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*Keywords:* complementary food, chronic malnutrition, nutritional education, diet, food taboos, children, determinants.

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*The choice of complementary foods, especially for children aged 0-23 months, remains an issue in most parts of the world, particularly in developing countries. We examine in this paper the factors determining the choice of complementary foods for children aged 0-23 months in southwest Benin. The data comes from the UntAmed survey conducted by the Applied Anthropology Research Group (AARG) in December 2020. The study employed an unordered multinomial logit regression model and bivariate analyses. Through econometric models, results show that complementary foods are introduced early to children. The choice of complementary foods is dependent on average family income, mother's occupation, food taboos, number of economically active persons in the household, residence environment, family food consumption score, survival strategy adopted by the family and reduced coping strategy index. Policy sensitization targeting heads of family on food restriction, family income and women's education improvement, and nutritional education for women are key actions for complementary food choice for children.*

*Keywords:* complementary food, chronic malnutrition, nutritional education, diet, food taboos, children, determinants.

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## I. INTRODUCTION

Among the 17 Sustainable Development Goals to be achieved by 2030, promoting good health and well-being is as important as the fight against poverty and hunger. One of the factors to ensure this good health is the diet, the quality of which depends on the first complementary foods chosen for the infant before weaning.

Complementary foods are foods that are consumed or administered to supplement the regular diet and that are a concentrated source of nutrients or other substances that have a nutritional or physiological effect alone or in combination with other food. Brown et al. (2000) define complementary foods as the first foods (liquid or solid) introduced into the infant's diet in addition to breast milk. These foods aiming to complement a child's diet found insufficiency in daily intake. From the age of six months, breastfeeding alone is no longer sufficient to guarantee better growth and optimal health for children. WHO (2001) recommends that adapted complementary foods be introduced to children's diets according to their changing nutritional needs. However, some countries make their recommendations. In 2008, the European Society of Pediatric Gastroenterology, Hepatology and Nutrition published an opinion stating that while exclusive breastfeeding for the first six months was the ideal goal, the introduction of complementary foods was still possible from 17 weeks and not after 26 weeks in healthy, full-term children (Agostoni, 2008). Countries such as Germany, Belgium, and Spain, and the United Kingdom recommend the introduction of solid foods between four (4) and six (6) months (Bolling, 2007; Schiess, 2010; Schwartz, 2011).

The age of admission of supplemental foods for the child represents the transition period during which the infant is particularly vulnerable. This transitional period is a sensitive time during which nutritional influences would have long-term effects on the child's later development and

health (Moorcroft, 2011). It is also a high-risk phase in the lives of infants, as poorly conducted complementary feeding elevates multi-deficiency malnutrition to a critical health issue in infants (Azagoh-K. et al., 2013; Victora et al., 2016). Thus, several studies indicate that the early introduction of solid, semi-solid, or soft foods is a nontrivial problem globally.

Healthy eating patterns in childhood promote optimal childhood health, growth, and intellectual development (Garcia-Mufozet al., 2022). Whether solid, semi-solid or soft, the choice of food depends on many factors inherent to the mother, the head of the household, and environmental factors. In Bopa (south west Benin), mothers are confronted with economic and socio-anthropological constraints that are likely to influence the choice of food as well as the mode of feeding infants. This study is aiming to analyze factors that influence families in the choice of complementary foods for children over 6 months of age (the critical age for the introduction of complementary foods). The objective of this study is to analyze the determinants of the choice of complementary foods for infants in southwest Benin.

Food choice has the potential to influence our health, community, social status, and self-efficacy (Niamh et al., 2022). Following scientific rigor, the search for information related to the problem addressed in this paper was carried out within specific frameworks through documentary research in scientific journals. In these scientific journals, the literature related to children's nutrition was analyzed within four ways: (i) complementary feeding and weaning, (ii) exclusive breastfeeding, (iii) complementary feeding, and (iv) early or late introduction of complementary foods. For this study, we specifically address the determinants of the choice of complementary foods for the infant. Several studies indicate that complementary foods are introduced early into children. This is the case for Danish infants, with the work of Kronborg et al. (2015). Kronborg et al. (2015) highlight that during the first weeks of birth, 14% of Danish infants eat a family diet. This proportion increases to 32%, 43%, and 74% at 2, 4, and 6 months, respectively. They point out that by six months, 87% of infants had been introduced to solid food. In 1999, the WHO work indicated that in Benin, the introduction of complementary foods was also early, with a rate of 34% of children aged 2-3 months receiving the first foods. For the author, Cameroon shows almost the same percentage, 28% of children under four (4) months of age consume complementary foods. The trend is similar in Sub-Saharan Africa. However, recent studies point to some improvement in the age introducing complementary foods to children in Benin. Indeed, the Country Profile on Nutrition conducted by the FAO in 2011 shows a rate of 43% of exclusive breastfeeding before six (6) months for Benin.

In the literature, voices have been raised to highlight the disadvantages of the early introduction of foods for children. Up to the age of six months recommended by WHO and UNICEF, research has shown that exclusive breastfeeding is associated with continued protection against gastrointestinal infections and diseases (Kramer et al., 2003; Kramer et al., 2002) and also against respiratory tract infections (Chantry et al., 2006).

