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Socio-cultural and economic factors affecting the choice of food diet in West Africa: a two-stage Heckman approach

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Abstract
West African countries have made impressive progress in fighting against malnutrition and hunger and ensuring food quality and varying food choices. This paper aimed for the first time to evaluate the determinants of diet choice by the populations of West Africa, especially those of Benin, Togo, and Nigeria. The data collected from 473 people relate mainly to their socioeconomic and cultural characteristics and the factors determining the choice of the diet for which they have opted. These data were analyzed using the Tobit model based on the Heckman method. The statistical analysis of the results obtained allowed us to deduce that the populations studied generally opt for a flexitarian, vegetarian or vegan diet. The age, level of education, religious and ancestral beliefs, social framework, monthly income, perception of the costs generated by each diet, perception of the consumption of products of animal origin such as meat and fish have a significant influence on the choice of diet. The intensity of the chosen diet was determined by variables such as sex, level of education, social framework, perception of consumption of animal products, and meat and fish. Diet being a determining parameter of our state of health, it is imperative to make people aware of the different diets so that they can identify and adopt the one that suits them best.

Keywords Diet · Flexitarian · Vegetarian · Vegan · West Africa

1 Introduction

In recent years, West African countries have made impressive progress in fighting against malnutrition and hunger and ensuring food quality and varying food choices. Nonetheless, food and nutrition insecurity remain a significant concern in some countries, especially after the pandemic breakout and induces changes in the agrifood sector [1–3]. Food and nutrition security is considerably associated with governance quality, food policy, production capacity, and economic factors. Ogunniyi et al. [4] mentioned that the governance quality ensures excellent food production, improves the dietary energy supply, and the control of corruption, government effectiveness, political stability, and the rule of law scores facilitates food and nutrition

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security. Food and nutrition security and economic conditions lead to food quality, good diet choices, and lifestyle change. Changing lifestyles and socioeconomic needs have been accompanied, in particular, by a change in food consumption patterns [5, 6]. Diets change over time under the influence of many factors and complex interactions. Income, prices, personal preferences and beliefs, cultural traditions, and geographic, environmental, social, and economic factors interact in complex ways and structure food consumption patterns [7–9]. Higher reliance on processed foods, increased intake of out-of-home foods, and increased usage of edible oils and sugar-sweetened beverages are all part of the concurrent rapid changes in diet [10]. This has a negative influence on consumer health. The nutritional transition in Southeast Asian countries, for example, frequently entails a shift in diet from plant protein to animal protein [11]. Most West African countries, like Southeast Asian countries, are in the early stages of the nutrition transition, with rapid increases in obesity and overweight rates in urban and rural parts of Sub-Saharan Africa's poorest countries [12]. They assured that the age-related changes (lower appetite, food changes, declining physical function); food access (food cost, support with food, maintaining independence); on your own (cooking for one, eating alone, shopping for one); and relationship with food (food variety, eating what you want, dieting) has a significant influence on food acquisition, food preparation, and cooking, as well as eating habits. Diet and nutrition are essential factors in being and staying healthy throughout life. Although cancer, diabetes, and other dietary-related illnesses are complex phenomena with many causes, they all depend, in part, on the diet choice. The role of nutrition and diet choice as determinants of chronic diseases is well established and, therefore, has a prominent place in preventing diseases [13].

Thus, promoting quality nutrition, the health of populations, and sustainable food systems against a background of population growth, changing consumption habits, and climate change remain some of the most significant challenges of our time. The last few years have seen the emergence or resurgence of many diets such as the Paleolithic diet (exclusion of cereal and dairy products), the gluten-free diet (exclusion of cereal products made from wheat, oats, barley, and rye), or even other variations of diets ("no added sugar," "no lactose," "no hydrogenated fat," etc.). However, vegetarianism appears to be the most widespread selective diet in Western societies [14, 15].

