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Determinant Factors of Fruit and Vegetable Consumption in Rural and Urban Adolescents Jakarta (Social Cognitive Theory Approach)

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ABSTRACT

Fruit and vegetable consumption in Indonesia still does not meet the recommended levels. Low intake of vegetables and fruits poses a risk of cardiovascular disease and mortality. Adolescence is a critical period for instilling healthy behaviors before transitioning into adulthood. The aim of this study is to analyze the factors influencing vegetable and fruit consumption among adolescents in rural and urban areas of Jakarta. The study used a cross-sectional design conducted in urban and semi-rural areas of Jakarta with a two-stage cluster sampling technique. Data related to knowledge, attitudes, preferences, self-efficacy, social, economic, and environmental factors, as well as family and peer behavior, were collected using questionnaires. Data on vegetable and fruit intake were collected using the SQ-FFQ. The data were analyzed using chi-square and logistic regression analysis with $\alpha < 5\%$. The determinants of vegetable and fruit consumption among adolescents in rural areas were parental influence and peer influence, while in urban areas, the determinants were parental influence and vegetable preferences. A tailored approach based on environmental and social characteristics is needed to promote healthy eating behaviors among adolescents.

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Introduction

Fruits and vegetables play an essential role in preventing overweight and obesity, as well as in lowering cholesterol levels due to their fiber content(Pardede, 2013; Wirakusumah, 2007). Currently, the prevalence of overweight or obesity among children and adolescents aged 5–19 years has risen sharply—from just 4% in 1975 to over 18% in 2016. This increase in body weight is a major risk factor for non-communicable diseases, particularly cardiovascular diseases, which are among the leading causes of mortality (World Health Organization, 2018).

To support health, it is recommended to consume 30–35 grams of fiber daily, equivalent to 3–4 servings of vegetables and 2–3 servings of fruit per day (Kementerian Kesehatan RI, 2019). However, national data show that 93.5% of Indonesians aged over 10 years consume fruits and vegetables below the recommended level. Among adolescents aged 10–14 years, this figure increased to 96.8% in 2018. On average, Indonesians consume only 173 grams of fruits and vegetables per day, with fruit intake (67 grams) being notably lower than vegetable intake (107 grams per capita per day) (Kementerian Kesehatan RI, 2013, 2018; Ridwan, 2017).

Addressing this low intake requires a comprehensive understanding of the factors influencing fruit and vegetable consumption. While various interventions from 2018 to 2020 have aimed to improve intake, most have focused merely on increasing knowledge (Azhari & Fayasari, 2020; Sekti & Fayasari, 2019). Research has identified factors such as age, gender, and parents' socioeconomic status (Farida, 2010; Lestari, 2012) along with other determinants including knowledge, attitudes, availability of fruits and vegetables, media exposure, parental influence, parental intake, income, self-efficacy, and individual preferences (Amelia & Fayasari, 2020; Anggraeni & Sudiarti, 2018; Fayasari et al., 2020; Rachman et al., 2017; Wiramah, 2016).

Social Cognitive Theory (SCT) is frequently used as a behavioral change framework in nutrition interventions. It incorporates the stages of change model (pre-contemplation, contemplation, preparation, action, and maintenance), and explores the dynamic interaction between personal, behavioral, and environmental factors. SCT provides a practical foundation for designing targeted strategies that align with individuals' readiness to adopt healthy eating behaviors—particularly fruit and vegetable consumption (Bandura, 1986; Contento, 2016; Hildebrand & Betts, 2009).

Access to fruits and vegetables also differs between rural, semi-urban, and urban settings. A study conducted in Yogyakarta revealed that rural residents had slightly better fruit and vegetable consumption compared to those in urban areas

(Oktavia et al., 2019). However, comparisons between different urban settings may be biased due to variations in food accessibility. Therefore, it is necessary to analyze disparities within the same region—such as Jakarta—by comparing rural and urban areas, especially among adolescents. This age group is considered a critical period for establishing lifelong healthy habits. Previous studies have shown that only 23.4% of adolescents met the recommended levels of fruit and vegetable intake (Amelia & Fayasari, 2020; Fayasari et al., 2020). Based on these considerations, this study aims to explore "Factors Influencing Fruit and Vegetable Consumption Among Adolescents in Rural and Urban Areas of Jakarta: A Social Cognitive Theory Approach."

