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Research Article

EXPLORING VARIABILITY IN VEGETABLE CONSUMPTION USING QUANTILE REGRESSION: THE CASE OF RURAL HOUSEHOLDS IN ISABEL, LEYTE, PHILIPPINES

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This study investigates the determinants of vegetable consumption among rural households in Isabel, Leyte using cross-sectional data. Primary data were collected through personal interviews with randomly selected households. The identification of determinants affecting vegetable consumption was analyzed using quantile regression. The estimated daily per capita vegetable consumption is below the recommended intake of the World Health Organization suggesting that vegetable consumption is relatively inadequate. The quantile regression results show that households in upland areas consistently have higher vegetable consumption than households in the lowland areas. In addition, there is a strong correlation between households who produce their own vegetable and vegetable consumption. The quantile regression results show that households producing their own vegetables are more likely to consume more vegetables. Results of the study suggests that to increase vegetable consumption, health practitioners, local government units, or stakeholders may intervene by promoting backyard gardening, community and school gardening, and improving agricultural and food systems.

***Keywords*:** vegetables, per capita consumption, rural households, quantile regression

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1. INTRODUCTION

Fruit and vegetable consumption plays an important role in our health as it is a source of different kinds of nutrients. Vegetables are a rich source of dietary fiber, minerals, and vitamins and have an imperative role in the human diet (Wargovich, 2000). Low fruit and vegetable consumption is among the top risk factor contributing to an estimated 5.2 million deaths worldwide (World Health Organization [WHO], 2015). In the Philippines, micronutrient deficiencies considerably impact economic productivity, growth, and national development (Department of Health [DOH], 2010). According to the Department of Health (DOH) (2010), widespread iron deficiency is estimated to decrease the gross domestic product (GDP) by as much as 2% per year. Malnutrition in the Philippines is caused by a host of interrelated factors such as health, physical, social, economic, and others (Food and Agriculture Organization [FAO], 2001).

Despite the availability of vegetables, a large proportion of the population in the Philippines consume inadequate amount of vegetables. According to the Bureau of Agricultural Statistics (2005), in 2003, the estimated vegetable production was over 5 million tons. A study by Kanungsukkasem et al. (2009) stated that a large number of populations in Asia consumes an inadequate amount of vegetable. Education and behavioral change programs are needed to promote fruit and vegetable consumption despite the abundance and availability. In the Philippines, vegetable intake is inadequate. The vegetable intake among Filipino is only 110 g, making up 13 % of the daily food intake (Maghirang, 2006). This included green leafy vegetables at 30 g per day and other vegetables at 80 g per day. The most commonly eaten vegetables were squash, string beans, gourds, eggplant, kangkong, camote, and malunggay (Maghirang, 2006). This average consumption is far behind the recommended consumption of 400 grams daily (Food and Nutrition Research Institute – Department of Science and Technology [FNRI-DOST], 2015). The below-average vegetable consumption is seen as one of the factors contributing to the inadequacy of energy and micronutrients in the Philippines (FNRI-DOST, 2015).

Eastern Visayas is considered among the poorest region in the country, with a poverty incidence of 37.4% (Oxford Business Group, 2015; National Statistical Coordination Board [NSCB], 2013; Seriño, 2014; Giles et al., 2019). Living in poverty exacerbates low consumption of all vegetables and appears to be a primary factor in eating fewer vegetables (Storey & Anderson, 2014). A large population in Eastern Visayas consumes inadequate amount of vegetable. In terms

of nutritional status, Eastern Visayas is plagued by problems of underweight and under height children, overweight adults, and micronutrient deficiency and disorders among vulnerable groups – children, pregnant women, and lactating mothers according to Food and Nutritional Research Institute - Department of Science and Technology (FNRI-DOST) (2015). Since a large proportion of the population in Eastern Visayas consume inadequate amount of vegetable. This study aims to examine and analyze the associated factors that affect vegetable consumption in Isabel, Leyte.

The findings of the study can contribute to society's benefit, considering that vegetable intake has an important role in economic development. Additionally, this study is also important in providing essential information for policymakers. Poverty, deprivation, and limited access to healthy foods explain some of the differences in vegetable consumption across groups. The study is also important in improving the vegetable intake of households and enhancing economic performance.

Review of Related Literature

A diet that is rich in fruits and vegetables is associated with decreased risk of cancer and heart disease (Harvard T.H. Chan School of Public Health, 2017). Vegetables, a rich source of dietary fiber, minerals, and vitamins, have an imperative role in the human diet (Wargovich, 2000). Vegetables also provide micro-nutrients like iron, magnesium, and calories. Vegetables are complementary foods of the first order and are much more important for man's health than products of animal origin (Hugues & Philippe, 1995).

The US Department of Agriculture and the US Department of Health (2010) recommended making one-half of plate fruit and vegetable. Fruit and vegetables include a diverse group of plants that vary greatly in the content of energy and nutrients. Additionally, fruit and vegetable intake supply fiber, and fiber intake are linked to improving health status and is linked to less cardiovascular disease (CVD) and probably has a role in obesity prevention (Slavin & Lloyd, 2012).