More and more people are choosing to adopt a diet that departs from the traditional Western way of eating and switch to a more plant-based diet, more developed in some countries such as India. Meats, sugars, fats are pointed out, recipes change according to consumer expectations. Adopting a vegetarian or vegan diet has become an increasingly widespread lifestyle, both for ecological reasons as well as for health and well-being [16]. «Veggie» has become so trendy that opening a gourmet vegetarian restaurant is no longer a high-risk bet. There is also growing pressure to encourage the population to reduce their meat consumption, exerted by health and environmental actors (due to climate change) or animal rights associations. This subject has got great interest, and concerns education relating to the environment as the issue of animal welfare refers to the philosophical foundations that irrigate the human-animal relationship [17].

According to Ruby [18] and Rosenfeld [19], vegetarianism is considered abstinence from meat fish but consuming eggs, cheese, and milk. In contrast, veganism is characterized by abstinence from meat, fish, dairy products, and eggs. A vegan eats only grains, vegetables, and fruits. The vegan strives to live without consuming products from animal exploitation to benefit animals, people, and the planet. Vegans eat a vegetable-based diet, with nothing from animals (no meat, eggs, or honey, for example). A vegan lifestyle also avoids leather, wool, silk, and other animal products for clothing or any other use. Finally, the flexitarian is characterized by a limitation in consuming meat without being exclusively vegetarian and regardless of financial situation.

Faced with this craze for "healthy" and vegetarian food, several studies have been carried out on the consequences of these diet trends on health, the environment, society, and development [20, 21]. Other research has also been conducted to understand people's motivations for adopting diets in Europe [22]. However, the socioeconomic and cultural parameters underlying the choice of so-called «Veggie» regimes have still not been studied, particularly in the regions of Africa and West Africa. This constitutes a gap in the literature that this study proposes to fill. The main objective of the research is to analyze the socioeconomic and cultural factors influencing the choice of diets in West Africa and the intensity of the adoption of the chosen diet.

2 Methodological approach

2.1 Study area and sampling

The present study was carried out in West Africa, specifically in Benin, Togo, and Nigeria, to study the parameters affecting the diet choice of the populations living there and the intensity of the adoption of choice. The surveys were carried out in Cotonou and Parakou in Benin, Lomé, and Sokodé in Togo, then Abuja and Ibadan in Nigeria. The choice fell on these cities given their

status and place in these different countries. In addition, the likelihood of getting a variety of diet types in these cities is much higher. A total of 473 people living in these cities' urban and peri-urban areas were randomly selected. This type of sampling was chosen to give all potential respondents an equal chance of being included in the sampling. This sampling method is generally only favorable in cases where the target population is very large and is widely dispersed geographically. In the case of this study, the populations are not geographically located according to their type of diet. Therefore, this approach was adopted. However, when the sample size is not large enough, some parameters may not be considered. Because this is a study on the choice of the diet of populations, the samples studied were mainly approached in public places. The surveys took place during the second quarter of 2020. The sample was formed, taking into account all social classes. The investigations were stopped after the 473rd investigation because of the information saturation. According to Kohn & Christiaens [23] information saturation is noticed when no more extended variation is recorded in the collected information during a survey. As a result, 41% of the surveys were made in Benin, 33% in Togo, and 26% in Nigeria.

2.2 Data collected and econometric analysis

The data collected mainly related to socioeconomic and demographic characteristics and factors likely to influence the choice of diet by the respondents. The data was collected using a structured questionnaire during the interviews. The questionnaire was pre-tested with a small sample of 13 respondents to ensure the relevance of the questions and that they are well understood by respondents to obtain precise answers.

The data analysis was mainly based on the methodological approach adopted by [24–26]. First, socio-economic and demographic characteristics of the producers were obtained during the field surveys. According to Drewnowski et al. [11], socio-cultural and economic variables are decisive in the choice of diet. Data related to their type of diet, age, sex, monthly income, level of education, marital status and their field of activity have been collected. Data analysis using descriptive statistics allowed us to characterize the respondents. In order to achieve the objectives of the study, questions related to religious and ancestral beliefs, the social environment, meat and fish consumption and those of animal products were formulated. Respondents were asked if these parameters influenced or could influence the choice of his food diet. If he answers "Yes" then he should indicate on a Likert scale to what degree he assesses the relevance of this parameter. Subsequently, an open question is asked to learn a little more about how this variable determines the choice of his diet. The content of these speeches was used to support the statistics obtained and to better discuss the results obtained.

