



Socioeconomics overview of fruits and vegetables consumption among population aged more than 5 years: A further analysis of Indonesia Health Survey 2023

Nilasari^{1,*}

¹ Department of Public Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Sleman, Special Region of Yogyakarta 55281, Indonesia.

*Correspondence: nilasari424@gmail.com

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ABSTRACT

Background: Low consumption of fruits and vegetables is estimated the cause of 1.7 million (2.8%) deaths and 16 million (1.0%) globally. In Indonesia, the behavior of the population > 10 years of age is to less consume fruits and vegetables, which is above 90%. This study aims to show the socio, economics consumption of fruits and vegetables in the Indonesian based on several characteristics. **Methods:** The data analyzed is the result of the Indonesia Health Survey/*Surver Kesehatan Indonesia* (SKI) 2023. The research was an observational study with a cross-sectional design, non-interventional. The data analyzed is data on fruit and vegetable consumption, along with the reasons why people do not consume them. **Findings:** The analysis showed that ($\geq 60\%$), based on all the characteristics studied, consumed 1-2 portions of fresh fruit/and/or vegetables per day. The most people who consumed ≥ 5 portions of fresh fruit/and/or vegetables per day in a week were public servants (6.7%) with completed education levels diploma/bachelor (6.0%). There are (18.4%) more people aged 5-9 years compared to other age groups who do not consume fresh fruit/and/or vegetables per day of the week. **Conclusion:** Socio economic factors, including income, education, and occupation, significantly influence these consumption patterns. The biggest reason for not consuming fresh fruit is no fruits (stock/price) and vegetables are disliked. Indonesian fruit and vegetable consumption is low in the context of balanced nutrition. **Novelty/Originality of this article:** This study provides a comprehensive national-level analysis of fruit and vegetable consumption patterns among the Indonesian population using the SKI 2023 data. It highlights variations in consumption according to socio-demographic and economic characteristics and identifies key reasons for non-consumption, including availability, affordability, and preference. These findings provide important evidence for developing targeted nutrition interventions to address socio-economic and behavioral barriers to adequate fruit and vegetable consumption in Indonesia.

KEYWORDS: consumption; fruits; Indonesian health survey; vegetable.

1. Introduction

Fruit and vegetable consumption was necessary to meet the body's nutritional needs (WHO, 2023). People often avoid fruits and vegetables because they taste bland or because they are not used to them (Głąbska et al., 2020). To achieve a healthy body, the body must consume fruits and vegetables as a source of vitamins, minerals, and fiber (Goryńska-Goldmann et al., 2023). This is due to the fact that the amount of fruit and vegetables ingested has an impact on nutritional intake, which in turn has an impact on the health of individuals and communities (Stea et al., 2020). Nutrition education and development is

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aimed at changing behavior towards a healthy and nutritious lifestyle, which is an effort to improve the nutritional status of a healthy and sustainable community. By applying a healthy and nutritious lifestyle, people will become accustomed to eating a variety of foods, leading a clean life, engaging in physical activity, and maintaining a normal weight. When all these balanced nutritional behaviors are applied, society will be healthier (Ministry of Health, 2014a).

Low consumption of fruits and vegetables is estimated to be the cause of 1.7 million (2.8%) deaths and 16 million (1.0%) globally. Age-standardized frequency of individuals (over the age of eighteen) who consume fewer than five portions (400 grams) of fruits and vegetables daily (WHO, 2023). The population includes "sufficient" consumption of vegetables and fruit if you consume vegetables and/or fruit (a combination of vegetables and fruit) at least five portions per day for seven days a week. It is categorized as "insufficient" if the consumption of vegetables and less fruit than the provisions above. Consuming enough fruits and vegetables lowers the incidence of stomach, cardiovascular, and cancer. Compared to low energy meals like fruits and vegetables, there is strong evidence that consuming large amounts of high energy foods, such as processed foods heavy in fat and sugar, promotes obesity (WHO, 2019). Fruit and vegetable consumption among the Indonesian population was 57.1 grams/day and 33.5 grams/day (Ministry of Health, 2014b). In Indonesia, the behavior of the population > 10 years of age who are less consuming vegetables and fruits is still above 90% (Ministry of Health, 2018). This condition is in line with the findings of the Individual Food Consumption Survey (SKMI) in the Total Diet Study (*Studi Diet Total/SDT*) 2014 that the population consumption of vegetables, fruits, and processed foods is still low (Hermina & Prihatin, 2019; Ministry of Health, 2014b). The total Diet Study 2014 showed that fruit and vegetable intake among Indonesian teenagers was lower than that of Indonesians, which was 45.8 grams/day and 25.2 grams. Only 7% of Indonesian teenagers ate five portions of fruit and vegetables a day, and 40.7% of adolescents ate more fast foods like fries (Ministry of Health, 2014b; Rarastiti, 2022).

Fruits and vegetables are essential parts of a healthy body. Decreased intake of fruits and vegetables is associated with ill health and a higher chance of non communicable diseases (NCDs). In 2017, it was predicted that 3.9 million deaths globally could be linked to insufficient eating of fruits and vegetables (WHO, 2023). Babies, children, and all age groups need ideal nutrition for normal physical growth and development, as well as intelligence (Carroll et al., 2024). Healthy body must be improved towards a balanced nutritional consumption as nutrition helps maintain a normal or healthy weight, prevents infection, increases labor productivity, and prevents chronic disease and premature death, because good health can improve the health of a person and society (Boca, 2021). Inadequate nutrition is associated with poor health, and increases the risk of infectious diseases, and non communicable diseases such as cardiovascular diseases (cardiovascular disease, hypertension and stroke), diabetes and cancer, which are the leading cause of death in Indonesia (Mandagie et al., 2023; Ministry of Health, 2014b). More than half of all deaths in Indonesia are caused by non communicable diseases (Ministry of Health, 2014b).

There are many factors that affect the consumption of fruit and vegetables in each individual, research conducted by Alhudzaifah (2021) have a results the factors that influence the consumption of fruit among household consumers in Mataram City are income, age, number of family members and the level of education (Alhudzaifah et al., 2021). Meanwhile, according to the study's findings, 24.3% of teenagers eat the recommended amounts of fruits and vegetables each day. The bivariate analysis revealed no significant link ($p = 0.063$) between knowledge and the availability of fruit and vegetables ($p = 0.048$), parental influence ($p = 0.032$), and self-efficacy ($p = 0.034$) (Amelia & Fayasari, 2020). Proper education is needed for the community, especially school children, to help increase the prevalence of fruits and vegetables consumption in Indonesia. The results of the univariate analysis were performed to see an overview of the changes in students knowledge before and after the given education. A bivariate analysis was conducted to determine the influence of education on the knowledge of students fruits and vegetables.

Thus it can be concluded that the provision of education in the form of instruction has a significant influence on the improvement of students knowledge (Putri et al., 2022). Most cohort studies provide evidence in favor of the hypothesis that eating fruit lowers the chance of developing depression. But when the impacts of eating vegetables were examined separately and the effects of eating fruit and vegetables together, different results were found. In spite of this, there appears to be mounting evidence of a potential relationship, which may have consequences for addressing the prevalence of mental illness among adults and youth between the ages of 15 and 45 (Dharmayani et al., 2021). That a high intake of fruits and vegetables in general, as well as some of their particular subgroups like berries, citrus, and green leafy vegetables, may protect against depressive symptoms, lower psychological distress, ambiguity, and cancer fatalism, and increase optimism and self-efficacy (Głabska et al., 2020). Based on this, this article presents a further analysis of the Indonesia Health Survey/*Survei Kesehatan Indonesia* (SKI) 2023 data (Ministry of Health, 2023), to get an overview of fruit and vegetable consumption among various age groups in the Indonesian population based on specific characteristics. This analysis also considers socio-economic factors such as income level, education, and employment status, which play a significant role in determining dietary behavior and access to nutritious food.