Past studies were conducted on household consumption of fruit and vegetables (Perez, 2002; Vermeir & Verbeke, 2008). A child's eating habits are already established in childhood or adolescence and may significantly track into adulthood (Mikkila et al., 2005). Besides that, adults are highly aware of their consumption choices. Kathleen et al. (2009) found that when more food items are available, the amount of consumption will increase. Availability is a major

influence on the consumption of fruits and vegetables. This finding is similar to the study of Ekesa et al. (2009), which revealed that poor availability of fruits and vegetables in the local shops was linked to poor consumption. Another study by Gardiner et al. (2013) found that fruits and vegetables retail initiatives in rural community stores have a role in supporting and promoting fruit and vegetable consumption. However, Kanungsukkasem et al. (2009) found that a large population in Asia consume inadequate amount of vegetable despite abundant availability.

Rasmussen et al. (2006) have conducted a review of the literature for potential determinants of fruit and vegetable consumption. Their findings reveal that the determinants supported by the greatest amount of evidence are gender, age, income, education, occupation, preferences, parental intake, and home availability/accessibility. Results show that girls tend to have a higher or more frequent intake of fruit and vegetables than boys, and a corresponding pattern is seen for the younger age groups compared to the older age groups. These findings were supported by previous studies that show significant socio-demographic attributes toward the consumption of fruits and vegetables (Riediger et al., 2007; Neumark-Sztainer et al., 1996).

According to Reynolds et al. (1996) and Rageliene (2021), gender is related to fruit and vegetable consumption, with girls consuming more servings than boys. The same findings were reported by Xaba and Dlamini (2021); Dehghan et al. (2011); and Tamers et al. (2009). These studies reported that females are more responsible for meal planning and preparation than males, which could give them an advantage of eating more fruits and vegetables than males. A survey from Australians shows that greater consumption of cereals, fruit, vegetables, and low-fat foods in young women of higher socioeconomic status (SES) was reflected in their nutrient profile with higher intake of fiber and vitamin C and a lower intake of fat. Men ate more cereals, meat, and sugary foods and less fruit, vegetables, and low-fat foods. Only 2.5% of men and 4.1% of women conformed to the health promotion message, widely publicized locally, to eat two fruits and five vegetables daily (Milligan et al., 1998). Fruit and vegetable consumption should be encouraged, particularly among boys. However, Gray and Leyland (2011) found that only 13% of boys and 12% of girls met the recommended daily intake of five or more portions of fruit and vegetables. Vegetable intake differs across the region. However, in another study Kim & Kwon (2013) found no relationship between vegetable intake and gender.

Lalluka et al. (2010) found that income is associated with fruit and vegetable consumption. The study revealed that higher income resulted in higher consumption of fruits and vegetables. This finding is similar to the study of Xaba and Dlamini (2021); Bui et al. (2016); Jones and Charlton (2015); and Herman et al. (2008). Another study by Buscail et al. (2018) investigated the impact of fruit and vegetable vouchers on children from low-income families in France. It was revealed that issuing vouchers to poor households significantly increase the consumption of fruits and vegetables. Also, people with more than 12 years of education have more intake of fruits and vegetables compared with those who have less than five years of education (Oliveira et al., 2014).

2. METHODOLOGY

Conceptual Framework

Consumption factors are determined by the combination of four main factors: household income, consumer food preferences, production and cost, and intra-household dynamics. According to Ruel et al. (2005), Consumption and production are separated because production does not depend on consumption. Consumption depends on total income rather than how the income is earned or the source of income. Also, consumption decisions depend on total income and other factors but not on the source of income.

Households who face high costs in getting goods to and from the market tend to produce their own food in the backyard. As a result, the household does not participate in the market for these items because they are producing their own food for their own consumption needs. Production decision partly depends on consumption needs, and consumption partly depends on production opportunities. Vegetables are highly perishable, so the cost of getting them into the market will be high in some areas depending on the distance and location. Thus, consumption may be constrained by whether or not they can produce (Ruel et al., 2005). In Eastern Visayas, low vegetable production combined with sophisticated market system and distance to market, affected the accessibility of vegetables (McDougall et al., 2019). The region is also constantly disrupted with extreme weather events making small scale production even more challenging (Giles et al., 2019; Ruales et al., 2020; Diacamos et al., 2021). To respond to these production challenges, several initiatives have been implemented to boost intensify vegetable productions (Castillo et al., 2021; McDougall et al., 2019). However, despite these initiatives, low vegetable consumption is still prevalent.

The following factors are the hypothesized to affect consumption behavior. This includes household income, consumer food preferences, production and cost and intra – household dynamics. Each of these factors are affected by the several variables. These four (4) determinants of vegetable consumption are illustrated in Figure 1.

