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# THE DETERMINANT IMPACTING FRUIT AND VEGETABLE CONSUMPTION AMONG FAMILIES IN MALUKU, INDONESIA

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**ABSTRACT**

**Introduction**: Consuming a minimum of 400 g of fruits and vegetables (FV) daily fulfills nutritional needs and diminishes the possibility of getting specific non-communicable diseases. In low or middle-income countries, about 80% of people consume fruits and vegetables below the WHO's recommendations, including Indonesia, where 93.6% of the population does so. In Indonesia, the annual per capita consumption of FV is only 35 kg; however, in Maluku, it is far lower at 7.78 kg per capita annually, below the Food and Agriculture Organization (FAO)'s objective of 75 kg per year. **Aims:** This study aims to identify the determinants that impact family behavior regarding FV consumption. **Methods:** This study took a cross-sectional approach. The purposive sampling chose a total of 398 families. The study employed a questionnaire that has passed validity and reliability tests, with Cronbach alpha >0.8. **Results:** The findings revealed that 192 (48%) respondents had enough knowledge, 253 (63.2%) had good access to fruits and vegetables, and 198 (49.5%) demonstrated good behavior. Furthermore, the chi-square test revealed that knowledge and family consumption of fruits and vegetables are correlated (p-value 0.001) as well as between FV availability and family consumption behavior (p-value 0.036). **Conclusions:** The study's findings serve as a road map for local governments, health institutions, and related parties seeking to ensure the availability of fruits and vegetables to meet the community's consumption demands. It also focuses on family-centered education to enhance FV consumption behavior.

**Keywords:** Eating Behavior; Family Health; Fruit and Vegetable; Consumption

## INTRODUCTION

World Health Organization., (2023) advises that individuals consume 400 g of FVs per day, with 250 g of vegetables and 150 g of fruit to enhance general health and mitigate the danger of specific non-communicable diseases (NCDs). Some studies show that consuming vegetables and fruits adequately can reduction of the possibility of heart disease, hypertension, diabetes, cancer, asthma, dementia, lung, and bone disease (Buil-Cosiales et al., 2016; Hosseini et al., 2017; Yahia, García-Solís and Maldonado Celis, 2019). Increasing fruit intake by one serving was demonstrated to diminish the possibility of heart disease (7%), stroke (8%), type 2 diabetes (8%-12%), breast cancer (6%), and oral cancer (49%) (Sun et al., 2021). The benefit of FV in preventing NCDs can be attributed to their substantial levels of micronutrients, fibers, antioxidant compounds, and polyphenols, which may mitigate the biochemical reactions that contribute to the development of cardiovascular diseases and other NCDs (Kalmpourtzidou, Eilander and Talsma, 2020).

In 2017, inadequate fruit and vegetable (FV) consumption was estimated to cause deaths totaling 3.9 million worldwide (World Health Organization, 2023). Only 40 nations, which account for 36% of the global population, demonstrated adequate availability, while 81 countries, which encompass 55% of the worldwide population, exceeded the WHO baseline objective for average FV availability in 2015 (Mason-D'Croz et al., 2019). By 2050, it is anticipated that the number of individuals will range from one to nine billion who may reside in nations where the average availability of FV is

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below 400 g per person per day (Mason-D'Croz et al., 2019).

FV consumption in Australia, North America, Europe, and Oceania falls significantly short of WHO recommendations (Nour et al., 2017; Rosi et al., 2019). Meanwhile, in 28 low or middle-income countries, almost 80% of people aged 15 years and older consume fruits and vegetables below the recommendations set by the WHO (Frank et al., 2019). Similarly, Indonesia's population of 93.6% fails to ingest the recommended between three and four servings of FV daily, or 50% of the contents of a plate, while consuming vegetables and fruits is important to meet nutritional needs (Minister of Health of The Republic Indonesia, 2018). In Indonesia, The average yearly intake of fruits and vegetables is merely 35 kg, whereas in Maluku it is a mere 7.78 kg per capita per year, much below the objective set by the Food and Agriculture Organization (FAO) of 75 kg per capita per year (The Central Bureau of Statistics, 2018).

