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Socio-Economic Determinants of Obesity in Indonesia: Analysis of IFLS 2014 Data

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Abstract

The phenomenon of obesity has become a serious problem in various countries, especially in Indonesia. According to WHO in 2016 there were 2.8 million people who died due to the problem of obesity, while according to the Indonesian Ministry of Health the prevalence of overweight and obesity in Indonesia in 2018 reached 13,6% and 21.8%. One of the factors that cause obesity is socio-economic status. However, there are often differences regarding the effect of socioeconomic status on obesity in developing and developed countries. This study aims to identify the determinant factors of socioeconomic status on overweight and obesity. The data used comes from the Indonesian Family Life Survey (IFLS) 5 in 2014 with samples are aged more than 18 years. The analysis was conducted by using the Ordered Logistic Regression model. The results of this study indicate that statistically, individuals with higher socioeconomic status have a higher chance of experience overweight and obesity. Therefore, the socialization of health care programs needs to be improved, especially in the community and schools to increase knowledge, awareness, and change lifestyles to be healthier.

Keywords
Obesity; socio-economic status; ordered logistic regression; IFLS

I. Introduction

The problem of overweight and obesity has become an epidemic problem for the whole world, especially for Indonesia. Based on the results of the 2016 report (WHO), more than 1.9 billion adults, aged 18 years and over, are overweight and 650 million of them are obese. Every year, at least 2.8 million people die as a result of being overweight and obese (World Health Organization, 2017).

The prevalence of overweight and obesity in Indonesia in the population aged over 18 years in the last decade continues to increase. In 2007, overweight was at 8.6%, then in 2013 it increased to 11.5%, and to 13.6% in 2018. As for obesity, in 2007 it was at 10.5% and increased in in 2013 (14.8%) and 2018 (21.8%) (Ministry of Health RI, 2018). This shows that the problem of overweight and obesity from year to year has always experienced a significant increase and is a health problem that must be addressed by the government. This is because obesity can trigger cancer such as cancer of the esophagus, kidney, uterus, pancreas, breast and colon (Kemenkes RI, 2018).

According to research conducted by Koliaki et al (2019), overweight and obesity can cause diseases that affect cardiovascular function such as coronary heart disease, heart failure, hypertension, atrial fibrillation, and others. In addition, excess body weight and obesity can cause breathing problems during sleep and other hypoventilation syndromes. Another study conducted by KB Smith and Smith (2016) found that obese people are very

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susceptible to co-morbidities such as cancer, cardiovascular disease, diabetes mellitus, hypertension, osteoarthritis, and stroke.

In addition to the health risks that arise, there are other effects of overweight and obesity such as decreased productivity and the overall economy (Lehnert et al, 2013). Research conducted by Dinsa, Goryakin, Fumagalli, & Suhrcke (2012) found that in developed countries a higher socioeconomic status is at risk for obesity. However, the results of research in several developing countries show that the relationship between socioeconomic status and obesity is always different.

Another study related to socioeconomic status in China in 2013 stated that the relationship between socio-economic status (SES) and obesity could not be seen clearly. This is because education level is negatively correlated while income level is positively correlated to overweight and obesity (Cai et al., 2013). However, research conducted in Paris and Seattle in 2014 stated that socio-economic status (SES) which consists of education and income is negatively correlated with overweight and obesity (Drewnowski et al, 2014).

Other findings according to Koliaki et al (2019), overweight and obesity are also mentioned as one of the direct and indirect causes of death in people with cardiovascular disease. According to KB Smith and Smith (2016) obesity is listed as the fifth leading cause of death in the world, nearly 3.4 million deaths every year. Another study conducted by Masters et al (2013) found a similar thing, namely at a further level there was a relationship between obesity and the risk of death in all age groups.

In Indonesia, research conducted using literature studies obtained different results, namely there is a positive correlation between socio-economic status (SES), namely education and income with the prevalence of overweight and obesity (Rachmi et al., 2017). Therefore, it is interesting to study further how the influence of socioeconomic factors on overweight and obesity by using quantitative analysis in order to obtain the probability level of being overweight and obese and be able to explain the differences in the results of research conducted in Indonesia and outside Indonesia with add another independent variable.

II. Research Methods

This study uses secondary data obtained from the results of the Indonesia Family Life Survey (IFLS), which is a longitudinal socio-economic survey of household life that is taken based on a household sample that represents 83% of the Indonesian population and was conducted in 13 provinces in Indonesia (Strauss et al. al., 2016).