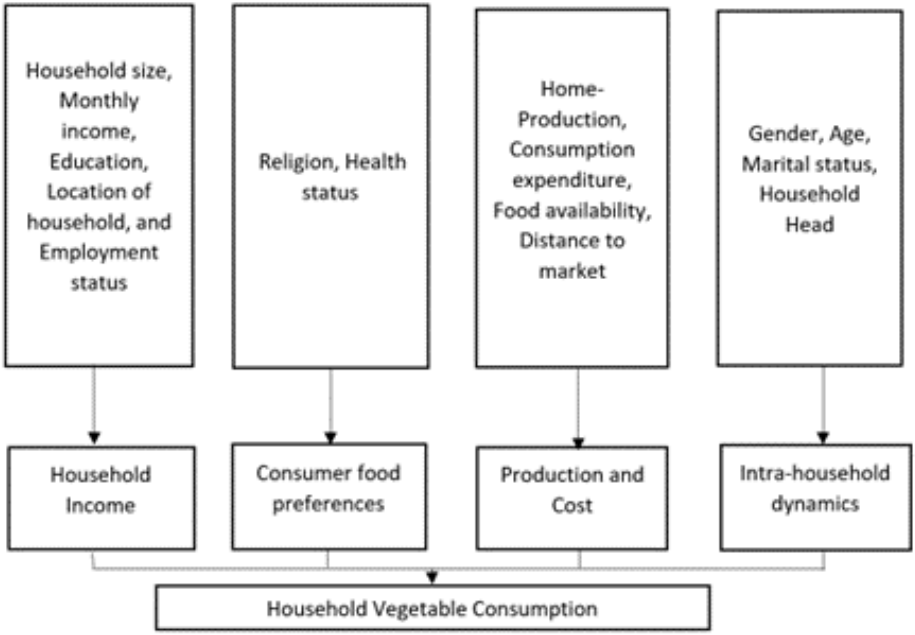

Figure 1. Conceptual framework of determinants of fruit and vegetable consumption.

Study Site

The selected study site is in Isabel, Leyte. According to the municipality of Isabel, the total number of households in selected barangay in Isabel is estimated to be about 13,684. It covers a total area of 64.01 km^2 and is located hilly and mountainous area. The site study is located at the northern portion of Leyte (Figure 2).

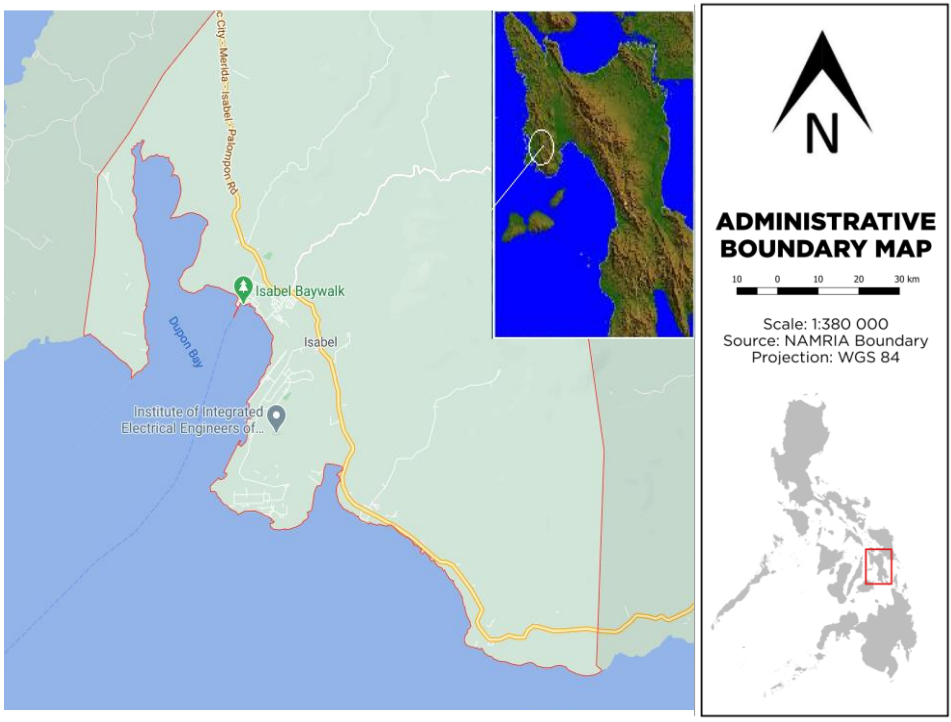

Figure 2. Location of the study (NAMRIA, 2020)

Data Collection

The study used primary data. Data was collected through face – to face interview with household. This was to provide the opportunity to explain questions which were difficult to answer and obtain the exact information needed for the study. Household survey was prepared with a structured questionnaire to investigate demographic, socioeconomic, family and lifestyle characteristics. Food intake was measured with a one-week dietary recall. A one-week dietary recall reporting the total food consumed by the respondent in the past 7 days, most commonly, from morning to midnight.

Simple random sampling was used to select the respondents included in the study. Slovin's fomula was used to determine the sample size with a margin error of 10%. The sample size was computed as follows:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

where:

N = is the total population

e = is the margin of error
n = is the estimated sample size

The estimated sample size for his study is 155 households. This computation of sample size is reflected as follows:

$$n = \frac{13{,}684}{1 + (13{,}684)(0.10)^2}$$
$$n = \frac{13{,}684}{88.5776}$$
$$n \cong 155$$

Quantile Regression Model

Following Seriño and Kim (2011), the method of quantile regression was applied in investigating vegetable consumption in Isabel, Leyte. This is a very informative regression since it evaluate the impact of consumption into different quantiles rather than focusing on the mean. Result from this regression will give useful insight in evaluating vegetable consumption across household distribution.

Koenker and Bassett (1978) first introduced quantile regression in which model conditional quantiles as functions of predictors. This model is a natural extension of the linear-regression model, an alternative approach to conditional mean modelling. This method replaces least square estimations with least absolute distance deviation (Hao and Naiman, 2007). Though distribution can be dissected into many parts, this study focuses only with the four different quantiles division modeling the 25th, 50th and 75th quantile enough to cover the breadth of vegetable consumption distribution.