Factors influencing FV intake can be divided into three categories: consumer-related, produce-related, and distribution channel-related (Rekhy et al., 2014). Factors associated with consumers include age, gender, education, income, household composition, awareness of portion size, background cultural attitudes, beliefs, lifestyle, and personal values; factors associated with the product include pricing, nutritional composition, seasonality, origin, and quality; factors associated with distribution encompass accessibility, quantity, and diversity of the product (Rekhy et al., 2014). Significant constraints affecting FV consumption include socio-demographic factors, environmental circumstances, cultural influences, and macroeconomic difficulties (Kaur, 2023). On the other hand, there are also health disparities based on education, race, ethnicity, gender, and residence (Adler et al., 2016).

Some previous studies show that there are factors that can influence FV consumption behavior, namely: socioeconomic, public awareness regarding the significance of consuming FV, as well as the limited availability of that product, both due to agricultural land that is not used optimally by farmers and limited accommodation of fruit from outside the area, which affects the consumption behavior (Black et al., 2014; Darmon et al., 2015; Miller et al., 2017). Pakpahan and Ayubi (2022) found that only 17.1% of families in Samosir Regency, Indonesia, consume vegetables and fruits in quantities of 2-3 servings per day, with knowledge, income, attitudes, community characteristics, access, and infrastructure identified as factors that were associated with family health behavior.

Ambon City also has the potential to produce fruits and vegetables that are not stable every year, sometimes experiencing an increase or decrease. The Central Bureau of Statistics of Maluku province reported that for Ambon city in 2010–2013, related to area, harvest area, and production of FV, horticultural crop production for vegetable commodities experienced a high increase of 60.75% (11,149.77 tons) from the previous year. In 2013, the agricultural yield of vegetables and fruit decreased by 49.91% (Food Security Bureau of Maluku Provincial Government, 2021). Health inequalities and health behaviors are the result of economic, cultural, and social resource inequity (Bayram and Donchin, 2019). Significant constraints were identified, including environmental conditions, individual and cultural variables, macrosystem effects, and sociodemographic characteristics (Kaur, 2023). Therefore, policies and actions to boost FV intake should consider cultural variation between regions and its impact on food preferences.

Over the past decade, numerous health promotion and social marketing initiatives have been implemented globally

to promote behavior change aimed at increasing FV intake. Nonetheless, the eating patterns of FV remain suboptimal. Consequently, advocating for the intake of FV is a primary goal of global food and nutrition policy initiatives undertaken by governmental and non-governmental entities (Rekhy et al., 2014).

Researchers seek to look more into how families in Ambon City consume FV, and the factors that influence them. Therefore, this study aims to identify the determinants that impact family behavior regarding FV consumption.

## METHODS

### Study Design

This study serves as a quantitative correlation that employs a cross-sectional design. The study was conducted on the family population in Ambon City from February to April 2021. This study investigates knowledge and availability of fruits and vegetables as independent variables, whereas consumption of fruits and vegetables is the dependent variable.

### Population, Samples, and Sampling

The study population was 76,512 families in Ambon City (The Central Bureau of Statistics, 2018). The selection of the family population facilitates a more precise assessment of FV consumption concerning familial habits and represents a significant healthy behavior (PHBS) among families in Indonesia. Ambon City was selected as the research site because its FV consumption behavior remains significantly below the target.

As many as 400 respondents were obtained utilizing the Slovin formula (margin of error (e) of 5%) and selected non-randomly using purposive sampling according to the inclusion criteria. Respondents were non-randomly selected from various districts in Ambon City. The inclusion criteria established by the researcher are as follows: (1) Residents of Ambon City, (2) Nuclear Families consisting of a father, mother, and child, and (3) Family members who fulfill the roles of mother/wife or father/husband. Exclusion criteria included divorced families, and husbands or wives under 18 years of age.