2. Methods

This research is a further analysis of this undertaken from the subset of data Indonesia Health Survey 2023 (Ministry of Health, 2023). The research carried out in SKI is a national-scale evaluation activity with a cross-sectional, non-interventional, and observational design. SKI 2023 is an integrated, "Riskesmas", "SSGI", as well as Biomedical, Dental, and Oral. The survey coverage is all over Indonesia, with the sampling units for Riskesmas, Biomedical, and Oral Dental being all ordinary households. The 2023 SKI sample size is 34,500 census blocks, consisting of 345,000 ordinary households for implementing Riskesmas and 345,000 toddler households for implementing SSGI. Of the 34,500 SKI census blocks, there are 2,500 census blocks. Stratification was carried out at the census block level and at the level of ordinary households in selected census blocks to produce a representative sample. Census block stratification is carried out explicitly (explicit stratification), while implicit stratification is applied at the household level. The entire 2020 regular census block population is grouped according to urban/rural classification and the implicit strata index of accessibility to health facilities.

The population's behavior in consuming fruit and vegetables was measured based on the frequency and portions of fruit and vegetable consumption among household members aged 5 years and over by calculating the number of days of consumption in a week and the average number of portions in a day. The instrument used to collect data on vegetable and fruit consumption is the STEP-wise instrument from the World Health Organization (WHO). The proportion of fresh fruit and/or vegetable consumption per day of the week is calculated by $\sum$ household members aged ≥ 5 years who consume fruit or vegetables per day of the week according to characteristics divided by $\sum$ household members aged ≥ 5 years according to characteristics. Meanwhile, the calculation of the proportion of reasons for not eating fruit in the population aged > 5 years according to characteristics was obtained by $\sum$ household members aged ≥ 5 years with certain reasons based on characteristics divided by $\sum$ household members aged ≥ 5 years who did not consume fruit based on characteristics. Then, the proportion of reasons for not eating vegetables was obtained by $\sum$ household members aged ≥ 5 years with certain reasons based on characteristics divided by $\sum$ household members aged ≥ 5 years who did not consume vegetables based on characteristics. The analysis stages used include: The data obtained is carried out by cleaning data on several variables that were not analyzed in the research, calculating the percentage of each characteristic variable, and then presenting the results using tables and graphs. The data analysis used was a univariate analysis, which was described to see the description of fruit and vegetable consumption in household members

aged ≥ 5 years in relation to sociodemographic characteristics including: age, gender, education, employment, type of residence, and economic status.

3. Results and Discussion

3.1 Results

The number of samples analyzed was 4,679,176. The sample distribution according to socio-demographic characteristics is presented in Table 1. In general, if we look at the characteristics of the age group, all age groups consume ($\geq 60\%$) 1-2 portions of fresh fruit/and/or vegetables per day of the week. Most people aged 15-19 years (68.1%) consume 1-2 portions of fresh fruit/and/or vegetables per day a week, at ages 55-59 years most people (20.2%) consume 3-4 portions of food. Fresh fruit/and/or vegetables per day of the week, at ages 55-59 years (4.0%) and 60-64 years (4.0%), most consume ≥ 5 portion of fresh fruit/and or vegetables per day of the week. Meanwhile, most people aged 5-6 years (18.4%) do not eat fresh fruit/and/or vegetables every day of the week. Based on gender, more male (67.7%) consume 1-2 portions of fresh fruit/and/or vegetables per day a week. while 3-4 portions more females (18.2%) eat fresh fruit/and or vegetables per day of the week, and more females (3.6%) consume ≥ 5 portions of fresh fruit/and or vegetables per day of the week, then in the not consumption, male consume the most (12.6%) compared to females (10.9%) who do not consume fresh fruit/and/or vegetables per day of the week. Based on education level, more finished senior high school (68.1%) consume 1-2 portions of fresh fruit/and/or vegetables per day a week, while 3-4 portions of completed diploma/bachelor (22.0%) eat more fresh fruit/and/or vegetables per day of the week, to consume ≥ 5 portions of fresh fruit/and/or vegetables per day in a week, the highest is at the completed diploma/bachelor (6.0%) and in the non-consumption category, education level no school (16.5%) not consuming fresh fruit/and/or vegetables per day of the week.

Table 1. Sample distribution of socio-demographic characteristics (N = 4,679,176)

Characteristics	N Weighted	%
Age group		
5-9	67,770	8.6
10-14	68,019	8.6
15-19	68,283	8.6
20-24	68,904	8.7
25-29	69,326	8.8
30-34	68,170	8.6
35-39	66,123	8.4
40-44	62,928	8.0
45-49	58,958	7.5
50-54	52,219	6.6
55-59	44,416	5.6
60-64	35,728	4.5
65 +	60,324	7.6
Gender		
Male	399,256	50.5
Female	391,911	49.5
Education		
No school	67,794	8.6
Not completed in primary school	112,837	14.3
Finished elementary school	193,963	24.5
Finished junior high school	141,291	17.9
Finished senior high school	212,471	26.9
Completed diploma/bachelor	62,812	7.9
Employment		
Unemployed	208,997	28.9
School	115,509	16.0

Public servants	20,409	2.8
Private employees	74,808	10.3
Self-employed	100,088	13.8
Farmers/farm laborers	105,791	14.6
Fisherman	5,254	0.7
Laborer/driver/helper	53,057	7.3
Other	39,484	5.5
Type of Residence		
Urban	462,718	58.5
Rural	328,449	41.5
Economic status		
Bottom	114,187	14.4
Lower middle	143,803	18.2
Intermediate	167,615	21.2
Upper middle	184,152	23.3
Top	181,352	22.9

(Ministry of Health, 2023)

Table 1, showed that the largest sample was in the 25-29 year age group (8.8%), and the least was in the 60-64 year age group (4.5%). Based on gender, the number of male samples (50.5%) is greater than the female samples (49.5%). The highest educational level of the sample was finished senior high school (26.9%), while the lowest was completed diploma/bachelor (7.9%). According to the employment, the majority were unemployed (28.9%), and the least were working as fishermen (0.7%). The type of residence, the majority are in urban areas (58.5%) compared to rural areas (41.5%), and at the economic status, the majority are in upper middle economic status (23.3%). The proportion of fruit or vegetables per day of the week for the population aged > 5 years, according to characteristics, is presented in Table 2.

