

# The Relationship between Environmental Factors and Other Factors with Energy Intake in Students of SMA Muhammadiyah 11 Jakarta in 2022

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**Keywords:** Energy Intake, Fast Food, Environmental Factors, Sugar-Sweetened Beverages, Muhammadiyah 11.

**Abstract:** Energy intake influences the incidence of nutritional problems in adolescents. This is related to the adolescent lifestyle that always wants to do anything in a short time and always follow the latest trends. The purpose of this study was to determine the relationship between environmental factors and the contribution of western fast food and sugar-sweetened beverages (SSBs) intake to RDA with total energy in students of SMA Muhammadiyah 11 Jakarta. This study has a cross-sectional design. This research was conducted on 159 students of class X and XI SMA Muhammadiyah 11 Jakarta. Environmental factors data were obtained by filling out questionnaires independently, consumption data of western fast food and sugar-sweetened beverages (SSBs) were obtained by interviewing a semi-quantitative food frequency questionnaire (SQ-FFQ), and data on energy intake was obtained by interviewing food recall 2 x 24 hours. A total of 159 students participated in this study. The proportion of students with excessive intake was 18,20%. Based on data analysis, factors that are related to the total energy in students of SMA Muhammadiyah 11 Jakarta are the contribution of western fast-food intake and the contribution of sugar-sweetened beverages (SSBs) intake.

## 1 INTRODUCTION

Being overweight is one of the nutritional problems experienced by many adolescents. The highest prevalence of overweight occurs in America, which is 30% of American adolescents experiencing overweight problems, and 22 – 25% of European adolescents also experience the same problem (Bibiloni et al., 2013). In 2018 there were 13.5% of adolescents aged 16-18 years in Indonesia experienced overweight problems, while in DKI Jakarta province reached 21.1% of adolescents aged 16 – 18 years experienced overweight problems (Kemenkes RI, 2018).

The high number of nutritional problems in adolescents can occur due to an imbalance between the food intake consumed and their needs. Adolescents who consume more food intake than their needs have a 4.69 times greater risk of obesity compared to adolescents who consume adequate energy intake (Adiyanti et al., 2015). If the food intake consumed by a person is to his needs, the

optimal nutritional status will be achieved (Kuswari et al., 2018).

Food intake comes from all food or drinks consumed by a person (Palupi, 2014). In adolescents, a person will be more easily influenced by the environment and their closest people, and adolescents will quickly follow the times or trends that are developing in society, especially in terms of modern food (Ardiani et al., 2017). At the age of adolescence, someone can already eat the food he likes and can also solve their curiosity about food (Chikamah & Nisa, 2020). Western fast food is one of the foods favored by almost all teenagers. Fast food products have high energy content and make a significant contribution to the recommended daily energy intake (Mackay et al., 2021). Lucio, et al. (2020) research also states that the menus available in fast food restaurants contain energy that exceeds the recommended daily intake for school children (Lucio et al., 2020). In addition to food, some drinks have a fairly high energy contribution to a person's needs, namely sugar-sweetened beverages (SSBs). The growing development of the sweet drink

industry today indicates that this drink is accepted by the community, including adolescents. Based on research on students in Jordan, sugar-sweetened beverages (SSBs) contribute up to 481 kcal in one day, hot drinks are the most frequently consumed by these students (Bawadi et al., 2019). There is also a study conducted on adolescents in Bandung, stating that the average energy intake contributed by sweetened drinks is 327.29 kcal, or 19.4% of the total average daily energy intake (Akhriani et al., 2016).

In addition to the selection of food types that can affect food intake, the obesogenic environment can also be an enabling factor that causes a person to consume excess food. An obesogenic environment is an environment that can support a person to experience obesity or being overweight. Being in that environment can be an easy way to get food and fulfill one's food intake needs. A study in the UK States that someone who is in an environment with access to a lot of food has almost twice the risk of being obese (Townshend & Lake, 2016). There is also a study in China that states that the existence of a wet market in urban areas contributes to a large enough nutritional intake for children (Wang & Shi, 2012). Currently, there is also a food delivery service facility, which of course also makes it easier for everyone to get the food they want without the need to leave the house. Food delivery services can be accepted by many people around the world, even in 2020, the use of food delivery services has become a trend in China (Li et al., 2020). The covid-19 pandemic that has occurred throughout the world has also revived food delivery services. This is evidenced by a survey conducted by the Katadata Insight Center that there are 44% of Gen Z have just started using food delivery services during the pandemic (Nurcahyani, 2021).

