

Proportion and Factors Associated with Inadequate Fruits and Vegetables Intake in Togo: Findings from the 2021 STEPS Survey

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Abstract Low fruits and vegetables (FV) consumption is a major risk factor for non-communicable diseases (NCDs). Few recent studies have explored this behavior in Togo. The aim of this study was to describe FV intake and associated factors in Togo in 2021-2022. A cross-sectional study was conducted using readily available data from STEPS survey. Variables related to lifestyle habits, socio-demographic characteristics, medical history related to NCD and physical measures were extracted for analyses. Binalry logistic regression analyses were conducted and the dependent variable was the consumption of at least 5FV. A total of 3,167 adults (58.9% female) with median age 38 years, IQR [28-50] were recruited. Among recruited participants, the proportion of diabetes and HBP was 7.7% and 35.8%, respectively. Two respondents in five (37.9%) reported having physical activity and 5.4% were using tobacco. Proportion of FV intake was 25.4%, 95%CI: [24.0-27.0]. Average household income > 52 500 FCFA and being physically active were factors that increased 5FV intake. Participants aged 60-69 years old and those avoiding eating meals prepared elsewhere than at home were less likely to consume 5FV daily. FV consumption remains low in Togo and is influenced by economic and sociodemographic determinants. Multisectoral interventions are needed to change fruit and vegetable consumption behaviors based on regional availability and varieties and to help reduce the risk of developing NCDs.

Keywords: fruits and vegetables, Intake, Proportion, associated factors, STEPS survey, Togo

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1. Introduction

According to the World Health Organization (WHO), non-communicable diseases (NCDs), including cardiovascular diseases, diabetes, cancers and chronic respiratory diseases, have become the leading cause of death worldwide, with more than 43 million deaths in 2021, accounting for 75% of non-pandemic related deaths globally [1,2]. In sub-Saharan Africa, NCDs related deaths are also on the rise with 37% of in 2019 compared with 24% in 2000, and they could become the leading cause of death in the coming years [3]. Non-communicable diseases represent a real public health challenge for resource-limited countries such as Togo which is already facing the burden of infectious diseases, particularly HIV,

malaria, and tuberculosis.

To address this challenge, WHO has launched a global action plan in 2013 to strengthen the prevention, diagnosis and management of NCDs, particularly in resource-limited countries. This plan includes the development of human, technical and financial resources, as well as the implementation of integrated control programs [4].

Among the main levers of prevention and control, regular consumption of fruits and vegetables occupies a central place [5]. The WHO recommends a daily intake of at least five portions, or approximately 400 grams, in order to reduce the risk of chronic diseases and premature mortality [6]. However, in many resource-limited countries, consumption remains below this threshold, due to economic constraints, dietary habits, sociocultural factors and difficulties in accessing fresh produce [7].

In Togo, information on the population's dietary habits,

particularly on fruits and vegetables consumption, remains limited [8,9]. This lack of data hinders the development of effective and targeted nutrition policies. In this context, the implementation of the second STEPS survey, conducted between December 2021 and February 2022 using the WHO's standardized methodology which assessed the levels of fruit and vegetable consumption, represented a key step. Understanding these data is essential to guide national strategies for prevention and health promotion with a view to reducing the burden of non-communicable diseases in Togo. Thus, the objective of this study was to describe fruits and vegetables consumption patterns and associated factors in the general population in Togo in 2021-2022.

2. Materials and Methods

2.1. Research Area

The research is performed in Togo, a West African country respectively bordered at West, East, North and South by Ghana, Benin, Burkina Faso and Guinea Gulf. This country is located at 8° north and 1° east. Togo covers an area of 56,785 km². It has a population of 8,095,498: 3,944,510 men and 4,150,988 women. The research focused on the five main regions of the country, to which the Autonomous District of Greater Lomé was added as a specific territorial community forming part of the maritime region.

2.2. Method and Technics

The study is an analytical and descriptive cross-sectional STEPS research. It is part of a quantitative approach that involves conducting a questionnaire-based survey. The study used data from the 2021 national STEPS survey conducted in Togo in the six health regions (Savanes, Kara, Central, Plateaux, Maritime, and Grand Lomé) between December 2021 and February 2022.

