Assessing Factors Associated with Catastrophic Healthcare Expenditure in Côte d'Ivoire: Evidence from the Household Living Standard Survey 2015

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To cite this article:
Akissi Regine Attia-Konan, Agbaya Serge Stephane Oga, Kouame Koffi, Jerome Kouame, Amadou Toure, Luc Kouadio. Assessing Factors Associated with Catastrophic Healthcare Expenditure in Côte d'Ivoire: Evidence from the Household Living Standard Survey 2015. *International Journal of Health Economics and Policy*. Vol. 4, No. 4, 2019, pp. 143-150. doi: 10.11648/j.hep.20190404.14

Abstract: Catastrophic healthcare expenditure (CHE) occurs in all countries and is responsible for inequalities in access to health care, particularly in low- and middle-income countries. The objective of this work is to analyse the determinants of CHEs in households living in Côte d'Ivoire. The data for the study are from the national household living standards survey conducted from January 23 to March 25, 2015 by the National Statistics Institute of Côte d'Ivoire (Institut National de la Statistique de Côte d'Ivoire). A one-way analysis and logistic regression were conducted to measure the association between CHEs and the socio-demographic, economic and health characteristics of households. The sample consisted of 12,899 households. Nearly 4% of households had experienced CHEs after completing OOPs. CHEs were more frequent in households including people over 65 years of age (OR: 4.75; 95% CI: 1.66-13.58), with chronic disease (OR: 2.10; 95% CI: 1.43-3.08), with more comfortable living conditions. Households without health insurance experienced fewer CHEs (OR: 0.29; 95% CI: 0.09-0.85) with large households including people over 65 years of age (OR: 0.60 95% CI: 0.40-0.91). This work highlighted socio-demographic and health determinants of CHEs. The reduction of CHEs involves considering social and individual factors.

Keywords: Out of Pocket, Direct Payments, Healthcare Expenditure, Catastrophic Health Expenditure, Côte d'Ivoire

1. Introduction

Households may experience financial hardship after using healthcare services called catastrophic healthcare expenditures (CHE) that may lead to impoverishment [1-4]. Health expenditure is described as catastrophic when direct payments (OOP) exceed a threshold where individuals must give up the consumption of other essential goods and services [3, 5, 6]. These CHE occur in all countries and regardless of the socio-economic status of individuals, and are increasing. The global incidence of CHE at the 10% threshold of household consumption increased from 9.7% in 2000 to 11.4% in 2005, and 11.7% in 2010. By 2017, nearly 808 million people had experimented CHE after using health services [7]. Africa has the highest population growth rate exposed to this type of expenditure, with an average growth rate of more than 5.9% a year. This breakdown of CHE is explained by the fact that households are the main source of health funding in these countries and OOPs represent the majority share [3].

These OOPs represent a financial barrier to accessibility to health care [8, 9]. As a result, these financial barriers often lead to the most disadvantaged populations giving up care or postponing the use of healthcare services [10, 11]. Households experimenting CHEs sometimes become poorer and find themselves below a poverty line estimated at less than US$2 a day per person according to the World Bank or a relative poverty line according to the WHO [3].

In Côte d'Ivoire, the use of healthcare services is low, with less than one contact per inhabitant each year [12]. Households are the main source of funding for care. In 2013, OOPs accounted for 51% of total healthcare expenditure [13]. In 2015, the share of healthcare expenditure represented only 5.86% of the GDP [13], below the global average (11.5%) and the Abuja target set in 2001 (15%). However, the higher the amount of OOPs, the greater the risk of experimenting with CHE [14]. In general, countries with a prepayment or social protection system offer better access to care and are less burdened by CHE [5]. However, these protection mechanisms are largely lacking in Côte d'Ivoire. In fact, less than 10% of the population has private insurance. The law on universal health coverage was passed in 2013 but is still not fully implemented. There is an exemption from fees for children aged 0 to 5 years and for the care of pregnancy and childbirth since 2012. However, there are shortcomings in the implementation of this policy, particularly in the availability of medicines [15], as has been observed in most countries where these exemption policies have been put in place [16]. Inequalities in access to health care persist, especially for the most disadvantaged. Protection against financial risk is a fundamental objective of Universal Health Coverage (UHC), a global challenge to achieving sustainable development goals [3]. The reduction of CHE is a key indicator for measuring the achievement of this goal [3].