The quantile regression model is postulated as follows:

$$C_i = \log(X_i)\,\beta_\theta + u_{\theta i} \qquad \text{with } Quant_\theta(C|\log(X_i)) = \log(X_i)\,\beta_\theta \qquad (2)$$

where $Quant_\theta(C_i|\log(X_i))$ denotes the $\theta' th$ conditional quantile of consumption (C) given the independent variables (X) expressed in logarithmic form and subscript i indexes the individual barangay. Usually in quantile regression, the distribution of error term is left unspecified (Koenker 2005) but for our reference, the error term is specified as $u_{\theta i}$.

The important feature of this regression is that the coefficients of the independent variables differ over quantiles (i.e. different values of θ). It is hypothesized that β for consumption is higher at lower quantile and would be

lower at higher quantile. Those residents who belongs to lower quantile usually produces their own vegetable, assuming that they have their own backyard of vegetable. Most of the respondents from the upland area belong to lower quantile and it is hypothesized that residents who belong to lower quantile consume more vegetables than meat. In particular, quantile regression will look into detail how household income would affect the vegetable consumption, the higher and lower quantile of consumption distribution.

To analyze the factors affecting consumption, the economic model is postulated as follows:

vegetable consumption = f (female, age, income, health condition, household size, employment, education, house ownership, food expenditure, religion, location, own production and availability of food)

Vegetable consumption intake was stratified by quantiles. The consumption was clustered into low income, middle income, and high income group to further investigate the dynamics of vegetable consumption across income group.

3. RESULTS AND DISCUSSION

Consumption Gap

Table 1 shows the estimated vegetable consumption by income category. The average vegetable consumption the weekly average intake of the household is only 1.69 kg translating to 338 grams of vegetable consumption per capita per week. On a daily basis, the estimated consumption per capita is 48.28 grams. Results show that the per capita daily vegetable consumption of 48.28 grams is lower than the recommended consumption by the World Health Organization (WHO) and Food and Nutrition Research Institute – Department of Science and Technology (FNRI-DOST).

The recommended vegetable consumption by WHO is 400g per person per day. Table 1 shows the average vegetable intake of person per income and their respective average household size. Household income under 5,000 pesos with average household size of 4, consumes 400g of vegetable per person weekly or 57.14 g daily. The vegetable consumption gap of household intake per person is 342.86g. However, with the recommended intake of FNRI-DOST with 3 servings of vegetable or equivalent to 225 g the vegetable consumption gap is a bit lower at

167.86 grams per person. On the other hand, household with income of 5,001 – 15,000 consumes 380 g or 54.28 g daily. Similarly, the vegetable consumption of household in the upper income bracket of above 25,000 monthly income is lagging behind national and international standards. This suggest that the vegetable intake per person in Isabel, Leyte is lower than what is recommended by WHO or FNRI-DOST. This result is consistent across income level. One of the reasons why respondents tend to consume inadequate amount of vegetable is preference and usual eating habit. This is in line with the study of Raggio and Gambaro (2018), which reported that the vegetable's color and flavor and the consumption habits in the family environment affect the consumption of vegetables. Based on the discussion with households, children eat only small amount of vegetable and prefer to eat meat. According to parents, their children only want the vegetable soup poured over their rice and children do not eat the vegetable. Hence, parents tend to cook less vegetable and prefer to cook meat or canned goods. Moreover, despite the inadequacy of vegetable consumption, households indicated that consuming vegetables reduces the risk of having hypertension and other chronic diseases. They believe that vegetable consumption is good for the body. Just like squash it is good for the eye sight and has lot of vitamins.

Table 1. Average vegetable consumption per person in household

Monthly Income	Household Weekly Vegetable Consumption	Per Capita Weekly Vegetable Consumption	Per Capita Daily Vegetable Consumption
5,000 and below	1.60 kg	400 g	57.14 g
5,001 – 15,000	1.90 kg	380 g	54.28 g
15,001 – 25,000	1.84 kg	306 g	43.71 g
Above 25, 000	1.38 kg	230 g	32.85 g
Average	1.69 kg	338 g	48.28 g

Note: The recommended daily per capita vegetable consumption by WHO is 400 grams and for FNRI 225 grams.

Age, Health Problems and Vegetable Consumption

Table 2 presents the average weekly vegetable consumption by age of household head. Table 2 also presents the common health problems of the respondents by age. The results shows that household head aged 20 to 35 years old consume an average of 1.84 kg of vegetables a week. It is followed by 1.68 kg of weekly vegetable consumption for respondents aged 36 to 50. Moreover, as age

increases to 51 to 65 vegetable consumption increases to 1.74 kg. It appears that vegetable consumption correlates with number of health problem. As the number of health problems increases, respondents tend to consume more vegetable. There is also a positive association between age and vegetable consumption. For respondents aging 36 to 50, there are 5 respondents who indicated that they have high blood. As age increases to 51 to 65, the number of health problem increases with 8 respondents having hypertension and person with 4 arthritis. One reason why vegetable consumption increases as age increases is that the number of respondents having health problem increases. This relates to increase awareness of consuming more healthy foods, as respondents get older experiencing more health problems.

