

*Full Length Research Paper*

# **Dietary patterns and nutritional adequacy among the youth (aged 15-24 years) in Ruaka-Nairobi and The Technical University of Kenya**

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**Malnutrition, in all its forms, is a problem of global proportions and requires urgent action. In many parts of the world, most adolescents receive inadequate nutrients needed to meet the body's daily requirements in terms of quantity, frequency, and quality to survive, grow and develop to their full potential. Food systems are therefore important in addressing problems of malnutrition, food insecurity and diet-related health problems. This study profiled the dietary patterns and nutrient adequacy of youths (aged 15-24 years) in Ruaka and The Technical University of Kenya using demographic questionnaires, food frequency questionnaires and a 24-h recall method. The study found that 17.6% of males and 13.0% of females skip their breakfast at least thrice a week due to too much time spent watching TV at night and waking up very late hence only having morning or afternoon snacks. In addition, many did not consume foods from at least four essential food groups according to the 24-h recall method. Thus, there is a need to educate youths and the society at large about healthy dietary patterns and the need to include at least four essential food groups in their meals in order to gain essential nutrients (both macronutrients and micronutrients) for healthy growth and development.**

**Key words:** Youth, diet, dietary pattern, fast foods, healthy eating habits, nutrition, malnutrition, food system.

## **INTRODUCTION**

The UN Department of Economics and Social Affairs defines 'Youth' as the category of the population that ranges between the ages of 15 and 24 years (UN, 2019). The phase of life refers to youth being between childhood and adulthood. Consequently, young people are conceived to be a group with common needs, interests

and characteristics. The current population of the youth worldwide stands at 1.2 billion whereas in Kenya they are about 9.5 million, which is more than 20% of the national population (the United Nations, 2019).

The youth is a heterogeneous group whose common denominator is defined by age. Commonly, the group is

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characterized by age differences as it includes 15 year olds in secondary schools as well as 24 years old young adults in colleges, universities, and others in search of employment and various trainings. There are many words that describe this cohort: teenagers, adolescents, youth, young persons and young adults, which can sometimes be confusing.

Adolescence, a major stage of youth is one of the most rapid phases of human development. The characteristics of both the individual and environment influence the changes taking place during adolescence. The changes in adolescents have health consequences not only in adolescence but over the life course. Young adolescents may be particularly vulnerable when their capacities are still developing, and they are beginning to move outside the confines of their families (WHO, 2020). It is therefore crucial for adolescents to eat healthy, nutritionally balanced meals in order to meet the demands of their changing bodies. Malnutrition could have detrimental effects which can extend to later stages in life.

Malnutrition in all of its forms is a problem of global proportion and requires urgent action (UNICEF, 2018). Poor dietary diversity, inadequate dietary patterns and frequent consumption of poor quality foods contribute to this reality (HLPE, 2017). The World Health Organization (WHO) acknowledged the importance of adequate nutrition to enable adolescents to enjoy good health while playing a full role in contributing to transformative change and sustainable development. Good nutrition during adolescence is vital for growth and development, health and well-being and the prevention of obesity and several chronic diseases (Yaktine AL, Stallings VA (Eds.) 2007).

Food systems are therefore important in addressing problems of malnutrition, food insecurity and diet-related health problems. A food systems approach engages actors at all levels of the system to reshape it and ensure that the food system delivers healthy, affordable and sustainable diets to all adolescents (UNICEF, 2018).

There is a variety of ways to represent food systems schematically, decomposing them into their constituent parts and relationships (Reuben et al., 2018). Some analysts have distinguished conceptually and analytically between the drivers, components, and outcomes of food systems. Drivers include biophysical and environmental factors (e.g., local agro-ecologies that shape farming systems), technologies and infrastructures (e.g., farm machinery and road networks), political and economic factors (e.g., policies, regulations and markets), socio-cultural norms and practices (e.g., dietary customs), and demographic change (e.g., population growth, migration and urbanization) (Béné et al., 2019). Food system components comprise the productive, reproductive and economic activities and functions that produce, process and distribute food. The outcomes of food systems are mediated by “food environments” that influence consumer choices and behavior, individually and in groups. Outcomes include effects on the nutrition, health and

well-being of food consumers and an array of social, economic and political effects, as well as environmental impacts such as wastage and pollution (HLPE, 2017).

