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Multilevel Analysis of the Social Determinants of Health Status and Wellbeing of Rural Farmers in North-central Nigeria

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ABSTRACT

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Introduction Over the years, rural dwellers have suffered from the unequal distribution of basic facilities when compared to the urban dwellers. This has resulted in situations where their health have been compromised and thus their productive capacity.

Methods This paper using a Multilevel Analysis examines these social determinants of health status and wellbeing of rural farmers in North-central, Nigeria. Analytical tools employed include the descriptive statistics and the multivariate multilevel model.

Results The result of the analysis showed that the income, years of schooling, living condition, frequency of physical exercise, alcohol consumption and smoking habit were some of the factors significantly influencing the health status and wellbeing of rural farmers in the study area. Others include exposure to tobacco smoke, access to improved toilet facilities, proper solid waste management and distance to potable water. It also revealed that community level co-variation between health status and wellbeing was stronger than at the individual level.

Conclusions Therefore, it was recommended that efforts should be made by government to provide rural areas with basic potable water sources. The rural dwellers should also be enlightened on the basics of good sanitation and hygiene. This will help reduce diseases and deaths from water-related infections and poor hygiene. Furthermore, laws should be put in place to prohibit smoking of tobacco products in public places. All these will reduce the incidence of disease conditions thereby resulting in a healthier workforce that can thus work together with the government towards the achievement of the sustainable development goals.

Keywords Social - Health - Wellbeing - Rural -Exposure.

INTRODUCTION

A healthy population is generally considered as the engine of economic growth. Health is not only the absence of illness but also being productive at the fullest extent possible.[1] Poor health can lead to production loss for an economy in terms of reduced productivity of the workers. The Universal Declaration of Human Rights also acknowledges that everyone has the right to a standard of living adequate for the health and wellbeing of himself and his family. This includes food, clothing, housing, medical care, necessary social services and the right to security in the event of unemployment, sickness, disability, widowhood or old age.[2] However, most health disparities affect groups marginalized because of socioeconomic status, gender, geographic location or some combination of any of these factors. People in such groups not only experience worse health but also tend to have less access to the social determinants or conditions (such as healthy diet, good housing, good education, safe neighborhoods, freedom from racism and other forms of discrimination) that support health.[3] It is therefore very important to examine the extent to which these determinants influence the health status and wellbeing for vulnerable groups such as the rural farmers. This will provide empirical evidence that can be used in inclusive policy options that will result in equitable, economically productive and healthy societies.[4]

Relatively few literatures have considered wellbeing of rural Nigeria. This includes that of Adeyemo et al.[5] where the functional approach was employed using data from the Core Welfare Indicators Questionnaires (CWIQ) for 2006. The available studies did not focus specifically on rural farmers. They also did not consider the health status of the rural farmers. This study, therefore, fills this gap in literature. This study is also unique in terms of methodology. The use of the categorical multilevel model helped to account for community level variation which was hitherto not available.

In Nigeria, agriculture is still largely labour-intensive and relies substantially on less skilled labour force. The effect of health shocks and diseases on the available labour force can result in productivity that is far less than the size of human engagement. This is because ill-health affects physical strength and work days or hours available for farm work. It also results in high medical expenditures that tend to deprive rural farmers of resources to invest in improved practices. [6] Recently, there is a growing recognition that non-communicable diseases are one of the major causes of mortality and morbidity. The causes and determinants of these non-communicable diseases are wide ranging and include exposure to environmental toxins, unhealthy diets and various forms of malnutrition, tobacco use, excess salt and alcohol consumption and increasingly sedentary lifestyles among others. These drivers are in turn, linked to broader social conditions such as low and insecure income, poor housing and working conditions among others. Therefore, addressing the social determinants of health can provide empirical evidence that might speed up the achievement of several global health programs including the Sustainable Development Goals (SDGs).[7]

Relatively few empirical literatures exist on these social determinants of health and wellbeing holistically. Some of these include those of Doll et al.[8]in a study set out to clarify the associations between obesity and health-related quality of life. The results showed that Body mass index was significantly associated with health status, but the pattern varied according to whether the measure reflected physical or emotional wellbeing. Also, physical wellbeing deteriorated remarkably with increasing degree of overweight and was limited in subjects who were obese but had no other chronic condition. Subramanian et al.[9] in another study investigated individual level determinants of self-rated health and happiness and the extent of community level co-variation. The results revealed that controlling for demographic markers, a strong income and education gradient was seen for self-rated poor health and unhappiness, with the gradient being stronger for poor health. Community level correlations between self-rated poor health and happiness were stronger (0.65) than the individual level correlations (0.16) between the two outcomes. This study will therefore contribute to these bodies of literature by providing information particularly concerning rural farmers in Nigeria.