Table 2. Household consumption by age of household head and their health problem

Age of Household Head	n	Weekly Vegetable Consumptions	No of Health Problems	Health Problems
35 and below	44	1.84	2	diabetes
			1	skin allergy
			1	cough
36 – 50	59	1.68	2	high blood
			1	asthma
			1	cough
			1	diabetes
51 - 65	39	1.74	8	high blood
			4	arthritis
			2	urinary tract infection
			2	diabetes
			1	asthma
Above 65	11	0.71	1	high blood
			1	arthritis
			1	eye problem

Table 2 shows that respondents aging 65 years older have relatively lower vegetable consumption. This is a bit unusual because Luszczki et al. (2019) reported a different finding, which mentioned that there is a statistically significant relationship between age and vegetable consumption, and vegetable

consumption increased with age in both sexes. One reasons for this is that old age is often having a change in appetite, and oral health problem could reduce consumption of vegetable. Older people suffer from gum diseases and tooth decay. Oral and dental is associated with decrease of consumption of vegetable.

Determinants of vegetable consumption

The analysis of the determinants of vegetable consumption is presented in Table 3. Results of the ordinary least square (OLS) regressions and the quantile regressions were presented. Results show that the major determinants of vegetable consumption are similar in both OLS and quantile regression. However, the quantile regression shows which level of distribution (quantiles) the effect is more pronounced.

In the 25th quantile, households in upland area have higher consumption compared to lowland area. As expected, households in upland areas have positive relationship with vegetable consumption. Looking at the coefficient, households from upland have higher vegetable consumption of 0.8112 grams compared to households in lowland area. This positive relationship is maybe due to backyard gardening of vegetables in the upland areas. Gardening vegetable in this community is popular. The main production area for vegetable is usually in highland or upland. It means that local agricultural production increases the quality, diversity and availability of vegetable and other foods. This suggest that households that living in upland can buy vegetable at farm gate market prices. This supports the law of supply and demand states that all else being equal, as price of the product decreases, quantity demanded increases.

Median regression (q50) reveals that upland and food expenditure has significant influences on vegetable consumption. Household from upland areas still has a significant positive relationship to vegetable consumption. Regression in this quantile shows that household from upland areas is associated with 1.8270 increase in vegetable consumption compared to lowland households. Food expenditure has a positive relationship with vegetable consumption. Household who spends more on food is associated with relatively higher vegetable consumption. For those in 50th quantile, an increase in food expenditure is associated with 0.0010 increase in vegetable consumption (Table 3).

In higher vegetable consumption quantile (q75), the variables like age, age-square, upland, food expenditure, production and food availability / accessibility significantly affect the vegetable consumption.

Table 3. Ordinary least square and quantile regression with vegetable consumption as dependent variable

VARIABLES	OLS	25th Quantile	50th Quantile	75th Quantile
Female	-0.0003	-0.0993	-0.1687	-0.132
	(0.267)	(0.194)	(0.306)	(0.376)
Age	-0.1352***	-0.0363	-0.0828	-0.1949**
	(0.050)	(0.032)	(0.056)	(0.082)
Age square	0.0012**	0.0003	0.0008	0.0018***
	(0.0004)	(0.0003)	(0.0005)	(0.0007)
Roman Catholic	-0.1847	-0.1745	-0.3525	0.1407
	(0.343)	(0.364)	(0.473)	(0.625)
Married	0.053	-0.0928	0.0483	0.3725
	(0.264)	(0.169)	(0.862)	(0.425)
General Health	0.7909***	0.2546	0.4817	0.8160*
	(0.246)	(0.166)	(0.344)	(0.480)
Middle Income	-0.5474*	-0.0293	-0.0657	-0.2283
	(0.320)	(0.247)	(0.413)	(0.513)
High Income	-0.6285	-0.1129	-0.6977	-0.6476
	(0.411)	(0.523)	(0.751)	(1.008)
Household size	0.0007	0.0407	0.0046	0.0904
	(0.075)	(0.037)	(0.068)	(0.103)
Employed	-0.2995	-0.0382	-0.3473	-0.4982
	(0.316)	(0.180)	(0.357)	(0.475)
Primary	-0.385	0.0801	-0.2000	-0.8755
	(0.418)	(0.438)	(0.621)	(0.841)
Secondary	-0.2047	0.0151	-0.1649	-0.3434
	(0.421)	(0.431)	(0.610)	(0.840)
Tertiary	-0.0541	-0.1458	0.2509	-0.8035
	(0.569)	(0.541)	(0.843)	(1.109)
College Grad	-0.3434	-0.2548	0.2017	-1.134
	(0.770)	(0.665)	(1.021)	(1.453)
Vocational	-0.3732	0.1096	-0.4943	-1.614
	(0.470)	(0.542)	(0.705)	(1.097)
Upland	1.3743***	0.8112***	1.8270***	1.518**
	(0.329)	(0.364)	(0.488)	(0.587)
House Ownership	-0.2742	-0.0151	0.2984	0.255
	(0.534)	(0.500)	(0.913)	(1.286)
Food Expenditure	0.0011***	0.0004	0.0010**	0.0012*
	(0.0003)	(0.0004)	(0.0004)	(0.0006)
Produces vegetable	0.6542**	0.1978	0.3519	0.7808*
	(0.254)	(0.204)	(0.312)	(0.451)
Food Availability	0.7446***	0.2352	0.3221	1.495***
	(0.256)	(0.1701)	(0.347)	(0.510)
Observations (n) = 153		R-Squared = 0.457		