2.3. Sampling

The research targeted the adult population aged 18 to 69 years who have resided in the country for at least six months. Participants were selected using a two-stage probability sampling method, ensuring national representativeness.

Database was made available by the NCD control program, the 'Division de la surveillance des Maladies Non Transmissibles' (DSMNT) of Togo. Our study focused on health behaviors, particularly on fruit and vegetable consumption. For the present study, we extracted the following variables: lifestyle habits (fruits/vegetables consumption, physical activity, tobacco use), as well as socio-demographic characteristics (age, sex, region of residence, study level, marital status, household income), medical history related to NCD (diabetes, high blood pressure) and physical measures (weight, height, blood pressure, glycemia).

Fruits/vegetables consumption was assessed based on four questions for fruits and vegetables: "In a typical week, on how many days do you eat fruits?"; "How many

servings of fruits do you eat on one of those days?"; "In a typical week, on how many days do you eat vegetables?"; "How many servings of vegetables do you eat on one of those days?".

Sample size calculation

This methodological section presents the process of determining and allocating the sample size used in a STEPS survey according to WHO standards conducted in Togo.

Reference population

The target population of the survey corresponds to the resident population of Togo, estimated at 8,095,498 inhabitants during the fifth General Population and Housing Census of Togo (RGPH5). Geographic stratification is based on the country's five administrative regions, with a specific distinction made for the Greater Lomé Autonomous District (DAGL). The demographic distribution is as follows:

- Savanes Region : 1,143,520 inhabitants
- Kara Region : 985,512 inhabitants
- Central Region : 795,529 inhabitants
- Plateaux Region : 1,635,946 inhabitants
- Maritime Region (excluding DAGL) : 1,346,615 inhabitants
- Greater Lomé Autonomous District (DAGL) : 2,188,376 inhabitants

Determining the overall sample size

The overall sample size was set at 3,167 respondents to ensure adequate statistical precision for national and regional estimates. In accordance with demographic and health survey practices, the sample size determination is based on an initial theoretical approach using simple random sampling, followed by an adjustment to account for the design effect associated with cluster sampling.

The initial theoretical size (n_0) is defined by the classic formula:

$$n_0 = (Z^2 \times p \times (1 - p)) / d^2$$

where Z represents the value of the normal distribution corresponding to the level of confidence retained ($Z = 1.96$ for a 95% confidence interval), p the expected proportion of the main indicator (set at 0.5 in the absence of prior estimation, in order to maximize the variance), and d the desired margin of error.

This initial size is then multiplied by a design effect ($DEFF > 1$) to account for the intra-cluster correlation inherent in the cluster sampling design. After adjustment for operational constraints and analytical objectives, the final sample size was set at 3,167 respondents.

Sampling plan

The survey employs a two-stage cluster sampling design, in accordance with DHS standards.

In the first stage, primary clusters (enumeration areas from the most recent census) are selected within each regional stratum according to a probability proportional to their size.

In the second stage, a fixed number of households or individuals are randomly drawn from within each selected cluster.

Regional allocation of sample size

The distribution of the sample between the regions is carried out in proportion to the size of their population, according to the following formula:

$$n_r = (N_r / N) \times n$$

where n_r denotes the size of the sample in the region r, N_r

the regional population, N the total population and n the total size of the sample.

The table below shows the final distribution of the sample by region.

Table 1. Distribution of the sample size by region

Region	Population	Demographic weight (%)	Sample size (n)
Savanes Region	1,143,520	14.1	447
Kara Region	985,512	12.2	386
Central Region	795,529	9.8	311
Plateaux Region	1,635,946	20.2	640
Maritime Region (excluding DAGL)	1,346,615	16.6	527
Autonomous District of Greater Lomé (DAGL)	2,188,376	27.0	856

2.4. Data Collection

Data collection involved 25 teams of healthcare professionals supported by community workers. The investigators, who received six days of training, used Android tablets with a standardized electronic questionnaire (e-STEPS), accompanied by visual aids to standardize responses. The STEPS instrument is comprised of three different levels of risk factor assessment: Step 1 (questionnaire), Step 2 (physical measures) and Step 3 (biochemical measures) [10]. Details of the methodology of Togo 2021 STEPS survey are available elsewhere [11].