METHODS

Study Area

The study was carried out in the North-central region of Nigeria. This region consists of six states namely Kwara, Kogi, Niger, Nassarawa, Benue and Plateau. These states are situated geographically in the middle belt region of the country spanning the west, around the confluence of the River Niger and the River Benue. Three states from the North-central region were selected purposively for this study. They are Kwara, Kogi and Niger states. Kwara state covers a total land area of 36,825 km^2 (14,218 square meters) with an estimated population of about 2,429,655 people[10]. It lies on latitude 8^o 30′ N and longitude 5° 00′ E. Kogi state is found in the central region of Nigeria. It is popularly called the Confluence State. This is because the confluence of River Niger and River Benue is at its capital, Lokoja, which is the first administrative capital of modern day Nigeria. The state was formed in 1991 with coordinates 7°30′ N and 6°42′ E. It has a total land area of about

29,833km^2 (11,519 square meters) and an estimated population of 3,359,465 people.[10] Niger state on the other hand is popularly regarded as the power state. It was created on 3rd of February, 1976 from the defunct North-western state. The state lies on latitude 8^o to 11^{o}30' North and longitude 3^o 30' to 7^o 40' East. The state covers a land area of 76,363 square kilometers, 85 per cent of which is arable land. The population of the state stands at an estimated 4,047,820 people[10]with the majority (85 percent) as farmers.

Sampling Technique

The sample for this study was selected from the sampling frame of farmers provided by the headquarters of the agricultural zones present in the study area.The study employed a four-stage sampling technique namely:

i) The first is the purposive selection of Kogi, Kwara and Niger states from the North-central region. This is because wellbeing in these states is still considerably lower than the national average at 0.1273, 0.1168 and 0.1185 respectively;[5]
ii) Second is the random selection of two (2) agricultural zones from each of the three (3) states that were selected to make a total of six (6) agricultural zones;
iii) The third stage is the random selection of six (6) communities from each of the selected agricultural zones to make a total of thirty-six (36) communities; and
iv) The last stage is the random selection of ten (10) farmers from each of the selected community to give a total of 360 respondents.

However, out of the 360 questionnaires administered in the study area, only 352 across 36 communities were found useful for the purpose of data analysis. The others were discarded as a result of incomplete information.

Analytical techniques

i) Descriptive statistics

Descriptive statistics such as frequencies, means, percentages, tables, bar charts, graphs etc. were used to examine the distribution of specific social determinants among the rural farmers.

ii) Multivariate Multilevel Analysis

The multilevel categorical model was used to examine the effects of the social determinants on the health status and wellbeing of rural farmers. The analytical framework adopted for this study is such that the outcomes: Health Status (HS), Multidimensional Wellbeing (MWB) and Subjective Wellbeing (SWB) are at level 1.They are seen as multiple outcomes nested within the households at level 2, who in turn are nested within their local communities at level 3. The analysis was done using the IBM SPSS software. This model was chosen on the assumption that:

i) The combination of a multivariate and multilevel formulation will help in the examination of people-place relationships in relation to the health status and the two dimensions of wellbeing.
ii) It also makes it possible to assess how the proportion of healthy and achieved households varies across these communities allowing for each rural community's composition.

The multivariate multilevel model with categorical response as it is the case in this study can be written as:

$$y_{ij}^{*} = \beta_0 + \beta_1 x_{ij} + \mu_j + e_{ij} \quad \ldots\ldots\ldots (1)$$

Where:

$$Y_{1ij} = Health\ status\ (Normal = 1\ , overwight\ or\ obese = 2\ and\ underweight = 3)$$

$$Y_{2ij} = Multidimensional\ Wellbeing\ index\ (Low = 1, Medium = 2\ High = 3)$$

$$Y_{3ij} = subjective\ Wellbeing\ index\ (Low = 1, Medium = 2\ High = 3)$$

The indicators for:

i) Health status in this study refers to the nutritional status of the farmers using the Body Mass Index (BMI).
ii) Wellbeing index was generated from the indicators of the six dimensions of multidimensional wellbeing and four domains of subjective wellbeing that were considered in this study (see Appendices).

