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IMPACT OF BREAKFAST HABITS, DIETARY DIVERSITY, AND FAMILY SUPPORT ON ADOLESCENT OVERWEIGHT: A CROSS-SECTIONAL STUDY

Pengaruh Kebiasaan Sarapan, Keragaman Pangan, dan Dukungan Keluarga terhadap Kejadian Overweight pada Remaja: Studi Potong Lintang

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ABSTRAK

Data Riskesdas 2018 Provinsi Daerah Istimewa Yogyakarta (DIY) menunjukkan bahwa 14,63% remaja usia 16-18 tahun mengalami kelebihan berat badan, dengan 10,89% diklasifikasikan sebagai obesitas. Kegemukan pada masa remaja dapat meningkatkan risiko kematian dan menjadi faktor risiko penyakit degeneratif. Melewatkan sarapan adalah kebiasaan yang berkontribusi terhadap masalah gizi pada usia remaja. Selain itu, keragaman makanan yang dikonsumsi memainkan peran penting dalam menentukan status gizi remaja. Dukungan keluarga juga mempengaruhi sikap individu dalam mengelola berat badan; dukungan positif dari keluarga cenderung menumbuhkan sikap positif. Penelitian ini bertujuan untuk menguji hubungan antara kebiasaan sarapan, keragaman makanan, dan dukungan keluarga dengan kejadian kegemukan pada remaja. Penelitian ini menggunakan desain observasional analitik dengan pendekatan cross-sectional dan dilakukan pada bulan April hingga Mei 2024. Sampel penelitian terdiri dari 110 remaja berusia 16-18 tahun di Kota Yogyakarta. Pengukuran antropometri dilakukan dengan menggunakan timbangan digital dan stadiometer. Dukungan keluarga dinilai melalui kuesioner yang telah divalidasi, dan asupan makanan dikumpulkan dengan menggunakan formulir recall 24 jam. Hasil uji chi-square menunjukkan adanya hubungan yang signifikan antara kebiasaan sarapan ($p<0,05$) dan keragaman makanan ($p<0,05$) dengan kejadian kegemukan. Namun, tidak ada hubungan yang signifikan yang ditemukan antara dukungan keluarga dengan kejadian kelebihan berat badan ($p>0,05$). Temuan ini menunjukkan bahwa kebiasaan sarapan dan keragaman makanan secara signifikan mempengaruhi kejadian kelebihan berat badan di kalangan remaja, sedangkan dukungan keluarga tidak. Penelitian di masa depan harus mempertimbangkan pengaruh kelompok teman sebaya dan media sosial untuk memberikan pemahaman yang lebih komprehensif tentang faktor-faktor yang berkontribusi.

Kata kunci: *dukungan keluarga, kebiasaan sarapan, keragaman pangan*

ABSTRACT

The 2018 Riskesdas data for the Yogyakarta Special Region Province revealed that 14.63% of adolescents aged 16-18 years were overweight, with 10.89% being classified as obese. Overweight during adolescence increases the risk of mortality and serves as a risk factor for degenerative diseases. Skipping breakfast is a habit that contributes to nutritional problems during this critical stage of life. Additionally, the variety of foods consumed plays a significant role in determining the nutritional status of adolescents. Family support also influences an individual's attitude toward managing weight; positive support from the family is likely to foster a positive attitude.This study aimed to examine the relationship between breakfast habits, dietary diversity, and family support with the

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incidence of overweight among adolescents. The research employed an analytic observational design with cross-sectional approach and was conducted from April-May 2024. The study sample consisted of 110 adolescents aged 16-18 years in Yogyakarta City. Anthropometric measurements were carried out using digital scales and stadiometer. Family support was assessed through validated questionnaire, and dietary intake was collected using 24-hour recall form. The chi-square test results indicated a significant association between breakfast habits ($p<0.05$) and dietary diversity ($p<0.05$) with overweight incidence. However, no significant relationship was found between family support and the incidence of overweight ($p>0.05$). The findings suggest that breakfast habits and dietary diversity significantly impact overweight incidence among adolescents, while family support does not. Future research should consider the influence of peer groups and social media to provide a more comprehensive understanding of the contributing factors.