2.5. Data Treatment and Analysis

The primary outcome was the proportion of consumption of at least 5 fruits and / or vegetables (5FV) among STEPS survey participants.

Secondary outcomes were the proportion of 5FV according to behavioral (tobacco use, physical activity) and metabolic (high blood pressure, diabetes, obesity) risk factors for cardiovascular diseases. Diabetes was defined as a fasting blood glucose level ≥ 1.26 g/L (i.e. 126 mg/dL), or medical history of diabetes or current use of anti-diabetic treatment (oral medication or insulin) or traditional herbal remedies within the last two weeks. High blood pressure (HBP) was defined as any participant whose systolic blood pressure is greater than or equal to 140 mmHg or whose diastolic blood pressure is greater than or equal to 90 mmHg, or any participant who has ever been diagnosed with high blood pressure by a physician or healthcare professional, or who has taken anti-hypertensive medication prescribed by a healthcare professional in the last two weeks, or who currently reports using traditional or herbal remedies to treat high blood pressure. Body Mass Index (BMI): BMI was calculated as

the ratio of weight (in kilograms) to the square of height (in meters) [BMI = weight (kg) / height² (m²)]. Participants were then classified according to World Health Organization (WHO) cut-off points: thinness: BMI < 18.5 kg/m²; normal weight: $18.5 \leq \text{BMI} < 25$ kg/m², overweight: $25 \leq \text{BMI} < 30$ kg/m² and obesity: BMI ≥ 30 kg/m².

2.6. Statistical Analyses

Descriptive analyses were performed. Categorical variables were expressed as counts and proportions, while quantitative variables were presented as medians with interquartile range (IQR). The proportion of 5FV was estimated along with its 95% confidence interval (95%CI). Comparisons of medians were performed using Wilcoxon-Mann-Whitney test and proportions were compared using Chi-square test or Fisher's exact test. Statistical analyses were carried out using R software (v.4.3.2), taking into account the sampling plan, in order to produce results representative at the national level. Significance level was set at 5%.

2.7. Ethical Considerations

This study was based on data that were collected by the Ministry of Health in Togo. Prior to these secondary analyses, authorization was granted by the 'Division de la surveillance des Maladies Non Transmissibles' of the Ministry of Health. This study was approved by the "Comité Ethique de la Faculté des Sciences de la Santé de l'Université de Lomé" (Ethics Committee of the Faculty of Health Sciences of the University of Lomé) (n°339/2025/CE-FSS/19/01).

3. Results

3.1. Socio Demographics Characteristics of Study Participants

A total of 3,167 adults with median age 38 years, IQR [28-50] participated in the survey. As shown in Table 2, almost three participants over five (58.9%) were female. Half (50.3%) of the study population has reached primary school level and 72.6% were in couple.

3.2. Clinical Characteristics of Study Participants

Among recruited participants, the proportion of diabetes and HBP was 7.7% and 35.8%, respectively. Two respondents in five (37.9%) reported having physical activity and 5.4% were using tobacco (Table 3).

Table 2. Consumption of fruits/vegetables according to sociodemographic characteristics, STEPS Togo, 2021-2022

	Consumption of at least 5 portions of vegetables or fruits			P
	No N = 2,363	Yes N = 804	Total N = 3,167	
Region				0.001*
Savanes	211 (8.9)	218 (27.1)	429 (13.5)	
Kara	471 (19.9)	99 (12.3)	570 (18.0)	
Central	422 (17.9)	97 (12.1)	519 (16.4)	
Plateaux	387 (16.4)	199 (24.7)	586 (18.5)	