Method

This study employed a cross-sectional design conducted in both urban and rural areas of Jakarta, involving junior and senior high school students between May and September 2021. The study population comprised all students enrolled in junior and senior high schools located in the designated rural and urban regions of Jakarta. Inclusion criteria were students currently enrolled in the selected schools who consented to participate as respondents. Exclusion criteria included students who had suffered from chronic illness within the past month.

A two-stage cluster sampling technique was applied. The sample size was calculated using the formula for comparing two proportions as follows:

$$n = \left(\frac{Z\alpha\sqrt{2P(1-\overline{P} + Z\beta\sqrt{P_1(1-P^1) + P_2(1-P^2)}}}{P_1 - P_2} \right)^2$$

To account for heterogeneity across regions, the sample size was adjusted using a design effect coefficient. The resulting total sample size was multiplied by a design effect of 2, with a base minimum of 105, resulting in a total minimum sample size of 210 subjects. The two-stage cluster sampling consisted of randomly selecting schools from each area in the first stage, followed by randomly selecting classes within those schools in the second stage.

The data collected in this study included: demographic characteristics, knowledge, attitudes, self-efficacy, preferences for fruits and vegetables, stages of change, socioeconomic and environmental factors, as well as family, peer behaviors, and actual fruit and vegetable intake. Data were collected using an online survey platform (bit.ly/FDSayurBuah).

Demographic characteristics included age, parental income, gender, and exposure to media and health information. The knowledge questionnaire consisted of 15 multiple-choice items, the attitude scale comprised 14 Likert-scale items, and self-efficacy was assessed with 6 Likert-scale questions adapted from (Wiramah, 2016). Fruit and vegetable intake was measured using a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) consisting of 28 fruit and vegetable items, reflecting consumption over the past two weeks.

Data analysis included univariate, bivariate, and multivariate approaches. Frequency distributions were described using univariate analysis. Associations between variables were analyzed using chi-square tests and Spearman's rank correlation, with a significance level set at $p < 0.05$. To identify key determinants of fruit and vegetable intake, logistic regression was conducted, including variables with a p-value < 0.25 in the model.

Results

Data collection was conducted from April to June 2021, involving a total of 553 subjects. Among those who completed the questionnaire, 47 responses were excluded due to incomplete data. As a result, the final sample consisted of 506 subjects from six schools in DKI Jakarta, on average, each school contributed approximately 50 students to the study. Respondents' characteristics are presented in Table 1. Since there are no rural areas in DKI Jakarta, semi-rural areas were selected for the study. A total of 239 students (47.2%) were from semi-rural areas, while 267 students (52.8%) were from urban areas. The gender distribution was relatively balanced across both groups.

Table 1. Subject Characteristic

Variable	Peri-rural		Urban		Total	
	n	%	n	%	n	%
Area	239	47,2	267	52,8	506	100,0
Sex						
Male	103	42,9	110	41,2	213	42,0
Female	137	57,1	157	58,8	294	58,0
Level of education						
Junior	135	56,3	133	49,8	268	52,9
Senior	105	43,8	134	50,2	239	47.1
Nutritional status						
Underweight	36	15,1	46	17,2	82	16,2
Normal	164	68,6	176	65,9	340	67,2
Overweight	39	16,3	45	16,9	84	16,6
Information source						
Social media	128	53,6	148	55,4	276	54,5
Website	32	13,4	39	14,6	71	14,0
Electronic device	37	15,5	46	17,2	83	16,4
Relatives	28	11,7	21	7,9	49	9,7
Book	10	4,2	6	2,2	16	3,2
Never	4	1,7	7	2,6	11	2,2

Variable	Peri-rural		Urban		Total	
	n	%	n	%	n	%
SCT stages						
Maintenance	195	81,6	226	84,6	421	83,2
Action	29	12,1	31	11,6	60	11,9
Preparation	4	1,7	1	0,4	5	1,0
Contemplation	9	3,8	3	1,1	12	2,4
Precontemplation	2	0,8	6	2,2	8	1,6

Among the selected schools, the number of junior high school (SMP) students was slightly higher than that of senior high school (SMA) students, although the difference remained relatively balanced. Based on BMI-for-age (BMI/A), the majority of subjects had a normal nutritional status. The prevalence of overweight was 16.6%, with similar proportions found in both semi-rural and urban areas.