The post-use financial risk assessment of health facilities in Côte d'Ivoire has not been sufficiently documented after the implementation of these exemption policies. No published studies have analyzed the frequency and distribution of CHEs in households in Côte d'Ivoire. However, the factors associated with CHEs are diverse and multidimensional, as several studies on the determinants of CHEs have highlighted other non-financial parameters such as rural residence, the existence of chronic diseases and elderly people in the household or the absence of health insurance [4, 17, 18]. The study of CHE determinants could provide relevant information for the implementation of policies to address inequalities of access to healthcare. The objective of this study was to identify the factors associated with CHE in Côte d'Ivoire.

2. Methods

2.1. Study Setting

Côte d'Ivoire is a West Africa country located in the Gulf of Guinea at latitude 7.54 and longitude -5.5471 with a tropical climate. It was ranked in 2016 according to the World Bank ranking in the lower-middle-income countries with GDP of 86.83 USD per inhabitant. It has an estimated population in 2014 of 22,671,331 of which 19.4% residing in the economic capital Abidjan in the south of the country, 30.9% residing in the rest of the urban area and 49.7% in rural area (RGPH, 2014). The proportion of people living below the poverty line (476,12USD per year) was estimated at 46.3% in 2015; 56.8% in rural areas and 35.9% in urban areas. The Gini index was estimated at 0.405 in 2015 (ENV, 2015). The health system is organized in two-sided pyramidal form, one administrative and the other service provider. This service provider is divided into three levels in the public sector: 1,910 first contact health centers and 68 district reference hospitals at the first level, 17 regional hospitals and 2 specialized hospital centers at the second level and 4 university teaching hospitals and 5 national specialized institutes at the third level. The private sector had 2,036 establishments in 2011. The practice and organization of traditional medicine and pharmacopoeia are governed by Law No. 2015-536 of 20 July 2015 and Decree No. 2016-24 of 27 January 2016 on Code of Ethics of Traditional Medicine and Pharmacopoeia Practitioners. Traditional medicine has more than 8,500 practitioners. The total health expenditure in 2015 representing 5.86% of GDP, and households contributed 32.55% [13]. The proportion of the population subscribing to health insurance policy was below 10% in 2014.

2.2. Data Sources

This analysis is based on the 2015 National survey on standard of living of households ENV 2015 (ENV 2015) conducted from 23 January to 25 March 2015 by the National Institute of Statistics of Côte d'Ivoire (NIS). The ENV2015 collects detailed data on socio-demographic characteristics of households and individuals, household expenditures, health expenditures and use of healthcare over a 4 week recall period. Stratified random sampling at 2 degrees was performed. Stratified 2-degree random sampling was conducted using the 2014 General Population and Housing Census results as a sampling frame. The Côte d'Ivoire ENV2015 has a sample of 12,899 households and 47,635 individuals drawn from the 1075 clusters comprised of 44.8% urban and 55.2% rural clusters. The national territory was divided into 33 zones made up of 31 regions and two autonomous districts of Abidjan and Yamoussoukro (political capital). In the 1st degree, counting Zone (CZ) corresponding to enumeration districts were randomly selected with proportional allocation. Outside the city of Abidjan, at least 23CZ were drawn in each zone. In Abidjan, all 99 CZ were included in the sampling. In the 2nd degree, 12 households were systematically drawn at each counting zone. The minimum size counted per zone was 192 households (α=0.05, margin of error=10% and p=50%). In each zone, between 276 and 1,188 households were randomly selected taking into consideration the demographic weight of the districts. The sample was constructed to allow for representativeness at both national and county levels as well as urban and rural areas. All analyses were carried out using the software package STATA 12.0.