Consumption of at least 5 portions of vegetables or fruits				
	No N = 2,363	Yes N = 804	Total N = 3,167	P
Maritime	391 (16.5)	111 (13.8)	502 (15.9)	0.061**
DAGL*	481 (20.4)	80 (10.0)	561 (17.7)	
Age				
Median [Q1-Q3]	38 [28-50]	37 [28-47]	38 [28-50]	
Mean (SD)	40 (14)	38 (13)	39 (14)	
Min-Max	18-69	18-69	18-69	0.008*
Age group (years)				
18-29	657 (27.8)	239 (29.7)	896 (28.3)	
30-44	844 (35.7)	315 (39.2)	1,159 (36.6)	
45-59	573 (24.3)	184 (22.9)	757 (23.9)	
60-69	288 (12.2)	66 (8.2)	355 (11.2)	0.001*
Sex				
Female	1,431 (60.6)	433 (53.9)	1,864 (58.9)	
Male	932 (39.4)	371 (46.1)	1,303 (41.1)	0.373*
Study level				
No instruction	687 (29.1)	253 (31.6)	940 (29.7)	
Primary	1 201 (50.8)	388 (48.4)	1 589 (50.2)	
Secondary	389 (16.5)	137 (17.1)	526 (16.6)	
Superior	86 (3.6)	23 (2.9)	109 (3.4)	0.324*
Missing	0	3	3	
Marital status				
Single	658 (27.9)	209 (26.1)	867 (27.4)	
Couple	1 704 (72.1)	593 (73.9)	2 297 (72.6)	
Avoid eating meals prepared elsewhere than at home				0.013*
No	1,533 (64.9)	560 (69.7)	2,093 (66.1)	
Yes	830 (35.1)	244 (30.3)	1,074 (33.9)	
Average household income (FCFA)				<0.001*
≤ 52 500	1 477 (73.0)	424 (57.3)	1 901 (68.8)	
> 52 500	545 (27.0)	316 (42.7)	861 (31.2)	
Missing	341	64	405	

*Pearson's Chi-squared test, **Wilcoxon rank sum test

DAGL: District Autonome du Grand Lomé

Table 3. Clinic characteristics according to fruits/vegetables consumption

Consumption of at least 5 vegetable or fruit portions				
	No N = 2,363	Yes N = 804	Overall N = 3,167	P
Diabetes				0.172 ²
No	2,031 (91.9)	720 (93.4)	2,751 (92.3)	
Yes	180 (8.1)	51 (6.6)	231 (7.7)	
Missing	152	33	185	0.109 ²
BMI class				
Thinness	183 (8.0)	52 (6.8)	235 (7.7)	
Normal weight	1,302 (56.8)	472 (61.8)	1,774 (58.0)	
Overweight	492 (21.5)	150 (19.6)	642 (21.0)	
Obesity	315 (13.7)	90 (11.8)	405 (13.3)	0.197 ²
Missing	71	40	111	
HBP				
No	1,501 (63.6)	531 (66.1)	2,032 (64.2)	
Yes	859 (36.4)	272 (33.9)	1 131 (35.8)	
Missing	3	1	4	
Tobacco use				0.014*
No	2,249 (95.2)	748 (93.2)	2,997 (94.6)	
Yes	114 (4.8)	55 (6.8)	169 (5.4)	
Missing	0	1	1	0.001**
Physical activity				
No	1,513 (64.0)	452 (56.3)	1,965 (62.1)	
Yes	850 (36.0)	351 (43.7)	1 201 (37.9)	
Missing	0	1	1	

*Pearson's Chi-squared test, **Fisher's exact test

3.3. Proportion of 5 FV intake

Regarding food consumption patterns, 33.9% reported avoiding eating meals prepared or served elsewhere than at home. FV intake, 16.3% declared that they consumed at least 5 fruits daily while 9.1% reported eating at least 5 vegetables daily. The proportion of 5FV intake was 25.4%, 95%CI: [24.0 - 27.0] (Figure 1). This proportion varies significantly by region, ranging from 27.1% in Savanes to 10% in Greater Lomé (DAGL) ($p = 0.0012$). A downward trend was observed across age groups: it decreased from 39.2% among people aged 30–44 years to 8.2% among those aged 60–69 years ($p = 0.0082$). Female participants reported 5FV intake compared to male counterparts (53.9% vs. 46.1%, $p = 0.0012$) (Table 2).