Table 2. Proportion of fruit or vegetable consumption per day of the week among the population age > 5 years according to characteristics

Characteristics	1 – 2	3 – 4	≥ 5	Not consump	N Weighted
5-9	67.0	12.3	2.3	18.4	67,770
10-14	67.7	13.1	2.3	16.9	68,019
15-19	68.1	14.6	2.5	14.8	68,283
20-24	67.7	16.3	3.2	12.8	68,904
25-29	68.0	18.3	3.5	10.2	69,326
30-34	68.6	18.3	3.9	9.2	68,170
35-39	68.0	18.9	3.8	9.3	66,123
40-44	67.6	19.5	3.6	9.3	62,928
45-49	67.3	19.4	3.8	9.5	58,958
50-54	67.4	19.8	3.9	8.9	52,219
55-59	66.5	20.2	4.0	9.3	44,416
60-64	66.5	19.4	4.0	10.1	35,728
65 +	66.4	18.9	3.5	11.2	60,324
Male	67.7	16.6	3.1	12.6	399,256
Female	67.3	18.2	3.6	10.9	391,911
No school	66.3	14.5	2.7	16.5	67,794
Not completed in primary school	67.1	14.4	2.5	16.0	112,837
Finished elementary school	67.9	17.4	2.7	12.0	193,963
Finished junior high school	68.0	17.8	3.2	11.0	141,291
Finished senior high school	68.1	18.2	3.9	9.8	212,471
Completed diploma and bachelor	65.1	22.0	6.0	6.9	62,812
Unemployed	68.1	17.0	3.5	11.4	208,997
School	68.3	14.1	2.5	15.1	115,509
Public servants	63.3	23.0	6.7	7.0	20,409
Private employees	68.6	19.2	4.0	8.2	74,808
Self-employed	67.8	19.5	4.0	8.7	100,088
Farmers/farm laborers	64.2	21.4	3.7	10.7	105,791

Fisherman	68.9	10.7	2.0	18.4	5,254
Laborer/driver/helper	70.2	15.8	1.9	12.1	53,057
Other	67.3	17.8	3.9	11.0	39,484
Urban	69.1	16.3	3.3	11.3	462,718
Rural	65.3	18.8	3.4	12.5	328,449
Bottom	63.8	18.0	3.1	15.1	114,187
Lower middle	67.2	17.2	2.7	12.9	143,803
Intermediate	68.4	16.9	2.7	12.0	167,615
Upper middle	69.0	16.6	3.1	11.3	184,152
Top	67.8	18.4	4.8	9.0	181,352

Table 2. the proportion of people who work as laborers/drivers/helpers (70.2%) who consume 1-2 portions of fresh fruit/and/or vegetables per day a week, while 3-4 portions more in public servants jobs (23.0%) eat fresh fruit/and/or vegetables per day of the week, and public servants also eat more (6. 7%) consume ≥ 5 portions of fresh fruit/and or vegetables per day of the week, then in the category of non-consumption work as a fisherman, the majority (18.4%) not consuming fresh fruit/and or vegetables per day of the week. Fruit and vegetable consumption patterns based on type of residence, in urban areas more people (69.1%) consume 1-2 portions of fresh fruit/and/or vegetables per day a week compared to rural areas (65.3%), while in rural areas. 3-4 more portions in rural residences (18.8%) eat fresh fruit/and or vegetables per day of the week, and rural residences also have more (3.4%) consumption of ≥ 5 portions of fresh fruit/and or vegetables per day of the week, however in the non-consumption category rural residences also had the most (12.5%) not consuming fresh fruit/and/or vegetables per day of the week compared to urban residences (11.3%).

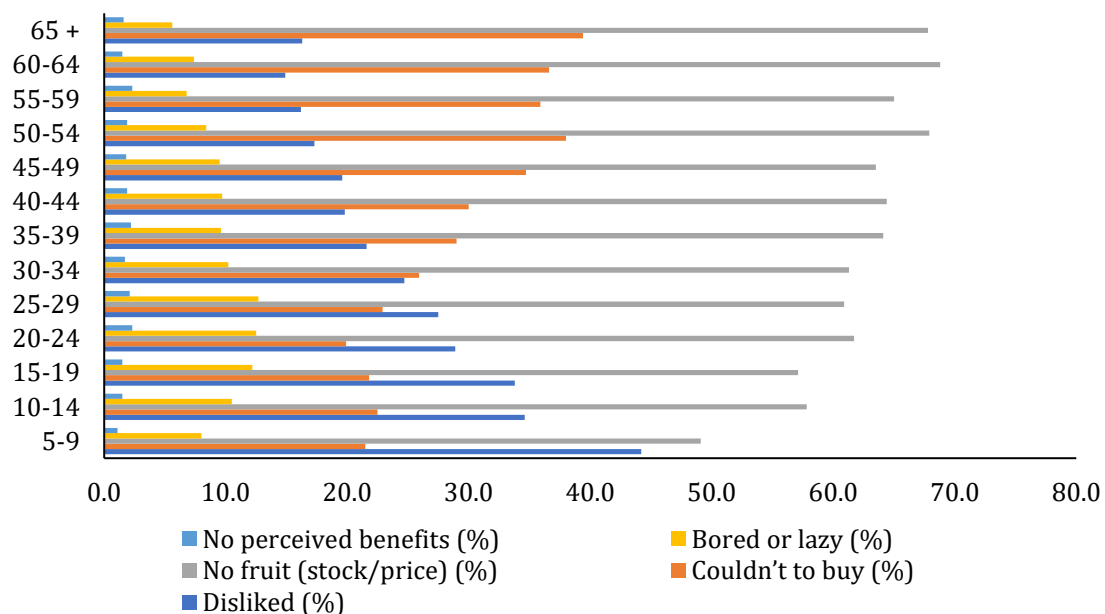


Fig. 1. Reasons not to eat fresh fruit (%) by age group

Based on the age groups in Figure 1, it can be seen that those aged 5-9 years most (44.2%) disliked fresh fruit, those aged 65+ years the most (39.4%) couldn't to buy fresh fruit, those aged 60-64 years most (68.8%) do not consume fresh fruit because the fruit is not in stock/price, aged 25-29 years the most reason (12.7%) is because they are bored or lazy, aged 20-24 years (2.3%) and those aged 55-59 years (2.3%) most often do not consume fresh fruit for the reason that there are no perceived benefits. The reasons for not consuming fresh fruit are because they disliked, which is most common among private employees (36.5%), the reason being because couldn't to buy most often found in farmer/farm laborer jobs (37.4%), the reason is because the fruit is not stock/price is most common among fishermen (78.0%), while the reason for not eating fresh fruit is because

they are bored or lazy, most often in private sector jobs (14.3%) and the reason for do not consuming fruit is because there are no perceived benefits most often in farmer/farm laborer jobs (2.1%) and others (2.1%). Then based on the level of education, the reasons for not consuming fresh fruit are because they disliked, the most are at the finished senior high school (29.9%), the reasons are because couldn't to buy fresh fruit the most at the education level are not school (34.6%), the reasons are because of the fruit not in stock/price is the most common among finished elementary school (66.6%), meanwhile the reason for not eating fresh fruit is because they are bored or lazy the most common among completed diploma/bachelor (15.7%) at completed diploma/bachelor is also the most common reason (2.4%) for do not consuming fruit because there are no perceived benefits.