Keywords: breakfast habits, dietary diversity, family support

INTRODUCTION

Overweight among adolescents has become a critical public health issue in the 21st century, reflecting the complex interplay of multiple factors that contribute to the annual increase in overweight rates [1]. According to the 2018 Yogyakarta Special Region Province Riskesdas data, 14,63% of adolescents aged 16-18 years were overweight and 10,89% were obese [2]. The incidence of nutritional problems in Yogyakarta City is the highest in the entire province. Overweight conditions can increase the risk of non-communicable diseases such as heart disease, type 2 diabetes, hormonal disorders, and mental health issues. Overweight during adolescence not only increases the risk of mortality but also serves as a risk factor for degenerative diseases [3],[4]

The habit of skipping breakfast shows an increasing trend as adolescents age, particularly in the 16-19 year age group [5]. Skipping breakfast contributes to nutritional problems during adolescence. Research by Sumartini and Ningrum indicates that adolescents with good eating behavior and breakfast habits have better nutritional status [6]. In contrast, individuals who habitually skip breakfast exhibit poorer anthropometric profiles and lifestyles [7],[8]. Research conducted by Halawa et al. (2022) on adolescents in Yogyakarta City shows that adolescents who rarely have breakfast risk for being obesity as much as 2.1 times compared to adolescents who often have breakfast [9]. The habit of skipping breakfast can affect daily nutrient intake. Research by Zou demonstrated that respondents who never had breakfast had lower daily intakes of essential nutrients such as rice, vegetables, poultry, fish, and shrimp [10]. Adolescents who often skip breakfast have a higher frequency of consuming snacks. The habit of skipping breakfast can increase the risk of consuming snacks higher and make it difficult to control appetite, resulting in being overweight. Adolescents who do not eat breakfast tend to buy snacks with energy-rich foods, so the number of calories entered will be greater than those used [11]. The imbalance between nutrient intake and bodily needs can lead to nutritional problems in adolescents. Adolescents who are overweight or obese often have poorer diet quality [12]. The diversity of food sources plays an important role in promoting good quality nutrition. The more varied the food a person consumes, the easier it is to fulfil their nutritional needs. The more types of food consumed, the easier it is for the body to obtain the nutrients it needs.[13] Food diversity and breakfast consumption habits are influenced by both internal and external factors. External factors such as family support and the food environment play a crucial role in shaping adolescent consumption behavior [14],[15]. Family support is social support obtained from the closest person in the form of information assistance, a sense of security, emotional acceptance and valued in a group, such as being accepted in a family

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[16]. Family support can reflected by consumption activities in the family.Food choices are typically based on family preferences, with families that prioritize healthy eating often providing a diverse range of food options [17],[18]. Parenting styles and motivational strategies also support the adoption of healthy lifestyles among adolescents [19]. Positive family support is associated with positive attitudes towards weight management and the prevention of overweight

Urban residents generally have greater access to affordable and diverse food options. However, the proliferation of high-energy-density foods has led to changes in dietary patterns, particularly among adolescents. Research by Lee and Um indicates that adolescents in urban areas are more likely to skip breakfast and consume fast food more frequently [20]. Despite these trends, studies on breakfast habits, food diversity, and family support among urban adolescents in Indonesia remain limited. Therefore, this study aims to explore the relationship between breakfast habits, food diversity, and family support with the incidence of overweight in adolescents. The findings are expected to provide valuable insights for policy formulation related to adolescent health and nutrition and to educate adolescents on healthy eating behaviors to achieve ideal nutritional status.

METHODS

The study was conducted in public high schools in Yogyakarta City, from April to May 2024. The study population comprised all adolescents in Yogyakarta City. A cross-sectional design with descriptive and analytical analysis was employed. Inclusion criteria included adolescents who were not on any diet or weight management program, living with their families, aged 16-18 years, residing in Yogyakarta City, and providing informed consent. Exclusion criteria were adolescents who were ill or unwilling to participate in the study. Ethical approval was granted by the Moewardi Hospital Ethics Committee, with approval number 432//II/HREC/2024.