Similarly, the results of the work of Macy (1949), Kannan et al. (2004), and Edmond et al. (2006) demonstrate that up to 6 months, breastfeeding is more favorable to the health of the child than artificial milk of bovine or vegetable base.

According to the Diagnostic and Statistical Manual of Mental Disorders (DHS-IV), 50% of babies hospitalized for stunting without an identifiable medical cause suffer from feeding problems. Polan et al. (1991), Satter (1986), and Ward et al. (1993) indicate that feeding problems are caused by insensitive mothering and lack of interaction at mealtime. Physiological difficulties with the feeding process (appetite and intake), food refusal, tantrums, and difficulty sucking, swallowing, or chewing food have been highlighted by Reilly et al. (1999), Ramsay et al. 1993), Art-Rodas et al. (1998) as symptoms of eating disorders related to the early introduction of complementary foods in children. Early introduction of complementary foods also leads to malnutrition. In north western Nigeria, the

prevalence of malnutrition among children is high due to poor complementary feeding practices (Anigo, 2010).

In many parts of the developing world, complementary feeding remains a challenge for good child nutrition. Thus, the type of complementary foods are different from one country to another. In China, Wang et al. (2017) reveals that most nannies prefer soy-based complementary foods to children. In Africa, analysis by Trèche (2002) and Traoré et al. (2005) reveals that the primary complementary foods given to African children are cereal- based porridges sparsely fortified with local legumes (peanut paste or roasted soybean meal), milk, or dried fish powder. This analysis was confirmed in a region of Nigeria, with the work of Anigo (2010) showing that in north western Nigeria, supplementary foods are composed of maize, millet, and sorghum with groundnuts and soybeans. In the same logic, the work of Fanou Fogny et al. (2018) highlights the composition of the flour used to prepare porridge for children aged 6 to 23 months in Benin. The analysis shows that corn flour obtained from incorporation rates of 70% corn, 13% soy, 16% peanuts, and 1% fretins is preferred by 46% of women, while porridge obtained from corn flour alone is the least appreciated (18%).

In addition, studies have shown that supplemental foods given to children are low in essential micronutrients. Abeshu (2016) points out that in Ethiopia, commonly used complementary foods are homemade but do not provide enough key micronutrients (especially iron, zinc, and calcium) to children aged 6 and 23 months. Similarly, in Benin, Nago et al. (2018) provided the evidence that proteins provided by these complementary foods are only vegetable and very poor in micronutrients. They raised inadequacy/insufficient energy density of porridges made with certain flours and used by families to feed young children. These porridges can't make them grow properly.

A large body of literature has been devoted to analyzing the determinants of complementary food choices. For Noukpoape (1997), several factors influence children's complementary foods choice. These include the socio-occupational status, the educational level of the nanny, her standard of living (poverty), and her secular tradition in infant feeding. Godin's (2012) work mentions personal factors (e.g., age, gender, education level) and environmental factors (social and physical environment). Similarly, Lange et al. (2013) found that introducing complementary foods to child diets is determined by duration of exclusive breastfeeding, weaning age, individual characteristics such as mother's age, her education level, caregiver during weaning, and child's gender. According to their analysis, fruits and vegetables were the least accepted foods by children in the early weaning period. For Kronborg et al. (2015), the higher birth weight of the child, the older age of the mother, and education level are the factors that determine supplemental foods. Other works such as Wang et al. (2017) reveal that a mother's nutrition education influences the behavior in supplementation introduction and feeding quality and nutritional status of children aged 6-23 months. In addition, research has shown that the choice of complementary foods is related to the income and development level of the country. In low-income countries, most infants receive cereal-based complementary foods prepared at the household level (Amagloh et al., 2012) that are lower in iron, calcium, and zinc.

Akpaki's (2021) analysis of Senegal reveals a number of factors that influence feeding behavior among children. Psychosocial factors, community, and household food availability, and socio-economic status were the determinants of household food insecurity and children's choice of complementary foods. His analysis also highlights traditional constructs, education level, literacy level, and residence influencing food choice behavior.

Maternal knowledge of infant feeding practices influences feeding patterns and the choice of complementary foods for children. Diarra (2020) assessed the ability of mothers of children under five years of age about infant and young child feeding practices in the Bla health district in Mali in 2019. This study was carried out two years after

the implementation of a project that consisted of distributing Lipid Nutritional Supplements and counseling on breastfeeding and infant feeding.

Based upon findings, 96.5% of mothers introduce complementary foods to the child's diet in the age range of 10-12 months. When a child is malnourished, 66.5% of mothers give specific vitamin-enriched complementary foods.

Because of religious taboos, families are not allowed to consume backyard animals and certain vegetables, which influence the choice of supplemental foods for children.

The literature provides a broad explanation of food taboos and their impact on household consumption patterns.