Based on nutritional problem data that occur in adolescents, the authors are interested to know whether there is a relationship between the environmental factors and other factors on the total energy of students at SMA Muhammadiyah 11 Jakarta.

## 2 METHOD

### 2.1 Design

This study used a cross-sectional study design, which is primary data taken at one time. The research is located on the SMA Muhammadiyah 11 Jakarta from February to March 2022.

### 2.2 Subject

The target population in this study were students of classes X and XI of SMA Muhammadiyah 11 Jakarta for the academic year 2021/2022, totaling 323 students. By calculating the sample requirement using the Lemeshow formula, the minimum sample size is 152 students. Sampling was carried out through stratified random sampling and purposive sampling. The inclusion criteria in this study were students of classes X and XI who were active as students of SMA Muhammadiyah 11 Jakarta in the academic year 2021/2022, were willing to become respondents, and users of food delivery services, while the exclusion criteria in this study were respondents who did not follow the research data process until completion.

### 2.3 Dietary Intake

Dietary intake data was obtained from the result of food recall 2 x 24 hours. The result was categorized based on WNP 2004 into deficit (intake < 80% RDA), normal (intake 80 – 110% RDA), and more (intake >110% RDA).

### 2.4 Environmental Factors

Environmental factors in this study are home distance with western fast-food restaurants, home distance with minimarket/supermarket/drink stalls, and frequency of food delivery service used. Environmental data were obtained from the questionnaire. Google maps applications were used for validating the distance data. The result of distance data was categorized into near ( $\leq$  median) and far ( $>$  median), while the result of frequency of food delivery service used was categorized into often ( $\geq$  3 times a week) and rarely ( $<$  3 times a week) (Harahap, 2019).

### 2.5 Consumption of Western Fast Food and Sugar-Sweetened Beverages (SSBs)

Consumption of western fast food and sugar-sweetened beverages (SSBs) data was obtained from the results of the semiquantitative – food frequency questionnaire (SQ-FFQ). The measurement results are the average energy contribution from the consumption of western fast food and sugar-sweetened beverages (SSBs) to the daily energy needs based on the Rate of dietary adequacy (RDA).

## 2.6 Data Analysis

Data were analyzed using chi-square ( $\chi^2$ ) for independent variables that have measurement results categorized and use an independent t-test on independent variables that have numerical measurement results. Independent t-test analyses were used because the data were distributed normally.

## 3 RESULTS

### 3.1 Description of Characteristics, Dietary Intake, Environmental, and Consumption of Western Fast Food and Sugar-Sweetened Beverages (SSBs)

Respondents were 159 students of class X and XI SMA Muhammadiyah 11 Jakarta in the academic year 2021/2022. Table 1 shows a description of the respondents' characteristics.

Table 1: Respondent Characteristics.

Characteristics	n	%
<b>Sex</b>		
Male	86	54.10
Female	73	45.90
Total	159	100.00
<b>Age (years)</b>		
15	44	27.70
16	78	49.10
17	36	22.60
18	1	0.60
Total	159	100.00
<b>Pocket Money (Rp)</b>		
10,000	16	10.10
15,000	14	8.80
20,000	24	15.10
25,000	17	10.70
30,000	36	22.60
35,000	10	6.30
40,000	15	9.40
50,000	27	17.00
Total	159	100.00

Dietary intake is divided into three categories, namely deficit, normal, and excessive to the WNPB 2004. Table 2 shows a description of the respondent's dietary intake.

Environmental Factors are divided into two categories for each variable. For distance, the variable is divided into near and far, while for

frequency of food delivery service used variable is often and rarely. Table 3 shows a description of the respondent environmental factors.

Table 2: Dietary Intake Data of Respondent.

Intake	n	%	Mean ± SD
<b>Energy</b>			
Deficit	6	3.80	2291.53 ± 381.69
Normal	124	78.00	
Excessive	29	18.20	
Total	159	100.00	
<b>Protein</b>			
Deficit	6	3.80	68.17 ± 9.34
Normal	124	78.00	
Excessive	29	18.20	
Total	159	100.00	
<b>Fat</b>			
Deficit	5	3.10	73.93 ± 13.38
Normal	122	76.70	
Excessive	32	20.10	
Total	159	100	
<b>Carbohydrate</b>			
Deficit	6	3.80	338.38 ± 60.78
Normal	123	77.40	
Excessive	30	18.90	
Total	159	100.00	

Table 3: Environmental Factors Data of Respondent.