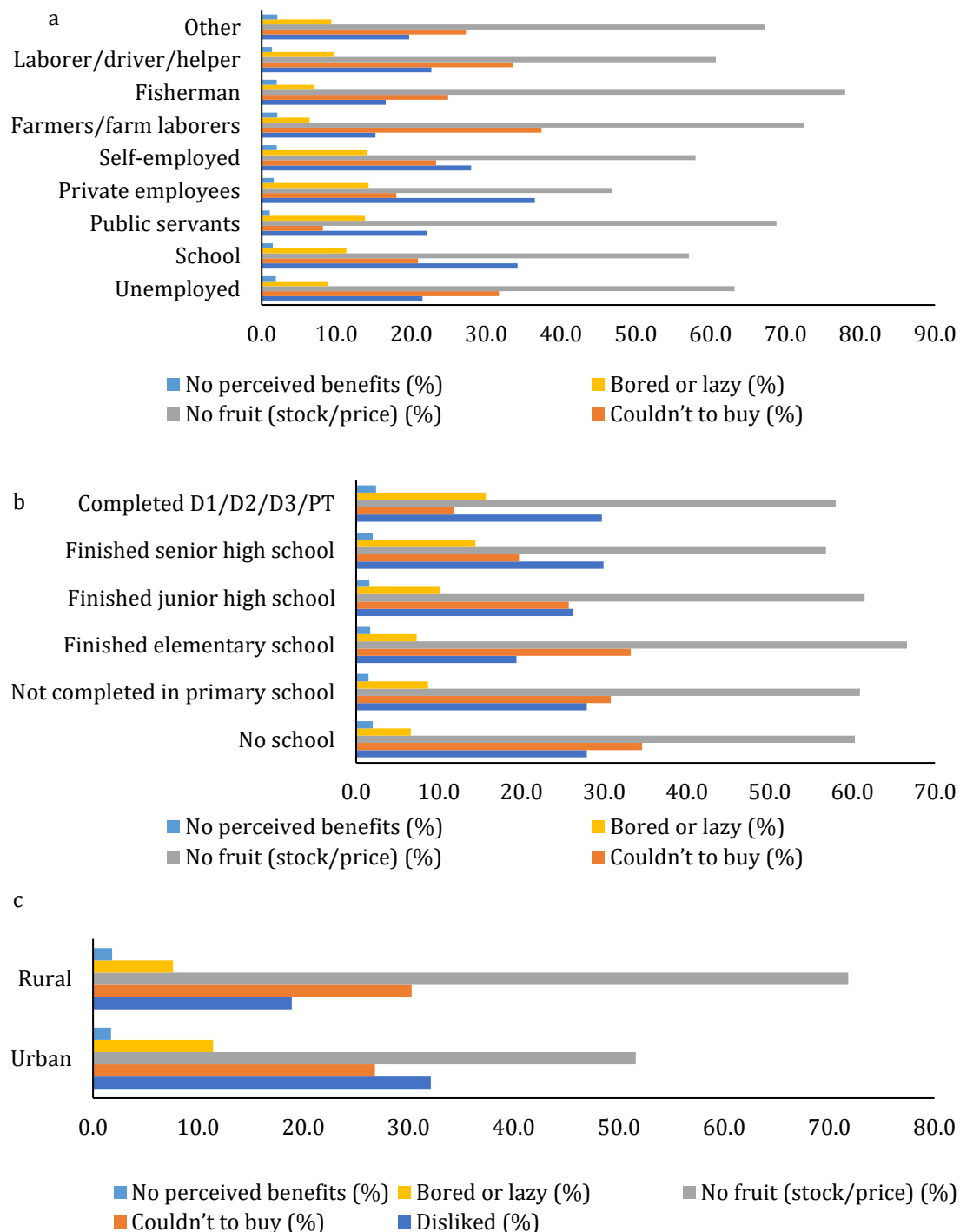


Fig. 2. (a) Reasons for not eat fresh fruit (%) by employment; (b) Reasons not to eat fresh fruit (%) by education; (c) Reasons not to eat fresh fruit (%) by type of residence (Ministry of Health, 2023)

According to type of residence, the reason for not consuming fresh fruit is because disliked, the most are in urban areas (32.1%), the reason is because couldn't to buy fresh fruit, the most are in rural areas (30.3%), the reason is because of the fruit not in stock/price is also highest in rural areas (71.8%), while the reason for not eating fresh fruit is because bored or lazy is highest in urban areas (11.4%) and the reason for not consuming fruit is because there are no perceived benefits rural areas (1.8%). Then based on the economic status, the reason for not consuming fresh fruit is because disliked, the most in the top economic status (49.3%), the reason couldn't to buy fresh fruit the most in the lowest economic status (40.6%), the reason is because not in stock/price highest in the lowest economic status (73.3%), meanwhile the reason for not eating fresh fruit is because they are bored or lazy the most in the top economic status (16.9%) and the reason for not consuming fruit is because there are no perceived benefits, most frequently in upper middle economic status (2.1%). Based on the gender, the reason for not consuming fresh fruit for male (60.8%) and females (63.1%) is mostly because the fruit is not in stock/price. Meanwhile, it is still seen that as many as (27.9%) male disliked consuming fresh fruit more than female (22.4%), but despite this there are (1.9%) male, more people think there are no perceived benefits from consuming fresh fruit than females (1.6%).

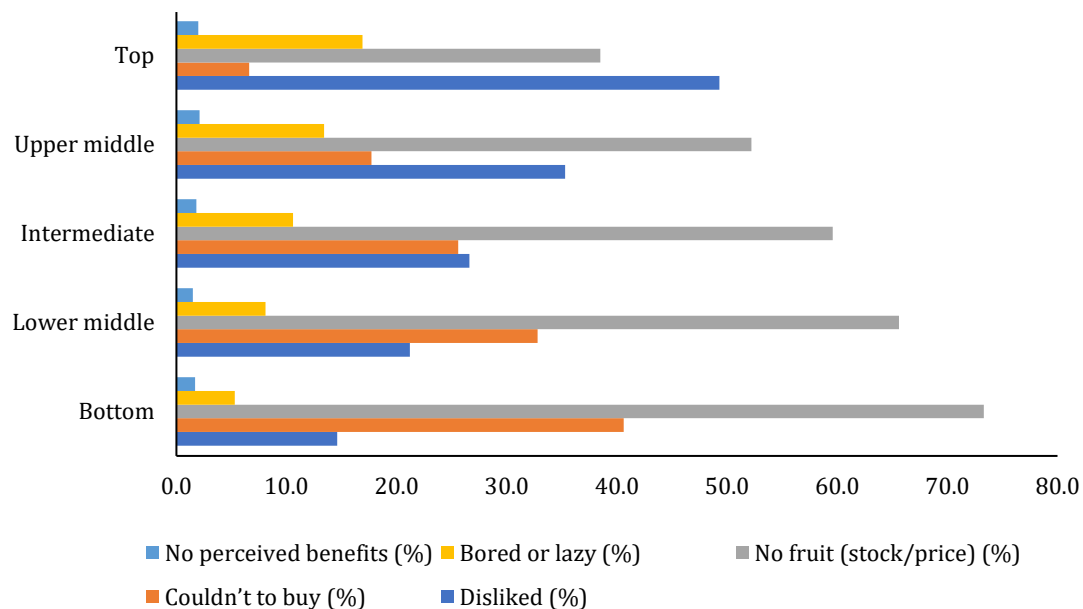


Fig. 3. Reasons not to eat fresh fruit (%) by economic status
(Ministry of Health, 2023)

Based on economic status Figure 3, in the upper middle economic condition (69.0%) who consume 1-2 portions of fresh fruit/and or vegetables per day a week, while 3-4 portions are more in the upper economic status (18.4%) eat fresh fruit/and or vegetables per day of the week. and the top economic status also has more (4.8%) consumption of ≥ 5 portion of fresh fruit/and or vegetables per day of the week, and in the category of not-consumption, the lowest income earners (15.1%) not consuming fresh fruit/and/or vegetables per day of the week. According to WHO, people are categorized as having "sufficient" consumption of vegetables and fruit if they consume vegetables and/or fruit (a combination of vegetables and fruit) at least 5 portions per day for 7 days a week, and "insufficient" if their consumption of vegetables and fruit is less than the provisions above. The proportion of reasons for not eating fruit in the population aged > 5 years according to characteristics was obtained by $\sum$ household members aged ≥ 5 years with certain reasons based on characteristics divided by $\sum$ household members aged ≥ 5 years who did not consume fruit based on characteristics. The proportion of reasons for not eating fruit among people aged > 5 years according to characteristics, SKI 2023, is presented in Figure 1.