Sources of information about fruits and vegetables were predominantly obtained through social media, websites, and electronic media. In the semi-rural group, information was more frequently acquired through personal networks such as family, friends, and relatives, compared to the urban group.

Based on the Stages of Change (SOC) model, most participants had reached the maintenance stage in fruit and vegetable consumption, followed by the action stage. A smaller proportion of participants were in the preparation, contemplation, and pre-contemplation stages. The maintenance stage indicates that the behavior of consuming fruits and vegetables has been adopted and become a habit. In contrast, the action stage indicates that the behavior has started but has not yet become habitual.

Table 2. Characteristic of the Availability of Fruit Vegetables

Variables	Peri-rural		Urban		Total	
	n	%	n	%	n	%
FV availability						
Good	107	44,8	113	42,3	220	100
Low	132	55,2	154	57,7	286	100
Fruit availability						
Never	2	0,8	0	0	2	0,4
Rarely	45	18,8	31	11,6	76	15,0
Sometimes	128	53,6	144	53,9	272	53,8
Everyday	64	26,8	92	34,5	156	30,8
Parents provide fruit						
Never	1	0,4	2	0,7	3	0,6
Rarely	25	10,5	27	10,1	52	10,3
Sometimes	129	54,0	139	52,1	268	53,0
Everyday	84	35,1	99	37,1	183	36,2
Vegetable availability						
Never	1	0,4	0	0	1	0,2
Rarely	11	4,6	10	3,7	21	4,2
Sometimes	72	30,1	79	29,6	151	29,8
Everyday	155	64,9	178	66,7	333	65,8
Parents provide vegetables						
Never	3	1,3	2	0,7	5	1,0
Rarely	16	6,7	13	4,9	29	5,7
Sometimes	108	45,2	118	44,2	226	44,7
Everyday	112	46,9	134	50,2	246	48,6
Access to FV						
Nearby	72	30,1	79	29,6	151	29,8
Moderate distance	70	29,3	81	30,3	151	29,8
Far, but accessible by walking	37	15,5	55	20,6	92	18,2
Far, but accessible by vehicle	51	21,3	48	17,9	99	19,6
Far, not easly accessible	9	3,8	4	1,6	13	2,6
Place to Buy Fruits and Vegetables						
Traditional market	99	41,4	100	37,5	199	39,3
Supermarket	33	13,8	35	13,1	68	13,4
Fruit store	21	8,8	12	4,5	33	6,5
Grocery store	0	0	2	0,7	2	0,4
Vegetables vendor	90	33,5	112	41,9	202	39,9
Combination	6	2,4	6	2,4	12	2,4
Storage location						
Refrigerator	225	94,1	252	94,4	477	94,3
Closed cabinet	4	1,7	4	1,5	8	1,6
Open cabinet	3	1,3	4	1,5	7	1,4
On the table	7	2,9	7	2,6	14	2,8

The availability of fruits and vegetables among subjects is presented in Table 2. Availability was generally better in urban areas compared to semi-rural areas. The proportion of daily availability of fruits and vegetables was higher in the urban group. When comparing vegetables and fruits, vegetables

were more readily available in the respondents' surroundings than fruits. Daily vegetable availability reached 65.8%, while daily fruit availability was only 30.8%.

Regarding access, the majority of respondents reported that fruits and vegetables were located nearby and easily accessible (29.8%), followed by those who described access as moderate (29.8%). Additionally, 18.2% indicated that the sources were far but still reachable by walking, 19.6% stated that access required transportation, and the remaining respondents reported that fruits and vegetables were far and not easily accessible.

Table 3. Fiber intake from Fruit and Vegetables

Variables	Mean ± SD		p-value
	Peri-rural	Urban	
Fiber from vegetables (g)	13,2±12,4	14,1±11,6	0,401
Fiber from fruits (g)	16,1±15,42	19,2±16,7	0,03*

*p-value< 0,05, independent t-test

The average fiber intake was higher in the urban group compared to the semi-rural group; however, a statistically significant difference was observed only in fiber intake from fruit sources (Table 3).