2.3. Variables

The CHE incidence measure, dependent variable,

estimates the fraction of households that incur CHE. We used the method proposed by the World Health Organization (WHO).

The incidence of CHE was estimated from a percentage of OOP payments in relation with household consumption expenditure which exceeds a certain threshold [19]. OOP health payments refer to the payments made by household at the point of health service [6]. There is no single accepted threshold for estimating CHE. In this study, we considered households incurred CHE if their total out of pocket health cost exceeded 40% of their non-food expenditure (referred to capacity to pay) [6, 20]. Monthly expenditure data were extracted to estimate CHE. We used the capacity to pay (CTP) method recommended by OMS [6] because it is a good estimate of the measure of financial protection [5]. To obtain OOP payment we subtracted costs that were reimbursed by health insurance from the total reported healthcare cost. The share of OOP health expenditure in the household's capacity to pay is defined as follow:

$$OOPCTP = \frac{OOP}{CTP} \qquad (1)$$

The denominator CTP is calculated as total household expenditures minus subsistence expenditures, ie, the expenditures necessary for basic needs, the non-subsistence effective income (SE) of household [6]. Where food expenditures are regarded as basic needs, then the average spending on food per person by households (food spending between the 45th and 55th percentiles) is used as the standard amount for subsistence expenditures. However, when food expenditures are less than subsistence expenditures, the CTP is defined as total household expenditures (Exp) minus food expenditures (F).

$$If\ SE > F, CTP = exp - F \qquad (2)$$

$$If\ SE \leq F, CTP = exp - SE \qquad (3)$$

We constructed a variable of CHE as a dichotomous variable with value "1" if OOPCTP exceed the threshold and value "0" if otherwise.

Several characteristics of the household's head and the household were included in the analysis as potential confounders: age, gender, marital status, level of education health insurance of the household head and his perception of one's social class in five ways. We included too households size, presence (none, at least 1) of children under 5 years of age, adults aged 65 years or older and chronic disease in the household. We classified households into settlement (urban, rural, Abidjan the economic capital), wealth quintiles by using per capita consumption expenditure and into wealth index of commodities. This index was constructed by adding the availability of portable drinking water system, adequate sanitary installation, electricity as a source of lighting, and gas as a source of energy. Adequate sanitary installation obey

the following three conditions: garbage disposal by removal by refuse disposal services with or without pre-collection, disposal of domestic wastewater in septic tanks or sewers and evacuation of sewage through water closet called water system. The comfortability variable was measured and coded according to a 5-model score (0, 1, 2, 3 and 4) corresponding to the number of modalities possessed by the individuals. These independent variables are in line with the determinants of CHE described in the background paper of the Bulletin of the WHO [21].

2.4. Statistical Analysis

We first calculated the incidence of CHE and present the distribution of CHE by the sociodemographics and health characteristics. A univariate analysis identified the associations between each explanatory variable and the occurrence of CHE from Pearson's Chi2 test. The age variable (in years) was transformed into a qualitative variable with 3 classes: [15 to 34], [35 to 64], 65 and over.

Logistic regression analyses were carried out to identify the relation between sociodemographic health characteristics and occurrence of CHE occurrence by the top-down step method from the most complete model. Then the model with the lowest AIC (Akaike information criterion) was selected. The interactions were then added to the final model. The quality of the model was measured by Wald's test. The adequacy of the model was measured by Hosmer Lemeshow's test. The Odds ratios were calculated and interpreted according to the significance of the p-value and the 95% confidence interval (CI$_{95\%}$). The significance of the statistical tests was set at 0.05. The variables for which p ≤ 20% were used in the final model were retained.

