framework. Researchers must first thoroughly understand the dataset's structure, design, and variable definitions, while accounting for possible confounding, mediating, and moderating variables. The use of a theory-driven approach, grounded in existing empirical literature, is essential to hypothesize plausible causal pathways. To address the limitations associated with self-reported measures, such as response bias, contextual factors including cultural norms specific to Indonesia were incorporated into the interpretation of results to enhance their validity and contextual relevance.

Data collection utilized a self-administered, anonymized questionnaire, and sampling followed a standardized two-stage cluster design at both the school and classroom levels. The GSHS methodology adheres to international standards, and previous validation studies have confirmed its acceptable levels of reliability and validity. The initial dataset included responses from 11,142 students aged 11 to 18 years. Following the exclusion of 1,809 cases due to incomplete data, the final analytical sample comprised 9,977 students. The dataset is publicly accessible via the WHO microdata repository at: <https://extranet.who.int/ncdsmicrodata/index.php/catalog/489>. While self-reporting is inherently vulnerable to bias, the robustness of the findings is supported by the high response rate of 94% achieved in the Indonesian GSHS.

### Variables

Variables	Question	Categorical
Sex	What is your sex?	0 = Male 1 = Female
School level	In what grade are you?	0 = Junior high school 1 = Senior high school
Economic level (proxy from feeling hunger)	Percentage of students who most of the time or always went hungry (because there was not enough food in their home during the 30 days before the survey)	0 = Low 1 = High
Eating fruit	Percentage of students who did not eat fruit (during the 30 days before the survey)	0 = No 1 = Yes

Variables	Question	Categorical
Eating vegetable	Percentage of students who did not eat vegetables (during the 30 days before the survey)	0 = No 1 = Yes
Physical activity	Percentage of students who were not physically active (for at least 60 minutes per day on any day during the 7 days before the survey)	0 = Yes 1 = No
Ride bicycle to school	Percentage of students who did not walk or ride a bicycle to or from school (during the 7 days before the survey)	0 = Yes 1 = No
Attend physical education class	Percentage of students who did not attend physical education classes (each week during this school year)	0 = Yes 1 = No
Sedentary habit	Percentage of students who spent three or more hours per day doing sitting activities (sitting and watching television, playing computer games, talking with friends when not in school or doing homework during a typical or usual day)	0 = Yes 1 = No
Drank carbonated soft drinks	Percentage of students who usually drank carbonated soft drinks three or more times per day (during the 30 days before the survey)	0 = Yes 1 = No
Ate fast food	Percentage of students who ate food from a fast food restaurant three or more days (during the 7 days before the survey)	0 = Yes 1 = No

### Data analysis

The analytical process commenced with descriptive statistics to summarize the distribution of the independent variables. This was followed by bivariate analyses to assess associations between categorical variables using Chi-square tests or suitable alternative methods, as appropriate. Subsequently, binary logistic regression was conducted to evaluate the association between potential risk factors and the likelihood of being overweight. This multivariate approach enabled the identification of independent predictors of overweight status. Furthermore, the analysis stratified the risk by economic level, allowing for comparisons between adolescents from low and high economic backgrounds.

### Ethical consideration

the Global School-based Student Health Survey (GSHS) received ethical clearance from the relevant Institutional Review Boards (IRBs) or Ethics Committees, in addition to

formal approval from the Ministry of Health or Ministry of Education in each participating country. In accordance with international ethical standards, de-identified data were made publicly accessible following a two-year embargo period. Detailed information regarding the methodology and data access can be found at: <https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-school-based-student-health-survey/methodology>.

## RESULTS

**Table 1.** Characteristic of Respondents (N: 9977)

Variables	N	%
Sex		
Male	4455	44.7
Female	5522	55.3
School grade		
Junior high school	7113	71.3
Senior high school	2864	28.7
Economic level		
Low	424	4.2
High	9553	95.8
Eating fruit		
No	948	9.5
Yes	9029	90.5
Eating vegetable		
No	292	2.9
Yes	9685	97.1
Physical activity		
No	3172	31.8
Yes	6805	68.2
Ride bicycle to school		
No	6036	60.5
Yes	3941	39.5
Attend physical education class		
No	1238	12.4
Yes	8739	87.6
Sedentary habit		
Yes	2695	27.0
No	7282	73.0
Overweight		
Yes	1464	14.7
No	8513	85.3
Drank carbonated soft drinks		
Yes	392	3.9
No	9585	96.1
Ate fast food		
Yes	1198	12.0
No	8779	88.0

**Table 2** presents the results of cross-tabulation analyses examining the relationship between potential risk factors and overweight status, stratified by economic level. Furthermore, the table outlines hypothesis testing results assessing the association between these risk factors and overweight among Indonesian adolescents. Among adolescents from higher economic backgrounds, most variables did not show statistically significant associations with overweight. However, school grade level ( $p = 0.012$ ) and sedentary behavior ( $p < 0.001$ ) were found to be significantly associated with overweight. In contrast, none of the examined risk factors demonstrated a significant association with overweight in the lower economic group.