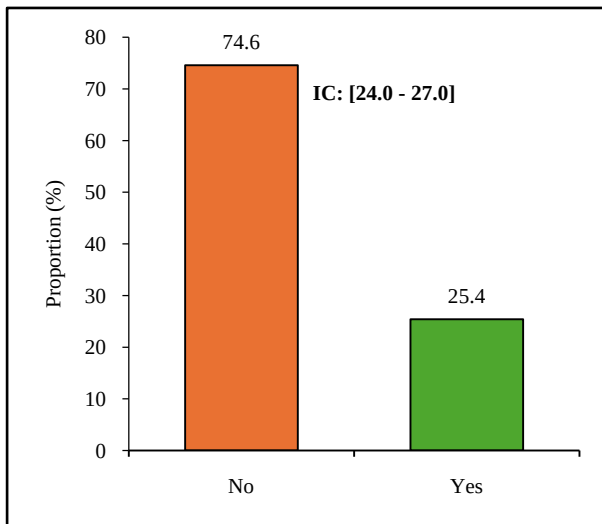


Figure 1. Distribution according to consumption of 5 portions of fruit or vegetables, N=3,167

5FV intake was higher in physically active participants and the difference was statistically significant (43.7% and 36.0%; $p=0.001$). 5FV proportion was higher in participants with normal BMI (58.0%); however, the difference was not statistically significant ($p=0.109$) (Table 3).

3.4. Factors Associated with 5FV Intake

In univariable analysis, age (60–69 years), being male, average household income > 52 500 FCFA, avoiding eating meals prepared elsewhere than at home, tobacco use and being physically active were factors associated with 5FV intake.

In multivariable analysis, after adjusting for other variables, participants reporting average household income > 52 500 FCFA (2.01; 95%CI: [1.68 – 2.41]) and being physically active (1.20; 95%CI: [1.02 – 1.45]) were factors that increased 5FV intake. Participants aged 60–69 years old (0.65; 95%CI: [0.46 – 0.89]) and avoiding eating meals prepared elsewhere than at home (0.74; 95%CI: [0.61 – 0.89]) were less likely to consume 5FV daily (Table 4).

Table 4. Factors associated with the consumption of 5 portions of fruit or vegetables

Characteristic	Univariate model			Final multivariable model		
	OR	95% CI	P	aOR	95% CI	p
Age group (years)						
18–29	1.00	—	—	1.00	—	—
30–44	1.03	0.84 – 1.25	0.798	0.96	0.77 – 1.19	0.695
45–59	0.88	0.71 – 1.10	0.272	0.82	0.64 – 1.04	0.109
60–69	0.63	0.46 – 0.85	0.003	0.65	0.46 – 0.89	0.009
Sex						
Female	1.00	—	—	1.00	—	—
Male	1.32	1.12 – 1.55	0.001	1.12	0.94 – 1.34	0.212
Study level						
None/Primary	1.00	—	—	—	—	—
Secondary/University	0.99	0.81 – 1.21	0.938	—	—	—
Marital status						
Single	1.00	—	—	1.00	—	—
Couple	0.91	0.76 – 1.09	0.324	1.01	0.82 – 1.23	0.959
Avoid eating meals prepared elsewhere than at home						
No	1.00	—	—	1.00	—	—
Yes	0.80	0.68 – 0.96	0.014	0.74	0.61 – 0.89	0.001
Average household income (FCFA)						
≤52 500	1.00	—	—	1.00	—	—
>52 500	2.02	1.69 – 2.41	0.001	2.01	1.68 – 2.41	0.001
Diabetes						
No	1.00	—	—	—	—	—
Yes	0.80	0.57 – 1.09	0.173	—	—	—
Body mass class						
Normal weight	1.00	—	—	—	—	—
Thinness	0.78	0.56 – 1.08	0.142	—	—	—
Overweight	0.84	0.68 – 1.04	0.108	—	—	—
Obesity	0.79	0.61 – 1.02	0.069	—	—	—
High blood pressure						
No	1.00	—	—	—	—	—
Yes	0.90	0.76 – 1.06	0.197	—	—	—
Tobacco use						
No	1.00	—	—	—	—	—
Yes	1.45	1.03 – 2.01	0.028	—	—	—
Physical activity						
No	1.00	—	—	1.00	—	—
Yes	1.38	1.17 – 1.63	0.001	1.20	1.02 – 1.45	0.047

CI : Confidence interval. OR = Odds Ratio, aOR= adjusted Odds Ratio

4. Discussion

The results obtained highlight that fruit and vegetable consumption in Togo remains generally low, although it is slightly higher in some neighboring countries such as

Burkina Faso (5.1%) and Uganda (12.2%), but well below the WHO recommendations (≥ 400 g/day). This variability observed at the regional level, with a higher proportion in the Savanes, constituting a rural area, is consistent with observations made in a study in Burkina Faso where rural populations consumed more fruit and vegetables than those in urban areas [12]. This disparity may demonstrate problems of economic accessibility and the proximity of the production areas of these fruits and vegetables.