3. Results

3.1. Sociodemographics and Health Characteristics of Household

Out of 12,899 households, 4402 carried out OOPs, i.e. nearly 3 out of 10 households (34.13%). The socio-demographic characteristics of households that recorded health expenditures are summarized in Table 1. The heads of households were mainly male (sex ratio=4.05), the average age in a year was estimated at 42.44±14.53. Near by 64.16 of them were not educated and 77.15% lived in couples. Almost half of the households resided in rural areas (53.02%) and the average household size was estimated at 4.21±2.69. About 4 out of 10 households did not have any wealth commodities (35.66%). Only 2.32% of households'head were insured, while 16.31% of households had a member with a chronic illness, 12.29% included persons over 65 years of age and 54.16% had children under 5 years of age.

Table 1. *Distribution of CHE by socio-demographic and economic characteristics (n=4402).*

Variables		Headcount	CHE		p
			n	%	
Household head characteristics					
Age in year	15 - 34	1,481	56	3.8	
	35 - 64	2,514	92	3.7	0.004*
	≥ 65	407	56	7.1	
Gender	Male	3,531	139	3.9	
	Female	872	38	4.4	0.571
Level of education	Not educated	2,825	116	5.0	
	Primary	816	32	3.9	
	Secondary	971	29	3.0	<0.001*
	Superior	238	0	0	
Marital status	Married	3,397	133	3.9	
	Divorced or widowed	443	25	5.6	0.156
	Single	563	19	3.4	
Geographic location	Rural	2,335	122	5.2	
	Urban	1,601	46	2.9	<0.001*
	Abidjan	467	9	1.9	
Quintile of household's consumption expenditure	1	841	44	5.2	
	2	1,031	33	3.2	
	3	904	42	4.6	0.110
	4	856	34	4.0	
	5	771	24	3.1	
Insurance cover	Oui	211	4	3.9	
	Non	4,192	173	4.0	0.959
Convenience score	0	1,570	44	5.2	
	1	1,349	33	3.2	
	2	943	42	4.6	<0.001*
	3	512	34	4.0	
	4	29	24	3.1	
Perception of social class	Very poor	378	39	10.3	
	Poor	2,376	106	4.5	
	Middle	1,493	27	1.8	<0.001*
	Rich	69	4	5.8	
	Very rich	86	1	1.2	
Size of household	1	588	27	4.6	
	2-3	1,397	64	4.6	
	4-5	1,321	59	4.5	0.046*
	6-7	687	19	2.8	
	>7	410	8	2.0	
Households with persons aged 65 and over	Yes	541	34	6.3	
	No	3,862	143	3.7	0.004*
Households with chronic illness	Yes	718	43	6.0	
	No	3,684	134	3.6	0.003*
Households with children under 5 years of age	Yes	2,384	89	3.7	
	No	2,019	88	4.4	0.291

3.2. Distribution of CHE

Of the 4402 households that made direct payments, 4.02% of households experienced CHE (177). The distribution of CHE at 40% threshold level is shown in Table 1. The univariate analysis revealed an association between CHE and the age of the head of household (p=0.004) his level of education (p<0.001) geographical location (p<0.001), commodities (p<0.001) and perception of one's social class (p<0.001). Household characteristics were also associated, including the presence of an elderly person in the household (p=0.004) or a chronic disease in the household (p=0.003), the size of the household (0.046) and the commodities (p<0.001).

The logistic regression revaled factors increasing or reducing CHE (Table 2). Presence in the household of a person over 65 years of age (ORs=4.75; CI$_{95\%}$: 1.66 − 13.58) and the existence of chronic disease (ORs=2.70; CI$_{95\%}$: 1.43 − 3.08). Households with more commodities with the exception of score 4 experienced fewer CHE. The head of the household's lack of affiliation with insurance ((ORs=0.27; CI$_{95\%}$: 0.09 − 0.85) and a perception of his or her higher social class also reduced the frequency of CHE. Household income approximated by consumption quintiles, gender and education level of the head of household were not associated with CHE.