### Instruments

The instrument employs an online questionnaire via Google Forms. The study employed a questionnaire that was developed and published by Pakpahan and Ayubi (2022) to assess FV consumption behavior, knowledge, and FV availability. The questionnaire was utilized with the consent of previous researchers. Families in several villages in Samosir District, North Sumatra, Indonesia, have used the Indonesian version of the questionnaire. Because the respondents' characteristics in the previous study were rural families, while in this study they were urban families, the researchers conducted validity and reliability (VR) tests.

In February 2021, the researchers conducted the VR test on 30 families in Karawaci District, Tangerang Regency. Karawaci district has similar characteristics to Ambon City, which is a growing urban area. The VR test results on the knowledge questionnaire obtained seven valid questions with an r count of 0.372-0.758 and Cronbach's alpha (CA) 0.811; the FV availability questionnaire obtained 10 valid questions with r count 0.502-0.718 and CA 0.873; and the FV consumption behavior questionnaire obtained eight valid questions with r count 0.702-0.868 and CA 0.919. All r-counts and Cronbach's alpha (CA) values of the three questionnaires show that they are valid and reliable.

Data collection was carried out in March-April 2021 using an online questionnaire by Google Form. The questionnaire includes demographic information, seven multiple-choice questions for knowledge variables, 10 statements on a Gutman scale (yes or no) for FV availability variables and eight

statements on a Gutman scale for FV consumption variables. The variables of knowledge, availability of fruits and vegetables, and FV consumption are measured using an ordinal scale with three categories: less, enough, and good.

FV consumption is divided into three categories using cut-off points; Less: Score <50% of the total score (score 1-3), Enough: 50-69% of the total score (score 4), and Good: Score 70-100% of the total score (score 5-7) (Nursalam, 2016). Knowledge is divided into three categories using cut-off points; Less: Score <50% of the total score (score 1-4), Enough: Score 50-69% of the total score (score 5-6), and Good: Score 70-100% of the total score (score 7-10) (Nursalam, 2016). FV availability is divided into three categories using cut-off points; Less: value <50% of the total score (score 1-3), Enough: value 50-69% of the total score (score 4), Good: 70-100% of the total score (score 5-7) (Pakpahan and Ayubi, 2022).

## Procedure

Researchers collaborated with community leaders in Ambon City to distribute online surveys to respondents via Google Forms. After receiving approval from the Ambon city administration, the surveys were disseminated through social media platforms such as WhatsApp and Line.

The link supplied contained information about the study for respondents, including the researcher's identity, research title, objectives, benefits, ethical considerations, and a solicitation for participation. Additionally, forms for informed consent and questionnaires regarding the three variables (knowledge, availability of FV, and FV consumption) were included.

## Data Analysis

Data analysis employed statistics software for both univariate and bivariate analyses. The univariate analysis summarizes the description of each variable under investigation; knowledge, availability of FV, and FV consumption. The chi-square test was used to assess the relationship between knowledge and FV consumption as well as the relationship between the availability of FV and its consumption. Researchers set categories based on predetermined cut-off points, which conceptually makes categorical data non-normally distributed (Black et al., 2014). We used the chi-square test for bivariate analysis between variables with categorical data.

## Ethical Clearance

Institutional Review Board (IRB) approval for this investigation, number 018/RCTC-EC/R/I/2021, was granted by the ethics board of the Faculty of Nursing at Pelita Harapan University. In conducting the study, researchers apply ethical principles, such as respecting the autonomy of respondents, maintaining the confidentiality of the data provided, ensuring the benefits of the study, and not bringing harm to research subjects.

Research information for respondents and informed consent were provided along with the online questionnaire. Those who indicated that they were willing to participate were subsequently utilized as research subjects. All individuals who completed the link indicated their consent as respondents. The data are securely stored on a Google Drive cloud that is exclusively accessible to researchers. Our utilization of data is exclusively for research objectives.

# RESULTS

Tables 1-6 show the study findings. Table 1 describes the respondents' characteristics. Tables 2-4 show the results of univariate analysis of knowledge, availability of vegetables and fruits, and family vegetable and fruit consumption behavior. Tables 5-6 present the outcomes of the bivariate

analysis on the knowledge and availability of vegetables and fruits with family intake of these items.