The method used is descriptive and quantitative research methods. Meanwhile, the variables collected are socio-economic determinants and factors that also influence obesity include the variables of food and beverage consumption, age, marital status, gender, smoking status, physical activity, and place of residence. Calculation of weight category using Body Mass Index (BMI) in accordance with the standards of the World Health Organization in 2000, namely normal (BMI<23), overweight (BMI≥23), Obese (BMI≥25). The unit of analysis in this study was individuals with a sample of 18,908 people with individuals over 18 years of age.

The software used is STATA 14. The data used is in the form of a cross section, namely the 5th IFLS wave of 2014 with an ordered logistic regression model. The model is appropriate to be used in this study because it has the advantage of being able to see the results of more than 1 category in the dependent variable so that it can answer the probability level of both overweight and obesity problems simultaneously. With the following specifications:

$$y_i^* = \beta_0 + \beta_i exp_i + \beta_2 tpt_i + \beta_3 kt_i + \beta_4 ki_i + \beta_5 kd_i + \beta_6 ks_i + \beta_7 kf_i + \beta_8 umur_i + \beta_9 jk_i + \beta_{10} kf_i + \beta_{11} mrkk_i + \beta_{12} afb_i + \beta_{13} afs_i + \beta_{14} afr_i + U_i$$

Description:

□	: Variable BMI (2=obese, 1=overweight, 0=normal)
□0	: Constant
□1-□21	: Parameter
exp	: Expenditure per capita (log)
tp	: Last education level (0=No School, 1=SD, 2=SMP, 3=SMA, 4=University)
kt	: Egg consumption (day/week)
ki	: Fish consumption (day/week)
kd	: Meat consumption (day/week)
age	: Individual age
jk	: Gender (1 = male, 0 = female)
wlyh	: Place of residence (0 = village, 1 = city)
mrk	: Smoking status (0 = no, 1 = yes)
mnkh	: Married status (0=no, 1=yes)
Afb	: Strenuous physical activity (0 = no, 1 = yes)
afs	: Moderate physical activity (0 = no, 1 = yes)
afr	: Mild physical activity (0 = no, 1 = yes)
i	: Individual
□	: *Error term*

III. Results and Discussion

Characteristics of research subjects are individuals aged more than 18 years. Table 1 shows that most of the respondents who answered were in the normal BMI category, which was 50.11%, for the overweight category 16.07%, and for the obesity category it was 33.83%.

Table 1. Frequency Distribution of Socio-Economic Determinants of Obesity

Variable	N	%
Gender		
Woman	10,194	53.91%
Man	8,714	46.09%
Residence		
village	8085	42.76%
City	10,823	57.24%
Age	18,908	100%
BMI		
Normal	9,474	50.11%
Over weight	3.038	16.07%
Obese	6396	33.83%
Education		
No school	1.092	5.78%
SD	6.661	35.23%
junior high school	3.335	17.64%
senior High School	5.337	28.23%
College	2.483	13.13%
Expenditure **(logs)**		
Egg Consumption (day/week)	**18,908**	**100%**
Fish Consumption (day/week)	**18,908**	**100%**
Meat Consumption (day/week)	**18,908**	**100%**
Milk Consumption (day/week)	**18,908**	**100%**
Consumption of fast food (day/week)	**18,908**	**100%**

Soft drink consumption (day/week)	**18,908**	**100%**
Married Status		
Not married yet	4.305	22.77%
Marry	14,603	77.23%
Heavy Physical Activity		
Not active	16,290	86.15%
Active	2.618	13.85%
Moderate Physical Activity		
Not active	13,602	714.94%
Active	5.306	28.06%
Light Physical Activity		
Not active	12.131	64.16%
Active	6.777	35.84%
Smoking Status		
Do not smoke	11,747	62.13%
Smoke	7.161	37.87%
TOTAL	18,908	100%

Table 1 shows that the majority of respondents have normal weight (50.11%). In the education status group, respondents with the last education level of elementary school were more than the other education levels, namely 6,661 (35.23%). In the gender group of respondents, there were more women as many as 10,194 (53.91%). Most of the respondents live in urban areas, as many as 10,823 (57.24%). Most of the respondents were married, as many as 14,603 (77.23%). While on the physical activity variable, the majority of respondents were not actively doing physical activity, either heavy 16,290 (86.15%), moderate 13,602 (71.94%), and light 12,131 (64.16%). On smoking status, more respondents did not smoke, namely 11,747 (62.13%).