School selection was based on areas with a high prevalence of overweight by data from health department of Yogyakarta City. The sample size was determined using the Lemeshow formula, resulting in a sample of 100 respondents, with an anticipated dropout rate of 10%, bringing the total sample size to 110 respondents. A multistage random sampling technique was employed. First, purposive sampling was used to select areas with a high prevalence of overweight adolescents. Second, students in grade XI were selected, as most students aged 16-18 years are in this grade. Third, simple random sampling was applied to distribute the 110 samples across three schools.

Body weight was measured using a digital scale, and height was measured using a stadiometer. Breakfast habits were assessed through breakfast intake from a 24-hour recall and the frequency of weekly breakfasts. Breakfast habits were classified as "good" if the frequency was ≥4 times per week and meet 15-30% RDA, and "poor" if the frequency was <4 times per week and does not meet 15-30% [21]. Food diversity was evaluated using the 24-hour recall and categorized as low (consume 1-3 from food groups), middle (consume 4-6 from food groups or high (consume 7-9 from food groups). Family support was assessed using a questionnaire adapted from Heratama (2021), which had been tested for validity and reliability which was conducted before the study with the same subject characteristics as the research subject, yielding a reliability coefficient of 0.947, indicating high validity and reliability [22].

Bivariate analysis was conducted using the chi-square test to examine the relationship between two variables. Multivariate analysis was performed using binary logistic regression to assess the strength of breakfast habits, dietary diversity, and family support in influencing the incidence of overweight among adolescents. The 24-hour food recall was also utilized to analyze the respondents' breakfast intake.

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RESULT

Table 1 presented the demographic characteristics of the 110 respondents in this study. The majority of respondents (63.6%) were 17 years old. Regarding gender, a higher proportion of female respondents (60.9%) was observed compared to male respondents (39.1%), Most respondents (70.9%) came from families where the father had a higher education level, and similarly, 68.2% of respondents mothers had a high level of education. Additionally, 64.5% of respondents had four or fewer family members.

Tabel 1. Respondent Characteristics

Variables	Characteristic	n	%
Age	16 years	38	34,5
	17 years	70	63,6
	18 years	2	1,8
Parental Income	<Regional Minimum Wage	27	24,5
	≥Regional Minimum Wage	83	75,5
Pocket Money	≤15000	40	36,4
	>15000	70	63,6
Gender	Male	43	39,1
	Female	67	60,9
Father Education*	Low (SD, SMP)	4	3,6
	Middle (SMA/SMK)	28	25,5
	High (College)	78	70,9
Mother Education*	Low (SD, SMP)	7	6,4
	Middle (SMA/SMK)	28	25,5
	High (College)	75	68,2
Family Member	≤4	71	64,5
	>4	39	35,5
Time of Breakfast	Before 09.00 am	91	82.7
	After 09.00 am	19	17.3
How To Eat Breakfast	Prepared at home	97	88,2
	Catering	2	1,8
	Buy at stall	11	10
Breakfast Place	At home	68	61,8
	On the way	6	5,5
	At school	36	32,7
Frequency of Family Meal	≥ 4 times/week	70	63,6
	<4 times/week	40	36,4
Breakfast Habit	Good	68	61,8
	Poor	42	38,2
Dietary Diversity	High	15	13,6
	Middle	66	60
	Low	29	26,4
Family Support	High	73	66,4
	Low	37	33,6
Nutrition Status	Normal	54	49,1
	Overweight	56	50,9

*Based on UU No. 20 of 2003

In terms of parental income, 24.5% of respondents had parental income below the minimum wage, while 75.5% had income equal to or above the minimum wage. From the results of the study it is also known that respondents with pocket money above Rp. 15.000, - as many as 70 people (63,6%) and respondents with pocket money below or equal to Rp. 15.000, - as many as 27 people (36,4%).