Then, the econometric analysis was applied to analyze the parameters determining the choice of respondents and the intensity of choice. The choice intensity is evaluated by dividing the number of years since the choice has been made and adopted (without interruption) by the respondent's age. Thus, respondents whose ratio is close to or equal to 1 (very high intensity) have therefore ideally adopted the regime they have opted for. This econometric analysis provides additional information, likely to help better understand the dependent variable, which represents the choice of diet. In this study, the method of Heckman (1976) based on the Tobit model developed by Tobin (1958) has been used to reduce the sample selection bias [24]. According to Elsheikh et al. [25], Heckman's model is used to assess the parameters that determine decision making. The Tobit model also called the censored regression model, is designed to estimate the linear relationships between variables when the dependent variable is censored either left or right. Heckman's model is done in two stages and estimates the probability of adopting a diet using a Tobit model. The second step is to perform the total estimate of the adoption intensity of choice made. Finally, the log-likelihood function of the sample is calculated from the combination of the two probabilities.

$$\sum_{y_i=0} \log\left(\Phi(-\frac{1}{\sigma}x_i\beta)\right) + \sum_{y_i=0} \log\left(\frac{1}{\sigma}\emptyset\left(\frac{1}{\sigma}(y_i - x_i\beta)\right)\right)$$

All statistical and econometric analyzes were carried out using STATA v 13.0 software.

3 Results and discussion

3.1 Socioeconomic and demographic characteristics of the respondents

In the present study, three main types of diets were distinguished, including flexitarians, vegetarians, and vegans. The socioeconomic and demographic characteristics of the respondents were presented in Table 1 according to the different types of diets. The sample studied included 60.2% (285) flexitarian, 24.9% (118) vegetarian and 14.9%

(70) vegan. Respondents have an average income of $240 (USD) and an average age of 37 years old. Flexitarians and vegetarians are mostly between 18 and 35 years.

On the other hand, most vegans are primarily elderly, as more than 60% are over 36 years old. The investigative group is predominantly male (around 52%) and has a high school or university education. Most of the respondents are married, work in the private sector and operate mainly in the automotive, education, agriculture, etc. (Table 1).

3.2 Factors determining the choice of diets

The parameter analysis determining the choice of the respondents' diet and the intensity of their choice was made with the method of Heckman (1976) based on the Tobit model developed by Tobin (1958). The analytical results have been reported in Table 2.

The regression model performed is statistically significant at the 1% level ($p = 0.000$). The variables introduced into the model, therefore, explain the explanatory variables. In addition, the results of the model estimates show that the Rho coefficient (correlation coefficient) is very low (0.083). Therefore, no correlation exists between the residuals (all errors from the sample data) from the Tobit and the linear regression model, respectively. The degree of significance obtained being 0.911, we could therefore deduce that the variables introduced into the model explain 91.1% of the respondents' choice of diet.

"Age" had a positive and significant effect at the 5% level on the choice of diet made by respondents. As a result, the older a respondent is, the more willing to opt for a vegetarian or vegan diet. Indeed, aging is a parameter that forces one to pay attention to one's diet [27]. The Nutrition or diet choice is essential in contributing to the health of older adults and the likelihood of active and healthy aging [9]. Being young, it is easier for the body to accept and digest certain foods without causing damage. Neumark-Sztainer et al. [28] determined that for the young people aged from 12-to 19, the factors perceived as influencing food choices included hunger and food cravings, the appeal of food, time considerations of adolescents and parents, convenience of food, food availability, parental influence on eating behaviors (including the culture or religion of the family), benefits of foods (including health), situation-specific factors, mood, body image, habit, cost, media, and vegetarian beliefs. Aging also induces the aging of internal organs, so it is necessary to pay attention to your diet. The majority of older adults surveyed opt for a diet that excludes or minimizes meat consumption and red meat in particular. According to Hocquette et al. [20], choosing a diet that excludes reducing meat consumption may benefit the body. In addition, the excessive consumption of animal products leads to a nutritional imbalance in the diet. Therefore, it can contribute to overweight and diseases such as hypertension, cardiovascular diseases, and type 2 diabetes if it is chronic. This might partly justify the choice of the respondents.

