



Socioeconomic, demographic, and lifestyle factors associated with adolescent obesity in Indonesia: Analysis of Indonesia Health Survey 2023 data

Faktor sosial ekonomi, demografi, dan gaya hidup yang berhubungan dengan obesitas remaja di Indonesia: Analisis data SKI 2023

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Article History:

Received: May 26, 2025; Revised: August 13, 2025; Accepted: August 30, 2025; Published: March 03, 2026.

Publisher:



Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

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Abstract

Adolescent obesity is an increasing public health problem in Indonesia, influenced by economic disparities, demographic factors, and lifestyle changes. This study aimed to analyze the socioeconomic, demographic, and lifestyle factors associated with adolescent obesity using data from the 2023 Indonesia Health Survey (IHS). This cross-sectional study involved 46,432 adolescents aged 10–19 years, classified as obese based on BMI-for-age z-scores using total sampling. The variables examined included age, sex, education, wealth index, place of residence, consumption of sweet, salty, and fatty foods, soft drinks, energy drinks, instant noodles, physical activity, and smoking. Data were analyzed univariately and bivariately using chi-square tests and multivariately using logistic regression. The results showed that wealth index and instant noodle consumption were significantly associated with obesity ($p < 0.05$). Consumption of fatty, fried, and cholesterol-rich foods ($p = 0.032$; OR = 0.956) and energy drinks ($p = 0.034$; OR = 1.104) were identified as significant risk factors. In conclusion, high-fat dietary patterns and energy drink consumption increase the risk of obesity. The widespread availability of unhealthy foods in both urban and rural areas poses challenges to obesity prevention. Therefore, interventions that promote healthy eating behaviors among adolescents, such as school-based nutrition education, social media campaigns, and community-based initiatives are essential.

Keywords: Adolescent Obesity, Socioeconomic Factors, Adolescent Lifestyle, Risky Food Consumption, IHS 2023.

Abstrak

Obesitas remaja menjadi masalah kesehatan masyarakat yang terus meningkat di Indonesia, dipengaruhi oleh ketimpangan ekonomi, demografi, dan perubahan gaya hidup. Penelitian ini bertujuan menganalisis faktor sosial ekonomi, demografi, dan gaya hidup yang berhubungan dengan obesitas remaja berdasarkan data Survei Kesehatan Indonesia (SKI) 2023. Studi cross-sectional ini melibatkan 46.432 remaja usia 10–19 tahun yang diklasifikasikan obesitas berdasarkan *z-score* IMT/U, menggunakan total sampling. Variabel yang diteliti meliputi usia, jenis kelamin, pendidikan, indeks kekayaan, tempat tinggal, konsumsi makanan/minuman manis, asin, berlemak, *soft drink*, minuman berenergi, mi instan, aktivitas fisik, dan status merokok. Analisis dilakukan secara univariat, lalu bivariat menggunakan uji chi-square, dan multivariat menggunakan regresi logistik. Hasil menunjukkan bahwa indeks kekayaan dan konsumsi mi instan berhubungan signifikan dengan obesitas ($p < 0,05$). Konsumsi makanan berlemak/gorengan/kolesterol ($p = 0,032$; OR = 0,956) dan minuman berenergi ($p = 0,034$; OR = 1,104) merupakan faktor risiko signifikan.

Kesimpulannya, pola makan tinggi lemak dan konsumsi minuman berenergi meningkatkan risiko obesitas. Akses makanan tidak sehat di wilayah urban dan rural menjadi tantangan dalam pencegahan obesitas. Oleh sebab itu, pentingnya intervensi yang mendorong perilaku konsumsi sehat di kalangan remaja, seperti program edukasi gizi di sekolah, kampanye melalui media sosial, dan inisiatif berbasis komunitas di lingkungan.