In all known cultures, food prohibitions are more critical for animal products than plant products. This is because animals have attributes or morphological characteristics that make them much closer to human beings. This makes them the object of dietary restrictions (Fischler, 1995; Lambert, 1997). Religion also establishes dietary taboos and restrictions. We have illustrations in religious prohibitions. In Islam and Judaism pork consumption is not allowed. Same for the beef in Hinduism. Christians avoid eating meat some days(Poulain, 2007).

Beyond religious prohibitions, there are also individual and cultural aversions. The attitudes one has towards an animal or meat are determined by a cultural and social code that refers to representations of the animal. Leach's analysis (1972) goes into the same track : edibility and non-educability are the result of a "derivation". This author affirms that the food taboos are justified by the proximity between animal and human beings. Thus, in some cultures, eating animals is similar to creating social disorder between humans and nature. That is why socio-cultural distance must separate them. Nowaday, the decline in meat consumption is linked to sensitivity to realities such as death, suffering, violence, waste, and contamination of animals, which are increasingly known as beings close to humans (Fiddes, 1992). Some cultures have been and continue to be fundamentally vegetarian, either for ecological reasons, as is the case with the Amharas of Ethiopia, or for philosophical reasons (Hinduism).

Some cultures have been and continue to be fundamentally vegetarian, either for ecological reasons, as is the case with the Amharas of Ethiopia, or for philosophical reasons (Hinduism). In the same vein, Naloubèbouolè (2002) emphasizes the importance of food prohibitions for children in Dagara society. His analysis reveals, among other things, that meat, fish, sugar, honey, and eggs are moral, sociocultural, and socio-economic prohibitions that influence children's choice of complementary foods. To update the previous findings, the present work uses appropriate materials and methods to approach the subject.

## II. MATERIALS AND METHODS

### 2.1 Data Source and Sampling Method

The data used are extracted from the databases of a survey conducted by GRAnAp. This survey was conducted from November 20 to December 11, 2020, in 40 villages from the commune of Bopa, in the Mono department of Benin. The data are collected from heads of households, mothers/ caregivers of children aged 0 to 23 months, and children under 59 months. The sample size is obtained by the formula:

$$n = \frac{[4*r*(1-r)*(deff*Rn)}{[(e)^2*(Pb)*n_h]}$$

Where:
n = required sample size, expressed in the number of households
Four = factor in reaching 95% confidence interval
r = prevalence of malnutrition in the Mono department ≈25.6% (EDSB 2018). (NB: The same baseline prevalence is assumed by default for Self-Medication due to a lack of similar quantitative work on the topic in the country)
Rn = factor needed to increase the sample size by 5% to account for the non-response rate
Rn=1.05
deff = design effect for the indicator = 1.232 for Mono
e = 6% : margin of error
Pb = proportion of children under two in the total population, Pb≈ 9.6%.
NH = average household size = 5

This formula gives a size n = 570.
Households were selected from a two-stage cluster random sample. In the first stage, 40 clusters were randomly selected from all villages.

In the second stage, 17 households were randomly selected per cluster. At the end of the survey, the total number of households surveyed was 558, including 137 in urban and 421 in rural areas. 82.97% of households were headed by men, 17.03% were women. 72.8% of mothers/childcare are staying with the head of the family, and 71.8% have a low level of education.

Of these, 37.9% are farmers, and 34.0% are shopkeepers. Moreover, 34.3% of nannies are under 24 years, 45.3% are over 30 years, 57.3% of the children surveyed are boys, and 42.7% are girls.

### 2.2 Unordered Multinomial Variables Model

In this paper, the dependent variable is an unordered category variable with eight possible categories or choices (1-Boiled; 2-Boiled and soup; 3-Boiled, soup and Milk; 4-Boiled and Other; 5-Boiled, and Milk; 6-Boiled, and Other; 7-Milk and 8-Other). The literature teaches us that the generalization of binomial models (logit, probit) to discrete variables with more than two modalities is made using multinomial models (several modalities). In the dichotomous logit model, only one parameter vector β was needed to determine the two probabilities since Pr(Yi = 0) + Pr(Yi = 1) = 1. In the multinomial case, one needs a different parameter vector βj for each alternative. In general, for a multinomial logit model with m+1 modalities, one estimates m probabilities:

$$P_j = \Pr Pr\,(X) = \frac{exp(X\beta j)}{1+\sum_{k=1}^{m} exp(X\beta_k)}$$ ; for j = 1,2, to m and

a reference probability p

$$P_o = \Pr Pr\,(X) = \frac{1}{1+\sum_{k=1}^{m} \exp exp\left(X\beta_k\right)} \text{with} \sum_{j=0}^{m} p_j = 1$$

Another fundamental characteristic of the multinomial logit is the independence from other events of the ratio of the two probabilities associated with two possibilities, j and i

$$\frac{P_j}{P_i} = \frac{\Pr Pr\,(X)}{\Pr Pr\,(X)} = exp(X(\beta j - \beta i))$$

This implies that $\frac{P_j}{P_0} = \frac{Pr(y=j|X)}{Pr(y=0|X)} = exp(X\beta_j)$

It is assumed that this ratio is independent of possibilities other than j and i. This assumption is called the Independence of Irrelevant Alternatives.