Like the "age" variable, the education level also had a positive and significant effect on diet choice at the 5% level. The most educated respondents tended to choose vegetarian or vegan diets. The acquisition of ample knowledge could explain this impact on the level of education. Furthermore, the academic curricula generally include chapters or courses related to foods, food composition, and diets. Thus, the education level might lead to operating more careful and healthy choices of diets. Similar to our findings, Banyte et al. [22] have found that education correlated significantly with the selection of meatless diets and that the higher educated men adhere easily to meatless diets. Moreover, it has been proved that education influences food choice by facilitating or constraining the ability to understand the information communicated in nutrition education messages or on food labels [29, 30]). Turrell et al. [30]) have mentioned that considering education as a single indicator to assess the diet choice might be overestimated because the education implies some variations that are the product of unmeasured socioeconomic influences. In addition, the internal dynamics of societies such as modernization, the influence of Western trends being closely linked to the education, these parameters would therefore not be without effect on the choice of diet [31].

Religious and ancestral beliefs had a negative and significant effect on diet choice at the 10% level. Therefore, religious and traditional beliefs represent a determining parameter in diet selection. Indeed, certain spiritual and ancestral practices prohibit the consumption of certain food products. These prohibitions may be general or limited to specific days of the week or particular occasions, which gradually influence the individual's diet. In the same line of thought, Ruby [18] and MacInnis and Hodson [32] assessed that in addition to concerns for the animals and environment and health improvement, religious reasons play a crucial role in desiring to be vegan or vegetarian.

The perception of the average costs generated by the diet choice and the monthly income from the survey had a positive and significant impact at the 10% level. This finding suggested that the people surveyed cope with the diet's

Table 1 Socioeconomic and demographic characteristics of the respondents

Variables		Flexitarian			Vegetarian			Vegan			Mean
		Frequency	Percentage	Standard deviation	Frequency	Percentage	Standard deviation	Frequency	Percentage	Standard deviation	
Quantitative variables											
Age	18–25	116	40.2	3.5	24	20.2	1.8	5	7.3	2.6	37.0
	26–35	110	38.9		42	35.6		20	28.9		
	36–55	32	11.3		38	32.0		24	33.6		
	56+	27	9.6		14	12.2		21	30.2		
Total		285	100.0		118	100.0		70	100.0		
Monthly income (USD)	80–200	190	66.7	33.1	82	69.5	27.0	46	66.3	29.4	240.3
	201–500	70	24.4		28	23.9		18	25.9		
	500+	25	8.9		8	6.6		6	7.8		
Total		285	100.0		118	100.0		70	100.0		
Qualitative variables											
Sex	Women	136	47.6	–	65	55.3	–	34	48.4	–	–
	Man	149	52.4	–	53	44.7	–	36	51.6	–	
Total		285	100.0		118	100.0	–	70	100.0		
Education level	None	24	8.6	–	9	7.9	–	6	8.5	–	–
	Primary	54	18.9	–	23	19.2	–	16	22.3	–	
	Secondary	109	38.1	–	49	41.9	–	23	33.4	–	
	University	98	34.4	–	37	31.0	–	25	35.8	–	
Total		285	100.0		118	100.0		70	100.0		
Marital status	Single	85	30.0	–	27	22.5	–	12	17.8	–	–
	Married	130	45.6	–	73	61.8	–	52	75.0	–	
	Divorced	63	22.1	–	18	15.7	–	2	3.5	–	
	Widower/Widow	7	2.3	–	0	0.0	–	2	3.7	–	
Total		285	100.0		118	100.0		70	100.0		
Activity area	Public	94	33.1	–	49	41.9	–	26	37.6	–	–
	Private	191	66.9	–	69	58.1	–	44	62.4	–	
Total		285	100.0		118	100.0		70	100.0		
Food diet	Flexitarian	285	60.2	–	–	–	–	-	-	–	–
	Vegetarian	–	–	–	118	24.9	–	-	-	–	
	Vegan	–	–	–	–	–	–	70	14.9	–	
Total		285	60.2		118	24.9		70	14.9		