The majority of respondents (Table 1) are female (228 respondents or 57.0%), aged 18-26 (267 respondents or 66.8%), have a bachelor's degree (200 respondents or 50%), work as entrepreneurs (206 respondents or 51.5%), have stayed for more than 6 months (389 respondents or 97.3%), and use the internet for health information (203 respondents or 50.7%). In addition, 192 respondents (48%) had enough knowledge of the significance of consuming fruits and vegetables (Table 2), 253 respondents (63.2%) had good availability of fruits and vegetables (Table 3), and 198 respondents (49.5%) had enough FV consumption (Table 4). According to Table 5, 90 (22.5%) respondents had enough knowledge and enough FV consumption. Six (1.5%) respondents who have good knowledge of FV consumption behavior are in the less category. Furthermore, there was a correlation between knowledge and family FV consumption (p-value 0.001). Based on Table 6, 125 (31.3%) respondents have good availability and enough consumption of fruits and vegetables. No respondents exhibit limited availability regarding FV consumption in the enough and good categories. Furthermore, a correlation was discovered between the availability of vegetables and fruits and the family's FV consumption (p-value 0.036).

**Table 1.** Distribution of Respondents' Characteristics (n=400)

| Characteristic | Frequency (n) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Female | 228 | 57.0 |
| Male | 172 | 43.0 |
| **Age (years)** | | |
| 18-26 | 267 | 66.8 |
| 27-35 | 58 | 14.5 |
| 36-44 | 75 | 18.8 |
| **Education level** | | |
| No School | 2 | 0.5 |
| Primary School | 8 | 2 |
| Junior High school | 87 | 21.8 |
| Senior High school | 51 | 12.8 |
| Bachelor | 200 | 50 |
| Master | 51 | 13 |
| **Jobs** | | |
| Housewife | 34 | 8.5 |
| Civil servant | 21 | 5.3 |
| Military/Police | 87 | 21.8 |
| Farmer | 52 | 13 |
| Entrepreneur | 206 | 51.5 |
| **Length of stay** | | |
| > 6 months | 389 | 97.3 |
| ≤ 6 months | 11 | 2.7 |
| **Information sources** | | |
| Television | 23 | 5.8 |
| Internet | 203 | 50.7 |

| Characteristic | Frequency (n) | Percentage (%) |
|---|---|---|
| Newspaper/Magazine | 36 | 9 |
| Health workers | 58 | 14.5 |
| Friends/ Relatives | 80 | 20 |

**Table 2.** Description of Respondents' Knowledge (n=400)

| Category | Frequency (n) | Percentage (%) |
|---|---|---|
| Less | 145 | 36.2 |
| Enough | 192 | 48 |
| Good | 63 | 15.8 |

**Table 3**. Description of Family Fruit and Vegetable Availability (n=400)

| Category | Frequency (n) | Percentage (%) |
|---|---|---|
| Less | 2 | 0.5 |
| Enough | 145 | 36.3 |
| Good | 253 | 63.2 |

**Table 4.** Description of Family Fruit and Vegetable Consumption (n=400)

| Category | Frequency (n) | Percentage (%) |
|---|---|---|
| Less | 127 | 31.7 |
| Enough | 198 | 49.5 |
| Good | 75 | 18.8 |

**Table 5.** The Knowledge and Family Fruit and Vegetable Consumption (n=400)

| Knowledge | Consumption Behavior | | | | | | Total | p-value |
|---|---|---|---|---|---|---|---|---|
| | Less | | Enough | | Good | | | |
| | n | % | n | % | n | % | N (%) | |
| Less | 50 | 12.5 | 73 | 18.3 | 22 | 5.5 | 145 (36.3) | |
| Enough | 71 | 17.8 | 90 | 22.5 | 31 | 7.8 | 192 (48.0) | 0.001 |
| Good | 6 | 1.5 | 35 | 8.8 | 22 | 5.5 | 63 (15.8) | |

