ABSTRACT

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Topic: Prevalence and associated risks factors of chronic malnutrition amongst children under five in Niger

Background

Niger is one of the largest landlocked countries in West Africa. It covers an area of 1,267,000 km², 2/3 of which is semi-arid or desert. The population, mostly poor, was 17,138,707 in 2012 and is estimated to 22,752,385 in 2020. More than 4/5 of this population live in rural areas. The population is unevenly distributed across the country, with a higher concentration in the less arid southern strip. Only 1% of the territory (extreme south-west) receives more than 600 mm of rain per year, while 89% of the territory, located in the northern part, receives less than 350 mm of rain per year. In addition to this poorly distributed rainfall in time and space, hygiene and sanitation conditions are not at their best. The rate of access to basic improved water services is 35.7% in rural areas and 46.3% in urban areas, and the rate of access to improved sanitation services is 29.16% in rural areas and 41.06% in urban areas in 2019. This results in an open defecation rate of 59.11% in rural areas and 10.12% in urban areas, contributing to the high prevalence of major morbidities such as diarrhea, coughs, malaria, etc., which affect the nutritional status of children and their mothers.However, recurrent shocks (droughts, floods, soaring cereal market prices, epidemics, pest attacks, insecurity) expose more than 2 million (13.4%) Nigeriens to food insecurity and around 6 million (32.4%) to a precarious situation and therefore to a risk of food insecurity, with the corollary of a high prevalence of undernutrition. Annual cereal balances drawn up by the Ministry of Agriculture for the period 2005-2021 reveal that national cereal production has been unable to cover food requirements for seven (7) years (2005, 2009, 2011, 2013, 2014, 2019 and 2021). This food deficit, which occurs practically every third year, regularly impacts the nutritional situation of children and their mothers.

Theoretical focus

The main objective of this study is to contribute to improving the nutritional status of children under 5 in Niger. Specifically, the aims are:

- Analyze levels and recent trends in the prevalence of chronic malnutrition according to socio-economic, demographic and geographical characteristics.
- Highlight differences according to region and certain maternal characteristics
- Document the political, programmatic and contextual factors that explain levels and trends in chronic malnutrition.

Data

To monitor nutrition policies and programs, Niger has been conducting a series of annual national surveys on malnutrition in children under five since 2005 (known as the SMART survey). The SMART surveys from 2006 to 2021 were used in this study. For the multivariate analysis, a special focus is made on the 2021 survey, which is the most recent one carried out nationwide, with representation at regional level for the 7 regions (Agadez, Diffa, Dosso, Niamey Tahoua, Tillabéry) and at departmental level for the Zinder region and three departments of the Tahoua region. A total of 10,153 households were surveyed in the 680 clusters sampled for the purposes of this survey.

Methods

For this study, descriptive analysis is carried out base on a group of variables classify as household characteristics, mother characteristics, child nutritional status and access to health care. Following these descriptive analyses, an explanatory analysis based on a lobit model was use to describe the association of chronic malnutrition with predefined variables. At this explanatory level, two logistic models were run: the first for children aged 6 to 23 months, and the second for children aged 24 to 59 months. Regression quality tests were also carried out before estimating the optimal models. Through this model, we are trying to explain the Y variable which represent the nutritional status of the child. It is defined as follow:

$$Y_i = \begin{cases} 1 : if\ the\ child\ is\ suffering\ from\ chronic\ malnutriton \\ 0 : if\ the\ child\ is\ not\ suffering\ from\ chronic\ malnutrition \end{cases}$$

We assume that the probability for a child to be suffering from chronic malnutrition $(Y_i = 1)$ is function of a number of socioeconomic and demographic caracteristics. An estimation of this probability is given by the logistic function:

$P_i = P(Y_i = 1) = P(Y^* > 0) = P(\beta_0 + \beta_i X_i + \varepsilon_i > 0) = P(\varepsilon_i > \beta_0 + \beta_i X_i) = \varphi(\beta_0 + \beta_i X_i)$ where :

- P_i : the probability for a child i to be be suffering from chronic malnutrition
- Y_i : the nutritional status of the child i;
- Y^* : a fonction of children caracteristics ;
- X_i : explanatory variables.

