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Relationship Between Proportion of Food Expenditure and Consumption of Energy and Protein

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Abstract: Food consumption has affected directly to human qualities. This study was carried out by using the data from "BPS" Indonesia. The data was analyzed by using a Pearson Correlation and paired t-test. The results shows that there is no significantly difference between energy consumption and proportion of food expenditure (r = 0.105 and p = 0.334); protein consumption and proportion of food expenditure (r = 0.129 and p = 0.234); but there is correlation between energy consumption and protein consumption (r = 0.892; p = 0.00). The correlation is very strong. By using the paired t-test it can be seen that proportion of food expenditure with energy consumption (p = 0.00) and energy consumption by consumption of protein (p = 0.00) were statistically significantly different, but the proportion of food expenditure with consumption of protein (p = 0.190) were not statistically different.

Key words: Food consumption, energy consumption, protein

INTRODUCTION

Income is one of the factors that determine the pattern of food consumption. Related aspect to the level of income is the level of expenditure. It is generally known that the level of income affects the pattern and level of expenditure (Nurmanaf and Susilowati, 2000). Sudaryanto *et al*. (1999) proved that the level of income has a negative relationship with the portion of food expenditure. The higher household income levels has lower portion of food expenditure.

It shows that the higher income, the higher purchasing power and also increasingly its access to quality food. Expenditure is one of the factors that can explain an overview of the income. The decline of purchasing power will affect consumption patterns. Engle law in Soekirman (2000) states that increasing the income, the proportion of food expenditure will decline, otherwise decreasing the income, will increase the proportion of food expenditure.

Food consumption is an early indicator that determines the nutritional status (Gibson, 2005). The pattern of food consumption in low-income communities tend to be dominated by carbohydrates, increasing the income, proportion of carbohydrate to be decline and the proportion of protein to be increase (Bannet law in Soekirman, 2000).

Food consumption has a direct relationship with human qualities. Food consumption is represented by the consumption of energy and protein is an early indicator that describes the unsuccessful development. According to the republic of Indonesia's health minister rules in 2013, the average consumption of energy and protein for Indonesia people is 2150 calories/capita/day and 57 g/capita/day, respectively. This study was aimed to show the relationship between food expenditure and consumption of energy and protein.

MATERIALS AND METHODS

Data: The data were proportion of food expenditure, energy and protein consumption, from 2008 until 2013 collected from "Badan Pusat Statistik" (BPS) Indonesia (Badan Pusat Statistik, 2014a,b,c).

Statistical analysis: Analyze data used descriptive analysis and bivariate analysis by using SPSS program. Presentation of the Data: data presented in tables and graphic.

RESULTS AND DISCUSSION

Level of energy consumption, protein consumption and proportion of food expenditure: Food consumption is an overview of nutritional status. Food will provide the nutrients needed by the body to carry out normal functions, if selected food well will give a good effect on the body, on the contrary if the food is not well chosen will give bad impact on the body (Almatsier, 2001). Table 1 and Fig. 1 shows that there is a tendency of decreasing the level of energy consumption, the level of protein consumption and proportion of food expenditure.

Depkes (2006) said that there are five groups of nutritional adequacy rate (NAR), which are: (1) severe deficit (NAR <70%); (2) moderate deficit (NAR 70-79%); (3) mild deficit (NAR, 80-89%); (4) to normal (NAR, 90-119%) and (5) more (NAR, >120%). Table 1 show that the protein consumption rate is normal, energy consumption rate is almost normal.