Kata Kunci: Obesitas Remaja, Faktor Sosial Ekonomi, Gaya Hidup Remaja, Konsumsi Makanan Berisiko, SKI 2023

Introduction

Adolescents are vulnerable to nutritional problems, as Indonesia is currently facing a triple burden of nutrition; undernutrition, overnutrition or obesity, and micronutrient deficiencies (UNICEF, 2021b). WHO (2024) reported that more than 340 million children and adolescents aged 5–19 years are overweight or obese, including Indonesia, continues to rise (World Health Organization (WHO), 2024). According to the 2023 Indonesia Health Survey (IHS), approximately 14.8% of adolescents aged 13–18 years are obese. Other findings also reported that the prevalence of overweight among adolescents was 11.9%, and obesity was 7.8%, which increased compared to Riskesdas 2018, which recorded around 16% combined prevalence of overweight and obesity among adolescents aged 13–15 years (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan RI, 2023; Kementerian Kesehatan RI, 2018; Saragih et al., n.d.).

Several factors contribute to obesity, including genetic, physiological, environmental, and socioeconomic factors, such as family affluence (Hamulka et al., 2018). Socioeconomic status (SES) can be considered one of the factors associated with obesity, which can be determined through variables such as education, income, and occupation. The pattern of obesity in population groups based on socioeconomic status varies across countries (Di Cesare et al., 2019; Iguacel et al., 2021). A study conducted in Malang City found that adolescents with overweight or obesity mostly came from families with higher socioeconomic status, which was associated with greater pocket money (Febriani et al., 2019). Place of residence is also a dominant factor related to obesity. According to Riskesdas 2018, the risk of obesity measured by body fat proportion was higher in urban areas compared to rural areas, and the risk of obesity measured by body mass index (BMI) was also higher in urban areas than in rural ones (Kementerian Kesehatan RI, 2018).

Adolescents are also prone to unhealthy eating patterns, such as high-calorie and low fiber consumption. Sugar intake has been linked to poor diet quality, increased energy intake, and a higher prevalence of obesity. Among children and adolescents, 16% of the total energy intake is derived from added sugars. Children, adolescents, and adults in Indonesia generally have poor dietary patterns, characterized by excessive intake of foods and beverages high in sugar, salt, and fat (SSF), and insufficient consumption of fruits and vegetables (FV). Approximately two out of three children and adolescents aged 5–19 years (66.7%) consume one or more sugar-sweetened beverages per day (UNICEF, 2021a).

Increased physical activity can contribute to better weight management. However, physical activity tends to decline during adolescence (Swift et al., 2014). Adolescents who smoke tend to have the same or even higher body mass index (BMI) as non-smokers. According to the Global School-Based Student Health Survey (GSHS), active transportation use is very low, with only 39.8% of children and adolescents walking to school regularly. Regarding sedentary behavior, adolescents tend to spend time watching TV, playing games, or using screens, which can increase the risk of overweight and obesity (UNICEF, 2019). Based on the IHS 2023 data, the largest group of smokers was adolescents aged 15–19 years (56.5%).

There remains a research gap in the existing literature, as most studies on adolescent obesity in Indonesia have been limited to certain regions or have primarily focused on lifestyle factors such as diet and physical activity without comprehensively integrating socioeconomic and demographic determinants. Moreover, no study has yet utilized the most recent nationally representative dataset, the 2023 Indonesia Health Survey (IHS), to analyze obesity in adolescents. Therefore, this study aimed to analyze the socioeconomic, demographic, and

lifestyle factors associated with obesity among Indonesian adolescents using data from the 2023 Indonesia Health Survey (IHS).

Methods

This study employed a cross-sectional design using secondary data from the Indonesian Health Survey (IHS), which included 345,000 households across 34,500 census blocks in 514 districts/cities from 38 provinces in Indonesia. A cross-sectional design was considered appropriate because it allowed for the analysis of associations between socioeconomic, demographic, and lifestyle factors and adolescent obesity at a specific point in time based on a nationally representative dataset.

The IHS applies a stratified sampling method to obtain nationally and provincially representative household samples in South Africa. Stratification was performed explicitly at the census block level (based on area classification and access to health services) and implicitly at the household level (based on the education level of the household head). Census blocks were selected using the Probability Proportional to Size (PPS) method to ensure proportional regional representation, and households were selected systematically.

In this study, the participants were adolescents selected through total sampling, including those who met the inclusion criteria: aged 10–19 years, adolescent obesity status based on BMI-for-age (BMI/A), socioeconomic characteristics (parental education and occupation, household wealth index), demographic characteristics, risky food intake (consumption of sweet, salty, and fatty foods, as well as fruits and vegetables), physical activity, smoking status, and anthropometric data (body mass index). Individuals with incomplete data on relevant variables were excluded from the analysis.