**Table 2.** Bivariate analysis of overweight risk factors based on economic disparities

Variables	Low economic level (N: 424)			High economic level (N: 9,553)		
	Overweight status		p-value	Overweight status		p-value
	Overweight	No overweight		Overweight	No overweight	
Sex						
Male	29	182	0.157	645	3,599	0.371
Female	19	195		771	4,538	
School level						
Junior high school	40	279	0.229	1,047	5,747	0.012
Senior high school	8	97		369	2,390	
Eating fruit						
No	6	46	0.958	123	773	0.358
Yes	42	330		1,293	7,364	
Eating vegetable						
No	5	22	0.365	37	228	0.755
Yes	43	354		1,379	7,909	
Physical activity						
No	17	131	0.937	439	2,585	0.589
Yes	31	245		977	5,552	
Ride bicycle to school						
No	23	207	0.435	850	4,956	0.551
Yes	25	169		566	3,181	
Attend physical education class						
No	7	57	0.916	162	1,012	0.312
Yes	41	319		1,254	7,125	
Sedentary habit						
Yes	18	90	0.064	439	2,148	0.000
No	30	286		977	5,989	

Variables	Low economic level (N: 424)			High economic level (N: 9,553)		
	Overweight status		p-value	Overweight status		p-value
	Overweight	No overweight		Overweight	No overweight	
Drank carbonated soft drinks						
Yes	1	23	0.420	53	315	0.876
No	47	353		1,363	7,827	
Ate fast food						
Yes	7	74	0.515	180	937	0.212
No	41	302		1236	7,200	

**Table 3** displays the findings of a binary logistic regression analysis assessing the relationship between behavioral and demographic risk factors and overweight status among Indonesian adolescents, stratified by economic level. In the low economic group, the majority of the assessed variables did not exhibit statistically significant associations with overweight, indicating that these factors may not independently account for overweight risk in this population—possibly due to the influence of unmeasured structural or environmental determinants. Notably, only sedentary behavior demonstrated a significant association with overweight ( $p = 0.025$ ; OR = 2.116; 95% CI: 1.101–4.070), suggesting that prolonged inactivity plays a critical role in this subgroup. Conversely, in the high economic group, two variables were significantly associated with overweight: school grade level ( $p = 0.001$ ; OR = 1.242, 95% CI: 1.088-1.419), with junior high school students showing higher risk, and sedentary behavior ( $p < 0.001$ ; OR = 1.291, 95% CI: 1.138-1.464), reinforcing its contribution to overweight in affluent adolescents. These results highlight the role of lifestyle factors, particularly sedentary habits, in influencing overweight risk, and underscore the need for context-specific strategies that account for socioeconomic disparities when addressing adolescent overweight.

**Table 3.** Binary logistic analysis of overweight risk factors based on economic disparities

Variables	Low economic level				High economic level			
	p-value	OR	95% CI		p-value	OR	95% CI	
Sex								
Male	0.195	1.514	0.809	2.835	0.454	1.045	0.932	1.171
Female (reff.)								
School grade								
Junior high school	0.133	1.914	0.821	4.459	0.001	1.242	1.088	1.419
Senior high school (reff.)								
Eating fruit								
No	0.812	0.893	0.352	2.267	0.403	0.917	0.749	1.123
Yes (reff.)								
Eating vegetable								
No	0.155	2.168	0.746	6.299	0.725	0.938	0.657	1.339
Yes (reff.)								
Physical activity								
No	0.972	1.012	0.518	1.977	0.766	0.981	0.864	1.114
Yes (reff.)								
Ride bicycle to school								

Variables	Low economic level				High economic level			
	p-value	OR	95% CI		p-value	OR	95% CI	
No	0.457	0.788	0.42	1.477	0.845	0.988	0.879	1.111
Yes (reff.)								
Attend physical education class								
No	0.894	0.941	0.385	2.302	0.367	0.920	0.768	1.102
Yes (reff.)								
Sedentary habit								
Yes	0.025	2.116	1.101	4.07	0.000	1.291	1.138	1.464
No (reff.)								
Drank carbonated soft drinks								
Yes	0.261	0.31	0.04	2.394	0.497	0.901	0.668	1.217
No (reff.)								
Ate fast food								
Yes	0.306	0.635	0.266	1.515	0.29	1.098	0.924	1.304
No (reff.)								