The estimation of the parameters of the model is performed using the algorithms of maximization of the log-likelihood function. The values of the coefficients are not directly interpretable in terms of marginal propensity; only the signs of the coefficients indicate whether the variable has a positive or negative effect on the relative probability of choosing j rather than 0. The estimation results are assessed in the same way as for the other models:

- the significance of the coefficients using the z-statistic ratios,
- the overall significance of the fit (the hypothesis: H0: $a_1 = a_2 = a_3 = \ldots = a_k = 0$) by the statistic LR = -2(Ln(LR) - Ln(LU)) which follows, under the null hypothesis H0, a distribution of a χ2 with k degrees of freedom. The pseudo-R2 is given by: R2 = 1 - Log(Lu) Log(LR).

## III. EMPIRICAL RESULTS

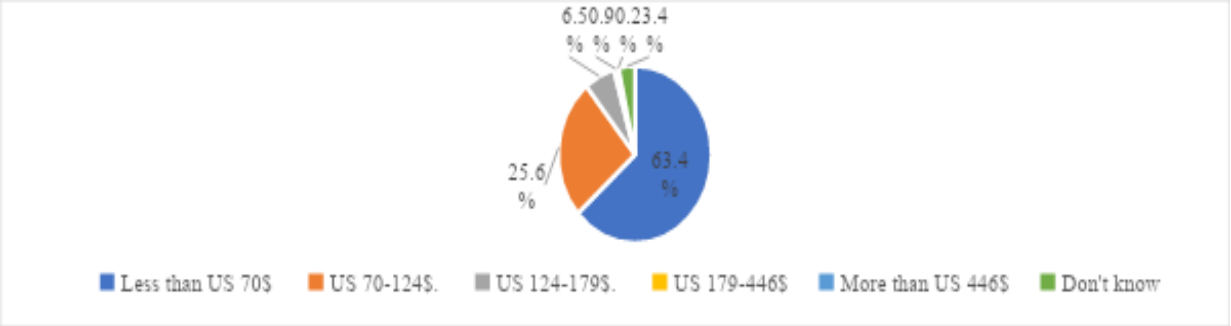
### 3.1 Univariate Descriptive Analysis

Analysis of Figure 1 shows a disparity or inequality in average household income. Indeed, nearly 90% of the surveyed population earn less than US 124$ average income per month. The statistics also show that approximately 85% of heads of household earning US 124$ work in the informal sector, and more than 40% are farmers.

We also note that 6.5% declare having an average income of US 124-179. In addition, the majority of heads of households with an average income of more than US 446 are civil servants and retirees.

About the number of economically active persons in the family, the survey data showed that a marginal proportion (3.5%) of households have no financially active persons. In comparison, 86.3% have at least two financially active persons, and

10.2% of households have at least three financially active persons.




*Source: Nut Aumed/GRAnAp survey, December 2020*

*Figure 1 :* Proportion of households by monthly average income groups

The staple foods consumed in these households are mainly processed into pastes or purees. Thus, maize and maize flour paste are widely consumed, which justifies the first food habit of these households. The statistics show that the most common primary food habit in the commune of Bopa is corn (96.8%). Cassava and beans are the second most consumed foods, with rates of 32% and 25.9%, respectively. Thus, we note that the overall diet of households in the commune of Bopa is based on roots/tubers (cassava, yams) and cereals (corn). According to this study, 41.8% of households have a high dietary diversity score (5-12 food groups), while 34.2% and 24.0% of households have a borderline and poor food consumption score, respectively.

For supplemental foods for children, Table 1 below provides an overview of the choices.

*Table 1 :* The proportions and numbers of households according to the type of complementary foods adopted

| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
|---|---|---|---|---|---|---|---|---|---|
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| Frequency | 42,0% | 36,9% | 4,3% | 2,9% | 4,1% | 7,5% | 0,2% | 2,1% | 100% |

*Source: NutAumed/2ARG survey, December 2020*

The analysis of this table shows that the complementary food given to children under two years of age is mostly porridge; 42% of the nannies gave only porridge as a complementary food to their children, while 0.2% gave only milk. 97.7% of the nannies included porridge in their complementary foods. The age at which these foods are introduced varies from one nanny to another. Table 2 shows the distribution of nannies according to the average age of introducing complementary foods to the child.

*Table 2 :* Average age of supplementary feeds admission

| Age | Frequency (%) |
|---|---|
| 3 months | 9,32 |
| 6 months | 66,87 |
| 9 months | 12,01 |
| 12 months and more | 11,80 |
| Total | 100,00 |

*Source:* NutAumed/2ARG survey, December 2020

Analysis of Table 1 reveals that more than ¾ of foster mothers integrate a family menu with the child during the first six months of birth. Less than 10% of mothers reported combining supplemental foods during the first three months.

This rate has improved significantly from the 1999 situation, with WHO research indicating that in Benin, the introduction of complementary foods is early, with 34% of children aged 2-3 months receiving the first foods. For about 12% of nursing mothers, it takes at least 12 months before introducing complementary foods to the child.

The early introduction of complementary foods to children is based on the belief that the breast alone is insufficient. In this analysis, the majority of households have a food taboo. More than 70% of households avoid eating mainly red or white meats (beef, goat, poultry, pork, egg, and fish).