The IHS 2023 collected data on socioeconomic, demographic, and lifestyle characteristics using a validated questionnaire. The variables included age, sex, residence, household wealth index, parental education and occupation, smoking status, physical activity, and dietary intake. Physical activity was measured using a modified version of the WHO Global Physical Activity Questionnaire (GPAQ) and expressed in MET-min. Smoking status was

categorized as smoker or non-smoker. Risky food consumption (sweet, salty, fatty/fried foods, sugary/carbonated drinks, and instant noodles/foods) was assessed using a validated Food Frequency Questionnaire (FFQ) and categorized as ≥ 1 time/day, 1–6 times/week, or ≤ 3 times/month. Anthropometric measurements included weight and height, measured using standardized procedures, and used to calculate BMI-for-age z-score (BAZ) (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan RI, 2023; Kementerian Kesehatan republik Indonesia, 2018). Nutritional status was determined using z-scores from the WHO AnthroPlus.

To minimize information bias, data were obtained from the nationally validated IHS 2023 questionnaires (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan RI, 2023). Multivariate analysis using logistic regression was applied to control for potential confounders, including age, sex, socioeconomic status, and residence. Data were analyzed using SPSS Statistics version 25. A descriptive analysis was performed to summarize the participant characteristics. Bivariate analysis using the chi-square test was conducted to explore the relationships between the independent and dependent variables. Multivariate analysis was subsequently performed using a binary logistic regression model to identify the socioeconomic, demographic, and lifestyle factors associated with adolescent obesity.

This study was approved by the Center for Data and Information Technology (PUSDATIN), Ministry of Health (No. FRM/SMKI PUSDATIN/70/0225/2024), and the Health Research Ethics Committee, Faculty of Medicine, Universitas Diponegoro (No. 462/EC/KEPK/FK-UNDIP/IX/2024).

Result and Discussion

This study included 46,432 adolescents aged 10–19 years, with a nearly equal distribution between the obese (23,145) and nonobese (23,287) groups. The mean age was similar between the groups (13.98 vs. 13.96 years). Males accounted for a slightly higher proportion of obesity (50.6%) than females (49.4%). Notably, the prevalence of obesity tended to be higher among adolescents from wealthier households (top quintile, 21.6% vs. bottom quintile, 17.5%) and in urban areas (55.5% vs. rural, 44.5%).

These findings indicate that socioeconomic and environmental factors, such as residence and wealth, may play important roles in shaping

adolescent obesity risk. Further characteristics related to dietary patterns are shown in Table 1.

Table 1. Test results of socioeconomic associations in obese adolescents in Indonesia: 2023 IHS analysis

Variables	Obesity n=23.145	No Obesity n=23.287	Total n=46.432	P-value
Education				
No/Not yet	1.746 (7.5%)	1.667 (7.2%)	3.413 (7.4%)	0.454
Never been to School				
Not graduated from elementary school / MI	7.315 (31.6%)	7.306 (31.4%)	14.621 (31.5%)	
Graduated from elementary/middle school	6.677 (28.8%)	6.881 (29.5%)	13.558 (29.2%)	
Graduated from junior high school / secondary school	5.449 (23.5%)	5.438 (23.4%)	10.887 (23.4%)	
Graduated from high school/MA	1.939 (8.4%)	1.974 (8.5%)	3.913 (8.4%)	
Graduated Diploma (D1 / D2 / D3)	13 (0.1%)	17 (0.1%)	30 (0.1%)	
College graduate	6 (0.0%)	4 (0.0%)	10 (0.0%)	
Index Quintile Ownership				
Bottom	4.056 (17.5%)	3.836 (16.5%)	7.892 (17.0%)	0.014*
Lower middle	4.412 (19.1%)	4.521 (19.4%)	8.933 (19.2%)	
Middle	4.768 (20.6%)	4.989 (21.4%)	9.757 (21.0%)	
Upper middle	4.990 (21.6%)	5.057 (21.7%)	10.047 (21.6%)	
Top	4.916 (21.2%)	4.883 (21.0%)	9.799 (21.1%)	