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Table 1: Distribution of energy consumption, protein consumption and proportion of food expenditure by different of time

Year	Energy consumption (Calory/capita/day)	Energy consumption rate (%)*	Protein consumption (g/capita/day)	Protein consumption rate (%)**	Proportion of food expenditure (%)
2008	2038	95	58	100	50
2009	1928	90	54	95	51
2010	1926	90	55	96	51
2011	1902	88	55	96	51
2012	1859	86	54	95	50
2013	1836	85	53	93	49

*Accounted by Regulation of Health Minister (2013), energy adequacy rate is 2150 cal/cap/day
**Accounted by Regulation of Health Minister (2013), protein adequacy rate is 57 g/cap/day

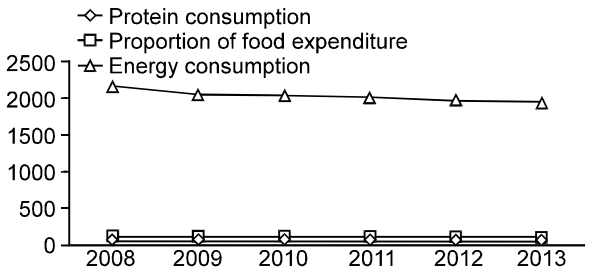

Fig. 1: Distribution of energy consumption, protein consumption and proportion of food expenditure in different periods of time

Table 1 shows that proportion of food expenditure range between 49-51%. Yudaningrum (2011) reported the average proportion of food expenditure was equal to 60% of total expenditure. The level of energy consumption was 85.7% and the rate of protein consumption was 94.41%. Amaliyah and Handayani (2011) reported that the proportion of household food expenditure of rice farmers in Klaten district was still high, amounting to 62.95%. Suhartini *et al.* (2015) reported that there was little difference in the proportion of household food expenditure between rich farmers with poor farmer households, which was amounted to 55.61 and 54.27%, respectively. This is associated with the quality and quantity of selected food.

Table 1 also shows that the energy consumption rate >85%. According to Jonsson and Toole (1991), in Handewi *et al.* (2015) the proportion of food expenditure <60% and energy consumption >80% of adequacy, it belongs to the group of food security.

Distribution of energy consumption by type of food and different of time: Table 2 shows that the most of energy consumption is derived from rice grains, which was amounted to 873-968 Calorie. This number is close to the number with the desired pattern of Indonesian food. Desired food patterns of energy consumption was recommend 50% of the total consumption of rice grains. According to the desired pattern of Indonesian food, suggesting the total energy consumption is 2000 Calories. There is a tendency of decreasing in the level of energy consumption. This was followed by the consumption of processed foods and fats and oils. Consumption of tubers is very low, that was 32-53 Calorie/cap/day. Statistical analysis showed that there was no significantly differences in the energy consumption on the different time (r = 0.00; p = 1.00). But it was seen the trend, there is a decline in the amount of energy consumption/capita/day. This is thought to be associated with increased levels of prosperity, in accordance with the law Bannet in Soekirman (2000) which states that energy consumption decreases with increasing income.

Distribution of protein consumption (g/capita) by type of foods and different of time: There is an interesting thing in Table 3, the rice grains, although not as a source of protein, but has the largest contribution as a source of protein. Table 3 shows that most of the protein consumption is derived from rice grains, which amounted 20.48 to 22.76 g/capita/day and followed by processed food, 7.96 to 8.68 g/cap/day and then by fish, 7.28 to 7.94 and 4.72 to 5.49 g/capita /day from nuts. Meat consumption is very low that is 2.22 to 3.16 g/capita/day.

The low consumption of meat suspected to be associated with its price is relatively expensive. Statistical analysis showed that there was no significant differences in the protein consumption on the different time (r = 0.05; p = 0.965). There was a tendency of decreasing in the level of protein consumption. p values were greater than 0.5 indicates that protein consumption in different years were not significantly different. Although not significantly different, but seen from the number, there remains a difference (r = 0.05). It is very weak correlation.

