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Modelling of the Therapeutic Itinerary of Households in the City of Bukavu

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Abstract: ***Background: Concerns about the onset of disease in family members usually create a demand for care and initiate action to seek treatment. Decisions are then made and treatment options are explored. This study aims to identify the therapeutic options used by the inhabitants of Bukavu, analyze the therapeutic itineraries of households, identify the determinants of the use of self-medication, modern medicine, traditional medicine and therapeutic prayer, and analyze the expenditures related to the cost of health care. Methods: A cross-sectional study was conducted in June 2014 in the Bukavu health district, with data collected through a questionnaire. The sample size was 250 households with at least one member who had been ill in the 2 weeks prior to the survey. Results: Self-medication was the most widely used treatment option (44%), followed respectively by modern medicine (36.4%), traditional medicine (14.4%) and prayer (5.2%). Traditional medicine as an initial treatment option accounted for less than 15% of households. We also note that 154 out of 250 households (61.6%) used more than one treatment option; the households described made up to 9 different paths from the first to their second treatment option. In 65.6% of cases (101/154), the shift from the first to the second treatment option is consistent with a care-seeking behavior considered 'rational' (i.e. starting from self-medication, progressing to the use of outpatient care offered by a health professional or a primary health care facility, and subsequently to the use of a hospital). The payment system for care costs is regressive, with poorer patients paying the same amounts as richer ones. Conclusions: This study highlights the importance of self-medication as the first and most used treatment option by households in Bukavu, regardless of the nature of the health problem. It is important to rationalize this practice. Although modern medicine is not the initial treatment option for households, it is the last resort for many patients. Household treatment pathways in this urban environment are complex; health managers should try to deal with this reality. Finally, our study indicates that poor patients face the same level of health care cost payments as the rich, hence the need for a better balance in health care financing mechanisms.***

Keywords: Therapeutic itinerary, self-medication, modern medicine, traditional medicine and therapeutic prayer

1. Introduction

Health is a fundamental right. This explains the constant intervention and involvement of public authorities in the health field. Concerns about the onset of disease in family members usually create a demand for care and initiate action to seek treatment. Decisions are then made and treatment options are explored. There is a vast literature on the nature and determinants of these treatment options, particularly in developing countries. Treatment options are categorized in the use of private versus private for-profit versus private not-for-profit, formal versus non-formal, modern versus traditional, and first-line versus second-line health care services [1-6]. The choice of treatment options is determined by demographics, socio-economic concerns, health problems, and the characteristics of different health services [7].

Today in the world, the use of alternative medicine cannot be ignored when it comes to health care pathways. In France, whether for the organization of the health care system or for daily clinical practice. Several studies attest to the frequent use of alternative medicine but also to the fact that a relatively small proportion of people talk to their doctor(s) about it. According to the WHO, 75% of French people have used complementary and alternative medicine (CAM) at least once in their lives [8]. A study carried out in a hospital in Reims showed that one out of five patients suffering from chronic inflammatory bowel disease (IBD) said they had used CAM, 75% had never spoken to their doctor about it. A study carried out at the Senlis hospital in the Oise region concluded that a third of the oncology patients questioned in this study were using CAM. Most of them were already using these methods before the cancer was diagnosed. Half did not inform their oncologist [9].

In the USA, a similar picture emerges. A study in paediatrics showed that up to 55% of children without a chronic disease had consulted CAM at least once [10]. An American publication by Dr. N. Vapiwala concluded that half of cancer patients used CAM in addition to their conventional treatment and 75% did not inform their physician [9]. However, the figures vary widely in different countries around the world depending on the population studied, the survey method used and the definition of CAM. [11]

In Africa, the health sector in most countries has been experiencing an increasing lack of resources over the last decade. Underfunding of health services has become one of the most worrying issues for all African governments.