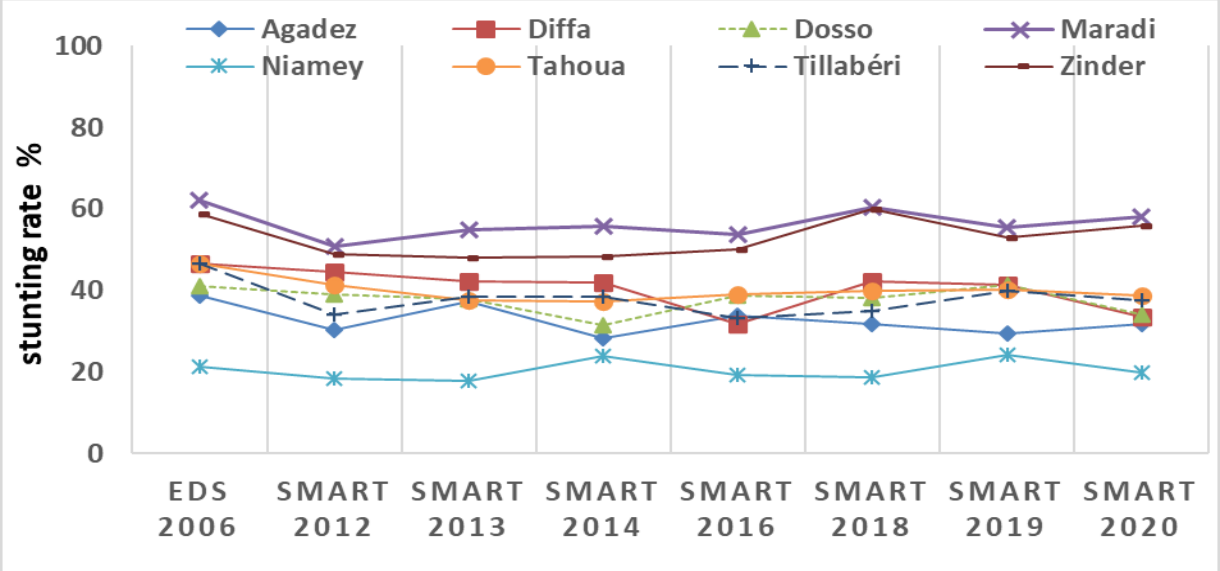
The model specification is as follow:

$$P(Y_i = 1) = \frac{1}{1 + e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p)}}$$

Findings

The analyses reveal that chronic malnutrition (stunting) rates ranging from 42.5% to 51%, and a prevalence of chronic malnutrition of 43.5% in 2021. An analysis of trends by region of residence reveals three groups of regions: the capital Niamey, whose rates do not reach the critical threshold of 30% over the entire period; regions with intermediate rates, such as Dosso and Tillabéri, which have rates between 30% and 40%; and regions with high prevalence, such as Maradi, Zinder, Diffa and Tahoua, which more often do not have rates in excess of 40%.

Graph 1: Regional trend of stunting among children under five in Niger from 2012 to 2020



Source : SMART 2012 – 2020 and DHS 2006

Gender analysis shows higher rates for boys than for girls, ranging from 39.5% to 52.8% for boys and from 39.3% to 49.1% for girls, with more pronounced differences in favor of girls in 2019 (around 5.3%) and smaller differences in 2008 (0.2%). As for the results of analysis by mother's characteristics, chronic malnutrition is more pronounced among children of single mothers than those of mothers in union. The distribution of chronic malnutrition shows disparities between children under five according to the mother's level of education. In fact, this prevalence is more pronounced among children whose mothers have no education at all (45.2%), followed by children of literate mothers (33.9%). Conversely, it is relatively low among children whose mothers have a higher level of education (20.1%). In terms of household characteristics, small household size, access to improved toilets, healthy waste disposal and the use of drinking water are the main factors protecting children against chronic malnutrition.