Distribution proportion of food expenditure (capita/month) by type of food and different time: It was interesting to note that the proportion of expenditures for processed food was relatively high compared to other foods which was amounted to 11.44-12.78. This was followed by spending for rice grains from 7.85 to 9.57; fish 3.96 to 4.34; vegetables 3.70 to 4.17 and eggs and milk 2.87 to 3.27. it was relatively small spending for meat which is equal to 1.84 to 2.16% of the total expenditure. By using statistical analysis it was found that there was no significant difference in the protein consumption on the different time (r = -0.09; p = 0.932). There was a tendency of decreasing in proportion of food expenditure. p values were greater than 0.5

Table 2: Distribution of energy consumption (Calory/capita) by type of food and different of time

Type of foods	2008	2009	2010	2011	2012	2013
Rice grains	968.48	939.99	927.05	906.2	890.88	872.97
Tuber crops	52.75	39.97	37.05	39.75	31.66	33.065
Fish	47.64	43.52	45.34	46.72	46.225	44.77
Meat	38.60	35.72	41.14	44.45	57.07	39.21
Egg and milk	53.60	51.59	56.20	54.09	49.57	53.34
Vegetable	45.46	38.95	38.72	37.46	37.72	35.83
Nuts	60.58	55.94	56.19	52.42	53.83	49.165
Fruits	48.01	39.04	40.91	36.66	36.11	33.02
Oil and fats	239.30	228.35	233.39	230.94	240.56	229.53
Beverage	109.87	101.73	100.29	95.71	84.02	88.44
Seasoning	17.11	15.61	16.00	16.02	48.90	14.49
The other	66.92	58.75	59.18	56.80	32.84	51.58
Processed foods	289.85	278.46	273.84	285.18	265.61	290.13
JUMLAH	2038.17	1927.63	1925.61	1902.42	1858.97	1835.58

Table 3: Distribution of protein consumption (g/capita) by type of foods and different of time

Type of foods	2008	2009	2010	2011	2012	2013
Rice grains	22.75	22.06	21.76	21.26	20.9	20.48
Tuber crops	0.42	0.33	0.32	0.33	0.27	0.28
Fish	7.94	7.28	7.63	7.84	7.67	7.45
Meat	2.40	2.22	2.55	2.75	3.165	2.42
Egg and milk	3.05	2.96	3.27	3.15	2.975	3.07
Vegetable	3.01	2.58	2.52	2.38	2.38	2.29
Nuts	5.49	5.19	5.17	5.01	5.14	4.72
Fruits	0.52	0.41	0.47	0.39	0.41	0.37
Oil and fats	0.39	0.34	0.34	0.29	0.27	0.24
Beverage	1.06	0.98	1.05	1.05	0.85	1.04
Seasoning	0.73	0.68	0.69	0.69	0.59	0.62
The other	1.37	1.21	1.21	1.16	1.04	1.06
Processed foods	8.36	8.10	8.03	8.36	7.96	8.68
JUMLAH	57.49	54.35	55.01	54.68	53.64	52.76

Table 4: Distribution proportion of food expenditure (capita/month) by type of food and different time

Type of foods	2008	2009	2010	2011	2012	2013
Rice grains	9.57	8.86	8.89	8.88	8.52	7.85
Tuber crops	0.53	0.51	0.49	0.50	0.43	0.46
Fish	3.96	4.29	4.34	4.32	4.14	4.00
Meat	1.84	1.89	2.10	2.00	2.16	1.84
Egg and milk	3.12	3.27	3.20	3.24	2.87	2.95
Vegetable	4.02	3.91	3.84	3.88	3.7	4.17
Nuts	1.55	1.57	1.49	1.53	1.325	1.29
Fruits	2.27	2.05	2.49	2.27	2.36	2.08
Oil and fats	2.16	1.96	1.92	1.94	1.87	1.6
Beverage	2.13	2.02	2.26	2.14	1.70	1.82
Seasoning	1.12	1.08	1.09	1.09	0.99	0.95
The other	1.39	1.33	1.29	1.31	1.05	0.99
Processed foods	11.44	12.63	12.79	12.78	12.18	12.78
Tobacco and betel	5.08	5.26	5.25	5.26	6.08	6.12
JUMLAH	50.17	50.62	51.43	51.03	49.89	48.92

indicates that the proportion of expenditure in different years were not significantly different. Although not significantly different, but seen from the number, there remains a difference (r = -0.09). The negative sign in front of the value that indicates the relationship is reversed; meaning that progressively decreased the proportion of food expenditure.