## DISCUSSION

The findings of this study indicate that sedentary behavior serves as a significant risk factor for overweight among adolescents across both low and high economic levels. This suggests that prolonged inactivity, regardless of socioeconomic background, contributes to an increased likelihood of being overweight. Furthermore, the study reveals a distinct pattern within the high economic group: adolescents attending junior high school exhibit a higher risk of overweight compared to their counterparts in senior high school. Sedentary behavior is a critical risk factor for overweight and obesity, particularly in different socioeconomic contexts. Research indicates that individuals with low economic status often experience higher levels of sedentary behavior, which may result from limited access to resources that promote physical activity, such as parks and recreational facilities, as well as educational opportunities to pursue healthier lifestyles. For instance, low-income women in Brazil have been shown to consume higher calories and engage in more sedentary activities, contributing to a greater prevalence of obesity/overweight and related health issues (Silva et al., 2020). Additionally, psychosocial factors such as fear of bullying and lack of social support can limit physical activity among overweight individuals in low-income contexts, creating a vicious cycle of inactivity and obesity (Vaidya & Krettek, 2014).

In contrast, in higher-income contexts, sedentary behavior tends to be associated with lifestyle choices, such as increased screen time and various sedentary leisure activities. This trend has been observed increasingly over the past decades in the U.S., with prolonged sitting linked to multiple health risks, including overweight, obesity and cardiovascular issues, independent of overall physical activity levels (Robert et al., 2015; Yang et al., 2019). Moreover, children from higher socioeconomic families may engage in less physical activity due to reliance on motorized transportation and a lifestyle that heavily incorporates screen-based entertainment. Thus, while both low and high socioeconomic groups exhibit sedentary behavior as a risk factor for overweight and obesity, the underlying causes and contributing factors differ (Navti et al., 2014).

The increased risk of overweight in upper socioeconomic groups can be linked to dietary patterns characterized by higher consumption of energy-dense foods. Students

in affluent families often have access to a variety of foods that are high in fat and sugar, which contributes to a positive energy balance—a critical factor in weight gain (Abdissa et al., 2021). Additionally, a correlation exists between increased household income and expenditure on foods, which often leads to a diet rich in high-calorie options, further exacerbating issues related to obesity (Schmeer, 2010). For junior high school students, the transition into a lifestyle with more snacking, often facilitated by economic means, promotes habits that contribute to overweight conditions (Hidayanti et al., 2022).

Furthermore, lifestyle factors such as reduced physical activity are prevalent among students from wealthier families. The correlation between sedentary behavior and obesity is well-established; affluent students might engage more in sedentary leisure activities such as using electronic devices or participating in less physically demanding hobbies compared to their lower-income peers who may have fewer resources for indoor entertainment (Franceschin & Veiga, 2020). The balance between sedentary behaviors and insufficient physical activity creates a conducive environment for weight gain among these adolescents.

Educational settings also play a role in the dietary habits and activity levels of junior high school students. Private schools may have vending options that encourage unhealthy snacking compared to public schools, where such accessibility might be regulated (Anteneh et al., 2015). Moreover, students from high-income families may not be as engaged in physical activity due to cultural perceptions that prioritize academic over physical achievement. This lack of engagement in sports or community physical activities further promotes a sedentary lifestyle, which is directly associated with higher rates of overweight (Bovet et al., 2010).

The Global School-based Student Health Survey (GSHS) utilizes a standardized and scientifically rigorous sampling methodology, widely adopted in school-based research, along with a structured questionnaire designed to facilitate reliable comparisons of overweight prevalence across countries and regions. This study employed nationally representative data from Indonesia, allowing for generalizable insights at the population level. Nevertheless, the cross-sectional nature of the survey introduces limitations related to temporal ambiguity, precluding any inference of causal relationships between variables. Furthermore, the data were collected through self-administered questionnaires, which may be prone to recall bias. Adolescents may have experienced difficulties in accurately interpreting the survey items, potentially due to limited reading proficiency, thereby leading to discrepancies between their responses and actual behaviors or experiences.

## CONCLUSION

This study reveals that sedentary behavior is a consistent and significant risk factor for overweight among Indonesian adolescents, regardless of economic status. In both low and high economic groups, prolonged inactivity contributes to increased overweight prevalence. Additionally, among adolescents from higher economic backgrounds, those in junior high school are at greater risk of being overweight compared to their senior high school peers, suggesting that age and school level intersect with lifestyle factors to influence weight outcomes. The findings underscore the importance of tailoring public health interventions to address socioeconomic disparities. For adolescents in wealthier families, strategies should focus on reducing sedentary habits and promoting active lifestyles, particularly during early adolescence. In contrast, for those from lower-income

households, broader structural interventions may be needed to overcome environmental and social barriers to physical activity.

## AUTHOR'S STATEMENT

PSN conceptualized the study, supervised the research process, data analysis and prepared the initial manuscript draft. Ayu Khoirotul Umaroh contributed to drafting of the methodology section. Faron Hattapradit provided critical revisions, contributed to interpretation of the findings, and assisted in finalizing the manuscript. All authors read and approved the final version of the manuscript.

## CONFLICTS OF INTEREST

There is no conflict of interest in this study.

## DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors state that AI tools were only used to improve language, grammar, and clarity. All ideas, analyses, interpretations, and conclusions are the authors' own responsibility.

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