Correlation test using chi-square test, $\alpha = 0.05$; significance is indicated by the notation*

Table 2. Test results of demographic associations in obese adolescents in Indonesia: 2023 IHS analysis

Variables	Obesity n=23.145		No Obesity n=23.287		Total n=46.432		P-value
	Mean±SD		Mean±SD		Mean±SD		
Age (year)	13.98±2.816		13.96±2.823		13.97±2.819		
Gender							
Male	11.718 (50.6%)		11.901 (51.1%)		23.619 (50.9%)		0.304
Female	11.427 (49.4%)		11.386 (48.9%)		22.813 (49.1%)		
Classification							
Place of Residence							
Urban	12.851 (55.5%)		12.989 (55.8%)		25.840 (55.7%)		0.582
Rural	10.294 (44.5%)		10.298 (44.2%)		20.592 (44.3%)		

Correlation test using chi-square test, $\alpha = 0.05$; significance is indicated by the notation*

Table 3. Test results of lifestyle associations in obese adolescents in Indonesia: 2023 IHS analysis

Variables	Obesity n=23.145 (%)	No Obesity n=23.287 (%)	Total n=46.432 (%)	P-value
Food Consumption Sweet				
Rarely	6.282 (27.1)	6.433 (27.6)	12.715 (27.4)	0.243
Often	16.863 (72.9)	16.854 (72.4)	33.717 (72.6)	
Drink Consumption Sweet				
Rarely	5.476 (23.7)	5.531 (23.8)	11.007 (23.7)	0.816

Often	17.669 (76.3)	17.756 (76.2)	35.425 (76.3)	
Food Consumption Salty				
Rarely	9.160 (39.6)	9.085 (39.0)	18.245 (39.3)	0.217
Often	13.985 (60.4)	14.202 (61.0)	28.187 (60.7)	
Consume burnt food				
Rarely	18.098 (78.2)	18.312 (78.6)	36.410 (78.4)	0.247
Often	5.047 (21.8)	4.975 (21.4)	10.022 (21.6)	
Food consumption of meat/chicken/processed fish preservatives				
Rarely	15.987 (69.1)	16.159 (69.4)	32.146 (69.2)	0.459
Often	7.158 (30.9)	7.128 (30.6)	14.286 (30.8)	
Flavoring Seasoning Consumption				
Rarely	4.205 (18.2)	4.342 (18.6)	8.547 (18.4)	0.184
Often	18.940 (81.8)	18.945 (81.4)	37.885 (81.6)	
Soft drink/carbonated beverage consumption				
Rarely	20.763 (89.7)	20.998 (90.2)	41.761 (89.9)	0.098
Often	2.382 (10.3)	2.289 (9.8)	4.671 (10.1)	
Energy Drink Consumption				
Rarely	21.798 (94.2)	22.077 (94.8)	43.875 (94.5)	0.003*
Often	1.347 (5.8)	1.210 (5.2)	2.557 (5.5)	
Consumption of Instant Noodles/other				
Rarely	14.187 (61.3)	14.521 (62.4)	28.708 (61.8)	0.019*
Often	8.958 (38.7)	8.766 (37.6)	17.724 (38.2)	
Physical Activity				
Simply	12.522 (54.1)	12.573 (54.0)	25.095 (54.0)	0.811
Less	10.623 (45.9)	10.714 (46.0)	21.337 (46.0)	
Smoking Status				
No Smoking	21.694 (93.7)	21.874 (93.9)	43.568 (93.8)	0.367
Smoking	1.451 (6.3)	1.413 (6.1)	2.864 (6.2)	

*Correlation test using chi-square test, $\alpha = 0.05$; significance is indicated by the notation**

This study demonstrated a significant association between wealth quintiles, energy drink consumption, and instant noodle consumption and obesity status among adolescents. Moreover, the prevalence of obesity was higher among male adolescents than among females, indicating potential biological and behavioral differences influencing obesity risk.