The youth phase of a life course usually entails lifestyle changes of various kinds, which may have consequences for each person's food environment, food habits, diets and energy needs. This is a period when changes in lifestyle and food habits can be influenced in positive or negative directions (Brooks and Begley, 2014). Youths are likely to become more independent in decision making around food especially when they move out of their parents' homes. They may consume more of street food and fast food, or meals in institutional canteens. Sites such as schools, gyms and workplaces may exert an influence over young people's food choices, whether through providing food or exposing the young people to guidance on nutrition and healthy eating (Fernandes et al., 2017; Hossain et al., 2019).

In current times, youths are associated with poor eating habits that include consumption of too much saturated fats and salts, less of vegetables and fruits, low water intake and high intake of calories and refined carbohydrates. For instance, a university student may not be able to keep up with a healthy eating routine due to his busy schedule that has back-to-back classes and projects. Therefore, many opt to grab a snack or reach out to a nearby fast food during short breaks. In the case of working youths, many are carried away by the tight deadlines thus snacking a lot rather than eating healthy. Others may not afford to eat a balanced meal as their income is low while the other lot makes wrong choices for meals like dinner either because they are too exhausted to prepare or prefer to meet up in social places where they end up consuming alcohol.

While the period of adolescence and youth is characterized by rapid physical, emotional, social, sexual, psychological development and maturation, these characteristics make adolescence and youths vulnerable to a range of nutritional issues (Anabwani, 2015). This study seeks to establish the dietary patterns and nutrition adequacy among the youths aged 15-24 years in Ruaka town-Nairobi, and The Technical University of Kenya. The objectives of this study were:

- (1) To determine the food consumption patterns among the youth aged 15-24 years.
- (2) Determine the factors that influence the dietary patterns of the youth 15-24 years.
- (3) Establish the choice of eating places by the youth.
- (4) Determine the nutrient adequacy of the meals consumed by the youth.

## METHODOLOGY

### Study design

The study adopted a cross-sectional descriptive research design.

Qualitative data was captured by the attitudes, opinions and behaviors of the youth while quantitative data was captured in the form of socio-economic characteristics of youths.

### Study location

This research was conducted at Ruaka and The Technical University of Kenya.

### Target population

The target population were youths, both male and female, aged 15-24 years in Ruaka and The Technical University of Kenya.

### Sample size

This study consisted of 120 youths from Ruaka and The Technical University of Kenya. The study was done during Covid-19 pandemic and most lectures were being provided online thus there were fewer students on campus, constituting those with practical activities on campus. This limited the sample pool significantly and thus the number of participants in the study represents mainly students with campus activities and those who were willing to participate in the study.

### Sampling technique

The study adopted convenience sampling method since the participants were selected based on availability and willingness to participate. The sampling location was picked using purposive sampling technique due to time and cost limitations. The Technical University of Kenya was chosen to represent cross-section universities in Nairobi County while Ruaka was chosen to represent developing towns with which many youths are found.

### Research instruments

A structured questionnaire was used to collect data. A 24-h recall interview schedule was administered to the youths to recall food consumed in the last 24 h from the time of the interview. A 7-day Food Frequency Questionnaire was also administered to the youths to collect data on the dietary intake and feeding patterns.

### Data collection procedure

Data on dietary intake and usual pattern of feeding of the youths was collected using a 7-day Food Frequency Questionnaire (FFQ), 24-h recall and a questionnaire. The FFQ was administered by interviews and it consisted of a list of foods and an associated set of frequency-of-use response categories. The food list was extensive to enable estimates of total food intake and dietary diversity of the youths. The frequency-of-use response was in categories as follows: rarely or never in a week, thrice or less in a week and four or more times weekly.

The 24-hour recall technique was in four stages as recommended by Rosalind et al. (2008). First a complete list of all foods and beverages consumed during the preceding day was obtained. Second, a detailed description of each food and beverage consumed, including cooking methods was collected. Third, estimates of the amount of each food and beverage item consumed were obtained. Household cups and serving spoons were used as memory aids to assist the respondent in assessing portion sizes of

food items consumed. Finally, the recall was reviewed to ensure that all items were recorded correctly.