**Table 6.** The FV Availability and Family Fruit and Vegetable Consumption (n=400)

| Availability | Consumption Behavior | | | | | | Total | P-value |
|---|---|---|---|---|---|---|---|---|
| | Less | | Enough | | Good | | | |
| | n | % | n | % | n | % | N (%) | |
| Less | 2 | 0.5 | 0 | 0 | 0 | 0 | 2 (0.5) | |
| Enough | 53 | 13.3 | 73 | 18.3 | 19 | 4.8 | 145 (36.3) | 0.036 |
| Good | 72 | 18 | 125 | 31.3 | 56 | 14.0 | 253 (63.2) | |

## DISCUSSION

Socioeconomic status, education, and urban areas are the main factors that impact the adequacy of FV intake (Hernández-Vásquez et al., 2022). The study revealed that respondents are of productive age, have high education, most

working, and earn a consistent income. In line with the study by Karim *e*t al. (2017) and Stea et al. (2020), the consumption of FV was positively impacted by a higher education level, higher income, female gender, limited physical activity, Smoking, and a body mass index exceeding 25 kg/m2. Another investigation demonstrated that inadequate FV consumption is frequently linked to youthful age, male gender, Inadequate education, limited-income occupation, low alcohol consumption, high tobacco use, and low utilization of health services (Msambichaka et al., 2018). Additionally, the frequency of inadequate FV consumption increased as individuals aged, while it decreased as they advanced in their educational levels (Karim et al., 2017).

A study by Yang et al. (2020) revealed that better dietary knowledge, attitudes, and behaviors are linked to better health. Most respondents in this study had sufficient knowledge, which may be related to their productive age, bachelor's level of education, and the most used source of information, the internet. The internet significantly enhances health knowledge. The study's findings indicate that the predominant source of health information utilized by respondents is the Internet. Although knowledge is not the only determining factor, a good understanding of good health can impact health behavior (Surendran et al., 2020). Health disparities are also found based on education, race, ethnicity, gender, and place of residence (Adler et al., 2016). Diets were found to be better in the elderly compared to younger adults, women compared to men, and countries with higher incomes than countries with low incomes (Imamura et al., 2015).

The research respondents are members of nuclear families (husband or wife) who have lived in Ambon for at least six months. Most of them had enough FV consumption. Kabwama et al. (2019) performed a study indicating that married individuals ingest a higher volume of FV compared to their unmarried counterparts. Marriage is linked to the endeavors of couples to regulate their health behaviors and social connections that serve as the foundation for a regular diet. This health behavior management may include the spouse preparing FV-rich meals or guaranteeing that fruits and vegetables are easily accessible at home (Kabwama et al., 2019). Moreover, modeling parental attitudes toward fruits and vegetables, along with the maternal supply of these foods, was responsible for an increase in the family's consumption of FV ) (Ong et al., 2017; Pakpahan and Ayubi, 2022).

Ambon City has the lowest income when compared to other cities in Maluku Province (Indonesian Data, 2023). This leads to moderate eating of FV. Socioeconomic status was a significant driver of total consumption of vegetables. A previous study by Bayram and Donchin (2019) revealed that education and income level are related to the consumption of fruits and vegetables. Moreover, compared to consumers with less education, those with more education in the low-income category spent a greater amount on vegetables. Compared to the high-income category, those with lower incomes exhibited reduced seasonal variation, allocated fewer resources to fresh veggies, and invested more in conserved and frozen meals (Ma et al., 2021). Hence, it is imperative to address social disparities alongside economic and cultural inequalities to reduce health behavior inequalities effectively (Bayram and Donchin, 2019). Social support has a significant impact on health behaviors, which will then impact the quality of life (Hong, De Gagne and Shin, 2018).

Consumption of fruits and vegetables also correlates with geographic region, potentially reflecting cultural and ethnic identity (Kabwama et al., 2019). Furthermore, urban dwellers have significantly better dietary conditions than rural dwellers (Yang et al., 2020). The study's findings revealed that most

respondents had plentiful access to FV, and there was a correlation between the family's consumption patterns and the availability of FV. This might be ascribed to Ambon's city status, which ensures proper infrastructure, access, and services. On the other hand, inequalities in healthcare availability have significant implications for the population's overall health (Ursulica, 2016). Limited availability of fruits and vegetables may stem from a lack of information about their nutritional worth and a focus on developing commercial agricultural goods that generate cash for farmers (Kabwama et al., 2019).