This custom is limiting children's access to the most nutritious micro-nutrients. Similarly, in this area, 6% of households remove vegetables and leaves, cereals and fruits from children's diet.

## IV. BIVARIATE ANALYSIS

Table 3 in annex 1 shows Chi2 test results. The survey findings indicate that poverty and low household purchasing power make it difficult for households to afford appropriate complementary foods with high nutritional value for children. The test of dependence between the choice of complementary foods and the average income level of households confirms these statements. Indeed, the chi2 statistic for this test is 71.9561, with probability Pr = 0.000 (Table 3).

This result means that the likelihood of being wrong that the choice of complementary foods does not depend on the average household income level is almost zero. Households with an average monthly income of US $ 124 or less are the ones who introduce complementary foods into their infant's diet the earliest. This trend is confirmed by Amagloh et al. (2012).

Other factors showed their influence on the choice of complementary foods for children under two years of age in the commune. A chi2 of 100.7893 and a probability Pr = 0.000, confirms the dependence between the choice of complementary foods and the occupation of the child's mother (Table 3). The majority of mothers who are giving only boiled food as a complementary food are farmers, dealers, and craftswomen. Nevertheless, nurses recommend a mixture of boiled food, soup and milk. The choice of complementary food also depends on the number of economically active people in the household (chi2(35) = 52.2128; Pr = 0.031). In families where mothers give to children a mixture of boiling food, soup and milk or any other complementary foods are hosting at least two economically active persons. On the other hand, boiling and soup are complementary foods in households where there are less than two economically active persons.The analysis also shows that dietary restrictions (dietary and religious taboos) affect the choice of complementary foods for children in the commune of Bopa. Over half of households where red meat (beef, goat, poultry, pork, eggs and fish) are food taboos, complementary food chosen are boiling and or soup.

Furthermore, the choice of supplement depends on several other factors, such as the household food consumption score (chi2 = 71.3875; Pr = 0.000), the reduced coping strategies index (chi2 = 50.7461; Pr = 0.000), and the livelihood strategy adopted by the household (chi2= 55.9440; Pr = 0.000) (Table 3). Nearly 70% of those who choose only boiling and or soup have a poor or borderline food consumption score. On the other hand, those who supplemented boiling and soup with other vitamin and protein-rich foods (rice, beans, bananas, cookies, yogurt, yams, eggs, and fruits) were predominantly in households with acceptable food consumption scores. The statistics show that more than 70% of those who choose only boiling and or soup have adopted at least one livelihood strategy, while those who supplement cooking and soup with other vitamin and protein-rich foods have no strategy or have at most stress.

It is important to note that further analysis showed that some of these factors are in turn dependent on other factors. Indeed, the average family income depends on the occupation of the head of the household. The mother's occupation depends on her education level and on her husband, her age group, and the area of residence. The number of economically active persons in the household depends on the size of the family.

## V. MULTIVARIATE ANALYSIS

This section examines the factors that influence the choice of supplement foods for children aged 0-23 months. In addition to the descriptive statistics that perform, a multinomial logistic regression model has been used to estimate the probability of choosing a supplemental food for the child. Table 4 provides a summary of the results obtained. Complementary foods mentioned are: pasta, corn paste, rice, beans, banana, cookies, yam yogurt, egg, and fruits.

The reference category chosen is the category composed of porridge and milk. The results show that the choice of porridge as a complementary food is influenced by the food consumption score, the livelihood strategy adopted by the household, the reduced coping strategy index, food taboos, the average household income, the area of residence, and the mother's occupation. For porridge + soup, we note that the choice of this category is influenced by the reduced coping strategy index, the average household income, the area of residence, and the mother's occupation.

The choice of the category composed of porridge + soup + others (pasta, corn paste, rice; beans, banana, cookies, yam yogurt, egg, fruit) is influenced by the reduced index of coping strategies, food taboos, average household income, and mother's occupation. On the other hand, the other category (composed of pasta, corn paste, rice; bean, banana, cookies, yam yogurt, egg, and fruit) is determined by the reduced coping strategies index and the average household income.

According to the regression coefficients assigned to the explanatory variables and the order ratios show that the food consumption score, the coping strategy adopted by the household, and the mother's occupation decrease the probability of choosing porridge + milk for the child than choosing only porridge. By the way, the reduced coping strategy index, average household income, and area of residence increase the probability of choosing porridge + milk for the child than choosing porridge alone as a complementary food for the child. Similarly, the reduced coping strategy index, average household income, and environment increase the probability of choosing porridge + milk as a complementary food for the child than choosing porridge + other as a complementary food for the child.