The Body Mass Index was calculated from the weights and heights of farmers measured during the field survey. The multidimensional wellbeing index was computed from 26 indicators across 6 dimensions as reflected in appendice 2. For the subjective wellbeing the WHO-BREF questionnaire was adopted. The index was computed based on the scoring method provided in the document. This was further divided into tertiles viz: low, medium and high. The social determinants of health which are the predictors were domesticated for Nigeria from the specific social determinants of health outlined by the World Conference on Social Determinants of Health (4).

Ethical Consideration

Considering the nature of this study, ethical approval was obtained from the University of Ilorin Ethical Review Committee, University of Ilorin, Nigeria. Each farmer was also made to understand the nature and purpose of the research after which they chose whether to participate or not.

RESULTS AND DISCUSSION

Socio-demographic Characteristics

Table 1 presents the socio-demographic characteristics of the rural farmers. The mean age of the farmers in the sample is 46 years with about seven years of schooling. This average years of schooling of the household head is a little higher than the national average. This can be attributed to the fact that majority of the rural areas within which these farmers reside has schools that provides basic (primary and junior high classes) education only.[11] This is very important as access to education enhances growth rate and also help reduce social disparities.[12] The average household size is five adult equivalents (AE) and this is consistent with the national average.[13] The average per capita income of the farmers is 6562.50 naira (32.98 USD).

Table 1 Socio-Demographic Characteristics

Variables	Mean	Standard Deviation
Age of Farmers (years)	46.4	11.1
Years of schooling	6.6	6.1
Distance to farm (kilometers)	3.1	3.0
Household size (AE)	5.4	2.8
Farming experience (years)	23.5	10.9
Farm size(hectares)	4.0	13.9
Per capita consumption expenditure(₦/month)	13,922.1	26,265.0
Per capita Income (₦/month)	6,562.5	15, 443.5
Per Capita Off-farm income (₦/month)	4,302.0	10,232.4
Waiting time before receiving healthcare services (hours)	1.9	2.0
Frequency of Stress (days/week)	2.5	1.8
Frequency of physical exercise (days/week)	0.9	1.3
Man-days lost to illness (days/month)	2.7	2.9
Wage rate (₦/day)	1, 053.0	502.2
Health expenditures (₦/month)	3, 972.3	4, 419.2
Community Level Variables		
Distance to healthcare center (kilometer)	5.0	12.2
Distance to the nearest school (kilometer)	4.5	10.3
Distance to nearest potable water (kilometer)	6.9	11.3

Source: Field survey data, 2015, AE= Adult Equivalent N= 352 for household level variables and 36 for the community level variables: ₦199=1 US Dollar as at the time of data collection

Also, the farmer experience stress on an average of three (3) days in a typical week while they only engage in conscious physical exercise just once (1) a week. The average health expenditures is 3,972.30 naira (20 USD) per month and the average time spent before receiving healthcare is about two (2) hours. At the community level, the average distance to the nearest healthcare center is 5 kilometers (km), average distance to the nearest source of potable water is 7 kilometers (km) All these have significant implication for the health status and wellbeing of these farming households.

Distribution of Households according to the Social Determinants of Health

Table 2 shows the distribution of the social determinants in relation to their level of exposure to the risk factors and their access to those factors that can enhance their health status and wellbeing. Table 2 shows that 21 percent of the household heads currently consumes alcohol, 13.9 percent also currently smokes tobacco products while about 82 percent though do not smoke but has been exposed to smoke in the last 30 days. Also, it shows that only 46.6 percent have access to healthy diet. This implies that despite the fact that they are farmers, they experience food insecurity to a large extent. This can be attributed to the fact that farmers do not cultivate the variety of crops needed for healthy living. They often times result into buying these other supplements from the market. Therefore, those who do not have enough money will have to make do with what was cultivated. This is consistent with the findings of Oni et

al.[20]who maintained that rural farmers remain largely food insecure.