Environmental Factors	n	%
<b>Home distance from a western fast-food restaurant</b>		
Far	75	47.20
Near	84	52.80
Total	159	100.00
<b>Home distance with minimarket/supermarket/drink stall:</b>		
Far	60	37.70
Near	99	62.30
Total	159	100.00
<b>Frequency of food delivery service used:</b>		
Often	110	69.20
Rarely	49	30.80
Total	159	100.00

The average energy contribution from consumption of western fast food is 1.22% of RDA and sugar-sweetened beverages (SSBs) are 1.51% of RDA. Table 4 shows a description of the respondents' western fast food and sugar-sweetened beverages (SSBs) consumption.

Table 4: Western Fast Food and Sugar-Sweetened Beverages (SSBs) Consumption of Respondent.

Energy Contribution	Mean (%RDA)	Min – Max	95% CI
Western Fast Food	1.22	0 – 3.93	1.07 – 1.37
Sugar-Sweetened Beverages (SSBs)	1.51	0 – 5.81	1.34 – 1.69

Table 5: Relationship between Environment Factors and Energy Intake.

Environment Factors	Energy Intake						p-value	PR
	Excessive		Normal - Deficit		Total			
	n	%	n	%	n	%		
Home distance from a western fast-food restaurant								
Near	15	17.90	69	82.10	84	100.00	1.000	0.990
Far	14	18.70	61	81.30	75	100.00		
Home distance with minimarket/ supermarket/ drink stall								
Near	19	19.20	80	80.80	99	100.00	0.851	1.031
Far	10	16.70	50	83.30	60	100.00		
Frequency of food delivery service used								
Often	6	12.20	43	87.80	49	100.00	0.278	0.901
Rarely	23	20.90	87	79.10	110	100.00		

### 3.2 Relationship Between Environment Factors and Energy Intake

The difference in proportion test was carried out by compositing the categories of energy intake into two categories, namely normal - deficit and excessive. Table 5 shows the result of the bivariate analysis of the environmental factors with total energy intake. Based on the analysis result using the chi-square test, the three environmental factors variables were not significantly related to energy intake (p-value > 0.005).

### 3.3 Relationship Between Consumption of Western Fast Food and Energy Intake

Table 6 shows the result of the bivariate analysis of the consumption of western fast food with total energy intake. Based on the analysis result using the independent t-test, there is a significant relationship between consumption of western fast food and energy intake (p-value < 0.005).

Table 6: Relationship between Consumption of Western Fast Food and Energy Intake.

Energy Intake	Energy Contribution of Western Fast Food (% RDA)	
	Mean (% RDA)	p-value
Excessive	1.98	0.042
Normal - Deficit	1.41	

### 3.4 Relationship Between Consumption of Sugar-Sweetened Beverages (SSBs) and Energy Intake

Table 7 shows the result of the bivariate analysis of the consumption of sugar-sweetened beverages (SSBs) with total energy intake. Based on the

analysis result using the independent t-test, there is a significant relationship between consumption of sugar-sweetened beverages (SSBs) and energy intake (p-value < 0.005).

Table 7: Relationship between Consumption of Sugar-Sweetened Beverages (SSBs) and Energy Intake.

Energy Intake	Energy Contribution of Sugar-Sweetened Beverages (% RDA)	
	Mean (% RDA)	p-value
Excessive	1.54	0.009
Normal - Deficit	1.13	

## 4 DISCUSSIONS

Being in environmental factors like that can increase the intake of energy contributed from snack foods generally causing excess fat intake and sugar intake in adolescents (Arundhana & Masnar, 2021). As many as 52.80% of students are in the near category on the variable distance from home and western fast-food restaurants. In addition, from the total fat intake of students in a day, there are 20.10% of students have more fat intake. The fat intake can come from western fast food, so it contributes to students' energy intake being excessive. However, the results of this study indicate that there is no significant relationship between distance from home and western fast-food restaurants with total energy intake (p-value > 0.05). This can be caused because students do not always buy food from the nearest fast food western restaurant. In Pranata and Gunawan's research (2018), it is stated that the most dominant factor in choosing a place to eat is the price of the food and distance is the last factor in determining the choice of where to eat (Pranata & Gunawan, 2018). Some students stated that the reason for buying food from the nearest western fast-food restaurant was because there was no other

choice. This means that students have a high probability of not choosing the nearest western fast-food restaurant to get food. In addition, the results of the recall of the total energy intake of most students did not eat the food sold by the western fast-food restaurant.