The definition of a good health policy, an objective of any nation concerned with the development of its human resources, requires a mastery of the factors acting on the components of human resources. Several studies have been

published on the health-seeking behaviour of individuals in rural sub-Saharan African contexts; very few are devoted to the urban environment. Those that do exist were published before 2000 [1, 12, 13], hence the need for the most recent data. This lack of information limits our understanding of patients' choice of care in urban settings, namely one in which the health care system is characterised, among other things, by a diversity of supply [2, 14, 15] and by a course of epidemiological transition with an increase in non-communicable diseases.

The Democratic Republic of Congo is currently undergoing a health system reform. Given the contextual differences between rural and urban settings, the city of Lubumbashi was chosen to pilot the reform in urban Congo. The epidemiological profile of the DR Congo is characterised by endemic diseases such as malaria, typhoid fever, tuberculosis and leprosy. Although cases of measles, Ebola haemorrhagic fever, whooping cough and cholera continue to occur, non-communicable diseases such as diabetes, hypertension and sickle cell anaemia are on the rise [16].

In the hospitals of South Kivu in general and Bukavu in particular, a reality encountered daily, most patients make a first choice of treatment before arriving at a health facility. 51.7% of children hospitalised in the paediatric ward from October 2011 to July 2012 at Panzi Hospital, 500 out of 967 children had a severed uvula and with a mortality rate of 20% [17]. Despite the magnitude of this public health problem in Bukavu, and despite the diversity of the health care delivery system, there is low utilization of curative care in formal health services which may be explained by financial constraints that lead patients to opt for recourse to informal care providers.

Under these conditions, individuals, considered to be rational enough to make choices between the various types of health services, according to demographic, anthropological and cultural, economic and subjective criteria, find themselves in a situation of medical pluralism. Research into the factors that motivate the use of each type of care is a priority that could help, on the one hand, to fight effectively against dangerous practices such as self-medication, on the other hand, to reduce the factors that lead to the disaffection of health centres and, finally, to promote the integration, safety, effectiveness and quality of traditional medicine, which is widely used but has long been stigmatised. What are the factors that determine the use of one form of medical practice rather than another? This is the central issue of the theme we are addressing in this paper. Starting from this obvious and effective problem, it is important to emphasise that this work aims to gain a better understanding of it while specifying its multiple determinants, as well as to identify the therapeutic options used by the inhabitants of Bukavu, to analyse the therapeutic itineraries of individuals, and to analyse the expenditure linked to the cost of health care.

In spite of a less abundant theory on therapeutic itineraries in the DRC, while there is therapeutic pluralism both in the city and in rural areas, we will try to cross the views, to generate ideas in order to help the health authorities to set evidence-based priorities in terms of reorganising the provision of health care in our countries, thanks to the contribution of authors from various horizons. We found this to be an inherent motive for conducting this cross-sectional study that focuses on the factors favouring the therapeutic itinerary of households in the Bukavu health district. Finally, this study is more comprehensive than previous ones limited to studying the formal health care sector [15, 18].

2. Methodological Approach

2.1. Type of Study

A cross-sectional analytical study was conducted through a rapid household survey in June 2014. We conducted semi-structured interviews with heads of households or any other household member able to respond to our survey questionnaire. To carry out our study, the statistical unit will be the households in the city of Bukavu on which the survey will be carried out.

2.2. Place of Study

The study was conducted in the Bukavu health district, in the eastern part of DR Congo. The city of Bukavu has a surface area of 60 km2 and extends over the city and part of the territory of Kabare. At the politico-administrative level, the Bukavu health district is limited as follows:

- In the North: Lake Kivu;
- In the East: the Rwandan Republic;
- In the South: the territory of Walungu and
- To the south-east and west: the territory of Kabare.

It has a humid, mountainous climate with an average temperature of 15°C in the rainy season and 25°C in the dry season.

The relief is mountainous with an altitude of 1500m at Lake Kivu and 2190m on the summit of Bangwe with differences in altitude noted between these two altitudes. The latitude is between 2° 3° East to West and 28° 50' North to South. With a wooded savannah vegetation, its hydrography is made up of Lake Kivu, the Ruzizi River and some small rivers [50].