Table 2 Estimation of the Tobit model by the Heckman method

Variables	Coefficient	Standard Error	z	P > z
Types of diets (0 = Flexitarian; 1 = Vegetarian; 2 = Vegan)				
Age (Number of years)	0.014	0.028	2.54	0.023**
Sex (0 = Man; 1 = Women)	2.215	1.748	3.11	0.342
Education level (0 = None; 1 = Primary; 2 = Secondary; 3 = University)	1.002	0.963	1.41	0.015**
Marital status (0 = Single; 1 = Married; 2 = Divorced; 4 = Widower/Widow	− 0.004	0.082	− 0.36	0.486
Religious and ancestral beliefs (0 = Decisive; 1 = Not decisive)	− 0.055	0.150	− 1.96	0.063*
Social framework (0 = Changed; 1 = Not Changed)	1.256	1.873	2.48	0.004***
Monthly income (In USD)	0.316	1.036	0.74	0.057*
Sector of activity (0 = Public; 1 = Private)	− 1.598	1.259	− 1.8	0.249
Perception of costs generated (0 = Expensive; 1 = Not expensive)	3.549	0.621	5.51	0.084*
Perception of meat and fish consumption (0 = Bad; 1 = Good)	− 2.658	2.125	− 3.69	0.000***
Perception of consumption of animal products (0 = Bad; 1 = Good)	3.052	0.986	3.54	0.001***
Constant	− 1.873	2.950	− 0.149	0.015
Intensity of choice (Duration/Age)				
Sex (0 = Male; 1 = Female)	0.018	0.630	0.25	0.068*
Education level (0 = None; 1 = Primary; 2 = Secondary; 3 = University)	0.556	1.264	1.73	0.056*
Marital status (0 = Single; 1 = Married; 2 = Divorced; 4 = Widower / Widow	− 1.753	0.369	− 2.84	0.491
Social framework (0 = Changed; 1 = Not Changed)	3.479	2.056	3.79	0.003***
Monthly income (In Dollars)	3.151	3.484	4.61	0.451
Perception of costs generated (0 = Expensive; 1 = Not expensive)	2.158	0.074	2.30	0.294
Perception of meat and fish consumption (0 = Bad; 1 = Good)	1.025	1.375	2.23	0.000***
Perception of consumption of animal products (0 = Bad; 1 = Good)	2.129	2.054	3.11	0.000***
Constant	2.596	3.651	1.84	0.058

There was a significant difference (*p< 0.05; **p< 0.01) in the thickness of the whole retina, the INL and the IPL

Number of observations = 473

Wald chi 2 (60) = 123.18

Prob > chi2 = 0.0000***

Rho = 0.083

Significance = 0.911

Sigma = 0.346

requirements by referring to the monthly income. Previous studies have shown that income strongly correlates with food preference, an essential indicator influencing food purchasing and diet choice [30, 33]. Some respondents who opted for the vegan diet, for example, declared to temporarily resort to food supplements rich in synthesized vitamin B12 to fill their nutrient deficits. Flexitarians, on the other hand, rarely use these products. Indeed, vegans are a population at risk for vitamin B12 deficiency [34]. According to Guéant et al. [35], vitamin B12 is an essential nutrient for the proper functioning of the organism. Vitamin B12 deficiency causes megaloblastic anemia, neuropsychiatric manifestations, and Hunter's glossitis [36].

The social environment in which the individual is born and lives also had a positive and significant effect on diet choice at the 1% level. This result is explained by the fact that the individual from birth is fed following the practices and principles governing the diet of those who provide him (parents, guardians, etc.). At the same time, some adults (13% of respondents) have seen their diet gradually change following a change in the social framework (housing, attendance, etc.). They have, for this purpose, gradually adopted the diet of people forming their new social framework. According to Léger and Pruneau [37], the social environment generates changes in our lifestyle, leading to remodeling habits and behaviors.