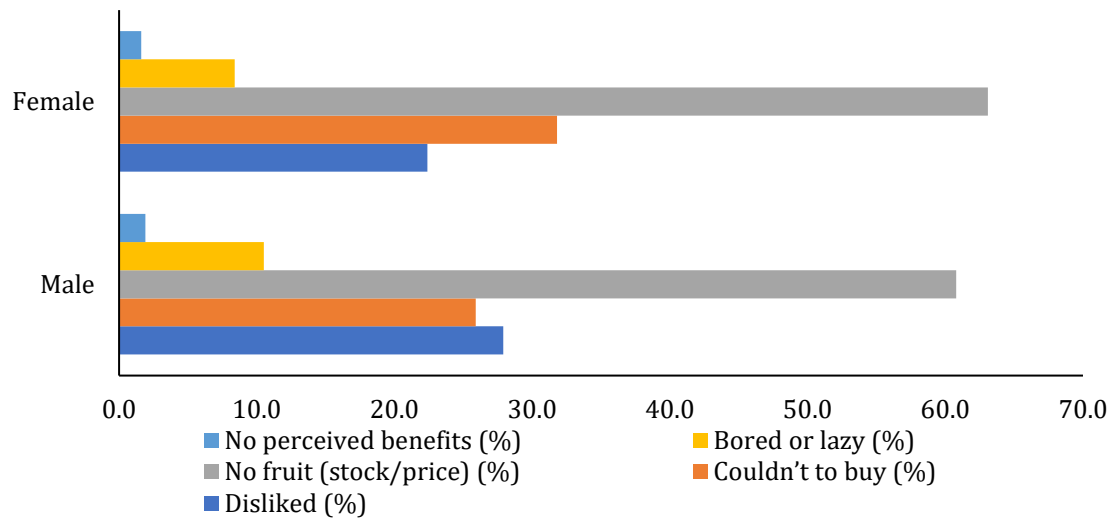


Fig. 4. Reasons not to eat fresh fruit (%) by gender
(Ministry of Health, 2023)

The proportion of reasons for not eating vegetables was obtained by Σ household members aged ≥ 5 years with certain reasons based on characteristics divided by Σ household members aged ≥ 5 years who did not consume vegetables based on characteristics. The proportion of reasons for not eating vegetables among people aged > 5 years according to characteristics SKI 2023, is presented in Figure 2. The reasons for not eating vegetables were categorized into five categories, namely disliked, couldn't to buy, no fruits (stock/price), bored or lazy and no perceived benefit. Then each characteristic is presented in the percentage. Based on the age groups, it can be seen that those aged 5-9 years most (94.7%) disliked vegetables, those aged 25-29 years the most (32.3%) couldn't to buy vegetables, those aged 60-64 years the most many (32.4%) do not consume vegetables because not in stock/price vegetables, those aged 50-54 years mostly (16.6%) because they are bored or lazy, those aged 50-54 years (5.5%) also most people do not consume vegetables because no perceived benefit.

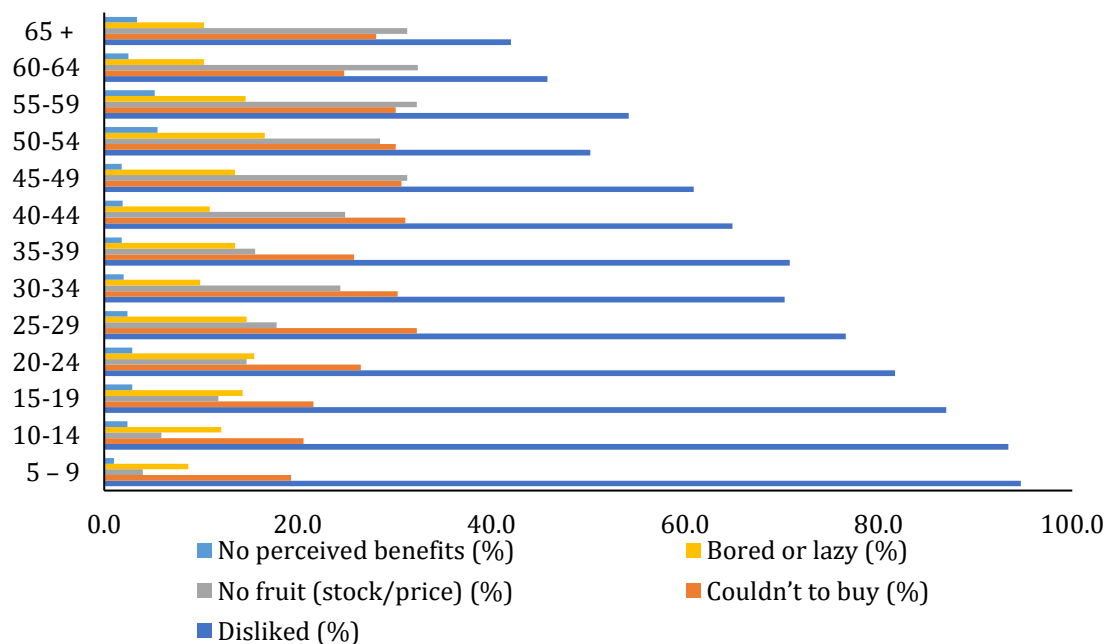


Fig. 5. Reasons not to eat vegetables (%) by age group
(Ministry of Health, 2023)

The reasons for not consuming vegetables are because disliked, most are school (91.3%), the reasons for because couldn't to buy vegetables, most are farmers/farm laborers (34.4%), the reasons do not consume vegetables there is not in stock/price vegetables is most common among fishermen (53.2%), meanwhile the reason for not eating vegetables is because they are bored or lazy most often in public servants (14.9%) and the reason for not consuming vegetables because there are no perceived benefits felt most often in the work of farmers/farm laborers (4.8%).

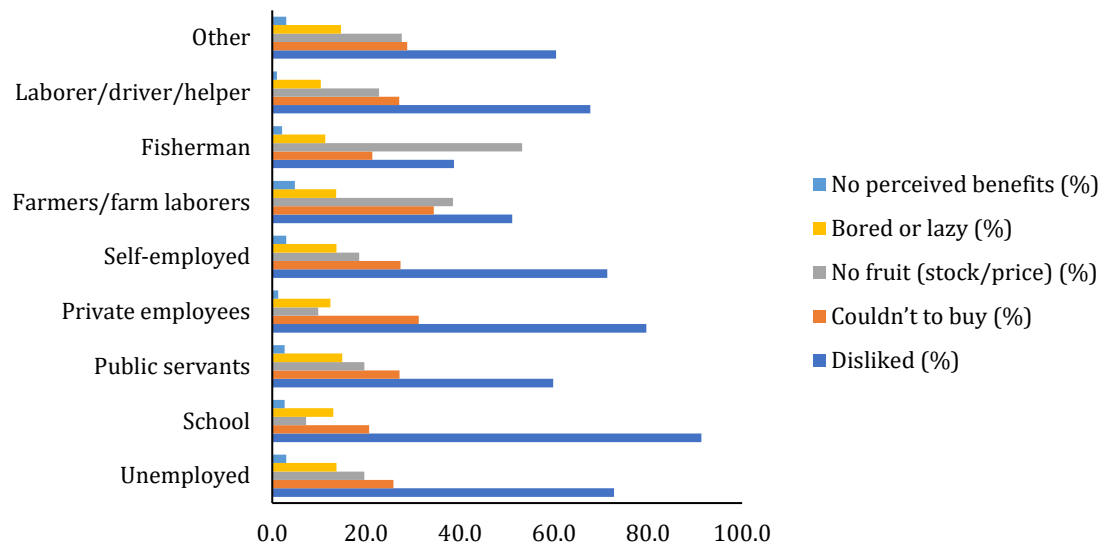


Fig. 6. Reasons not to eat vegetables (%) by employment (Ministry of Health, 2023)