Table 2. *Relationship between sociodemographic economics health factors and CHE: logistic regression (n=4112).*

Variables	OR	CI 95%
Level of education		
Reference: Secondary		
Not educated	1.1	0.70 – 1.72
Primary	1.03	0.61 – 1.78

Variables	OR	CI 95%
Superior	1.0	-
Size of household		
Reference:>7		
1	1.78	0.75 – 4.24
2 à 3	1.81	0.83 – 3.91
4 à 5	1.90	0.88 – 4.07
6 à 7	1.33	0.57 – 3.10
Convenience score		
Reference: Score 0		
Score 1	0.46*	0.31 – 0.67
Score 2	0.49*	0.30 – 0.74
Score 3	0.12*	0.04 – 0.40
Score 4	0.70	0.08 – 6.04
Insurance cover		
Reference: Yes		
No	0.27*	0.09 – 0.85
Perception of social class		
Reference: Very poor		
Very rich	0.13*	0.02 – 0.94
Rich	0.54	0.18 – 1.64
Middle	0.25*	0.15 – 0.42
Poor	0.49*	0.33 – 0.72
Households with persons aged 65 and over		
Reference: No		
Yes	4.75*	1.66 – 13.58
Households with chronic illness		
Reference: Non Oui	2,10*	1.43 – 3.08
Size of household* Households with persons aged 65 and over	0.60*	0.40 – 0.91
Constant	0.07*	0.03 – 0.17

There was an interaction between household size and the presence in the household of a person over 65 years of age (ORs=0.60 CI$_{95\%}$: 0.40 – 0.91). Large households with persons over 65 years of age experienced less CHE than household with fewer members (Table 3).

Table 3. *Link between CHE and households with persons over 65 years of age by household size (n=4402).*

Households with persons aged 65	Size of household	Headcount	CHE n (%)	p
	1	536	21 (3.9)	
	2 à 3	1,239	46 (3.7)	
No	4 à 5	1,172	52 (4.4)	0.248
	6 à 7	603	17 (2.8)	
	>7	311	7 (2.3)	
	1	51	6 (11.8)	
	2 à 3	158	18 (11.4)	
Yes	4 à 5	149	7 (4.7)	0.002*
	6 à 7	84	2 (2.3)	
	>7	99	1 (1.0)	

4. Discussion

Our results show that nearly 1% of households had experienced CHE in the overall sample and 4% of those who had done OOPs. These frequencies are well below those of other low- and middle-income countries [7, 20-23]. A low incidence of catastrophic payments could reflect the fact that people receive the care they need and are protected from direct payments. However, a low incidence of catastrophic payments could also mean that people do not get (and do not pay for) the care they need.

Methodological differences in the measurement of CHE may limit direct comparisons between studies [5]. However, there is no reference method. In our study, we have adopted the WHO threshold of 40% of households' ability to pay [6]. This threshold has been controversial. Indeed, the remaining 60% of non-food expenditure has different meanings for the richest and poorest quintile households. The choice of threshold level is based on the idea that households will find themselves with a certain balance of income or ability to pay what it takes to spend on other needs [19]. Indeed, it is necessary to take into account the value judgment that differs from one group to another [24], in particular the appreciation of the marginal utility of a penny spent in each group. However, the WHO method based on living expenses seems more sensitive to measuring the occurrence of CHE [5]. On the other hand, the budget share method used in the MDGs overestimates the financial difficulties of rich households and underestimates the difficulties faced by poor households.

The low percentage of CHE observed in our study could be related to the high rate of waiver of care due to lower OOPs in Côte d'Ivoire (about 32% of health expenditures)[13]. Renunciation of care is also a measure of non-income poverty [25]. Indeed, the measurement of CHE only takes into account those who have actually used care.