A questionnaire was administered to collect data on demography, occupation and other factors that influence food consumption patterns.

### Data analysis and presentation

Food frequency data was analyzed (through excel) to determine the frequency of food intake by youths aged 15-24 years. Consumption of these foods for more than four times a week was considered regular while one to three times was considered irregular. The 24-h recall data was analyzed (through Stata) to determine if respondents consumed foods from at least four food groups and their places of eating.

## RESULTS AND DISCUSSION

### Socio-demographic characteristics of youths in Ruaka Kenya

Gender distribution amongst respondents per age group is shown in Table 1. The majority of the respondents in this study can be considered literate owing to their levels of education. At least 31.4% males and 27.5% females' attained secondary level education (ongoing students and high school graduates) while 68.6% males and 66.7% females had managed to get to university. Four female respondents (5.8%) attained only up to primary school education due to lack of interest in pursuing studies and opting for early marriage. A total of 78.4% of the male respondents and 79.7% females were not working either because they are still studying or they have not yet found job opportunities. Out of the 21.6% (11 males) who were employed, only 17.6% earned a salary of Ksh 10,000 and above while of the 20.3% females employed, 14.5% earned Ksh 10,000 and above. Males (5.9%) and females (2.9%) who earned less than Ksh 10,000 stated that working in the informal sector led to poor pay or rather lower wages.

### Dietary patterns of youths in Ruaka and The Technical University of Kenya

Most of the dietary patterns were associated with health related lifestyle characteristics e.g. physical activity and frequency of family meals.

Some studies have shown that adolescents skip regular meals, breakfast being the most skipped. Skipping of breakfast has been associated with poor eating habits. In addition, it has been associated with other unhealthy behaviors such as smoking, alcohol consumption and sedentary behaviors (WHO Fact Sheet, 2016).

This study found that 17.6% of males and 13.0% of females skip their breakfast at least thrice a week due to too much time spent watching TV at night and waking up very late hence only having morning or afternoon snacks.

**Table 1.** Socio-demographic and socio-economic characteristics of youths in Ruaka and the Technical University of Kenya.

Characteristics	Male		Female	
	N	%	N	%
<b>Age</b>				
15-18 years	10	19.6	11	15.9
19-24 years	41	80.4	58	84.1
<b>Highest education level</b>				
College/University	35	68.6	46	66.7
Secondary	16	31.4	19	27.5
Primary	-	-	4	5.8
<b>Marital status</b>				
Single	49	96.1	61	88.4
Married	2	3.9	6	8.7
Separated	-	-	2	2.9
<b>Employment status</b>				
Employed	11	21.6	14	20.3
Unemployed	40	78.4	55	79.7
<b>Income</b>				
Less than 10,000	3	5.9	2	2.9
More than 10,000	9	17.6	10	14.5

Since sleep is a priority for this age group, they do not have enough time to consume breakfast (Reddan et al., 2002). Another study found that adolescent girls skip breakfast as a strategy to lose weight (Cohen et al., 2003). Males (82.4%) and (87%) females did not skip breakfast stating that breakfast consumption was important as it made them energetic and active in their work while others noted it was a family routine to consume breakfast. Males (29.4%) and 18.8% of females skipped lunch at least thrice a week. Male respondents (29.4%) explained that food preparation was time consuming and therefore opted to maximize their time in daytime activities like soccer while another lot mentioned that consuming lunch was not necessary. Females (18.8%) also stated that preparing lunch meals was time consuming and others claimed that they were watching on their weight. All the respondents mentioned that they did not skip supper, this was because they were fully dependent on their parents who prepared meals for them thus their evening meal patterns and choices were being influenced (Figure 1).

The majority (70.6% males and 88.4% females) ate meals with their families at least four times a week. Taking regular meals as a family is associated with healthier diets for adolescents, providing an opportunity for parents to offer healthy choices and present an example of healthy eating (WHO Fact Sheet, 2016).

From this study it was observed that the youths who ate meals at home with their family had healthy eating habits.