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Table 2. Bivariat Analysis Test

Variable	Nutrition Status				*p-value**
	Normal		*Overweight*		
	n	%	n	%	
Breakfast Habits					
Good	39	35,5	29	26,4	0,045
Poor	15	35,7	27	24,5	
Dietary Diversity					
High	8	7,3	7	6,4	0,044
Middle	39	35,5	27	24,5	
Low	7	6,4	22	20	
Family Support					
High	41	37,3	32	29,1	0,060
Low	13	11,8	24	21,8	

*Chi-square test

Bivariate analysis was used to determine the relationship between the independent and dependent variables. The independent variables in this study were breakfast habits, food diversity, and family support, while the dependent variable was the incidence of overweight. Table 2 presents the chi-square test results, which show a significant relationship between breakfast habits and the incidence of overweight ($p = 0.045$). Similarly, a statistically significant relationship was found between food diversity and the incidence of overweight ($p = 0.044$). However, family support did not show a statistically significant relationship with the incidence of overweight ($p = 0.060$). The p-value <0.25 in all three variables indicates that they meet the criteria for multivariate testing.

Table 3. Multivariat Analysis Results

Variable	**OR***	***p-value****	**CI 95%**	
			Lower	***Upper***
Breakfast Habits	2,390	0,040	1,039	5,499
Dietary Diversity	2,099	0,031	1,072	4,111
Family Support	1,968	0,122	0,835	4,639
R Square			0,153	
Hosmer and Lemeshow			0,113	
Omnibus Test			0,004	

***Logistic Regression Test

Table 3 shows the results of multivariate analysis, indicating a significant relationship between breakfast habits, food diversity, and family support with the occurrence of overweight among adolescents ($p < 0.05$). The odds ratio (OR) indicates the potential risk between the independent variable and the dependent variable. OR for breakfast habits was 2.390, suggesting that adolescents with poor breakfast habits are 2.39 times more likely to be overweight than those with adequate breakfast habits. The OR for dietary diversity was 2.099, indicating that adolescents with low dietary diversity are at a higher risk of being overweight compared to those with high dietary diversity. The OR for family support was 1.968, implying that adolescents with low family support are 1.968 times more likely to be overweight than those with high family support.

The Nagelkerke R Square value of 0.153 indicates that breakfast habits, dietary diversity, and family support together contribute to 15.3% of the variance in overweight occurrence among adolescents, with the remaining 84.7% influenced by other factors not examined in this study. Breakfast habits emerged as the most dominant variable, with the highest OR of 2.390.

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DISCUSSION

Relationship Between Breakfast Habits and Overweight

Breakfast habits are crucial in determining adolescent nutritional status. Consistently eating breakfast can help fulfill daily nutritional requirements and potentially prevent overweight and obesity [23]. This study found a significant association between poor breakfast habits and the incidence of overweight among adolescents. Several studies have similarly reported that skipping breakfast or having an inadequate breakfast is linked to abnormal nutritional status, including obesity and overnutrition [24],[25],[8],[26],[27].

Breakfast can serve as a protective factor against overweight or obesity [25],[28]. Breakfast at the right time and portion can control hunger, improve blood sugar response, and increase insulin sensitivity at the next meal. Breakfast breaks the overnight fast, but the longer the fasting, the higher the hormone ghrelin, which causes hunger, which can mimic fasting to increase the hedonic response, orbitofrontal cortex, and hippocampus response to food [29]. A report form randomized control trial show negative effects of skipping breakfast included an increase in insulin and free fatty acid after lunch, an increase in hunger, and a decrease in satiety [30]. Lack of breakfast can cause changes in metabolic control, including elevated postprandial hyperglycemia in the following meals, which is linked to decreased iGLP-1 and a less effective insulin response [31],[32]. These altered metabolic responses can contribute to obesity, high cholesterol, and elevated glucose levels [33].

Adolescents with poor breakfast habits were shown to have a higher risk of being overweight, suggesting that regular, nutritious breakfasts may play a protective role against excessive weight gain [34]. These findings are consistent with those of Olatona et al., who found that skipping breakfast is associated with a higher body mass index (BMI) [35]. Other studies have also indicated that skipping breakfast is linked to increased consumption of ultra-processed foods, which are high in calories and low in nutrients [35],[36],[37],[38],[39]. In addition, adolescents who skip breakfast have a higher frequency of consuming snacks. The risk of consuming snacks increases 1.5 times in people with poor breakfast habits [40]. Adolescents who do not eat breakfast tend to buy snacks with high-density energy so that the number of calories entered will be greater than those used [41].