## VI. DISCUSSIONS

The survey results indicate that complementary foods are introduced to children aged 0 to 23 months in the commune of Bopa. More than 3/4 of children receive complementary foods before six months. This result supports the results of work by made Brown et al. (2000), Bolling (2007), Schiess (2010), Schwartz (2011), Agostoni (2008), Moorcroft (2011), Azagoh- K. et al. (2013), and Victora et al. (2016). This early introduction of foods is causing sometimes gastrointestinal diseases (Kramer et al., 2003; Kramer et al., 2002), respiratory tract infections (Chantryet al., 2006), eating disorders (Polan et al., 1991; Satter, 1986; Ward et al., 1993; Reilly et al., 1999; Ramsay et al., 1993; Art-Rodas et al., 1998) and malnutrition (Anigo, 2010). These supplementary foods are usually made from cereals and contain little nutritional substance. The study shows that 42.0% of mothers give only porridge as a complementary food, 36.9% give porridge + soup, and 4.3% give porridge + soup + milk. Such a composition of complementary food for children is in line with the analyses made by Trèche (2002), Traore et al. (2005), and Fanou Fogny et al. (2018) in the case of African countries and those made by Anigo (2010) in the case of north western Nigeria. This result also supports the analysis of Nago et al. (2018) in the case of Benin.

The literature shows that several factors are drivers of the choice of complementary foods for children. The choice of complementary foods for children aged 0-23 months is influenced by average household income, place of residence, mother's occupation, food and religious taboos, food consumption score, livelihood coping strategy and reduced coping strategy index, which in turn are influenced by their determinants.

Roisin Gallagher et al. (2022) recently indicate that attitude, control and social norms determine the intention to consume the perceived inedible parts of fruits and vegetables. Of all these constructs, attitude has the strongest impact on

intention, followed by perceived behavioral control and social norms. The results also show that perceived edibility, sustainability, and health benefits have a positive and significant impact on attitudes toward the perceived inedible parts of fruits and vegetables.

Other findings were shared by several researchers. In their analyses, Noukpoape (1997) and Hadi (2020) refer to the socio-professional situation, the educational level of the nanny, and her standard of living (poverty). Godin (2012) mentions personal and environmental factors (social and physical environment). Lange et al. (2013) mention individual characteristics (mother's age, education level, caregiver during weaning and child's gender), and duration of exclusive breastfeeding. For Kronborg et al. (2015), higher birth weight of the child, the older age of the mother, and education level influence the choice of complementary foods. The work of Amagloh et al. (2012) indicates the influence of income level on the selection of complementary foods. The result of Naloubèbouolè (2002); Fiddes (1992), Poulain (2007), Leach (1972), Fischler (1995); Lambert (1997) who similarly emphasized the determining role of religious and cultural taboos in the choice of complementary foods for children. Other factors such as the mother's nutritional education (Wang et al., 2017; Diarra, 2020), and psychosocial aspects of the mother Akpaki (2021) have also been mentioned in the literature.

Findings provide the factors that influence the choice of complementary foods for children in Bopa and complement the existing literature.

The results of these dietary patterns corroborate with the work of Séhonou et al. (2019) and Fanou Fogny et al. (2018) in the case of Cotonou. Anne Walsh et al. (2015) noted that complementary foods help infant weight gain, sleep patterns, and enjoyment at mealtime. Delpech (1995) points out in his review that complementary foods introduced to children are often deficient in protein and have more disadvantages than advantages. But, they expose the child to risks of contamination; on the other hand, intensive force-feeding can lead the child to wean himself. A turn to the literature teaches us that food taboos constitute a dietary restriction for mothers and then for children can be an influential factor in the choice of complementary foods.

The multinomial model used to approach this complex subject present work is bringing an added value for social analysis. It helps to highlight the presence of the number of economically active persons in the household, the reduced index of coping strategies and the subsistence strategy adopted by the household as the main drivers of complementary foods choice for children.

## V. CONCLUSION

This paper is aiming to analyze the determinants of complementary food choices among households hosting stunting children in the commune of Bopa. Using a two-stage design with cluster sampling representative of the population of Bopa, this study collects anthropometric constants from children in the sampled households. It collects socio-economic data and dietary habits of the heads of families, mothers/caregivers. To achieve this goal, bivariate analysis and multivariate logistic regression models were used to analyze data. . The bivariate analysis consists of a Chi2 test of dependence between variables.

The results of this study generate a few key findings. First, foster mothers introduce complementary foods to children early (more than ¾ of children receive complementary foods in the first six (6) months after birth). Second, the choice of complementary foods depends significantly on average household income, mother's occupation, food taboos, number of economically active persons in the household, residence setting, food consumption score, livelihood strategy adopted by the families, and reduced coping strategies index. The multinomial model helps to confirm these factors.

We recommend implementing policy patterns targeting which can raise household awareness on food restriction, improve household income levels, improve women's educational levels, and provide vocational skills focused on women empowerment. Means to be used toward this goal

are microfinance projects increasing welfare, nutritional education targeting nursing mothers improving in the commune.

However, this paper has some limitations. The use of systematic sampling in the registers of health facilities for the recruitment of pregnant and lactating women, malnourished children under treatment, and the heads of households in which they live proved unproductive. This creates a minor discrepancy between the intended and covered sample. Anthropometric data were collected on only one child under five years of age per sampled household for logistical reasons. Nevertheless, they provide trends in the nutritional status of children under five years of age in Bopa.

In the future, a national or regional survey can be conducted to analyze the risks of early supplementary foods on malnutrition in children.