Note: Standard errors are in parenthesis

*** significant at 1%, ** significant ay 5% * significant at 10%

Consistent with previous results, family living in upland area and food expenditure still has positive effect on vegetable consumption. This means that family living in upland areas consumes more vegetable than those living in lowland areas. Food expenditure significantly affects vegetable consumption in 50^{th} and 75^{th} quantile suggesting that households who spend more on food have higher vegetable consumption. This is due to households' consumption pattern. Consuming meat is complemented with vegetable consumption. Food availability / accessibility exhibits a positive relationship with vegetable consumption. This shows that if food is always available in the home it contributes to 1.4956 increase in vegetable consumption. Those household that consumes more vegetable usually produce some vegetable at their backyard. As expected at higher quantile of vegetable consumption, household who produces vegetable consumes more vegetable. Results show that household who produces vegetable increase their consumption by 0.7808. This is simply because household who produce their own vegetable increase supply of vegetable and availability at home.

4. CONCLUSION

This study aims to identify and analyze the determinants that affects vegetable intake in Isabel, Leyte by analyzing socio – economic factor and demographic factors. This study employs a cross – sectional data and, and primary data were collected through personal interviews. Specifically, this study aims to (1) to describe the socio-economic factors of households and their vegetable consumption; (2) to identify significant determinants influencing vegetable consumption; (3) to provide inputs for policy maker, and health practitioners to encourage increase intake of vegetables.

The estimated daily per capita vegetable consumption is estimated around 48.28 grams. This below the recommended average daily consumption by the World Heath Organization of around 400 grams daily intake of fruits and vegetables. The regression analysis suggests that promotion and support of vegetable backyard gardening, in community and school is a feasible approach in influencing increase intake of vegetable consumption. There is a strong correlation between own production of vegetables and consumption. Producing their own vegetables will help increase vegetable consumption. As reflected in the regression results, households who produce vegetable at their backyard consume more vegetables as well as increase the accessibility and/or availability of vegetable in their home. To increase vegetable consumption, health practitioners may

intervene by promoting backyard gardening, conduct seminars on the benefit of consuming vegetable. Seminars about behavioral intervention designed to increase vegetable consumption, programs about to encourage people to consume vegetable and exercise are some of the possible options. The government also may launch a campaign about the benefit of consumption healthy foods and warn people of the harm of consuming less vegetable. They may start a program on teaching households on small container gardening or cultivate the small area of which it has no use for the meantime. This could also help to reduce their expenditure on food especially on vegetables. For example, by producing vegetables at their backyard or on a small area in their house, the household now have their own supply of vegetables. This will increase the availability of the vegetables in their household.

The government could also improve the consumption of the people through the improvements of agricultural system and food system. In addition, the negative relationship between income and age to vegetable consumption should motive the government to generate more mechanisms to increase awareness on consuming more vegetables. This could be in the form of more advertisement, seminars about health and increase the number of health practitioners. The positive relationship between general health and vegetable consumption may help to provide solution about the increases number of having chronic diseases by providing knowledge on the people that vegetable may help them to avoid this kind of health problems. Additionally, most of the respondents doesn't have any idea how much is the recommended grams of vegetable to be consumed. Maybe it is one of the factors they did not consume adequate amount because the lack of knowledge about vegetable recommended consumption. Health practitioners must double their efforts about providing knowledge to the residents about vegetable consumption.

Further research related to this study should be conducted to include body mass index (BMI) of the respondents. Including BMI will help in knowing whether the respondents are normal in weight with respect to their height. Correlation with BMI and vegetable consumption is an important research study. Also, fruit consumption should be included in the analysis. Middle income households and higher income households appear to consume less vegetable compared lower income household. Maybe one of the reasons that they consume less vegetable because they have high consumption of fruits. However, fruit consumption is not included in the study. Hence, it is recommended in future studies that fruits should be included in the analysis.

5. CONFLICT OF INTEREST

The authors declare no conflict of interest.

6. REFERENCES

Bui, T. V., Blizzard, C. L., Luong, K. N., Truong, N. V., Tran, B. Q., Otahal, P., Srikanth, V., Nelson, M., Au, T., Ha, T., Phung, H., Tran, M., Callisaya, M., Smith, K., Gall, S. (2016). Fruit and vegetable consumption in Vietnam, and the use of a 'standard serving' size to measure intake. *British Journal of Nutrition*, 149-157.

Bureau of Agricultural Statistics. (2005). *Selected Statistics on Agriculture.* Quezon City: Bureau of Agricultural Statistics.

Buscail, C., Margat, A., Petit, S., Gendreau, J., Daval, P., Lombrail, P., Hercberg, S., Lation-Martel, P., Maurice, A., Julia, C. (2018). Fruits and vegetables at home (FLAM): a randomized controlled trial of the impact of fruits and vegetables vouchers bin children from low-income families in an urban district of France. *BMC Public Health*, 1-15.

Castillo, G., Ruales, J.H., Seriño, M.N.V., Ratilla, T.C., 2021, Gross Margin Analysis of Selected Vegetables Grown Under Protected and Open Field Cultivation in Leyte, Philippines. Scientific Paper Series Management, Economic Engineering in Agriculture and Rural Development, 21(3), 247-253. http://managementjournal.usamv.ro/pdf/vol.21_3/Art27 .pdf, Accessed on January 10, 2022.