In the variable distance, home distance with minimarket/supermarket/drink stall, 62.30% of students have a near distance between their house and minimarket/supermarket/drink stall. This number is a larger number than the number of students near distance of their homes and western fast-food restaurants. In addition, 18.90% of students have excessive carbohydrate intake which can cause students to have excessive energy intake. Carbohydrate intake probably comes from the contribution of sugar in the composition of sweet drinks consumed by students. However, the results of this study also show that there is no significant relationship between the distance from home and the minimarket/supermarket/drink stall with total energy intake ( $p$ -value  $> 0.05$ ). This could be because some respondents stated that they did not often purchase food or drinks from the nearest minimarket/supermarket/drink stall. In addition, some students have a stock of food or drinks at home, so students no longer need to buy food or drinks from the nearest minimarket/supermarket/drink stall. From the variable distance, the average distance from home and minimarket/supermarket/food stall is 1.13 km compared to the distance between home and western fast-food restaurant, which is 3.16 km. This distance is a longer distance when compared to Erdianti's (2021) study, which is that there are fast food restaurants within a distance of  $< 200$  m around the research site which can lead to high consumption of fast food in research subjects (Erdianti, 2021).

Activity that uses food delivery services as intermediaries to get food is called the frequency of food delivery service used. As many as 69.20% of students have a frequency of using food delivery services in the rare category. The results of this study indicate that there is no significant relationship between the frequency of using food delivery services and total energy intake ( $p$ -value  $> 0.05$ ). The results of the study by Maretha, et al (2020) also have the result that there is no relationship between the use of online food delivery applications with eating frequency and diet quality (Maretha et al., 2020). Based on the reasons students when using food delivery services, because by using food delivery services students do not need to leave the house to get food and the attractive promos offered

on food delivery service applications are also the reasons students use food delivery services. In Purba, et al research (2022) as many as 45.2% of students also stated the reason for purchasing food/beverages through online applications was because there was a promo (Purba et al., 2022).

The contribution of western fast-food intake is the percentage contribution of energy intake from western fast-food to the needs of students based on the rate of dietary adequacy (RDA). The average contribution of energy intake from western fast-food respondents is 1.22% of the student's energy needs based on the rate of dietary adequacy (RDA). This study shows that there is a significant relationship between the contribution of western fast-food intake and total energy intake ( $p$ -value  $< 0.05$ ). The study by Lucio, et al (2020), stated that the main dish contained in the package menu provided by western fast-food restaurants such as McDonald's, Burger King, and Carls Jr. had a 49% energy contribution. The large energy contribution of western fast-food is caused by the high-fat content in these foods (Lucio et al., 2020). In the study by Bonita and Fitranti (2017), it was stated that there was a significant relationship between total energy from western fast-food and the incidence of overweight in stunting adolescents (Bonita & Fitranti, 2017).

Contribution of sugar-sweetened beverages (SSBs) intake, which is the percentage of it to the needs of respondents based on the rate of dietary adequacy (RDA). The average contribution of energy intake from sugar-sweetened beverages (SSBs) of respondents is 1.51% of respondents' energy needs based on the rate of dietary adequacy (RDA). This study shows that there is a significant relationship between the contribution of sugar-sweetened beverages (SSBs) intake and total energy intake ( $p$ -value  $< 0.05$ ). This is related to the research of Dewi, et al (2012) which also has research results that there is a relationship between calorie intake of energy and total energy consumption (Dewi et al., 2012). Energy from the intake of sugar-sweetened beverages (SSBs) cannot maintain a feeling of fullness for a long time so that it will make repeated consumption of sugar-sweetened beverages (SSBs) results in excess energy intake (Annisa et al., 2020). Some respondents consume sugar-sweetened beverages (SSBs) purchased from contemporary drink stalls which are widely spread among students. In addition, students also consume packaged tea drinks that are easy to find, some students even state that they have a stock of packaged tea drinks at home.



## 5 CONCLUSIONS

In this study, there is no significant relationship between distance from home to fast food restaurant, distance from home to minimarket/supermarket/drink stall, and frequency of use food delivery service with total energy in students of SMA Muhammadiyah 11 Jakarta and there is a significant relationship between the contribution of western fast-food intake to RDA and sugar-sweetened beverages (SSBs) intake to RDA with total energy in students of SMA Muhammadiyah 11 Jakarta. Future researchers are expected to conduct further research related to nutritional status as an impact that can arise if there are problems with total energy intake.

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