These findings are consistent with those of previous studies highlighting the role of socioeconomic factors and modern dietary patterns in the rising prevalence of adolescent obesity. Evidence from Indonesia shows that shifts in socioeconomic status affect dietary choices: lower-income groups tend to rely on staple starchy foods, while middle- and high-income groups have greater access to processed foods, sugar-sweetened beverages, and high-fat diets (Qaim, 2019; Samodra et al., 2023). The

socioeconomic gradient of BMI among adolescents varies across the stages of nutritional transition and economic development in different regions. Over time, obesity has increasingly affected poorer groups in Indonesian society, with the concentration index decreasing from 0.287 in 1993 to 0.093 in 2014. This supports the concept of the “nutrition transition,” which is also occurring in other developing countries (Aizawa & Helble, 2017; Marteleto et al., 2017). Similarly, a study in Malaysia reported that socioeconomic factors, including household income, parental education, and occupation, were significantly correlated with BMI status, particularly in urban settings (Ahmad et al., 2018).

Energy drink consumption is associated with various health problems, including obesity and cardiovascular issues. Previous studies have

shown that energy drink intake is associated with higher BMI in adolescents and increased consumption of other sugar-sweetened beverages (Williams et al., 2017). The combination of caffeine, sugar, and other ingredients in energy drinks may exert synergistic effects on weight gain and on cardiovascular health. Both caffeine and sugar in energy drinks can pose harmful impacts on children and adolescents (Dawodu & Cleaver, 2017).

Instant noodles are popular among adolescents because they are inexpensive, convenient, and palatable. However, regular consumption (≥ 1 time/week) has been linked to an increased risk of overweight and obesity (Efrizal, 2020; Istiqomah et al., 2021). To prevent obesity, adolescents are recommended

to engage in at least 60 minutes of moderate-to-vigorous physical activity per day and perform muscle-strengthening exercises at least three times per week (Shrivastava & Shrivastava, 2020). Prior studies in Indonesia also reported a dietary shift toward ultra-processed foods high in sugar, fat, and salt, such as instant noodles and fried snacks, as major contributors to weight gain (Oddo et al., 2019).

Sex differences also play an important role. Ma et al. (2024) reported that hormonal changes are associated with body fat distribution and obesity risk. This aligns with previous research from Thailand, which indicated that male adolescents tend to have a higher prevalence of obesity in Southeast Asia (Pawloski et al., 2023).

Table 4. Results of multivariate analysis with logistic regression: Socioeconomics, demographics, and lifestyle in obese adolescents in Indonesia: A 2023 IHS analysis

Variable	P-value	OR	95% CI for Exp B	
			Lower	Upper
Gender	0.185	1.026	0.988	1.065
Education	0.571	0.981	0.918	1.048
Ownership Index Quintile	0.157	1.029	0.989	1.071
Classification of Residence	0.915	0.998	0.960	1.037
Consumption of Sweets	0.282	1.029	0.977	1.085
Consumption of Sugary Drinks	0.430	0.978	0.926	1.033
Consumption of Salty Foods	0.430	1.016	0.976	1.057
Consumption of Fatty/Cholesterol/Fried Foods	0.032*	0.956	0.918	0.996
Consume burnt food	0.585	1.013	0.966	1.063
Food consumption of meat/chicken/processed fish preservatives	0.885	1.003	0.962	1.046
Flavoring Seasoning Consumption	0.187	1.033	0.984	1.085
Soft drinks/carbonated beverages consumption	0.944	1.003	0.935	1.075
Energy Drink Consumption	0.034*	1.104	1.007	1.210
Consumption of Instant Noodles/other	0.099	1.034	0.994	1.075
Physical Activity	0.729	0.994	0.958	1.031
Smoking Status	0.286	1.044	0.964	1.131

Logistic Regression Value $\alpha = 0.05$ Significance indicated by notation*

Table 4 presents the results of the logistic regression analysis for various factors potentially associated with adolescent obesity. Only two variables were found to be significant: the consumption of fatty, cholesterol-rich, and fried foods ($P = 0.032$, $OR = 0.956$, $CI: 0.918-0.996$). The OR value of 0.956, which is close to neutral ($OR \approx 1$), suggests that the finding may be statistically significant but clinically irrelevant. In addition, as shown in Table 2, energy drink consumption was significant ($P = 0.034$, $OR = 1.104$, $CI: 1.007-1.210$). The OR

value of 1.104 indicates that adolescents who consume energy drinks have a 10.4% higher risk of obesity than those who do not.