The age-related variation in fruit and vegetable consumption among older adults in Togo could be explained by both cultural preferences and the fact that adult men, who generally have greater financial autonomy, have better access to these foods. This situation is consistent with trends reported in Kenya, Tanzania, and sub-Saharan countries [13,14,15]. It may also be explained by financial constraints, loss of appetite, or health-related restrictions. However, other studies have shown the opposite effect, with the frequency and quantity of fruit and vegetable combination, and vegetable consumption increasing with age [16,17,18,19]. However, there are also studies that have found no association between age and fruit consumption or purchase, or between age and fruit and vegetable combination consumption or purchase [20,21,22].

The gender gap, with higher consumption among men, contrasts with some observations made in Burkina Faso and Mozambique, where women consumed more fruits and vegetables than men [23].

As for the link between household income and adequate consumption among the surveyed populations, this is one of the most striking findings, as it is a determining factor explaining why respondents with high annual incomes are the consumers who meet the WHO recommendation regarding fruit and vegetable consumption. This finding corroborates studies showing that fruits and vegetables are still often perceived as expensive products in low- and middle-income countries, limiting their regular consumption [24,25].

Similarly, at the behavioral level, there is a positive link with those who consume outside the home and this could suggest that certain urban retail outlets offer better access to fruits and vegetables. While this trend is the opposite in other contexts where meals prepared outside the home are often associated with a less healthy diet [13].

Regarding clinical parameters, the lack of statistical association with diabetes, hypertension, and cholesterol should be interpreted with caution, due to the cross-sectional nature of the study. However, the observed trend toward a more normal BMI among adequate consumers is consistent with results from international cohorts, which show that a diet rich in fruits and vegetables contributes to limiting the risk of obesity, type 2 diabetes, and cardiovascular disease [26,27,28].

Finally, people with an adequate diet, particularly rich in fruits and vegetables, are less likely to smoke, which is why in our study regular smokers were less represented among adequate consumers. This trend has been observed in Europe and Africa where fruit and vegetable promotion initiatives are well established and a series of projects have been implemented to encourage local production and consumption aimed at reducing micronutrient deficiencies

[26,29]. Hence the importance of simultaneously promoting several protective behaviors, because interventions targeting diet can also contribute indirectly to reducing smoking and, more broadly, to improving public health.

Similarly, the practice of intense physical activity may reflect both better access to fruits and vegetables in rural areas and a generally more active lifestyle.

These results illustrate the nutritional transition phenomenon observed in many developing countries, characterized by urbanization, food globalization, and a diet rich in processed foods, accompanied by a decline in the consumption of fresh produce. The gap observed between rural and urban areas, or between rich and poor, is fully in line with this context.

However, the study has some limitations, as it relies on personal statements that may be inaccurate. It does not allow for the establishment of causal relationships and does not take into account certain contextual factors such as the availability of fruits and vegetables, means of transport or cultural habits.

5. Conclusion

This study shows that fruit and vegetable consumption in Togo remains low, with only one adult in four meeting the WHO recommendation of at least five daily portions. Adequate intake was strongly influenced by socioeconomic and behavioral factors, particularly higher household income and physical activity, while older age and avoidance of meals prepared outside the home were associated with lower consumption. Marked regional disparities highlight inequalities in access to fruits and vegetables, likely driven by availability, affordability, and food environments. Although no significant associations were found with major metabolic conditions, the cross-sectional design limits causal interpretation. Overall, these findings reflect the ongoing nutritional transition in Togo and emphasize the need for multisectoral, context-specific interventions to improve access to affordable fruits and vegetables and support healthier dietary behaviors, thereby contributing to the prevention of non-communicable diseases.

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