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## Annexes

*Table 3:* Chi 2 results

| | Choice of child's supplementary foods by average household income | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| Less than US 70$ | 148 | 95 | 15 | 6 | 16 | 20 | 0 | 4 | 304 |
| 70 - US 124$ | 41 | 58 | 5 | 5 | 4 | 9 | 0 | 5 | 127 |
| 124 - US 179$ | 6 | 18 | 1 | 3 | 0 | 5 | 0 | 0 | 33 |
| 179- US 446$ | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| More than US 446$ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| DK | 6 | 5 | 0 | 0 | 0 | 2 | 1 | 1 | 15 |
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| Pearson chi2(35) = 71.9561 Pr = 0.000 | | | | | | | | | |
| Choice of supplemental child support by mother's occupation | | | | | | | | | |
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| Farmer | 81 | 52 | 2 | 4 | 3 | 10 | 0 | 1 | 153 |
| Reseller Shopkeeper | 45 | 45 | 6 | 1 | 3 | 8 | 1 | 0 | 109 |
| Artisan | 49 | 46 | 8 | 7 | 6 | 13 | 0 | 4 | 133 |
| Teacher | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Nurse / Caregiver | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 3 |
| Professional/ Public servant | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Other | 9 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 11 |
| No | 18 | 34 | 2 | 2 | 7 | 5 | 0 | 4 | 72 |
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| | Pearson chi2(49) = 100.7893 Pr = 0.000 | | | | | | | | |
| Choice of complementary foods for children according to food taboos | | | | | | | | | |
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| No taboos | 57 | 25 | 4 | 8 | 2 | 11 | 0 | 5 | 112 |
| Corn, corn porridge, rice, sorghum, millet paste, bread and other cereals | 6 | 2 | 0 | 2 | 0 | 1 | 0 | 0 | 11 |
| Beans, peas, peanuts and cashews | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| Vegetables and leaves | 5 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| Fruits | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| Beef, goat, poultry, pork, eggs and fish | 132 | 139 | 17 | 22 | 12 | 8 | 1 | 5 | 336 |
| Oils, fats and butter | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 |
| Total | 203 | 178 | 21 | 36 | 14 | 20 | 1 | 10 | 483 |
| | Pearson chi2(42) = 59.8409 Pr = 0.036 | | | | | | | | |
| | The choice of the complement depends on the number of economically active persons in the household | | | | | | | | |
| Number of economically active persons in the household | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| 0 | 6 | 7 | 1 | 2 | 0 | 1 | 0 | 0 | 17 |
| 1 | 57 | 52 | 3 | 4 | 3 | 6 | 1 | 5 | 131 |
| 2 | 118 | 106 | 17 | 20 | 11 | 11 | 0 | 3 | 286 |
| 3 | 16 | 11 | 0 | 8 | 0 | 2 | 0 | 0 | 37 |
| 4 | 4 | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 10 |
| 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Total | 203 | 178 | 21 | 36 | 14 | 20 | 1 | 10 | 483 |
| | Pearson chi2(35) = 52.2128 Pr = 0.031 | | | | | | | | |

| | The choice of supplement depends on the household food consumption score. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| Poor food consumption | 78 | 33 | 2 | 0 | 4 | 1 | 0 | 0 | 118 |
| Food consumption limit | 73 | 61 | 14 | 6 | 4 | 11 | 1 | 2 | 172 |
| Acceptable food consumption | 52 | 84 | 5 | 8 | 12 | 24 | 0 | 8 | 193 |
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| | Pearson chi2(14) = 71.3875 Pr = 0.000 | | | | | | | | |
| | The choice of complement depends on the reduced index of coping strategies | | | | | | | | |
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled and other | Boiled and Milk | Boiled and other | Milk | Other | Total |
| 0 à 3 | 117 | 137 | 19 | 7 | 18 | 16 | 0 | 4 | 318 |
| 4 à 18 | 26 | 17 | 2 | 3 | 2 | 7 | 1 | 3 | 61 |
| 19 and over | 60 | 24 | 0 | 4 | 0 | 13 | 0 | 3 | 104 |
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| | Pearson chi2(14) = 50.7461 Pr = 0.000 | | | | | | | | |
| | The choice of supplement depends on the livelihood strategy adopted by the household | | | | | | | | |
| | Boiled | Boiled and Souped | Boiled, Soup and Milk | Boiled Soup and others | Boiled and Milk | Boiled and other | Milk | Other | Total |
| No strategy | 99 | 83 | 7 | 6 | 11 | 8 | 0 | 4 | 218 |
| stress | 65 | 54 | 12 | 1 | 1 | 14 | 0 | 5 | 152 |
| crisis | 22 | 25 | 1 | 1 | 6 | 8 | 0 | 1 | 64 |
| emergency | 17 | 16 | 1 | 6 | 2 | 6 | 1 | 0 | 49 |
| Total | 203 | 178 | 21 | 14 | 20 | 36 | 1 | 10 | 483 |
| | Pearson chi2(21) = 55.9440; Pr = 0.000 | | | | | | | | |