Previous research in Indonesia reported that adolescents who consumed excessive fat had a 6.5 times higher risk of obesity. This is attributed to the rising prevalence of obesity among adolescents due to the high consumption of fatty, cholesterol-rich, and fast foods, coupled with low fiber intake. Dietary fats are absorbed in the form of free fatty acids and stored as energy reserves in adipose tissue (Telisa et al.,

2020). Consuming large amounts of fried foods tends to promote unhealthy eating patterns and higher total energy intakes.

Frying alters the nutritional content of foods, including their protein, vitamin, and antioxidant content. Fried food consumption leads to high fat intake, increased energy intake, and low satiety levels (Parinduri et al., 2021). Therefore, the observed association between fatty, cholesterol-rich, and fried food consumption and obesity showed a protective effect, although the impact was relatively small.

Energy drink consumption was significantly associated with acne ($P = 0.034$, OR = 1.104, CI: 1.007–1.210). An OR value of 1.104 means that each increase in energy drink consumption is associated with an increased risk of obesity. As the OR is > 1 , this relationship can be categorized as a risk factor. Energy drinks are highly popular among adolescents and are commonly consumed to enhance mental and physical stimulation in the short term or to relieve thirst during exercise. They are marketed as products that enhance physical performance, alertness, and mental capacity during sports and recreational activities (M'Touguy et al., 2016). A study further showed that adolescents who frequently consume sugary drinks have a 1.58 times higher risk of being overweight compared to non-consumers. In Indonesia, there has been an ongoing policy discussion regarding the imposition of excise taxes on sugar-sweetened beverages (SSBs), including energy drinks. However, although such measures were initially planned for implementation in 2024, their enactment has been postponed until 2025 (Ringkasan Kebijakan, 2018).

The findings of this study underscore the urgent need for targeted public health interventions focusing on adolescent health. Existing obesity prevention efforts in Indonesia include nutrition education in schools that emphasizes reducing the intake of instant noodles, high-fat foods, and sugary/energy drinks. Furthermore, regulatory policies are essential, such as restrictions on the marketing of sugar-sweetened beverages and increasing the availability of affordable and healthy food choices. Notably, the excise taxation of SSBs has not yet been implemented in Indonesia. Additionally, promoting physical activity through the provision of open spaces and youth sports programs is particularly important in urban areas that are characterized by sedentary lifestyles.

Thus, this study provides valuable evidence to inform multisectoral strategies for curbing the rising trend of adolescent obesity in Indonesia.

This study had several limitations. The cross-sectional design restricted the ability to infer causal relationships. Dietary intake data were collected through recall, which may have introduced information bias. Another limitation is that the descriptive analysis did not apply survey weights, which may have reduced the representativeness of the national estimates. Considering that the Indonesian Health Survey employs a complex sampling design, weighted analyses yielded more accurate national estimates. Nevertheless, the large sample size and stratified sampling framework provide meaningful insights into the patterns of adolescent obesity in Indonesia. In addition, this study did not conduct model adequacy testing (e.g., Hosmer–Lemeshow test) or explore potential interaction effects (e.g., sex \times residence and socioeconomic status \times dietary patterns). Future research should incorporate model fit assessments and interaction analyses to provide a deeper understanding of the determinants of adolescent obesity.

Conclusion

This study showed that certain socioeconomic and lifestyle factors influence obesity among Indonesian adolescents. The analysis found that the ownership index quintile variable and instant noodle consumption had a significant bivariate relationship with obesity status. However, based on multivariate analysis, only the consumption of fatty/fried/cholesterol foods and energy drinks was found to be significantly associated with adolescent obesity. Energy consumption increased the risk of obesity, whereas fatty food consumption showed a weak negative association with obesity.

These findings indicate that the transition in consumption patterns due to globalization and increased access to high-fat foods and energy drinks contributes to the increasing prevalence of adolescent obesity, which could be an important strategy for obesity control in this age group. In practical terms, these findings highlight the importance of public health interventions that promote healthy eating behaviors among adolescents. Nutrition education programs in schools, campaigns on

social media, and community-based initiatives should emphasize the risks of frequent energy drink and fried food consumption while encouraging healthier dietary choices. Such interventions can help shape long-term eating habits and support obesity prevention efforts among Indonesian adolescents in the future.

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