With regard to the presence of chronic disease within households, those with an adult over 65 years of age made households more vulnerable to CHE according to the literature [21, 22, 26-28]. CHE decreased in households with more conveniences of life, when the head of household had a fairly good perception of his or her wealth. These two characteristics can be considered as proxy for socio-economic status. Thus, a better status would contribute to reducing CHE [14, 22]. In our study, the presence of a person over 65 years of age in the household reduced CHE in large households. This effect was not observed in the absence of people over 65 years of age. The large size of households was a protective factor for CHE unlike what is usually observed [21, 29]. This suggests the complexity of care consumption choices in households. The existence of socio-demographic inequalities in the distribution of CHE is alarming since our estimates only reflect households that have been able to reach and actually use health services. However, waiver of care was important in Côte d'Ivoire (about one-third of individuals who reported a morbid condition) and was more prevalent among people over 65 years of age [30]. This measure of financial protection tends to underestimate the burden of health expenditures on household finances and well-being [25]. This result reinforces the need for health services utilization to be taken into account when measuring the consequences of health expenditures. Moreover, the frequency of CHE is expected to increase in Côte d'Ivoire in the absence of a financial protection system, given that the frequency of chronic diseases is increasing as well as the population over 65 years of age.

Our results on the influence of health insurance on CHE feed into the mixed information in the literature on this subject. While some studies indicate that health insurance reduces the risk of experiencing CHE [14, 31], others do not show the protective effects [22, 32]. Insured persons were more exposed to CHE, which seems to reflect the complexity of individuals' consumption choices and dysfunctions in the execution of insurance contracts. Indeed, delays in the payment of benefits by insurance companies sometimes lead healthcare providers to suspend their benefits, so insured persons do not benefit from financial protection during this time.

As opposed to the literature, the area of residence was not a predictor of CHE [28, 33]. Our study may have some limitations because the data we used were collected for a more general assessment of household living standards, which goes beyond health issues. However, most studies of this type use the same type of data with information on household expenditures. The sample analyzed in this study was not superimposed on the results of the 2014 general population and housing census, where Abidjan represented 22.7% of households and 19.4% of individuals, with a sex ratio of 0.98. The urban population excluding Abidjan represented 30.9% of the population and the rural population 49.7%. However, differences in the distribution of socio-economic variables justified the search for predictors of CHE in these different areas of residence. The method of collecting expenditure data could introduce a memorization bias. There may be an underestimation of the amounts reported. The more the expenses are with smaller amounts, the more challenging memorization is. However, the possible information bias introduced by the different recall periods (3 months) was minimized by the significant nature of the disease event measured. In addition, most studies of this type use the same recall period or a longer 12-month period [34]. The same periods used allow a comparison of the parameters studied between studies.

5. Conclusion

This work has highlighted predictors of CHE that could serve as a lever for actions to reduce social inequalities in health. Factors influencing the increase in CHE are ageing, socio-economic status (the rich), and the existence of a chronic disease and a person over 65 years of age in the household. This work also shows the need to refine the understanding of the social factors at the collective and individual level that determine care consumption behaviors as financial barriers and geographical access issues are overcome. Social protection of vulnerable groups within the health system must be implemented through broader social policies aimed at improving the economic situation of the poor as well as living conditions such as access to welfare commodities (drinking water, sanitation, electricity and domestic gas). The negative impact of chronic diseases in terms of increased household health expenditure has been demonstrated. Public health funding mechanisms should focus on prevention.

Abbreviations

CHE: Catastrophic Health expenditure; OOP: out of pocket; NIS: National Institute of Statistics of Cote d'Ivoire; ENV15: household living standard survey 2015.

Authors' Contributions

ARAK, KLK and ASSO conceived the study design, data analysis and interpretation.

AT contributed to conception, design and acquisition of data. ARAK, KK and JK conducted the data analysis. ARAK and ASSO drafted and critically revised the early version of the manuscript. All authors read and approved the final manuscript.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgements

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