Table 4 presents the relationship between various factors and the consumption of fruit and vegetables among adolescents in peri-rural and urban areas. In peri-rural areas, a significant association was observed between attitude (p=0.038), parental influence (p=0.000), and peer influence (p=0.001) with fruit and vegetable consumption. Adolescents with a positive attitude, strong parental support, and peer encouragement were more likely to have good fruit and vegetable intake. Other factors such as fruit and vegetable preferences, knowledge, and self-efficacy showed no significant association in peri-rural settings.

In urban areas, a significant association was found between vegetable preference (p=0.022) and parental influence (p=0.000) with fruit and vegetable consumption. Adolescents who preferred vegetables and received greater parental support had better consumption levels. Other variables such as fruit preference, knowledge, attitude, self-efficacy, and peer influence were not significantly associated with intake in the urban group.

Table 4. Factors related to FV consumption

Variables	Consumption of Fruit Vegetables						p-value
	Low		Good		Total		
	n	%	n	%	n	%	
Peri-Rural							
Fruit preference							
Low	32	28.8	79	71.2	111	100	0.275
Good	29	22.7	99	77.3	128	100	
Vegetable preference							
Low	22	21.8	79	78.2	101	100	0.294
Good	39	28.3	99	71.7	138	100	
Knowledge							
Low	24	26.1	68	73.9	92	100	0.874
Good	37	25.2	110	74.8	147	100	
Attitude							
Negative	34	32.1	72	67.9	106	100	0.038
Positive	27	20.3	106	79.7	133	100	
Self-efficacy							
Low	33	28.7	82	71.3	115	100	0.279
Good	28	22.6	96	77.4	124	100	
Parental influence							
Low	39	36.8	67	63.2	106	100	0.000*
Good	22	16.5	111	83.5	133	100	
Peer influence							
Low	40	35.4	73	64.6	113	100	0.001*
Good	21	16.1	105	83.3	126	100	
Urban							
Fruit preference							
Low	15	11.7	113	88.3	128	100	0.418
Good	21	15.1	118	84.9	139	100	
Vegetable preference							
Low	21	19.8	88	80.7	109	100	0.022*
Good	15	9.5	143	90.5	158	100	
Knowledge							
Low	13	13.3	85	86.7	98	100	0.937
Good	23	13.6	146	86.4	169	100	
Attitude							

Variables	Consumption of Fruit Vegetables						p-value
	Low		Good		Total		
	n	%	n	%	n	%	
Negative	18	14.3	108	85.7	126	100	0.717
Positive	18	12.8	123	87.2	141	100	
Self-efficacy							
Low	22	17.5	104	82.5	126	100	0.072
Good	14	9.9	127	90.1	141	100	
Parental influence							
Low	26	23.4	85	76.6	111	100	0.000*
Good	10	6.4	146	93.6	156	100	
Peer influence							
Low	14	14.1	85	85.9	99	100	0.809
Good	22	13.1	146	86.9	168	100	

Based on Table 5, the factors influencing fruit and vegetable consumption among adolescents in the semi-rural group were parental influence and peer influence. In contrast, in the urban group, the key factors affecting adolescent fruit and vegetable consumption were parental influence and vegetable preference. Based on Table 6, the key determinants of fruit and vegetable consumption in urban areas were parental influence and vegetable preference, with odds ratios (OR) of 4.807 and 2.596, respectively. In rural areas, parental influence and peer influence emerged as the main determinants, with OR values of 2.556 and 2.351, respectively. However, the R^2 values for both models were relatively low—14% for the urban model and 12% for the rural model—indicating that other unmeasured factors may also play a role in influencing fruit and vegetable intake.