*Source: NutAumed/GRAnAp survey, December 2020; Authors' calculations*

*Table 4:* Choice of child's supplementary foods by average household income

| Categorical dependent variable | Explanatory variables | Coef | Relative-Risk-Ratio( RRR). | P-Value | Sig |
|---|---|---|---|---|---|
| Boiled | Food consumption score | -1.211 | 0.298 | 0.001 | *** |
| | Livelihood strategy adopted by the household | -0.519 | 0.595 | 0.077 | * |
| | Reduced index of coping strategies | 1.959 | 7.094 | 0.003 | *** |
| | Food taboos | 0.391 | 1.479 | 0.081 | * |
| | Number of economically active persons in the household | -0.067 | 0.935 | .843 | |
| | Average household income | 1.484 | 4.409 | 0.006 | *** |
| | Place of residence | 1.09 | 2.973 | 0.009 | *** |
| | Mother's occupation | -0.122 | 0.885 | 0.032 | ** |
| | | | | | |
| Boiled and Souped | Food consumption score | -0.55 | 0.577 | 0.136 | |
| | Livelihood strategy adopted by the household | -0.123 | 0.884 | 0.666 | |
| | Reduced index of coping strategies | 1.194 | 3.302 | 0.072 | * |
| | Food taboos | 0.363 | 1.438 | 0.104 | |
| | Number of economically active persons in the household | -0.275 | .76 | 0.41 | |
| | Average household income | 1.542 | 4.675 | 0.004 | *** |
| | Place of residence | 0.785 | 2.193 | 0.057 | * |
| | Mother's occupation | -0.099 | .906 | 0.075 | * |
| | | | | | |
| | Food consumption score | -0.554 | 0.574 | 0.231 | |

| | | | | | |
|---|---|---|---|---|---|
| Boiled, Soup and Milk | Livelihood strategy adopted by the household | -0.063 | 0.939 | 0.862 | |
| | Reduced index of coping strategies | 0.05 | 1.051 | 0.956 | |
| | Food taboos | 0.224 | 1.251 | 0.384 | |
| | Number of economically active persons in the household | 0.027 | 1.027 | 0.951 | |
| | Average household income | 0.838 | 2.312 | 0.194 | |
| | Place of residence | -0.084 | 0.919 | 0.871 | |
| | Mother's occupation | -0.052 | 0.949 | 0.474 | |
| | | | | | |
| Boiled Soup and others | Food consumption score | -0.083 | 0.92 | 0.875 | |
| | Livelihood strategy adopted by the household | 0.331 | 1.392 | 0.383 | |
| | Reduced index of coping strategies | 1.5 | 4.483 | 0.043 | ** |
| | Food taboos | 0.408 | 1.503 | 0.093 | * |
| | Number of economically active persons in the household | -0.623 | 0.536 | 0.185 | |
| | Average household income | 1.428 | 4.171 | 0.016 | ** |
| | Place of residence | -0.764 | 0.466 | 0.179 | |
| | Mother's occupation | -0.19 | 0.827 | 0.026 | ** |
| | | | | | |
| Boiled and other | Food consumption score | -0.013 | 0.987 | 0.975 | |
| | Livelihood strategy adopted by the household | 0.048 | 1.049 | 0.884 | |
| | Reduced index of coping strategies | 1.743 | 5.715 | 0.011 | ** |
| | Food taboos | 0.375 | 1.455 | 0.104 | |
| | Number of economically active persons in the household | -0.077 | 0.926 | 0.841 | |
| | Average household income | 1.386 | 3.997 | 0.013 | ** |
| | Place of residence | -0.625 | 0.535 | 0.19 | |
| | Mother's occupation | -0.191 | 0.826 | 0.005 | *** |
| | | | | | |
| Milk | Food consumption score | -0.548 | 0.578 | 1 | |
| | Livelihood strategy adopted by the household | 10.116 | 24741.29 | 0.99 | |
| | Reduced index of coping strategies | -7.373 | 0.001 | 0.997 | |
| | Food taboos | -0.123 | 0.884 | 1 | |
| | Number of economically active persons in the household | -7.407 | 0.001 | 0.996 | |
| | Average household income | 7.172 | 1302.083 | 0.985 | |
| | Place of residence | -24.142 | 0 | 0.989 | |
| | Mother's occupation | -1.851 | 0.157 | 0.997 | |
| | | | | | |
| Other | Food consumption score | 0.045 | 1.046 | 0.935 | |
| | Livelihood strategy adopted by the household | -0.885 | 0.413 | 0.108 | |
| | Reduced index of coping strategies | 2.204 | 9.059 | 0.004 | *** |
| | Food taboos | -0.008 | 0.992 | 0.98 | |
| | Number of economically active persons in the household | -0.522 | 0.593 | 0.301 | |
| | Average household income | 1.236 | 3.44 | 0.045 | ** |
| | Place of residence | -0.603 | 0.547 | 0.323 | |
| | Mother's occupation | -0.074 | 0.928 | 0.371 | |
| | | | | | |
| | *** p<0.01, ** p<0.05, * p<0.1 | | | | |

*Source: NutAumed/GRAnAp survey, December 2020; Authors' calculations*