Based on education level in Figure 7, the reasons for not consuming vegetables because disliked are mostly those who not completed in primary school (90.1%), the reasons for because couldn't to buy vegetables them are mostly those who have finished senior high school (27.9%), the reason is because do not consume vegetables there is not in stock/price vegetables is finished elementary school (21.3%), meanwhile the reason for not eating vegetables is because they are bored or lazy the most at the finished senior high school (15.8%) at the finished senior high school there are also the most reasons (3.5%) not consuming vegetables is because there is no perceived benefit.

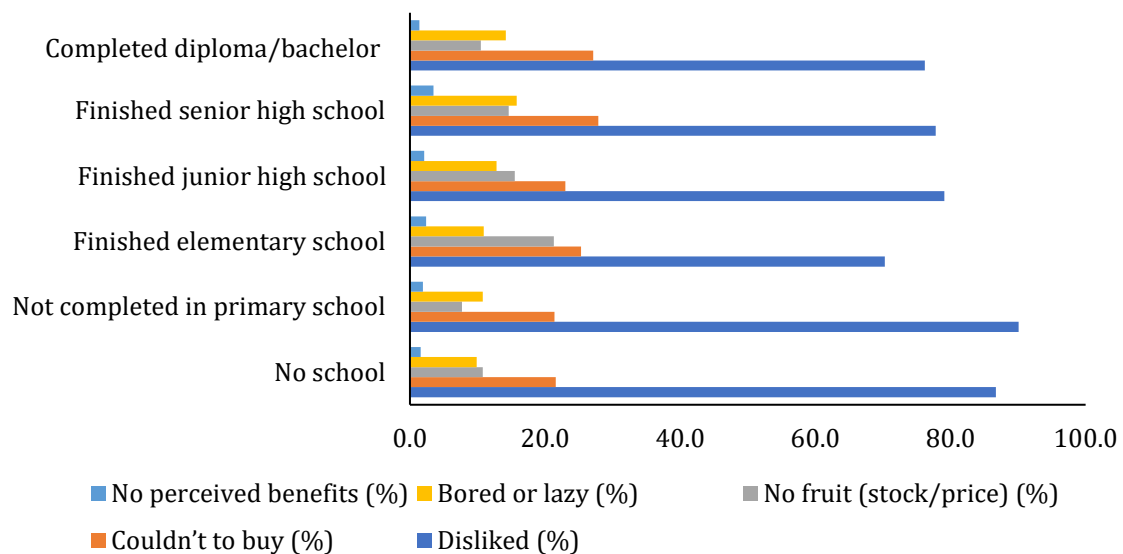


Fig. 7. Reasons not to eat vegetables (%) by education (Ministry of Health, 2023)

According to economic status Figure 8, the reason for not consuming vegetables is because disliked most in the top economic status (88.8%), the reason because couldn't to buy vegetables it is the most in the lower middle economic status (25.3%), the reason is because do not consume vegetables there is not in stock/price vegetables in the lowest economic status (31.6%), while the reason for not eating vegetables is because they are bored or lazy the most in the lowest economic status (12.7%) and the reason for not consuming vegetables is because there is no perceived benefit most often in the lowest economic status (2.5%) and upper middle economic status (2.5%).

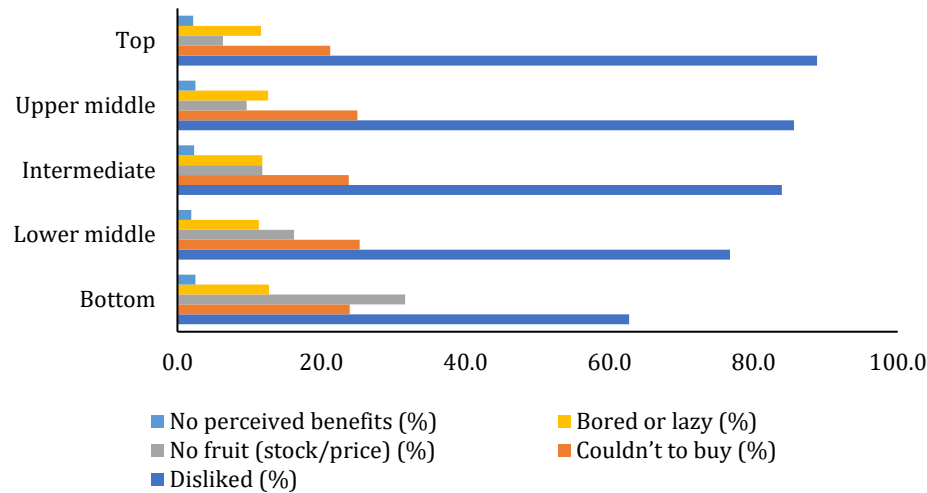


Fig. 8. Reasons not to eat vegetables (%) by economic status
(Ministry of Health, 2023)

Meanwhile, the reasons for not consuming vegetables are because disliked, mostly in urban areas (83.2%), the reasons because couldn't to buy vegetables them are mostly in rural areas (25.6%), the reason is because do not consume vegetables there is not in stock/price vegetables are also highest in rural areas (18.4%), while the reasons for not eating vegetables are because they are bored or lazy most often in urban areas (12.0%) and the reasons for not consuming vegetables are because there are no perceived benefits most often in rural areas (2.5%). Based on gender characteristics, the reason for not consuming vegetables among male (81.8%) and females (80.9%) is mostly disliked to eat vegetables. Meanwhile, it is still seen as many as (24, 8%) of the male are more likely couldn't to buy vegetables than females (22.5%), but even so, among the male there are (2.3%) more people who think there is no perceived benefit if they vegetable consumption than female (2.2%).