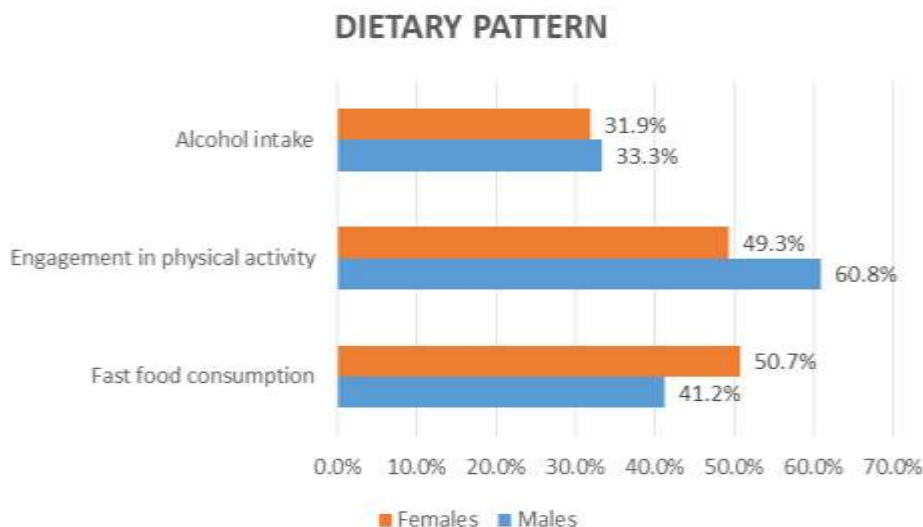
Fast foods consumption is popular with busy adolescents and is considered as unhealthy dietary habit. Such unhealthy dietary habits in youth are thus associated with an increased risk of obesity, cardiovascular disease, type 2 diabetes and cancer in later adulthood (Li et al., 2020). These foods tend to be low in iron, calcium, riboflavin and vitamin A. However, 58.8% of males and 49.3% females did not buy or eat foods from restaurants. Figure 2 illustrates the consumption of fast foods at least twice a week.

Majority of youths being unemployed, they could not afford to buy themselves foods from restaurants but instead ate what their parents provided. Those who consumed fast foods (41.2%) males and (50.7%) females mentioned that they were either bored with eating healthy foods/foods cooked at home or had cravings for junks.

Appearance and body image are the greatest influence on the dietary choices especially among ladies. Some of the justifications being that they need to take care of their skin, have attractive hair, and control their weight (Chambers et al., 2008). In this study, both males (11.8%) and (27.5%) females were concerned about their weight. The males stating that they wanted to achieve healthy lives while females wanted to keep their bodies fit. Despite the given reasons, only 5.9% males and



**Figure 1.** Meals skipped at least thrice a week among youths aged 15-24 years.



**Figure 2.** The dietary patterns of youths aged 15-24 years in Ruaka and the Technical University of Kenya.

17.4% females were on diet to lose or maintain weight.

Eating disorders and unhealthy eating behaviors such as restrictive dieting, overeating and the use of harmful weight-control behaviors such as vomiting, overuse of laxatives represent major health concerns affecting adolescents. An eating disorder develops as a way for an adolescent to feel in control about what is happening in their life (Striegel-Moore, 1997). In this study, 15.9% females admitted to have used diet pills, tried vomiting and skipped meals to lose weight.

It was noted that male respondents (60.8%) participated in physical activities explaining that it was a stress reliever and a way of having fun with friends. Only

49.3% of females participated in physical activities, the rest (50.7%) mentioned that engaging in such activities was tiresome.

As one grows, an active lifestyle becomes even more important for health and overall wellbeing. Youths who are physically active exhibit a higher level of bone health, cardio-respiratory and muscular fitness; and have a healthier body mass and composition, and enhanced strength, power, and intrinsic neuromuscular activation. They are also at lower risk of all-cause mortality, coronary heart disease, cardiovascular disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, colon cancer, breast cancer, and depression

(Ministry of Health, 2017).

It was noted that all the youth's family watched TV, browsed on their phones or watched movies on their laptops during meals. All stating that they could not afford missing good programs and for their parents they paid attention to news briefing.