The respondents' perception of meat and fish consumption also significantly impacted the 1% level on diet choice. This result confirms the hypothesis that the vegan-type diet does not tolerate the consumption of meat and fish [38]. Like the previous variable, the respondents' perception of the consumption of animal products such as milk, cheese, and eggs also significantly impacts the choice of diet at the 1% level. This result corroborates with that published by

FranceAGRIMER [38]. The vegan-type diet excludes the consumption of meat fish, and Some vegetarians and vegans have chosen these diets because they care about the well-being of animals and are part of a fight to protect the environment. This result is similar to that of Banyte et al. [22]. According to Hocquette et al. [20], the decrease in meat consumption by all significant consuming countries would reduce the environmental footprint of food by reducing greenhouse gas emissions, saving on water resources, reducing their pollution by nitrates redirecting cultivable land towards human consumption without increasing deforestation.

3.3 Perception of the costs generated and the consumption of products of animal origin

As indicated in Table 2, the perception of the costs generated by the diet and the consumption of meat, fish, and their by-products play vital roles in the diet choice. Indeed, a proportion of respondents (56.8%) declared that they could not opt for the diet of their choice due to a lack of financial means. Beydoun and Wang [39] reported that the associations between socioeconomic status, the perceived barrier of food price, perceived benefit of diet quality, and diet quality indicators and indices varied significantly across gender and ethnic groups. In the same study, Beydoun and Wang [39] found out that the perceived barrier of food price acted as a mediator in the association between socioeconomic status and diet quality indicators and indices. Depending on the degree of body adaptation and part from leaving in the flexitarian diet mode, the vegetarian or vegan may require a synthetic protein or dietary supplement intake over a given period. However, these products are difficult to access in the areas studied, especially looking for excellent quality products. According to our survey results, these products cost on average 100 USD/Kg in Benin, 93USD/Kg in Nigeria, and 91 USD/Kg in Togo. The populations find these costs relatively high and justify them because they are products imported from Europe, America, and Asia. In a context where the average per capita income is around USD 250 [40], it is apparent that this raises questions among people wishing to change or adopt a diet.

Moreover, the income varies significantly among the studied region and depends on the periods and activities. For example, Semanou and Uslu [41] stated that lower-income countries such as Benin and Togo have lower steady-state incomes than Ghana and Cote d'Ivoire. In addition, the revenue in West Africa is disequalized by population density, natural resources dependence, domestic investment rate, government consumption expenditure, trade openness, inward foreign direct investment, international remittances, and civil conflicts [42].

Costs related to acquiring synthetic proteins and food supplements are not the only costs mentioned by respondents. 42.5% identify the costs of having their health status monitored (right after the change in diet) by a dietitian as a blockade. Indeed, from a scientific and nutritional point of view, opting for or making a change in diet is not a choice that is made alone. This requires a specialist's help who accompanies the choice of diet and follows the evolution of the diet. Therefore, the dietitian will be necessary to carry out periodic checks on the state of health of his patient and evaluate over time the degree of adaptation of his body, which is not free of charge. In West Africa, the consultation costs by a dietician vary from 15 to 45 USD/ month depending on the prestige level of the specialist consulted and the center in which he practices. If the dietician is obliged to prescribe certain medical products to correct certain anomalies, fees may apply. Elsewhere, regular nutritional care in nursing homes costs more than in developing countries. For instance, the dietitian or nutritionist costs associated with malnutrition in Dutch nursing homes were estimated as 5329.93 euros per year (444.16 euros per month) [43]. The remaining 0.7% of respondents mentioned personal reasons for their monthly income. As a result, the possibility of having recourse to synthetic proteins and food supplements on the one hand and the other hand to a dietician are the main parameters affecting their perception of the costs generated by diets.

The respondents' perception of the consumption of meat, fish, and their by-products is 95.8% focused on maintaining the environment and the ecosystem we live in. According to them, reducing meat consumption on a planetary scale could eventually reduce the impact of climatic variations and the overuse of the soil. These arguments align with those developed by Banyte et al. [22] and Hocquette et al. [20].