2.3. Study population

The total population is 811,852 inhabitants; spread over three health zones comprising the Bukavu health district. It should also be noted that this health district also includes three communes, Bagira, Ibanda and Kadutu, where the predominant economic activities are: trade, processing industries (Bralima, Pharmakina, etc.), artisanal fishing, livestock breeding and agriculture in the periphery. The sources of income are the salaries and bonuses of civil servants, while trade revenues remain precarious, due to the political and economic situation of the country.

Given the growing population of the Bukavu health district, a large number of health facilities are in operation in the field, including the private sector. These health facilities are divided into health areas, eight of which are in Bagira, twelve in Ibanda and eleven in Kadutu, each health area having a general referral hospital.

2.4. Inclusion criteria

The inclusion criteria for this study were: a household in which someone had been ill in the two weeks prior to the survey and in which there was a person able to answer the questions. Houses were revisited once (the next day) when there was no one at home at the time of the survey visit.

When the household was missing someone who had been ill or who was able to respond, the interviewer was instructed to move to the first house on the right opposite the previous one, and to continue this route until he or she found a household that had met the inclusion criteria. If a person had developed more than one episode of illness in the two weeks prior to the survey, the focus was on the most recent one [11]. If more than one person was ill in a household, one member of the household was randomly selected.

The selection of households in the health areas was done according to the following procedure: in each health area, the enumerators (3 in total) target a landmark (a church, a school, etc.) in order to determine a direction to follow in a random way i.e. by throwing the pen away from his head and once the pen is on the ground, the enumerators look at the direction of the pen tip and this is the direction they were taking for the data collection. The interviewers take this direction and count the number of houses (x) on either side in this direction to the end of the health area. A number between 1 and x is drawn, determining the first house to be surveyed. The next houses to be surveyed are chosen in a sequence along the right-hand side from the exit of the first house.

2.5. Sampling

2.5.1. Sampling method

We used the probability sampling method of stratified random sampling. This consists of dividing the population into homogeneous groups called strata, and then selecting independent samples from each stratum using the desired sampling method. In our case, the strata are the Health Zones of the city of Bukavu, so we opted for simple random sampling for the selection of the three Health Areas in each stratum, given our limited financial resources, and finally for the selection of households in each Health Area.

The following table shows the distribution of the population of the city of Bukavu in 2013.

Table 1: Distribution of the population of the city of Bukavu by Health Zone

Ibanda Health Zone		Bagira Health Zone		Kadutu Health Zone	
Health areas	Pop.	Health areas	Pop.	Health areas	Pop.
Panzi	68377	Bagira	12301	CBCA Nyamugo	20412
Cidasa	33922	Burhiba	23269	CECA Mweze	37676
Chahi	52274	Cigurhi	7782	8th CEPAC	22086
Gihamba	20846	Kahero	11918	Ciriri	58288
Mama Mwilu	41148	Lumu	14832	Funu	18419
Muhungu State	31974	Makoma	10049	Bishop Kataliko	25349
Muhungu Diocese	20615	Mushekere	19834	Maendeleo	23424
Malkia wa Amani	16748	Nyamuhinga	16047	Maria	56040
The Boot	7595			Bishop Mulindwa	17809
Red Cross Saio	22206			Neema	16398
Nyawera	27120			Uzima	11386
Nguba Red Cross	27160				
TOTAL	388533		116032		307287
Proportion	47%		14%		39%

Source: Central Health Area Offices

2.5.2. Distribution of the sample in the health zones and health areas

The sample size distributions by health zones and areas will be made according to the weightings in Table 1. We therefore have the following tables:

Table 2: Distribution of the sample by health zone

Health zone	Ibanda	Bagira	Kadutu
Population	388533	116032	307287
Proportion	47%	14%	39%
Sample size	118	35	97

Source: our calculations

In each health zone, 3 health areas were selected by simple random draw, see following table:

Table 3: Distribution of the sample by health area

IBANDA HEALTH ZONE			BAGIRA HEALTH ZONE			KADUTU HEALTH ZONE		
Health areas	Pop.	No. Men.	Health areas	Pop.	No. Men.	Health areas	Pop.	No. Men.
Panzi(48%)	68377	57	Nyamuhinga (42%)	16047	15	8th CEPAC (35%)	22086	34
Muhungu Dioces (15%)	20615	18	Lumu (38%)	14832	13	Funu (29%)	18419	28
Chahi(37%)	52274	43	Cigurhi(20%)	7782	7	Maendeleo (36%)	23424	35
Total	141266	118	Total	38661	35	Total	63989	97

2.5.3. Sampling technique

2.5.3.1. Sample size

In order to draw a sample size that respects the representativeness rule, sampling theory shows that a number of steps must be followed in order to estimate a sample size with a known risk of error.

Indeed, the researcher needs the following indicators to define the sample size:

A tolerable error and a significance level. Each researcher can choose the tolerable error and the significance level as he or she sees fit for the study. Note that the smaller the error and the lower the significance level, the larger the sample size. For our purposes, the accepted error is 5%, i.e. a confidence level of 95%.

The relative variance of the population ($\sigma 2$), to obtain it we used the following formula:

$\sigma^2 = \frac{(1-\pi)}{\pi}$ With π proportion of the population representing the characteristic under study

Indeed, to determine our sample size, we used the following formula:

$$N \geq \frac{t^2.(1-\pi)}{\varepsilon^2 \pi}$$

Where

t^2 Is the coefficient of feasibility at 1.96 for a 95% confidence interval

εIs the accepted error of 0.05

This formula has some shortcomings in that the proportion of the variable being studied is often not available. To do this, the researcher can use the results of a similar study carried out in the past to estimate the relative variance, but also the researcher can organise a pre-test on at least 30 households to estimate the relative variance.

However, this last alternative seems feasible as we do not have a similar study already carried out.

The thirty households to be tested are allocated by health zone, respecting their weighting in the total population. We have referred to Table I to make this allocation.

At the end of our surveys, we found that out of 30 households surveyed, 26 respondents opted for other therapeutic choices, i.e. traditional, self-medication and prayer rooms rather than medical ones, because they felt that health costs were high. The calculated sample size :

$$N \geq \frac{t^2.(1-\pi)}{\varepsilon^2 \pi} = \frac{1{,}96^2.(1-0{,}867)}{0{,}05^2 * 0{,}867} \geq 250{,}15$$
$$\cong 250\ ménages$$

Our sample size is 250 households.

2.5.3.2. Data processing and collection

2.5.3.2.1. Data processing

The data processing will be organised in two stages:

An estimate of descriptive statistics (frequencies, means, standard deviation, coefficients of variation).

An estimation of the therapeutic choice models and an analysis of the econometric results. This estimation is preceded by a search for possible correlation between the different explanatory variables. The test of significance of the coefficients is the chi-square test. We will have to use the multiple linear regression statistic to understand the research question. Data processing will be done using SPSS 20 and Excel spreadsheet software.

2.5.3.2.2. Data collection

A questionnaire was developed to list all possible treatment options and patient itineraries.

The information on treatment options was classified as follows:

- Traditional medicine (or the use of a traditional healer).
- Self-medication with modern medicines available at home, bought at the market or in a nearby pharmacy.
- Modern medicine or any occasional use of the services of a health professional or self-employed person (doctor or private nurse) in his or her own home or in the patient's home or use of the services of a public or private hospital capable of providing MAP or BCP.
- Therapeutic prayer: Consultation with a marabout or use of a prayer room, laying on of hands by a pastor.
- The interviewer also collected information on variables that could explain the choice of a given treatment option.

Variables reported by the respondent included age and sex of the patient, household size, religion, ethnicity, education level, income and nature of the disease, and acuity or chronicity of the disease (as reported by the respondent), type of disease or symptoms.