Table 5. Determintant Factors related to FV consumption

Variables	Exp(B)	p value
Urban		
Parental influence		
Low	1	0.000
Good	4.807	
Vegetable preference		
Low	1	0.013
Good	2.560	
Constant	0.158	0.027
Pseudo R^2	0.147	
Rural		
Parental influence		
Low	1	0.003
Good	2.556	
Peer influence		
Low	1	0.007
Good	2.351	
Contant	0.206	0.010
Pseudo R^2	0.119	

Discussion

Factors influencing fruit and vegetable consumption among adolescents in rural areas were parental influence and peer influence. Based on Tables 8 and 9, the key determinants in the urban setting were parental influence and vegetable preference, with odds ratios (OR) of 4.807 and 2.596, respectively. In rural areas, peer influence also played a significant role, while in urban areas, vegetable preference was more influential. These results are consistent with previous research (Franko et al., 2013) and (Woo & Lee, 2017) which emphasize the role of familial and social contexts in shaping adolescent dietary behaviors. Parental influence, in particular, may manifest through food availability at home, family eating practices, and parental dietary habits. These practices include parental control over dietary norms and the shaping of healthy eating habits in the household.

Study by Cullen *et al*, parental influence operates through multiple mechanism, including parental control, permissive eating (allowing children to eat a variety of foods freely), and children's involvement in food preparation. Some respondents in this study reported that adolescents already held responsibilities for preparing their own meals (Cullen et al., 2003). Similarly, Woo and Lee (Woo & Lee, 2017) noted that adolescent vegetable consumption is influenced by parents and the home environment—even though adolescents often make independent food choices outside parental influence. Ahlstorm also highlighted adolescents' growing autonomy in food selection, reflected in their cooking self-efficacy *(Ahlstrom, 2019)*.

One of the challenges in improving fruit and vegetable intake among adolescents is the influence of family and peers. This includes perceptions such as "I feel embarrassed to eat fruits and vegetables

when I'm with friends," or "My family doesn't like fruits and vegetables." Peer approval alone may not be enough to influence actual consumption behavior. (Franko et al., 2013). found a significant association between peer normative beliefs and fruit and vegetable intake, but not with peer modeling, normative expectations, or perceived norms. This suggests that while adolescents may recognize that eating fruits and vegetables is healthy, their peer environment might not support or might even discourage such behavior through negative social feedback (Cullen et al., 2003; Helsel et al., 2019).

Family and peer support are significantly associated with fruit and vegetable intake, but primarily among majority groups. Adolescent food choices are still largely shaped by their immediate social environment—particularly family and peers. Therefore, interventions aimed at increasing fruit and vegetable consumption should consider engaging peers, especially by raising awareness about the health benefits of fruits and vegetables.

Children and adolescents who regularly eat with their families tend to consume healthier foods, including more fruits and vegetables (Neumark-Sztainer et al., 2003). Family meals have been consistently associated with higher fruit and vegetable intake. This effect is strengthened when fruits and vegetables are already prepared and made readily available on the table (Cullen, 2001; Cullen et al., 2003; Patrick & Nicklas, 2005).

The relatively low R^2 values in both models (14% urban, 12% rural) indicate that while these social factors are influential, other unmeasured variables likely play a role, such as media exposure, school food environments, or individual psychological traits. Thus, while the study's claims are largely supported by both the data and existing literature, the complex interplay of individual, familial, and social factors warrants further exploration.

This study supports existing theories regarding the importance of family and peer contexts in adolescent nutrition. However, it also highlights the need for targeted interventions that not only engage parents but also leverage peer dynamics and adolescent autonomy, especially by promoting social norms that favor healthy eating.

Conclusion

Fruit and vegetable preferences among subjects in this study were generally favorable (>50%), with a tendency for higher preference scores among adolescents in urban areas. The key determinants of fruit and vegetable consumption among adolescents in rural areas were parental influence and peer influence, while in urban areas, the main determinants were parental influence and individual preference.

Access to information about fruits and vegetables plays an important role in shaping both consumption patterns and preferences. Enhancing the availability and accessibility of fruits and vegetables at home is also crucial to improving intake among adolescents. Interventions aimed at increasing fruit and vegetable consumption among adolescents—both in rural and urban settings—should involve support from parents and peers. Moreover, strengthening adolescents' self-motivation and awareness is essential to encourage sustainable healthy eating behaviors.

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Author Contribution and Competing Interest

AF: conceptualization, investigation, methodology; supervision, writing–review and editing; TAK: methodology, writing–original draft, formal analysis, resources. The author declares that there are no conflicts of interest in the writing and preparation of this article.

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