Males (33.3%) and 31.9% females mentioned that they drink alcohol due to peer influence, to have fun and relieve stress. Of the 31.9% females, one drank alcohol as it is in line with her mother's nature of work (brewing alcohol).

### **Food frequency of youths in Ruaka and The Technical University of Kenya**

In this study, it was noted that consumption of animal proteins was low where 26.4% consumed thrice a week, 5% consumed four or more times a week while majority (68.6%) rarely consumed stating that it is a luxury and is considered as a 'holiday meal'.

Milk and its products were rarely consumed by youths (66.9%), indicating that they could either not afford or that they were lactose intolerant. Cheese was rarely or never consumed by youths in this study explaining that it was expensive to purchase. Only 8.3% rarely consumed cheese. The remaining mentioned that despite having an idea of cheese existence, their parents have never found it as a necessity in their homes.

The common starchy foods consumed at least four times in a week were rice and ugali. Rice was consumed four times a week majority stating that it was easy and fast to prepare and has different cooking styles which people tend to enjoy. Ugali being a staple food in Kenya, it was also consumed at least four times a week. The youths mentioned that this was because it was cheap as most harvested maize from their farms and milled thus saving on purchasing costs. Chapati was also consumed between three and four times a week. Those who rarely consumed chapati mentioned that it was expensive to buy the ingredients while some mentioned that they did not know how to make chapatis hence they ate it on weekends when their parents were available to prepare.

Eating of legumes at least four times a week is vital in our diets (Ministry of Health, 2017). In this study, majority of youths (57.7%) consumed legumes thrice a week, 4.6% consumed four times a week while 37.7% youths rarely consumed legumes mentioning that it was expensive to buy them and expensive to prepare due to long cooking time (as fuel costs are high).

Tubers and roots were rarely consumed many (60.3%) giving reasons that they were meant for the aged and people with health issues. Those who ate tubers (39.7%) noted that it was because there were no alternatives for breakfast so they ate what was available (Figure 3).

Fruits and vegetables were irregularly consumed by most of the respondents. Vegetables such as pumpkin

leaves, 'terere' and 'managu' were rarely consumed and were referred to as traditional foods, foods of the old and the sick.

Youths in this study area rarely consumed sugars or sweets giving reasons that they were not a necessity.

### **Dietary diversity of youths in Ruaka and The Technical University of Kenya**

From the results obtained in this study area, it was noted that there was low intake of fruits and vegetables among the male respondents. Most of the youths mentioning that they ate when provided for but did not find that as a necessity in their diet. Male respondents (31.6%) and 68.4% females ate fruits while 41% males and 59% females had vegetables in their diet, in the last 24 h. Intake of fruit and vegetables provides part of the high nutrient needs necessary for supporting rapid physiological growth and development which is characteristic for childhood and adolescence (Lytle and Kubik, 2003). Fruit and vegetable consumption during adolescence is linked to many positive short and long term health outcomes, with decreased risk of NCDs (Non Communicable Diseases) such as cardiovascular disease, diabetes, obesity and cancer in adulthood. Hence, there is need to educate youths on healthy eating to lower the chances of cardiovascular diseases (WHO Fact Sheet, 2016).

Male respondents (58.3%) and 41.7% females consumed cereals. Rice and ugali was noted to be consumed by majority of the youths as these are staple foods in many homes. Mandazi and bread were also consumed as part of breakfast. Meat and meat products were termed as a 'holiday meals'. Males (56.3%) and 43.8% females consumed meat and meat products over the last 24 h.

Because of accelerated muscular, skeletal and endocrine development, calcium needs are greater during adolescence than in childhood or adult years. The nutritional recommendation of calcium intake for adolescents is of 1100 mg/day, according to the estimated average requirements (EAR), which should not exceed the tolerable upper intake level of 3000 mg/day (Institute of Medicine, 2011). Milk and milk products are the main source of calcium, protein, riboflavin (vitamin B2), vitamin B12 and potassium (Ministry of Health, 2017). However, in this study there was low consumption of milk and milk products among males. Only 35% males and 65% females consumed milk and its products over the last 24 h. Those who did not drink milk mentioned that it was not important as their tea was prepared using milk (Figure 4).