Table 1: Rate of chronic malnutrition from 2006 to 2012 according to the sex of the child

years	Rate of chronic malnutrition (%)		
	Male	Female	Both
2006	44,5	43,3	**43,8**
2007	43,9	43,1	**43,5**
2008	39,5	39,3	**39,3**
2009	48,2	44,4	**46,3**
2010	50,1	45,9	**48,1**
2011	52,8	49,1	**51**
2012	45,8	41,9	**46,1**
2013	47,1	43,7	**42,5**
2014	44,7	40,4	**42,5**
2015	48,1	44,5	**46,3**
2016	43,8	40,6	**42,2**
2017	47,1	43,8	**45,5**
2018	50	45,6	**47,8**
2019	51,8	46,5	**45,7**
2020	47,6	42,6	**45,1**
2021	45,5	41,5	**43,5**

Source: SMART 2006-2021

Pearson's chi2 test of association was used to see if there was a link between the variables identified in the literature review and malnutrition in children. Out of all the variables, seven (7) variables, i.e. mother's level of education, household size, source of drinking water, type of latrine used, waste disposal method, age group and sex of the child, are the variables likely to influence chronic malnutrition in children under five (5) years of age in Niger.

The hypotheses made about these variables were tested using logistic regression, the results of which revealed that the mother's level of education for children aged 6 to 23 months was associated with the risk of chronic malnutrition. In fact, children whose mothers attended school had a lower risk (38.2% chance) than those whose mothers had no education at all. The main source of drinking water for household members positively affects children's risk of malnutrition. The greater the household's access to drinking water, the lower the relative risk of chronic malnutrition. Indeed, children from households without access to drinking water are 29.5% more likely to suffer from chronic malnutrition than those whose households have access to drinking water. Given the multicollinearity observed in the descriptive analysis, the importance of the drinking water source sums up both the importance of sanitation (latrine) and hygiene (garbage disposal) in the occurrence of chronic malnutrition in children aged 6 to 23 months in Niger.

As for the minimum acceptable frequency, this is an explanatory factor in child malnutrition. Indeed, children who have not received solid, semi-solid or soft foods are more than twice (2) as likely to be chronically malnourished as their counterparts who have. It should also be noted that this form of malnutrition is much more pronounced among males. Finally, breastfeeding for up to two years also plays a key role in protecting against chronic malnutrition. Indeed, children whose mothers continue to breastfeed until the age of two are 33.41% more likely not to suffer from chronic malnutrition than those who do not.

For children aged between 24 and 59 months, the mother's level of education, household size, source of drinking water and deworming influence the onset of chronic malnutrition. Children whose mothers attend school have a 46.51% greater chance of avoiding chronic malnutrition than children whose mothers have no education at all. Children from large households are more likely to suffer from chronic malnutrition than those from small households. Indeed, children from households with 5 to 10 members are 45.24% more likely to experience this phenomenon. As for the source of drinking water, it has a positive influence on the probability of experiencing chronic malnutrition. Children from households using a non-drinking water source are 43.7% more likely to experience chronic malnutrition than those from households with drinking water. Finally, children who have not been dewormed have a 26.1% relative risk compared with those who have been dewormed.

Table 2: result of Logistic regression of chronic malnutrition in children aged 6 to 23 months

Chronic Malnutrition	***Odds Ratio***	***P-value***	***[95% Conf. Interval]***	
Ref :No level of education				
Literate mother	1,15	0,86	0,25	5,33
Schooled mother	0,62	0,01*	0,42	0,91
Ref : Source d'eau potable				
Non-potable source of water	1,29	0,07**	0,98	1,71
Ref : Healthy waste disposal				
Unsanitary waste disposal	1,35	0,16	0,89	2,05
Ref : Minimum acceptable frequency				
Unacceptable minimum frequency	2,30	0,00*	1,74	3,04
Ref : Male				
Female	0,74	0,03*	0,57	0,97
Ref : Non Continued breastfeeding				
Continued breastfeeding	0,66	0,01*	0,49	0,89
Constant	0,52	0,00*	0,33	0,81

***: P<0.05**

Conclusion

Due to its geographical location and the climate variation, Niger is facing a precarious nutritional situation. Chronic malnutrition rates as a whole have remained above the critical threshold of 30% for over ten years. Regional disparities persist, enabling the country's eight regions to be classified into three groups, with the exception of the capital Niamey, where rates are below the critical threshold.Analysis by household characteristics shows that children living in small households, with clean drinking water, healthy waste disposal and toilets appear to be better protected. As far as the mother's characteristics are concerned, children of mothers with schooling and in union are more protected from malnutrition. As for the child's characteristics, children with a diversified diet and female sex are the most spared from malnutrition. From a health point of view, deworming and measles vaccination protect children against malnutrition.