Table 2 further reveals that 62.8 percent have access to safe drinking water, 2.8 percent to improved solid waste management, 18.5 percent to improved toilet facilities and only 9.7 percent have access to improved cooking fuel. This depicts the depth of deprivation being experienced across most rural communities in north-central Nigeria. This is despite the various investments and commitments made by government at various levels to ensure rural people's access to basic social amenities. It is however evident from these findings that these efforts are yet to yield positive result in the lives of rural dwellers. This is because looking at the result of those with access to safe drinking water (62.8 percent) which appears to be a bit impressive, about 54.3 percent of farmers in the communities sampled still travel as far as three (3) kilometres to access this improved source of water supply. The result is however not too different from that of Tolulope et al.[21] that also concluded that sanitation (related to solid waste management and toilet facilities in this study) is a major household problem in Nigeria, especially among those in the rural areas.

Table 2 Social Determinants of Health

Social determinant Variables	Frequency	Percentages
Alcohol consumption	74	21.0
Smokes any Tobacco product	49	13.9
Exposed to tobacco smoke in the last 30 days	288	81.8
Stressed at least twice in a week	267	75.9
Physical exercise at least once a week	130	36.9
Access to Healthy diet (FCS >35)	164	46.6
Access to safe drinking water	221	62.8
Access to improved solid waste management	10	2.8
Access to improved toilet facilities	65	18.5
Access to improved cooking fuel	34	9.7
Access to electricity	186	52.8
Living condition (number of persons per room ≤3)	188	53.4
Distance to farm/off-farm occupation (≤3km)	240	68.1
Distance to the nearest healthcare center (<3km)	25	71.4
Distance to nearest source of potable water (<3km)	19	54.3
Waiting time for healthcare service (≤1 hour)	73	20.7
Health expenditures (<₦5000/month)	246	69.9

Source: Field Survey data, 2015; No of observation=352 Farmers within 36 communities; FCS= Food Consumption Score.

Also considering the distance to the nearest healthcare center, waiting time before receiving healthcare and the cost of healthcare, table 2 shows that 71.4 percent of the farmers travel as far as three (3) kilometers to access healthcare services. More so, 20.7 percent of them will have to wait for about one (1) hour before they are attended to while 69.9 percent spend less than 5,000 naira (equivalent to 25.13 USD) on healthcare monthly. This situation is not good enough considering the importance of good health in increasing productivity especially in the agricultural sector so as to be able to achieve sustainable development in the economy. This finding is not too different from that of Olajide[14] where it was concluded that the more expensive and farther healthcare services are, the less accessible it becomes to rural dwellers most especially.

Social Determinants of Health Status and Wellbeing of Rural Farmers

The social determinants of health status and wellbeing were examined using the multivariate multilevel model. The outcomes that were considered are the health status (measured using the Body Mass Index (BMI) as the indicator), multidimensional wellbeing and subjective wellbeing. The result as presented in table 3 shows that out of the seventeen (17) predictors that were considered, eight (8) were found to significantly determine the health status of farmers, nine (9) significantly determine their state of multidimensional wellbeing while five (5) of them also significantly determine their subjective wellbeing (level of satisfaction). Also the model was found to be 77.7 percent correct on the overall with a 2logpseudolikelihood of 11406.93

Also shown in Table 3 is result for the odd ratios. The odd ratio of the variables that were found to be significant for the health status of the farmer include the income which was linear associated with the likelihood for all the categories of health status being considered. Also as the number of years spent schooling increases, farmers are 0.69 times (69 percent) and 0.66 times (66 percent) less likely to be overweight/obese and underweight respectively. For the frequency of physical exercise, those with increased frequency of physical exercise are 0.30 times (30 percent) and 0.35 times (35 percent) less likely to be overweight / obese and underweight respectively compared to those within the normal health status (BMI =18.5kg/m^2 to 24.99kg/m^2) group. Also worthy of note is the result for alcohol intake and exposure to tobacco smoke where farmers who drink alcohol are 13.32 times (1332 percent) and 32.18 times (3218 percent) more likely to be overweight/obese and underweight respectively. While those who are exposed to tobacco smoke on the other hand are14.21 times (1421 percent) and 6.42 times (642 percent) more likely to be overweight/obese and underweight respectively compared to those within the normal health status (BMI =18.5kg/m^2 to 24.99kg/m^2) group. While those that smokes tobacco products are 19.66 times (1966 percent) more likely to be underweight compared to those within the normal health status (BMI =18.5kg/m^2 to 25kg/m^2) group. This result is in tandem with that of Subramanian et al.[9] who also concluded that level of education is an important determinant of an individual's health status. Also, the result for access to healthy diet is not different from that of Asenso-Okyere et al.[15] for a related study.