In this study majority of the youths 95% did not skip breakfast while all youths (100% males and females) had supper, hence there was less snacking in between meals. Almost half of the respondents ate 'Mandazi' as

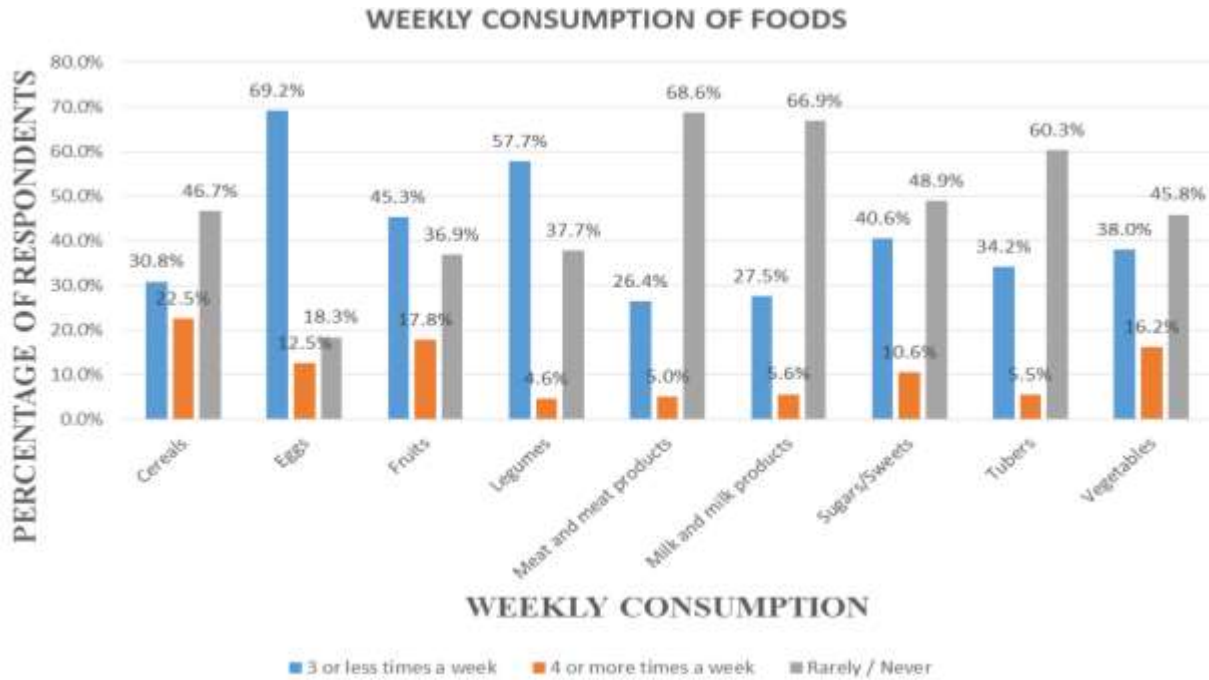


Figure 3. Food frequency among the youth aged 15-24 years in Ruaka and the Technical University of Kenya.