Relationship of energy consumption, protein consumption and proportion of food expenditure: Household income is allocated for various purposes, among others: consumption, social activities, the cost of education and others, in meeting the needs of households there is priorities, especially in households with limited income levels. Spending on food consumption was the ranks first, followed by the fulfillment of other purposes.

Pearson Correlation showed that there was no significant difference between energy consumption and proportion of food expenditure (r = 0.105 and p = 0.334); protein consumption and proportion of food expenditure (r = 0.129 and p = 0.234); but there was correlation between energy consumption and protein consumption (r = 0.892; p = 0.00).

Pearson correlation is used to measure the strength and direction of a linear relationship of two variables.

Two variables are said to be correlated if one variable changes accompanied by changes in other variables, both in the same direction or opposite direction. Small correlation coefficient value (not significant) does not mean that the two variables are not interconnected. Maybe just the two variables have a strong relationship, but the value of the correlation coefficient close to 0, for example in the case of non-linear. Thus the correlation coefficient only measures the strength of the linear relationship and not the non-linear relationship. If there is a strong relationship between the two variables, not always indicate the presence of causality. There are six classifications of interpretation of the strength of the correlation relationship, namely; (1) 0: There is no correlation; (2) >0 to 0.25: The correlation is very weak; (3) >0.25 to 0.5: Correlation good enough; (4) >0.5 to 0.75: Correlation strong; (5) >from 0.75 to 0.99: The correlation is very strong and (6) 1: Correlation perfect (Sarwono, 2006).

By using Pearson correlation, it can be seen that there was a strong relationship between energy consumption with consumption of protein (r = 0.892; p = 0.00), but otherwise cannot be seen statistically significant relationship between the proportion of food expenditure with energy consumption and the proportion of food expenditure to the protein intake. Allegedly this is related to the shape of the relationship which may not be linear. So the author tries to use it paired t test, to see if there is difference between the proportion of food expenditure to the level of energy consumption and the proportion of food expenditure to the protein intake.

By using the paired t-test it can be seen that proportion of food expenditure with energy consumption (p = 0.00) and energy consumption with consumption of protein (p = 0.00) were statistically significantly different, but the proportion of food expenditure with consumption of protein (p = 0.190) were not statistically different. This indicated that the proportion of food expenditure affect energy consumption, while the proportion of food expenditure does not affect the consumption of protein. While the consumption of protein and energy consumption significantly different statistically. This allegedly was associated by the function of the protein as an energy source.

Conclusion: The protein consumption rate is normal, energy consumption rate is almost normal.

There is a tendency of decreasing in the level of energy consumption. The energy consumption is derived from rice and grains, which was amounted to 873-968 Calorie. This was followed by the consumption of processed foods and fats and oils. Consumption of tubers is very low, that was 32 to 53 Calorie/cap/day.

The most of the protein consumption is derived from rice grains, which was amounted 20.48-22.76 g/capita/day and followed processed food, 7.96-8.68 g/cap/day and then by fish, 7.28-7.94 and 4.72-5.49 g/capita /day from nuts. Meat consumption is very low that is 2.22-3.16 g/capita/day.

The proportion of expenditures for processed food is relatively high compared to other foods which amounted to 11.44-12.78. This was followed by spending for rice grains 7.85 to 9.57; fish 3.96-4.34; vegetables 3.70 to 4.17 and eggs and milk 2.87 to 3.27. it was relatively small spending for meat which was equal to 1.84 to 2.16% of the total expenditure.

Pearson Correlation showed that there was no significantly difference between energy consumption and proportion of food expenditure (r = 0.105 and p = 0.334); protein consumption and proportion of food expenditure (r = 0.129 and p = 0.234); but there was correlation between energy consumption and protein consumption (r = 0.892; p = 0.00).

Paired t-test showed that the average proportion of food expenditure with average energy consumption (p = 0.00) and average energy consumption by average consumption of protein (p = 0.00) were significantly different, but average proportion of food expenditure with average consumption of protein (p = 0.190) were not significantly different.

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