Poor breakfast habits are associated with nocturnal lifestyles, such as short sleep times and were more likely to choose sugar-sweetened beverages (SSBs) as snacks. This pattern is associated with a greater risk of overnutrition [42]. A person who always eats breakfast often engages in health-related behaviors, including regular sleep patterns, better food choices [43], [44]. In addition, individuals who consumed frequent breakfast had higher intakes of thiamine, niacin, and folate, and folate was higher than those who have poor breakfast habits [45]. In addition, individuals who consumed frequent breakfast had higher intakes of thiamine, niacin, and folate, which was higher than those who did not eat breakfast.

Some respondents brought food from home and consumed it during their break at 09:35. For some respondents, food consumption at this time was still considered breakfast. This indicates a need for more knowledge about breakfast. Lack of knowledge about the benefits of eating breakfast on time and anticipating things that cause not eating breakfast needs to be understood by adolescents. Several studies mentioned that increasing awareness and knowledge about healthy food can increase the frequency of breakfast [46].

Relationship Between Dietary Diversity and Overweight

Dietary diversity is another factor associated with overweight incidence. A diverse diet is a marker of good diet quality and is crucial for providing the necessary nutrients

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to maintain a healthy weight. This study found a significant association between low dietary diversity and a higher incidence of overweight. These results are consistent with research conducted in China, which also found that low dietary diversity is linked to higher BMI and body fat [47]. Similar findings were reported in studies from West Sumatra and Iran, showing that low dietary diversity is common among overweight adolescents [48],[49]. Research conducted by Susmiati et al., on adolescent girls in West Sumatra showed a significant relationship between low dietary diversity scores and the risk of obesity [50]. Similar results were also found in Khamoushi et al.'s study, which showed that overweight, obesity, and abdominal obesity were correlated with dietary diversity. The higher the dietary diversity score, the percentage of individuals with overweight, obesity, and abdominal obesity decreased [51],[52],[53],[54].

Various factors influence individual dietary diversity at the household level, such as food availability, number of family members, and socioeconomic status. [55]. Food availability is one of the determinants of food diversity. Adequate food availability will fulfil a person's energy adequacy obtained from food containing carbohydrates, protein and fat [56]. In this study, most respondents had food available mainly in the morning. This means that at the household level, families can provide food. In addition, the number of family members in a household will affect the availability of the type and amount of food in the family.

The results showed that all respondents consumed cereal and starchy staple food of the nine food groups. In this food group, the food items consumed were rice as the staple food, noodles, flour, sweet potatoes, and white bread. In addition, food groups consumed by more than 50% of respondents were meat and, fish, and eggs. Meanwhile, food groups that respondents rarely consume are offal. The results of this study indicate that all respondents consume starchy staple food groups. Meanwhile, the food group consumed by a small proportion of respondents (3.6%) was offal. These results align with research conducted by Manalu and Yuliarti (2022), where all respondents consumed starchy food groups and only a small proportion of respondents (6%) consumed offal. [57]

Dietary diversity can be a protective factor against metabolic syndrome. Individuals with low dietary diversity scores indicate a higher insulin profile. The interaction of a diverse diet with glucose homeostasis which more diverse diet can decrease the risk of diabetes or impaired glucose homeostasis [51],[58]. This protective mechanism can control body weight. A varied diet provides a balance of essential vitamins, minerals, and bioactive compounds, which can help regulate body weight and improve overall health. However, some studies have reported conflicting results. For example, Heidari-beni et al. found that a higher dietary diversity score was associated with an increased risk of overweight and obesity in children and adolescents [59]. Paulo et al. also found no significant relationship between dietary diversity and overweight. Some important limitations should be considered in this study. The difference in research results from several studies can be caused by different methods in measuring food diversity scores due to differences in the types of food groups from each country. For example, in the study conducted by Paulo et al., the groups of sugary foods and drinks, as well as fried and salty foods, were included in the dietary diversity score assessment category [60].