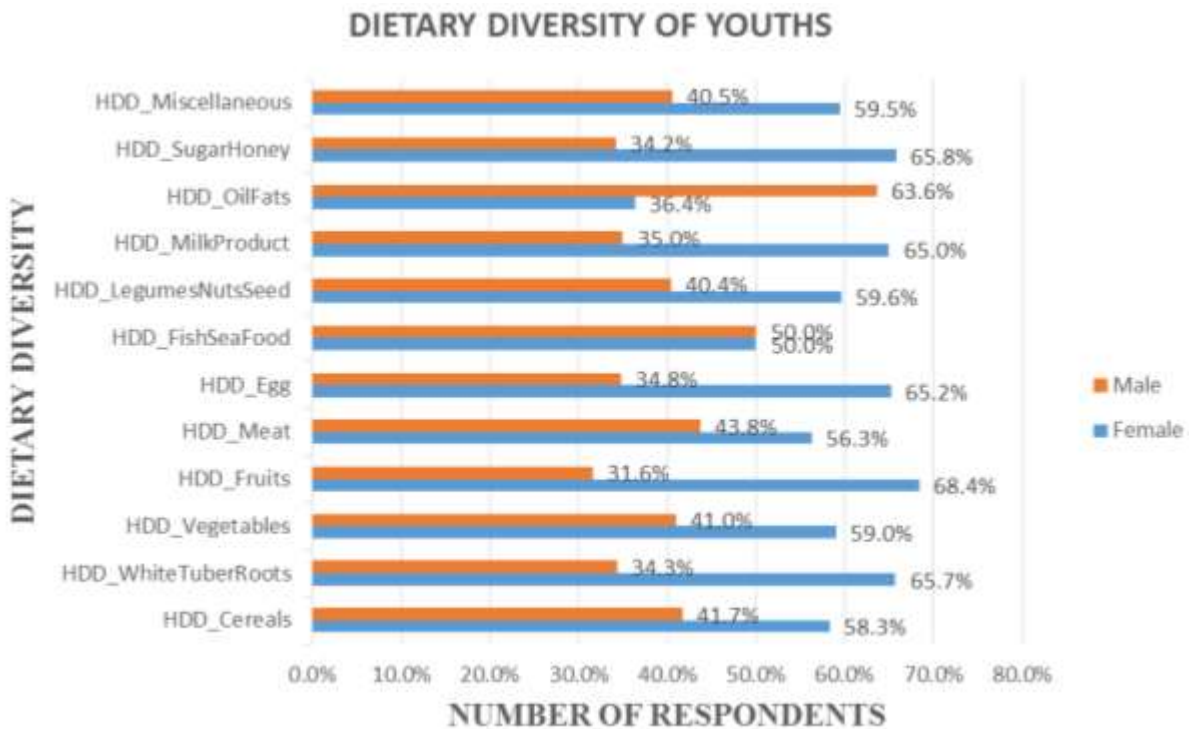


Figure 4. Dietary diversity amongst youths aged 15-24 years in Ruaka and the Technical University of Kenya.

one of the wheat products. Since Mandazi is consumed mostly by youths, OFSP puree can be incorporated

during its preparation to alleviate vitamin A deficiency. Less youth (1.7% males) consumed alcohol for

pleasure. From this study it can be noted that many youths did not engage in alcoholism hence having healthy eating habits.

## RECOMMENDATION AND CONCLUSION

From the results obtained in this study area, it can be concluded that there is the necessity of nutritional education among youths and their parents to shape the proper eating behavior of young people and to correct mistakes made. Though it was found that majority of youths did not consume fast foods, sweetened foods, alcohol and drugs, it is vital for them to be educated on the importance of consuming regular meals (breakfast, lunch and dinner) so as to reduce snacks intake during the day and to avoid intake of excess sodium and calories from solid fats, added sugars and alcoholic beverages.

Youths should also be taught on the need to eat their dinner early and in good amount to avoid overload of the digestive tract during the night-time rest. It is thus vital for young people to know the principles of nutrition and be aware of the health effects of inappropriate nutritional behaviours.

There is a huge impact that nutrition has on building societies, families and transforming lives of youths. Therefore, there is an important need for a food system approach in developing and implementing national policies and interventions aimed at improving the youth's diet. Such interventions will not only enhance the diet and nutritional status of youths, but also allow the achievement of Sustainable Development Goal (SDGs) targets including ensuring healthy lives, promoting life-long learning, improving economic growth and building inclusive societies (UNICEF-GAIN, 2018).

The following messages can be used to inform and educate youths about the types of foods that they should consume (Ministry of Health, 2017).

- (1) Eat a variety of foods from different food groups every day. Include whole or unprocessed starchy foods as part of meals.
- (2) Eat plenty of green leafy vegetables, red and yellow vegetables and fruits every day; and include a variety of other vegetables and fruit.
- (3) Eat beans, peas, lentils, cowpeas, pigeon peas, soya, nuts and edible seeds regularly (at least four times a week).
- (4) Eat lean meat, fish and seafood, poultry, insects or eggs at least twice a week.
- (5) Drink fresh milk, fermented milk or yoghurt every day.
- (6) Use oil or fat in moderation in meals; limit the amount of solid fat. Use fortified oil.
- (7) If you use sugar, use it sparingly.
- (8) Use iodized salt, but use it sparingly.
- (9) Drink plenty of safe water.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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## REFERENCES