Dehghan, M., Akhtar-Danesh, N., & Merchant, A. T. (2011). Factors associated with fruit and vegetable consumption among adults. *Journal of Human Nutrition and Dietetics*, 128-134.

Department of Health (DOH) (2010), The Aquino Health Agenda: Achieving Universal Health Care for All Filipinos, Administrative Order No. 2010-0036.

Diacamos, Q. V., Ramoneda, B. M., Seriño, M. N. V., Tambis, M. M., & Bellezas, M. H. I. (2021). Adaptation Strategies to Drought Among Smallholder Farmers in Southern Leyte, Philippines. *Scientific Papers: Management, Economic Engineering in Agriculture & Rural Development*, *21*(3).

Ekesa, B. N., Walingo, M. K., & Abukutsa-Onyango, M. O. (2009). Accesibility to and Consumption of Indigenous Vegetables and Fruits by Rural

Households in Matungu Division, western Kenya. *African Journal of Food Agriculture Nutrition and Development*, 1725-1738.

Food and Agriculture Organization (FAO). (2001). *The State of 2001 Food Insecurity in the World.* Rome, Italy: Food and Agriculture Organization.

Food and Nutrition Research Institute - Department of Science and Technology (FNRI-DOST). (2015). *Philippine Nutrition Facts and Figures: National Nutrition Survey Overview.* Bicutan, Taguig City, Metro Manila: Food and Nutrition Research Institute, Department of Science and Technology.

Gardiner, B., Blake, M., Harris, R., Gee, C., Charaktis, S., Choong, C., Lade, R., Duff, L., Palermo, C. (2013). Can small stores have a big impact? A qualitative evaluation of a store fruit and vegetable initiative. *Health Promotion Journal of Australia*, 192-198.

Giles, J., Macandog, P.B., Sova, C., Seriño, M.N.V., Ruales, J.H., Enerlan, W.C., Palao, L.K., Balanza, J.G., Hildebrand, J., Grosjean, G., 2019, Climate Resilient Agriculture in The Philippines: Climate Risk Profile, Visayas. International Center for Tropical Agriculture (CIAT); Department of Agriculture - Adaptation and Mitigation Initiative in Agriculture, Government of the Philippines; The Food and Agriculture Organization of the United Nations (FAO). Manila, Philippines. https://ciatph.github.io/#/crads/crp, Accessed on January 7, 2021.

Gray, L. and Leyland, A. (2011). Chapter 7: Adult and child obesity. In Bromley, C. and Given, L. [eds.] The 2010 Scottish Health Survey – Volume 1: Main Report. Edinburgh, Scottish Government. www.scotland.gov.uk/Publications/2011/09/27084018/51

Hao, L., & Naiman, D. Q. (2007). *Quantile regression*. No. 149. Sage.

Harvard T.H. Chan School of Public Health. (2017). *The Nutrition Source*. Retrieved from hsph.harvard.edu: https://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/vegetables-and-fruits/

Herman, D. R., Harrison, G. G., Afifi, A., & Jenks, E. (2008). Effect of a Targeted Subsidy on Intake of Fruits and Vegetables Among Low-Income Women in the Special Supplemental Nutrition Program for Women, Infants, and Children. *American Journal of Public Health*, 98-105.

Hugues, D., & Phillippe, D. L. (1995). African gardens and orchards growing vegetables and fruits. Alphabet Publishers, Owerri

Jones, H. A., & Charlton, K. E. (2015). A cross-sectional analysis of the cost and affordability of achieving recommended intakes of non-starchy fruits and vegetables in the capital of Vanuatu. *BMC Public Health*, 1-10.

Kanungsukkasem, U., Ng, N., Van Minh, H., Razzaque, A., Ashraf, A., Juvekar, S., Ahmed, S. M., & Bich, T. H. (2009). Fruit and vegetable consumption in rural adults population in INDEPTH HDSS sites in Asia. *Global Health Action*, *2*.

Kathleen, F. H., Connie, L. K., Leslie, A. M., & Frank, A. F. (2009). Fourth graders' reports of fruit and vegetable intake at school lunch: does treatment assignment affect accuracy*? Journal of the American Dietetic Association*, 109, 36-44

Kim, Y., & Kwon, Y. S. (2013). The Relationships with Fruit and Vegetable Consumption among Korean Adolescents and Sociodemographic Factors. *The FASEB Journal*, *27*(1Supplement), lb373-lb373.

Koenker, R. (2005). *Quantile Regression.* Cambridge: Cambridge University Press.

Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica* 33-50.

Lallukka, T., Pitkaniemi, J., Rahkonen, O., Roos, E., Laaksonen, M., & Lahelma, E. (2010). The association of income with fresh fruit and vegetable consumption at different levels of education. *European Journal of Clinical Nutrition*, 324-327.

Luszczki, E., Sobek, G., Bartosiewicz, A., Baran, J., Weres, A., Deren, K., & Mazur, A. (2019). Analysis of Fruit and Vegetable Consumption by Children in School Canteens Depending on Selected Sociodemographics Factors. *Medicina*, 1-16.