Table 2. Analysis of the Ordered Logistic Model of Socio-Economic Determinants of Obesity

Variable	**Coefficient** ***Ordered Logit***	***Marginal Effect*** **Obesity**
Expenditure (logs)	0.364***	0.0791***
	(0.0206)	(0.00448)
SD	0.569***	0.109***
1=SD, 0=otherwise	(0.0706)	(0.0120)
junior high school	0.642***	0.125***
1=junior high school, 0=otherwise	(0.0786)	(0.0140)
senior High School	0.625***	0.121***
1=high school, 0=otherwise	(0.0784)	(0.0137)
College	0.687***	0.135***
1=College, 0=otherwise	(0.0858)	(0.0158)
Egg Consumption (day/week)	0.0205***	0.00445***
	(0.00719)	(0.00156)
Fish Consumption (day/week)	0.0116**	0.00252**
	(0.00591)	(0.00128)
Meat Consumption (day/week)	0.0244***	0.00529***
	(0.00865)	(0.00188)
Milk Consumption (day/week)	-0.0596***	-0.0130***

	(0.00692)	(0.00150)
Consumption of fast food (day/week)	0.0414*	0.00900*
	(0.0231)	(0.00502)
Consumption of soft drinks (day/week)	0.0344**	0.00746**
	(0.0158)	(0.00344)
City Area	0.298***	0.0647***
1=City, 0=Village	(0.0311)	0.0647***
Marry	0.625***	(0.00677)
1=Married, 0=otherwise	(0.0370)	0.136***
Age	0.0134***	0.00291***
	(0.00113)	(0.000246)
Man	-0.565***	-0.123***
1=Male, 0=Female	(0.0446)	(0.00970)
Smoke	-0.485***	-0.105***
1=Smoking, 0=otherwise	(0.0454)	(0.00985)
Light Physical Activity	-0.0535*	-0.0116*
1=Active, 0=otherwise	(0.0311)	(0.00676)
Moderate Physical Activity	-0.0365	-0.00792
1=Active, 0=otherwise	(0.0330)	(0.00716)
Heavy Physical Activity	-0.151***	-0.0329***
1=Active, 0=otherwise	(0.0458)	(0.00994)

Based on table 2, it is known that all variables are significant for obesity, except for the moderate physical activity variable. This is due to the limited data available in IFLS, namely, information on the amount of time required for physical activity does not match the amount of time recommended by WHO. The results of the ordered logit regression test from the above equation show that socio-economic status (SES) has a significant relationship with obesity. Higher levels of per capita expenditure and education will increase the likelihood of being obese with a p value < 0.01.

Higher levels of food consumption will increase the likelihood of being obese at different alpha values ($p<0.01$; $p<0.05$; $p<0.1$). However, the milk consumption variable has an inverse relationship because the available information on milk consumption is in days/week, whereas the better unit is in cups/day. While on the lifestyle habits variable, heavy physical activity has a p value <0.01 and light physical activity has a p value <0.1. That is, individuals who perform heavy or light physical activity have a lower likelihood of becoming obese.

3.1. Socio-Economic

Individuals who have a higher socio-economic status (SES), namely the level of per capita expenditure and higher education, have a positive and significant correlation ($p<0.01$) to obesity. This is in line with previous research conducted by Monteiro, Moura, Conde, & Popkin (2004) which found that obesity in every developing country tends to shift towards groups with lower SES and McLaren (2007) research that socioeconomic status which consists of income, property ownership, education and occupation, women in developing countries have a positive correlation with overweight and obesity, while in developed countries it has the opposite relationship.

Another study conducted in Asia, namely China, according to Zhang et al. (2017) found that men with higher income and education levels had a higher likelihood of being overweight and obese in men. Another study conducted by Rachmi et al (2017) found that a

higher SES will lead to more weight and obesity. This is because individuals with higher income levels tend to behave consumptively, especially in the consumption of food and beverages so that it will increase the number of calories that enter the body (Rachmi et al 2017). Meanwhile, individuals with a high level of education tend to get high-status jobs that make the individual more busy and reduce the physical activity of the individual. However,

Food consumption (eggs, fish, meat, milk, fast food, soft drinks) was positively and significantly correlated at different levels ($p<0.01$;$p<0.05$;$p<0.1$) with respect to obesity, except milk variable is negatively correlated with obesity. This is in line with research conducted by Rachmi et al. (2017) and Trivedi (2015) which showed that the more food consumed, the greater the probability of being obese. However, there are differences in the methods used, which in previous studies still used literature studies, while in this study, variables related to health indicators (smoking status) were added.