Relationship Between Family Support and Overweight

Family support is an external factor that can influence an adolescent's nutritional status. This study found no significant association between family support and the incidence of overweight, although adolescents with low family support were at a slightly higher risk of being overweight. Although not interrelated, adolescents with low family support showed a higher risk of being overweight compared to adolescents with high family support. This is related to the central role of family and parents in providing a

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healthy and quality family environment. Previous research has shown that strong family support can promote healthy behaviors, such as increased physical activity and reduced screen time, which may help prevent overweight [61]. In addition, research conducted by Uramako showed that family support significantly influences nutritional status [62]. Sufficient family support is mainly obtained by adolescents with ideal nutritional status. This means that a positive family role can have a positive impact. However, the current study did not find a significant impact of family support on adolescent overweight, possibly due to the influence of other external factors such as peer pressure and socio-economic status.

Parental income, a proxy for socio-economic status, can affect the quality of family support. Finance motivates parents to buy healthy food [63]. This influences families in the maintenance of a healthy diet and healthy living. Maintaining a healthy diet is also done through eating together. Shared activities increase family interaction and bonding and model healthy eating. Eating together is key to supporting children and adolescents in healthy food practices, highlights the link between eating through shared meals and healthy diets and provides affirmation about healthy and enjoyable food [64]. Fulfilment of nutrients in quality and quantity can be fulfilled to achieve optimal nutritional status in adolescents. However, in this study, adolescent students spent more time outside the home. Adolescents spend time at school from morning to evening, from Monday to Friday. On certain days, extracurricular activities cause adolescents to return home at night. This means that adolescents spend more time outside, have limited family interaction, and spend a lot of time accessing food independently through pocket money. Adolescents from higher-income families may have more access to pocket money, leading to increased snacking and fast food consumption, which are associated with overweight [65]. High-income parents can provide a larger allowance, thus increasing adolescent snacking activities.

Excessive pocket money can give individuals the freedom to spend on things they like, including food. A large allowance indicates that adolescents spend money likely to buy fast food, this correlates to make someone overweight [66]. In Yogyakarta, there are many food outlets called *warmindo*. The foods sold at these outlets are high-carbohydrate foods such as magelangan, fried rice, and instant noodles. School students, including teenagers, often eat these foods. Besides *warmindo*, Yogyakarta is also famous for *angkringan*. *Angkringan* is a type of stall that sells small portions of rice and one kind of side dish, such as sambal or oseng vegetables. The small portions and one side dish certainly reflect the quality of the food. Access to this type of food is unavoidable, especially in the school environment, low prices and filling portions are certainly a platform for adolescents to buy food.

Although in this study the father and mother's education was in the high category. High education indicates high knowledge about health and nutrition and the support adolescents get, such as motivation for a healthy diet and life behavior. A person with a higher level of education has more knowledge and can develop good behaviour, including good health behaviour [67]. This does not have a serious impact on the nutritional status of adolescents. Adolescents who are more outside and have social interactions cause adolescents to have deviant eating patterns. Peer influence is another factor that can override the effects of family support, particularly in adolescents. Peers can influence unhealthy eating behavior and are difficult for families to control [62].

CONCLUSION

Breakfast habits, food diversity, and family support collectively contributed 15.3% to the occurrence of overweight in adolescents, with other factors accounting for the remaining influence. Among these, poor breakfast habits posed the most significant risk, with an odds ratio (OR) of 2.390.

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However, this study has limitations. It did not consider the influence of peer groups, which is significant given that adolescents spend considerable time outside the home and interact with their peers. Future research should explore the role of peer influence and social media in the incidence of overweight among adolescents. Additionally, educational strategies within the school environment are crucial for promoting healthy habits, including regular and nutritious breakfasts. An ideal school environment is essential for supporting the implementation of nutrition education activities that encourage adolescents to make healthy food choices. Schools should provide a healthy canteen by limiting the types of high-energy foods and providing quality food. In addition, teachers can also provide nutrition education at certain times even in a short time.

Awareness regarding the importance of parental support for adolescents' health-related behaviors should be raised and parental support should be assessed in order to prevent and/or manage childhood obesity. For instance, health care providers should ask parents what types of parental support parents are providing for their children and encourage them to engage in feasible/available parental support activities (e.g., such as playing sports with their children). In addition, parents' guidelines and brochures could encourage parental support for adolescents' health-related behaviors, and paren- tal education and counseling programs can disseminate these resources.

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