Table 3 Social Determinants of Health Status and Wellbeing of Rural Farmers

Variables	Health status		Multidimensional wellbeing		Subjective wellbeing	
	Overweight/ obese	Under weight	Medium	High	Medium	High
	Odd Ratio	Odd Ratio	Odd Ratio	Odd Ratio	Odd Ratio	Odd Ratio
Gender(Male=1)	1.29	0.15	2.89	6.87	1.42	2.06
Income (₦/month)	1.00	1.00	1.00	1.00	0.95	1.00
Years of schooling	0.69	0.66	1.06	1.15	1.02	1.03
Membership of cooperative society (Yes = 1)	2.08	15.64	1.24	1.61	0.76	0.98
Living condition (Number of people per room)	0.61	0.29	0.96	0.74	1.02	0.88
Stressed (Days/week)	0.98	0.79	0.97	1.02	1.09	1.00
Physical exercise (Days/week)	0.30	0.35	1.11	0.76	0.85	0.92
Access to healthy diet (Yes=1)	0.09	0.01	0.70	1.02	1.64	1.48
Alcohol consumption	13.32	32.18	0.66	0.32	0.77	0.43
Smokes Tobacco products (Yes=1)	0.62	19.66	0.86	0.43	0.99	1.10
Exposure to Tobacco Smoke	14.21	6.42	1.71	0.42	0.39	0.61
Access to electricity supply (Yes=1)	0.62	0.44	0.73	0.57	1.64	0.92
Access to improved toilet facilities(Yes=1)	0.91	1.03	7.17	54.28	1.07	1.04
Access to improved cooking fuel (Yes=1)	1.03	1.92	2.40	2.11	0.54	0.37
Distance to healthcare center (Kilometer)	0.99	1.01	1.00	1.04	1.05	1.07
Distance to safe water source (Kilometer)	0.99	0.97	0.97	0.91	0.96	0.92
Access to improved Solid Waste Management (Yes=1)	0.50	1.05	3.05	3.12	0.63	0.85
Constant	43.54	15.00	0.14	0.15	1.57	1.75
-2logpseudolikelihood	11406.73					
AIC	11414.97					
BIC	11434.35					

Source: Field Survey Data, 2015
Note:
i) The reference category is the Normal BMI(Health status), Low percentile= (Multidimensional and Subjective wellbeing)
ii) AIC= Akaike Information Criterion
iii) BIC =Bayesian Information Criterion

The odd ratio of the variables found to be significant for multidimensional wellbeing also on Table 3 shows that farmers with higher numbers of year spent schooling, have access to improved toilet and solid waste management facilities are 1.15 times (115 percent), 7.17 times (717 percent), 54.28 times (5428 percent), 3.05 times (305 percent) and 3.12 times (312 percent) more likely to fall within the medium and high percentile categories relative to the low percentile category respectively. Also, farmers that are exposed tobacco smoke, consumes alcohol and with healthcare centers far away from them are 0.42 times (42 percent), 0.32 times (32 percent) and 0.92 times (92 percent) less likely to fall within the high percentile category relative to the low percentile category respectively. This is because farmers with limited number of years spent schooling will not have the required qualification to engage in off-farm activities especially during the off-seasons. These off-farm activities often serve as complements that help in bringing in additional income thereby improving their welfare. These findings are not different from those of Dedman et al.[16] for access to improved toilet facilities, Adeyemo et al.[5]for the level of education and Subramanian et al.[9] for income of household heads. Also, such households are deprived of the needed resources to help them improve their wellbeing. This is because the little income they have is likely to be diverted to the consumption of alcohol thereby living them with only a little to improve their access to the basic necessities of life. This was further substantiated by the findings of Bourne[17] and Adebowale et al.[18]