3.4 Factors determining the intensity of the choice

The intensity of choice was obtained by dividing the number of years since the choice of diet was made (without interruption) by the respondent's age. The analysis of the results revealed that intensity is determined by variables such as respondent's sex and age, the perception of meat and fish consumption, and social framework. Accordingly, Finke and Huston [44] suggested that education, smoking, exercise, nutrition panel use, and motivation for nutrition knowledge

mainly influence the chances of choosing a risky diet. Furthermore, they added that the tradeoff costs between present and future utility-location, income, race, gender, and age significantly impact choosing a dangerous diet.

Gender had a positive and significant effect at the 10% level on the intensity of the diet choice, suggesting that women, unlike men, adopt the diet they have chosen better. Women defend and respect the food choice of their household (case of married women) or protect and follow their mother's will (case of those living with their parents). The fact that women are generally those is holding the key to the kitchens in West Africa, allowing them to protect better and transfer their values. However, the inadequacy between diet and health among low-income women should be considered. Therefore, nutrition interventions that educate low-income families on inexpensive, healthful eating and diet-disease relationships are recommended [45]. Like the "sex" variable, the education level also has a positive and significant impact at the 10% level on the intensity of choice made by the respondent. As a result, the more educated, the better adoption of the chosen food regime. According to Miassi and Dossa [46], education is a determining parameter in adoption. The respondents' perception of meat, fish and animal products positively and significantly impact the intensity of choice at the 1% level. It can be concluded that the convictions and beliefs are essential and decisive for diet choices. The social framework has a positive and significant impact on the intensity of choice at the 1% level.

Moreover, people living in the same social environment where they were born showed the highest intensity. Therefore, they adopted their diet better because their social framework has not changed compared to people who had changed their social environment over time. Nonetheless, the policy changes would be accountable for incrementing the affordability and accessibility of healthful food in low-income areas. In addition, several food assistance programs would help ensure food and nutrition security [45] diet choices.

4 Conclusion

The objective of this study was to analyze the factors that influence diets in West Africa. The data collection carried out made it possible to identify 3 types of diet. In other words, West African populations generally opt for one of three diets: the flexitarian diet, the vegetarian diet, and the vegan diet. The flexitarian diet is a type that tolerates the consumption of any product, whether of plant or animal origin. The particularity of this diet is that it limits the consumption of animal products. Several studies have shown the importance of controlling meat consumption on human health. The vegetarian diet excludes the consumption of meat fish but allows the consumption of eggs, cheese, milk, etc. Like vegetarianism, veganism also does not tolerate meat and fish consumption. This diet is even stricter in that it also prohibits the consumption of all dairy products, eggs, and all other animal products. Therefore, the vegan diet is based on cereals, vegetables, and fruits.

The analyses show that age, level of education, religious beliefs, social environment, monthly income, perception of the costs generated by each diet, perception of the consumption of animal products, and meat and fish significantly influence diet choice. For example, the elderly, with a high level of education and who have a consistent monthly income, are more favorable to a vegetarian or vegan diet. The same is true for people who do not like consuming animal products, meat, and fish. At the same time, some people remain convinced that reducing the consumption of meat and fish on a planetary scale could reduce the impacts of the natural disasters our planet is subjected to.

The food strategy is essential for health. The choice of diet should be based on logical foundations since the health and life of the individual depend on it. Therefore, it is necessary to inform the population a little more about the benefits of each diet in terms of health and environmental protection to encourage the West African population to eat healthily and avoid chronic non-communicable diseases.

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Author contributions All the authors in the present study contributed actively to the data collection, manuscript preparation, and writing. All authors read and approved the final manuscript.

Data availability The dataset generated for this study are available on request to the corresponding author.

Declarations

Ethics approval and consent to participate We authors of this article declared, for all due purposes, the project that gave rise to the present data of the same has been submitted for evaluation to the Ethics Committee of the University /Research Institute "Cukurova University" and has been approved. We certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Thus, the authors assume full responsibility for the presented data and are available for possible questions, should they be required by the competent authorities.

Competing interests The authors declare no competing interests.

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