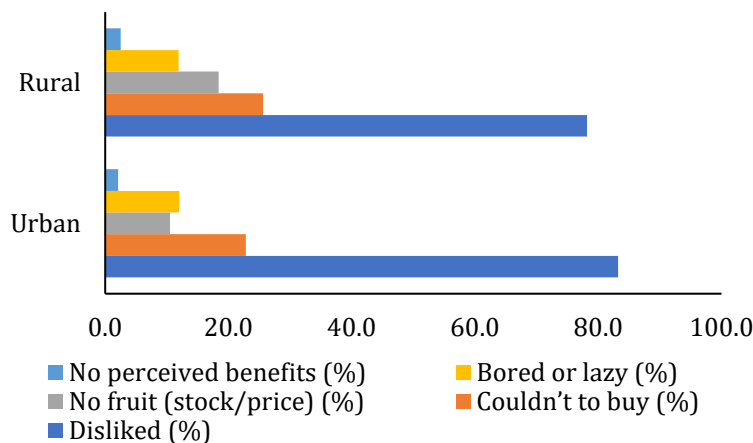


Fig. 9. Reasons not to eat vegetables (%) by type of residence
(Ministry of Health, 2023)

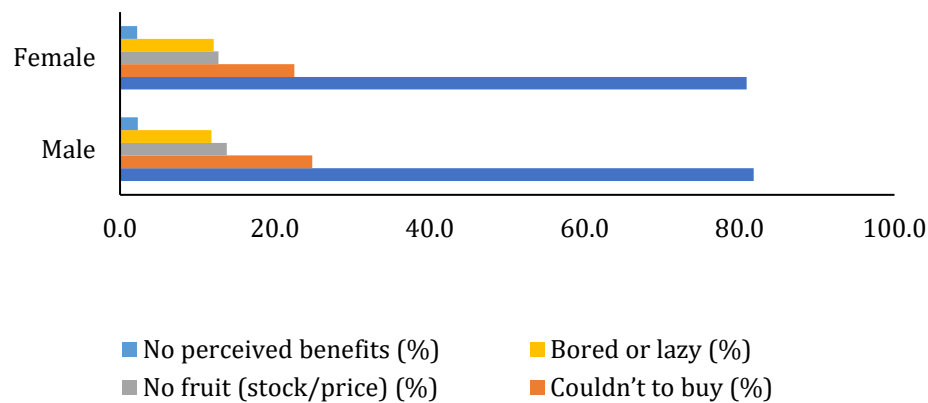


Fig. 10. Reasons not to eat vegetables (%) by gender
(Ministry of Health, 2023)

3.2 Discussion

The diversity of types of food consumed affects the nutritional quality and completeness of nutrients (Stanaway et al., 2022). It is easier for the body to meet its nutritional needs by consuming more types of food, and consuming more types of food also makes it easier for the body to obtain various other substances that are good for health (Madsen et al., 2023). Consumption of a variety of foods is one of most important ways to maintain balanced nutrition (Ministry of Health, 2014a). PGS (Balanced Nutrition Guidelines) is available in Indonesia, and almost all countries have it to provide accurate guidelines on how their inhabitants should consume healthy foods and beverages (Ministry of Health, 2014a; WHO, 2023). The Balanced Nutrition Guidelines aim to encourage everyone to eat and behave in a healthy way. The principles consist of consuming a variety of foods, clean living behaviors, engaging in physical activity, and maintaining a normal body weight (Haddad et al., 2016; WHO, 2020).

From the results of this further analysis, it was found that ($\pm 60\%$) in general, based on all the characteristics studied, consumed more than 1-2 portions of fresh fruit/and/or vegetables per day of the week, according to WHO people are categorized as having "sufficient" consumption of vegetables and fruit if they consume vegetables and/or fruit (a combination of vegetables and fruit) at least 5 portions per day for 7 days a week, and "insufficient" if their consumption of vegetables and fruit is less than the provisions above. The highest proportion of the population who have consumed ≥ 5 portions of fresh fruit/and/or vegetables per day of the week are in public servant jobs (6.7%) with an education level of completed diploma/bachelor (6.0%). Meanwhile, the results of further analysis also show that there are (18.4%) of the population aged 5-9 years older than other age groups who do not consume fresh fruit/and/or vegetables per day of the week. This condition shows that consumption of vegetables and fruit The Indonesian population is still not in accordance with the context of balanced nutrition. The recommended minimum consumption of vegetables and fruit for teenagers and adults is 400 grams/person/day and for children under five (< 5 years), aged 5-12 years, 300 grams/person/day.

Most of the vitamins, minerals and dietary fiber can be found in vegetables and fruit, some of these vitamins and minerals function as antioxidants or protect the body from bad substances (Nishi et al., 2023). Different of vegetables, fruits also provide carbohydrates, especially fructose and glucose. Certain vegetables, such as carrots and potatoes, also provide carbohydrates, while certain fruits, such as avocados and red fruit, also provide unsaturated fats. (Noopur et al., 2023). Eating vegetables and fruit is an important part of maintaining balanced nutrition (Ministry of Health, 2014a). WHO recommends consuming 400 g of vegetables and fruit every day, this includes 150 g of fruit (equivalent to 3 medium-sized oranges, 1.5 pieces of papaya, or 2.5 glasses of vegetables after cooking and draining) and 250 g of vegetables (equivalent to 2.5 servings or 2.5 cups of vegetables after cooking

and draining). It is recommended that Indonesians consume 300-400 grams of vegetables and fruit every day for toddlers and school-age children, and 400-600 grams every day for teenagers and adults. Vegetable portions represent around two-thirds of the amount of vegetables and fruit consumed recommended for consumption (Ministry of Health, 2014a; WHO, 2023).

The reasons do not consume fresh fruit because the fruit is not in stock/price. A study conducted by Amelia (2020) found an association between the availability of vegetables and fruits ($p = 0.048$) and the consumption of fruits and vegetables among junior high school students (Amelia & Fayasari, 2020). In line with research conducted in Minahasa Regency, which found a relationship between availability and frequency of fruit and vegetable consumption with a value ($p = 0.003$) (Berhenti et al., 2021). There is a significant relationship between the availability of vegetables and fruit and the consumption of vegetables and fruit, namely that the higher the availability of vegetables and fruit, the higher the consumption of vegetables and fruit for each individual (Rachman et al., 2017). Furthermore, the biggest reason why people aged > 5 years do not consume vegetables in all their characteristics is because they dislike vegetables. Research Alhidayati et al. (2023) shows that of the 77 respondents who do not like vegetables and fruit, there are 45 respondents who behave badly in consuming vegetables and fruit, the results of the chi-square test were obtained ($p = 0.050 < \alpha 0.05$), which means there is a relationship between children's preferences and vegetable and fruit consumption behavior in kindergartens in the working area of the RI Sidomulyo Community Health Center, with a prevalence odds ratio (POR) value of 3 (CI 95%: 1.103-8.233), which means that parents who have children who do not like vegetables and fruit have 3 times the risk of having bad vegetable and fruit consumption behavior compared to parents who have children who likes vegetables and fruit (Alhidayati et al., 2023). There is a relationship between preferences and the behavior of consuming vegetables and fruit in children with a value ($p = 0.000$) and a POR value = 9.200, where students who dont like fruit and vegetables are 9,200 times more likely to have the behavior of not consuming fruit and vegetables compared to students who like to consume fruit and vegetables (Purba et al., 2019). A study Aulia & Ulfah (2023) conducted on teenagers found 43 teenagers (77%) saying vegetables tasted bad, as many as 2 teenagers (3%) said vegetables formed unattractive, and as many as 11 teenagers (20%) said fruits and vegetables were rarely available/not always available, so they could not eat vegetables and fruits every day (Aulia & Ulfah, 2023).