McDougall, S., Gonzaga, Z., Rodgers, G., Adam, G., Borines, L., Gerona, R., Seriño, M.N.V., Labonite, M., Gonzaga, N., Justo, V., Carusos, E., Lonzaga, E., Acosta, R., Tesoriero, L., Singh, S.P., Kernot, I., 2019, Integrated Crop Management (ICM) to Enhance Vegetable Profitability and Food Security in the Southern Philippines and Australia. Australian Centre for International Agricultural Research (ACIAR), Canberra ACT 2601, Australia.

Maghirang, R. (2006). National Strategic Plan for Vegetables. Proceedings of the Fourth Mindanao Vegetable Congress. Davao Convention and Trade Centre. April 27-28.

Mikkilä, V., Räsänen, L., Raitakari, O. T., Pietinen, P., & Viikari, J. (2005). Consistent dietary patterns identified from childhood to adulthood: the cardiovascular risk in Young Finns Study. *British Journal of Nutrition*, *93*(06), 923-931.

Milligan, R. A. K., Burke, V., Beilin, L. J., Dunbar, D. L., Spencer, M. J., Balde, E., & Gracey, M. P. (1998). Influence of gender and socio-economic status on dietary patterns and nutrient intakes in 18-year-old Australians. *Australian and New Zealand journal of public health*, *22*(4), 485-493.

National Mapping and Resource Information Authority (NAMRIA), 2020, Philippine Administrative Map with West Philippine Sea. http://www.namria.gov.ph/download.php#maps, Accessed on March 15, 2020.

National Statistical Coordination Board (NSCB) (2013). *Poverty, Human Development and Gender Statistics*. 2012 Full Year Official Poverty Statistics of the Philippines. Makati City.

Neumark-Sztainer, D., Story, M., Resnick, M. D., & Blum, R. W. (1996). Correlates of inadequate fruit and vegetable consumption among adolescents. *Preventive medicine*, *25*(5), 497-505.

Oliveira, A., Maia, B., & Lopes, C. (2014). Determinants of inadequate fruit and vegetable consumption amongst Portuguese adults. *Journal of Human Nutrition and Dietetics*, 194-203.

Oxford Business Group. (2015). *The Report The Philippines 2015.* Oxford.

Pérez, C. E. (2002). Fruit and vegetable consumption. *Health Reports*, *13*(3), 23.

Rageliene, T. (2021). Do children favor snacks and dislike vegetables? Exploring children's food preferences using drawing as a projective technique. A cross-cultural study. *Appetite*, 1-14.

Raggio, L., & Gambaro, A. (2018). Study of the reasons for the consumption of each type of vegetable within a population of school-aged children. *BMC Public Health*, 1-11.

Rasmussen, M., Krølner, R., Klepp, K. I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006). Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. *International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 1.

Reynolds, K. D., Blaum, J. M., Jester, P. M., Weiss, H., Soong, S. J., & DiClemente, R. J. (1996). Predictors of sun exposure in adolescents in a southeastern US population. *Journal of Adolescent Health*, *19*(6), 409-415.

Riediger, N. D., Shooshtari, S., & Moghadasian, M. H. (2007). The influence of sociodemographic factors on patterns of fruit and vegetable consumption in Canadian adolescents. *Journal of the American Dietetic Association*, *107*(9), 1511-1518.

Ruales, J. H., Seriño, M. N. V., Ratilla, T. C., Cuizon, J. G., & Enerlan, W. C. (2020). Investment appraisal of selected climate smart agricultural (CSA) practices among small scale coconut farmers in Leyte, Philippines. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, *20*(3), 499-506.

Ruel, M. T., Minot, N., & Smith, L. (2005). *Patterns and determinants of fruit and vegetable consumption in sub-Saharan Africa: a multicountry comparison*. Geneva: WHO.

Slavin, J. L., & Lloyd, B. (2012). Health benefits of fruits and vegetables. *Advances in Nutrition: An International Review Journal*, *3*(4), 506-516.

Seriño, M. N. V. (2014). Decomposition analysis of income inequality in Eastern Visayas, Philippines. *DLSU Business and Economics Review*, *24*(1), 126-139.

Serino, M. N. V., & Kim, D. (2011). How do international remittances affect poverty in developing countries? A quantile regression analysis. *Journal of economic Development*, *36*(4), 17.

Storey, Maureen, and Patricia Anderson. "Income and race/ethnicity influence dietary fiber intake and vegetable consumption." *Nutrition Research* 34.10 (2014): 844- 850.

Tamers, S. L., Agurs-Collins, T., Dodd, K. W., & Nebeling, L. (2009). US and France adult fruit and vegetable consumption patterns: an international comparison. *European Journal of Clinical Nutrition*, 11-17.

US Department of Agriculture, & US Department of Health and Human Services. (2010). *Dietary Guidelines for Americans 2010. 7th Edition.* Washington, DC: US Government Printing Office.

Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological economics*, *64*(3), 542-553.

Wargovich, M. J. (2000). Anticancer properties of fruits and vegetables. *HortScience*, *35*(4), 573-575.

World Health Organization (WHO). (2015). Increasing fruit and vegetable consumption to reduce the risk of non - communicable diseases. Retrieved from http://www.who.int/elena/bbc/fruit_vegetables_ncds/en/ on May 18, 2017

Xaba, T., & Dlamini, S. (2021). Factors associated with consumption of fruits and vegetables amongst adults in the Alfred Duma Local Municipality, Ladysmith. *South African Journal of Clinical Nutrition*, 72-83.