Also, the odd ratio of the variables found to be significant for subjective wellbeing also on Table 3 shows farmers that consumes alcohol, exposed to tobacco smoke and those with longer distance to source of portable are 0.43 times (43 percent), 0.39 times (39 percent), 0.96 (96 percent) and 0.92 (92 percent) less likely to fall within the medium and high percentile categories relative to the low percentile category respectively. This may be attributed to the fact that longer distances to the farm and source of potable water supply constitute a form of stress that reduces the level of satisfaction of these farmers with their access to basic amenities such as good water supply and access roads even to their farm places. Exposure to tobacco smoke and access to improved cooking fuel (use of kerosene stove) also poses a lot of dangers (fire related accidents) to the farmers. More so, in some cases where there are prolonged exposure tobacco smoke, it often result in several forms of respiratory tract infections which is not good for the farmers health. Furthermore, those with shorter distances to healthcare centers tend to be less satisfied as many of the healthcare centers within their rural communities lack the basic medical facilities. What is available in most of the healthcare centers are just first-aid services before the onward transfer to well-equipped centers around them which in most cases is about three (3) kilometers. These results are consistent with those of Deeming19 for gender and Koushik et al.1 for health infrastructures and wellbeing.

The result on Table 4 shows that healthy farmers are likely to be farmers with higher multidimensional and subjective wellbeing. So also, healthy communities are likely to be communities with higher levels of multidimensional and subjective wellbeing with the co-variation within communities being stronger for each category. It can also be seen from the table that communities who are within the high percentile have a weaker covariance with their population being underweight than those who are at the medium percentile. This might be as a result of the fact that communities without basic infrastructure (deprived communities) that can enhance their health status are likely to have a larger percentage of their population suffering from poor health condition. These findings are in consonance with that of Subramanian et al.[9] for a similar study in the United States of Africa (USA).

Table 4 Random Effects the Social Determinants of Health Status and Wellbeing

Level	Health Status/MWB	Health Status/SWB
Communities	0.480	1.494
Households within Communities	0.384	0.001

Source: Field Survey Data, 2015: MWB = Multidimensional Wellbeing, SWB = Subjective Wellbeing

Table 5 Dimensions and Indicators of Multidimensional Wellbeing

S/no	Dimensions	Indicators	Weight
1.	Economic	Per capita income (PCI)	3/26
		Monthly per capita consumption expenditures (MPCE)	
		Value of Household assets	
2.	Education and Health	Educational level	2/26
		Distance to nearest school (Kilometre)	
3	Health	Health as a limiting factor	2/26
		Waiting time before receiving healthcare (hours)	
4.	Psychological	Level of satisfaction with economic resources	5/26
		Level of satisfaction with personal and social relationships	
		Level of satisfaction with living condition	
		Level of satisfaction with your health status	
		Level of satisfaction with local/neighborhood environment	
5.	Social interactions	Frequency of contact with friends and relatives	3/26
		Level of participation in communal/political activities	
		Access to social support services	
6.	Physical Environment	House ownership	11/26
		Type of house dwelling	
		Roof material	
		Wall material	
		Floor material	
		Presence of tarred road within the community	
		Source of electricity	
		Source of drinking water	
		Method of waste disposal	
		Types of toilet facilities	
		Source of cooking fuel	

CONCLUSIONAND RECOMMENDATION

This article examined the social determinants of health status and wellbeing of rural-farmers in north-central Nigeria using the Multivariate Multilevel Approach. The major findings showed that the frequency of physical exercise, alcohol consumption and smoking habit were some of the factors significantly influencing the health status and wellbeing of rural farmers in the study area. Others include exposure to tobacco smoke, access to improved toilet facilities, proper solid waste management and distance to portable water. It was also discovered that community level co-variation between health status and wellbeing was stronger than at the individual level. It was therefore recommended that efforts should be made by government to provide rural areas with basic portable water sources. Also, the rural dweller should be educated on the essentials of good basic sanitation and hygiene. This will help reduce diseases and deaths from water-related infections and poor hygiene. Specific laws should be put in place to stop smoking of tobacco products in public places. All these will reduce the incidence of diseases; ensure a healthier workforce that can work towards the achievement of the sustainable development goals.

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