Another study conducted by Garcia, Sunil, & Hinojosa (2012) illustrates that regular consumption of fast food can increase obesity at a significantly higher level. The increase in consumption of all the excessive food variables directly affects obesity, this is due to the imbalance of calories between intake and output.

3.2. Social Demographics

Individuals living in urban areas were positively and significantly correlated ($p<0.01$) with obesity. This is because individuals who live in urban areas find it easier to get various types of food and access to transportation, thereby reducing physical activity. This research is in line with research conducted previously by (Rachmi et al, 2017). However, in developed countries this is inversely proportional to where people living in rural areas are more at risk of obesity (Patterson et al., 2004) and (Jackson et al., 2005). Marital status was positively and significantly correlated ($p<0.01$) with obesity. This is because married individuals do less physical activity than unmarried individuals. This is in line with research conducted (Trivedi, 2015),

Age has a positive and significant correlation ($p<0.01$) to overweight and obesity, because the older a person gets, the more risky they are to get a disease accompanied by a bad lifestyle. This is in line with research conducted by (Smith et al, 2012) and (Amoah, 2003). Meanwhile, individuals with male gender have a negative correlation, which means that men have a lower risk of being overweight and obese because they do physical activity more often and spend less screen time compared to women. This is in line with previous research conducted by (Katsaiti & Anshasy, 2014) and (Klumbiene et al, 2004).

3.3. Health Indicator

Individuals who smoke have a negative and significant correlation ($p<0.01$) with weight obesity, because cigarettes contain nicotine which disrupts hormone levels in the body where the function of hormones is to regulate appetite so that people who smoke will reduce their appetite. This is in line with research conducted by (Cai et al, 2013). Research by Courtemanche et al (2018) and Dare et al (2015) found a similar finding where individuals who quit smoking in the long term would increase their BMI by 1.8-1.9, especially at a younger age.

3.4. Lifestyle Habits

Individuals who are active in physical activity have a negative and significant correlation between mild ($p<0.1$) and severe ($p<0.01$) on obesity, because the more active individuals in physical activity will be, the more calories they will expend. This is in line with research conducted by (Bruner et al, 2009). This is similar to research conducted by

Pietiläinen et al (2008) that both in adolescence and older age, lack of physical activity can increase the risk of overweight and obesity.

3.5. Research Limitations

In this study, there are shortcomings, namely although this study has controlled several variables such as per capita expenditure, education, physical activity, and so on, there are still confounding variables that are difficult to control in this study such as genetic factors. A person with a high level of food consumption but not obese due to hereditary problems has a faster metabolism in the body than normal.

In addition, there are limitations to IFLS data, namely that consumption data is still less specific, such as no data on the number of units consumed per day. An example of the availability of milk consumption data that can only know the frequency in units of days/weeks of consuming milk. It is better to know this in units of cups/day so that the measurement is more accurate on BMI. Then the length of time required for physical activity in IFLS is not exactly the same as the length of time recommended by WHO.

IV. Conclusion

Based on the results of the study, the socio-economic status variables consisting of per capita expenditure, education level, and food consumption had a positive and significant relationship with obesity, except for milk consumption which had the opposite relationship. While the socio-demographic variables, namely the area of residence, marital status, and age have a positive and significant relationship to obesity, while the rest, namely gender, have the opposite relationship. The health indicator variable, namely smoking status, has a negative and significant relationship with obesity, while the rest, namely the ownership of health insurance, has the opposite relationship. Lifestyle habits variables, namely light, moderate, and heavy physical activity have a negative and significant relationship to obesity.

From the results of this study, the authors suggest lifestyle changes, such as routine physical activity and controlling food nutritional intake. In addition, the government's role is needed, especially the ministry of health, in conducting counseling and programs on problems of various kinds of diseases, how to prevent them, how to find out if we are infected with these diseases or not, and how to overcome them. In addition, it also encourages healthy living community movement programs (germas) such as increasing healthy living behavior, periodic health checks, and increasing physical activity.

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