- Anabwani G(2015). Nutrition issues in Adolescence. Retrieved from World Wide Web on October, 3, 2016.
- Béné C, Prager SD, Achicanoy HAE, Alvarez Toro P, Lamotte L, Bonilla Cedrez C, Mapes BR (2019). Understanding food systems dynamics: a rigorous review of global food system drivers. *Global Food Security* 23:149-159.
- Brooks N, Begley A. (2014). Adolescent food literacy programmes: A review of the literature. *Nutrition and Dietetics* 71(3):158-171.
- Chambers S, Lobb A, Butler LT, Trail WB (2008). The influence of age and gender on food choice: A focus group exploration. *International Journal of Consumer Studies* 32(4):356-365.
- Cohen B, Evers S, Manske S, Bercovitz K, Edward HG (2003). Smoking, physical activity and breakfast consumption among secondary school students in a southwestern Ontario community. *Canadian Journal of Public Health* 94(1):41-44.
- Fernandes M, Folson G, Aurino E, Gelli A (2017). A free lunch or a walk back home? The school food environment and dietary behaviours among children and adolescents in Ghana. *Food Security* 9(5):1073-1090.
- The United Nations-International Youth Day, 12 August 2019 [https://www.un.org/development/desa/youth/wp-content/uploads/sites/21/2019/08/WYP2019\\_10-Key-Messages\\_GZ\\_8AUG19.pdf](https://www.un.org/development/desa/youth/wp-content/uploads/sites/21/2019/08/WYP2019_10-Key-Messages_GZ_8AUG19.pdf)
- High Level Panel of Experts (HLPE) (2017). Nutrition and Food Systems. A report by the High-Level Panel on Food Security and Nutrition of the Committee on World Food Security, in HLPE Report. Rome: Committee on World Food Security.
- Hossain M, Islam Z, Sultana S, Rahman AS, Hotz C, Haque M, Ahmed T (2019). Effectiveness of workplace nutrition programs on anemia status among female readymade garment workers in Bangladesh: a program evaluation. *Nutrients* 11(6):1259.
- Institute of Medicine (2011). Dietary reference intakes for calcium and vitamin D. Washington, DC: The National Academies Press.
- Li L, Sun N, Zhang L, Xu G, Liu J, Hu J, Han L (2020). Fast food consumption among young adolescents aged 12–15 years in 54 low- and middle-income countries. *Global Health Action* 13(1):1795438.
- Lytle LA, Kubik MY (2003). Nutritional issues for adolescents. *Best Practice and Research Clinical Endocrinology and Metabolism* 17(2):177-189.
- Ministry of Health (2017). National Guidelines for Healthy Diets and Physical Activity. Government of Kenya. Nairobi.
- Reddan J, Wahlstrom K, Reicks M (2002). Children's perceived benefits and barriers in relation to eating breakfast in schools with or without universal school breakfast. *Journal of Nutrition Education and Behavior* 34(1):47-52.
- Reuben R, Verhagen J, and Plaisier C (2018). The challenge of food systems research: what difference does it make? *Sustainability* 11:171. doi: 10.3390/su11010171
- Striegel-Moore RH (1997). Risk factors for eating disorders.
- United Nations (UN) (2019). World population prospects 2019: Highlights. New York (US): United Nations Department for Economic



and Social Affairs. UNICEF-GAIN (2018). Food Systems for Children and Adolescents. In Working Together to Secure Nutritious Diets; UNICEF Office of Research: Rome, Italy.

World Health Organization (WHO) (2020). Adolescent health. Available online: <https://www.who.int/news-room/factsheets/detail/adolescents-health-risks-and-solutions>

World Health Organization (WHO) (2016). Adolescents' Dietary Habits: WHO FACT SHEET. Available online: [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0006/303477/HBSC-No.7\\_factsheet\\_Diet.pdf%3Fua%3D1](https://www.euro.who.int/__data/assets/pdf_file/0006/303477/HBSC-No.7_factsheet_Diet.pdf%3Fua%3D1)

Yaktine AL, Stallings VA (Eds.) (2007). Nutrition standards for foods in schools: leading the way toward healthier youth. National Academies Press.