Food intake, including vegetables and fruits, is influenced by habits, flavor quality, and the nutrients contained therein. Food can also vary between age groups and gender, preferences for certain foods can change from time to time or settle, as well as dislikes for specific foods. Adults and teenagers prefer to choose what they eat on their own, and adolescents are usually less concerned with high-nutrition foods and prefer popular foods (Kalmpourtzidou et al., 2020; Tarigan, 2020). A person's dislike of foods such as vegetables can be affected by one of them because of minimal knowledge of the benefits of vegetable consumption, a study conducted by Putri et al. (2022) showed that there was an increase in knowledge in students ($p = 0,000$), that the provision of education in the form of dissemination had a significant influence on the improvement of students' knowledge regarding the benefits of fruit and vegetable consumptions (Putri et al., 2022). In line with research (Chandry et al., 2021), the majority of them 59.61% of the 31 respondents an inadequate understanding of the significance of eating fruit. It is recommended that the community, parents, and health professionals working in the district's service area take a more active role in educating children about the value of eating fruits and vegetables by holding counseling sessions or handing out pamphlets and brochures (Chandry et al., 2021). Less information or health education about the importance of consuming fruit and vegetables can cause low fruit and vegetable consumption in the community (Turner et al., 2021). The lack of attitudes and knowledge among young people is apparently caused by a lack of knowledge about the benefits of fruit and vegetables for health (Mandagie et al., 2023).

Many factors influence people to consume fruit and vegetables, research in Bekasi Regency shows that the factors, that influence vegetable consumption in vegetable farming households are maternal nutritional knowledge, maternal education, and maternal employment (Wijayanti et al., 2021). Other factors such as motivation from other people, such as peers, showed a correlation between motivation with fruit and vegetable consumption behavior ($p = 0.007$) (Ayu et al., 2022). Family and parental factors also influence the availability of fruit and vegetables at home. Parents, especially mothers, are important people in the house and play an important role in providing fruit and vegetables at home so that other family members can consume them according to WHO recommendations. Therefore, parents must be able to provide fruit and vegetables in their own home, so that other family members can also consume them (Safitriani & Masnina, 2022). Other research Supriyanto (2020) shows that factors that influence the food consumption of farmer households in Belitang District include household income and the number of family members, while the level of education has no effect on the amount of household consumption (Supriyanto, 2020).

Fruits and vegetables with a relatively high level of vitamins, antioxidant compounds, polyphenols, and fibers can help prevent NCDs by counteracting the metabolic processes that lead to the beginning of CVDs and other diseases (21). For ischemic stroke, esophageal cancer, ischemic heart disease, and hemorrhagic stroke, we discovered statistically significant protective effects of vegetable consumption (Stanaway et al., 2022). Foods that are high in fat and cholesterol increase the risk of heart and blood vessel disease. Sufferers of coronary heart disease and other cardiovascular diseases should consume lots of vegetables and fruit. The risk of severity due to cardiovascular disease can be reduced by consuming chemicals such as fiber and antioxidants. The risk of plaque buildup in blood vessels can be reduced by reducing cholesterol levels through the consumption of fiber (Pertiwi, 2020). Vegetables and fruits contain nutrients that are good for the heart and blood vessels, among others: vitamin A, vitamin C, lycopene, amino acid strulin, vitamin E, and others (Fandizal et al., 2020).

Consuming fruits and vegetables on a daily basis may lower the chance of developing certain NCDs, such as cardiovascular illnesses and some cancers. A smaller body of research indicates that eating fruits and vegetables can also help prevent weight gain and lower the risk of obesity, which is a separate risk factor for NCDs, when combined with a nutritious diet low in fat, carbohydrates, and salt/sodium. Consuming a variety of fruits and vegetables helps to ensure an adequate intake of many of these essential nutrients. Fruits and vegetables are also rich sources of vitamins, minerals, dietary fiber, and a host of beneficial non-nutrient substances, including plant sterols, flavonoids, and other antioxidants (WHO, 2023). A high fruit and vegetable (FV) intake has been repeatedly linked to a lower risk of certain non-communicable diseases. There are several obstacles to raising food and beverage intake, such as behavioral, physical, and economic ones, which need to be taken into account when investigating potential avenues for change and weighing the viability of various strategies to promote higher FV consumption (Woodside et al., 2023).

Communication, information, and education approaches (*Komunikasi, Informasi, dan Edukasi/KIEs*) are one way to improve community fruit and vegetable consumption patterns. The results of the research carried out (Ahmad, 2023) were processed after given education that there was improvement of knowledge in school age children in the State SD Pijorkoling City, Padangsidempuan. This education is expected not only to enhance the child's knowledge but also to change behavior so that the knowledge acquired can be applied in everyday life (Ahmad et al., 2023). Except for ferritin levels in the intervention group, all nutritional parameters within the study groups were statistically significant ($p < 0.05$) both before and after the intervention (Wiafe et al., 2023). The knowledge of nutrition among educated students increased significantly (+75.5%), and the children who had the best understanding of nutrition at the follow-up had a considerable improvement in their nutritional status (+218.9%) (Kendel Jovanović et al., 2023). The aim of KIE activities is to change behavior in accordance with the message conveyed. So that message delivery can be carried out successfully and efficiently (efficiently and effectively), the first stage is to

determine who the target will be. "Targets are not only objects but also subjects" is the basis of KIE Balanced Nutrition. In relation to the aim of KIE Balanced Nutrition to change behavior at all levels of society, the appropriate and community-based strategy and implementation of IEC greatly influences the success of disseminating the balanced nutrition message to the community. To achieve optimal results, appropriate and community-based IEC strategies and implementation are needed to impact changes in people's living behavior towards balanced nutrition behavior, namely healthy eating and living behavior. This change in behavior is greatly influenced by the implementation of socialization, education, public services, and other public health programs. The success of these activities is largely determined by the role of the government at both the central and state levels. In addition, it needs to be emphasized that other health stakeholders must actively participate in making efforts to change perceptions and practices of public health and nutrition, including the role of other agencies (Ministry of Health, 2014a).

Socioeconomically, patterns of fruit and vegetable consumption were strongly correlated with job status, education, and income level. People with steady jobs and those from wealthier families tended to be more aware of healthy eating practices and have easier access to a wider range of fresh vegetables. On the other hand, because of conflicting household demands, those from lower socioeconomic backgrounds frequently encountered obstacles such as restricted availability, greater relative costs, and a decreased priority for eating fruits and vegetables. This suggests that in order to promote appropriate fruit and vegetable consumption among the general public, it is imperative to improve socioeconomic conditions and provide access to reasonably priced fresh food.

4. Conclusions

From the results of this further analysis, it was found that as many as ($\pm 60\%$) in general, based on all the characteristics studied, consumed more than 1-2 portions of fresh fruit/and/or vegetables per day a week. This was still considered insufficient because the population was categorized as "sufficient". Consumption of vegetables and fruit if you consume vegetables and/or fruit (a combination of vegetables and fruit) at least 5 portions per day for 7 days a week, is categorized as 'less' if the consumption of vegetables and fruit is less than the provisions above. The largest proportion of the population who have consumed ≥ 5 portions of fresh fruit/and/or vegetables per day of the week is are public servants (6.7%) with a completed education level of diploma/bachelor (6.0%). Meanwhile, the results of further analysis also show that there are (18.4%) more people aged 5-9 years compared to other age groups who do not consume fresh fruit/and/or vegetables per day of the week. The most common reason for people aged >5 years not consuming fresh fruit for all the characteristics studied is that reason do not consume fresh fruit because the fruit is not in stock/price. Furthermore, the biggest reason people aged >5 years do not consume vegetables for their characteristics is because they dislike vegetables.

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Author Contribution

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Conflicts of Interest

The authors declare no conflict of interest.

Declaration of Generative AI Use

During the preparation of this work, the authors did not use any generative artificial intelligence tools. All content was created and reviewed solely by the authors, who take full responsibility for the publication.

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Biography of Author

Nilasari, Department of Public Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Sleman, Special Region of Yogyakarta 55281, Indonesia.

- Email: nilasari424@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A