Ambon City exhibits the potential for fluctuating yearly output of fruits and vegetables, occasionally witnessing variations in yield. The extent of agricultural land and the harvest of fruits and vegetables have declined since 2013 (Food Security Bureau of Maluku Provincial Government, 2021). This impacts the FV intake. A study by Rekhy et al. (2014) revealed that factors associated with the product include pricing, nutritional composition, seasonality, origin, and quality; factors associated with distribution encompass accessibility, quantity, and diversity of the product

The nutrition environment has long been recognized as a significant indicator of health, with the setting's principles, regulations, and practices that significantly impact an individual's beliefs and actions, such as their dietary choices; (1) The environment of community nutrition determines the accessibility of sources of food in the setting of dwellings neighborhoods; (2) The consumer nutrition environment is defined by the factors that consumers encounter within a retail food outlet, including the categories of food accessible, price, advertisements, location, various options, fresh or quality, and nutrition information; and (3) The organizational nutrition environment is a specific institutional setting in which specific categories of individuals are situated (Black et al., 2014).

Meeting these nutritional objectives may be significantly impeded by the exorbitant cost of FV. A study conducted by Miller et al.(2016) discovered that compared to high-income countries, individuals in countries with low income consume a smaller quantity of FV and allocate a greater portion of their income to food. A rise in the price of fruits and vegetables with household earnings is associated with a decrease in consumption. According to another study by Ma et al. (2021), the cost of FV at their shopping location is unreasonably high, which serves as an impediment to higher consumption. Low-income consumers prefer foods with lower nutrient quality and value because they are generally less expensive per calorie (Darmon et al., 2015). The government and the corporate sector should provide facilities, lower prices, and enhance the supply of fruits and vegetables so that low-income suburban residents can consume more of them (Faber et al., 2013;; Surendran et al., 2020).

This study is limited to investigating the variables of knowledge and availability of FV on consumption behavior; however, other factors did affect it. Another limitation is the cross-sectional design and purposive sampling; one should be careful not to draw causal conclusions and generalizations of the population. However, the study included 400 respondents from various districts in Ambon City, providing sufficient data to describe the FV consumption of families in Ambon City. Governments can assess compliance with local regulations, evaluate the accessibility of both nutritious and harmful food options in stores, analyze the changes in food environments over time and across various regions, and comprehend the effects of changes in retail food settings on health outcomes (Mhurchú et al., 2013).

Local governments, health

institutions, and other sectors can guarantee that fruits and vegetables are accessible and reasonably priced to meet the community's consumption demands, while also maximizing efforts to increase vegetable and fruit consumption behavior through family-centered education. This may include cadres, as well as community or religious leaders. It is possible to encourage families to cultivate FV in their yards for their consumption.

## CONCLUSIONS

According to the study findings, most respondents were knowledgeable about the significance of consuming fruits and vegetables, having sufficient access to them, and engaging in adequate consumption of these food items. Furthermore, it was shown that the respondents' awareness and accessibility of fruits and vegetables played a role in determining their family's consumption patterns of these food items.

Consequently, advocating for the consumption of fruits and vegetables is a primary goal of global food and nutrition policy initiatives undertaken by governmental and non-governmental entities. The findings of this study provide a roadmap for local governments, health institutions, and other interested parties, inviting them to join in the effort to ensure that fruits and vegetables are available to the community's consumption demands. It also motivates them to optimize their efforts to increase the consumption of vegetables and fruits through family-centered education, underscoring the shared responsibility we all have in promoting healthy eating practices. These findings offer hope for a healthier future for the people of Maluku. Future studies could investigate qualitative or quantitative factors that influence FV consumption, such as attitudes, income, food preferences, culture, price, social support, and other variables.

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