The interviewer also asked about financial expenditures for household expenses and about the management of the health

problem. The interview guide was designed in French (the official language of the Democratic Republic of Congo)

Data collection was carried out by 9 nurses, all of whom were from these three health zones.

The surveys were organised in two stages, namely the pre-survey and the survey itself.

The pre-survey: the main purpose of this pre-survey is to get a better idea of the field in which we want to work. The sample size was set at thirty households for the reasons mentioned above.

The survey itself: the survey covered the three health zones of the city of Bukavu, namely the health zone of IBANDA, KADUTU and BAGIRA. The size of the sample surveyed was 250 households, including 118 households in the Ibanda health zone, 35 households in the Bagira health zone and 97 households in the Kadutu health zone.

In these households, only the heads of household (mother or father) were interviewed on a few questions that we developed a priori. In order to find out the reason for a particular treatment decision. Since we were forced to read the questions in the language that the respondents understood so that they could give us their opinion on our questions. The heads of household were all interviewed at their respective homes, which is why we organised our field visit on Saturday before 10am and on Sunday from 7am to 5pm so that we could meet the people in charge. It should be noted that all the questionnaires that we had launched were completely filled in.

2.5.3.3. Study variables and conceptual model

2.5.3.3.1. Dependent variable

This variable is polytomous with a set of four alternatives or choices that the household faces in case of a morbid episode: self-medication, modern medicine, traditional medicine, and therapeutic prayer.

Self-medication: refers to the case where the patient does not consult a practitioner to treat the disease. They use modern medicines (tablets) or traditional medicines (bark, tree leaves) available at home or bought for the occasion.

Modern medicine: refers to the case where patients consult an officially recognised modern health professional (graduate, authorised to set up) or a public or private health facility.

Traditional medicine: includes cases where patients consult a traditional practitioner, herbalist or healer.

Prayer: includes cases where patients consult prayer chambers, marabouts, a pastor for laying on of hands, etc.

2.5.3.3.2. Independent variables

They are grouped into three sets of variables: the socio-economic characteristics of the households surveyed, the characteristics of the disease and the characteristics of financial access for the heads of household and for the children

Socio-economic characteristics include:

- Age
- Sex
- The level of education
- Marital status
- Religion
- Ethnicity.
- The profession
- Income

Disease characteristics include the type of disease the patient has (a head of household or children).

The last characteristic is the amount (price) that the patient has to pay for the services of the practitioner. Indeed, this price includes the consultation, the medical tests and the medicines

3. Ethical considerations

The interviewers were asked to explain in advance the objectives of the study and to emphasise the anonymous and confidential use of the data collected. Informed consent was sought from respondents, and signed consent forms were obtained in advance.

4. Presentation of the Results

A total of 250 households met the inclusion criteria; one person in each household was interviewed. Our analysis was based on a sample of 250 households. Profile of the households interviewed and the patients

Descriptive Statistics

Table 5: Socio-demographic and economic characteristics of surveyed households in Bukavu

VARIABLES	FREQUENCY	%
Age of the head of household		
<35	57	23%
35-54	110	44%
55-74	70	28%
>75	13	5%
Gender of the head of household		
Woman	32	13%
Male	218	87%
Civil Status		
Other	28	11%
Single	15	6%
Marie	207	83%
Household size		
1-5	119	48%
6-11	127	51%
>11	4	2%
Level of study		
Without instruction	19	8%
Primary	41	16%
Secondary	120	48%

Superior	70	28%
Profession		
No occupation	84	34%
Officials	53	21%
Private	113	45%
Income		
<100	41	16%
100-200	97	39%
200-300	59	24%
300-400	23	9%
400-500	10	4%
>500	20	8%
Level of study		
Without instruction	19	8%
Primary	41	16%
Secondary	120	48%

110 heads of households, i.e. 44%, are aged between 35-54 years, 48% have a secondary education and 45% have a private profession.

The gender of caretakers in Bukavu households is 87% male, the predominant marital status is 83% married with a household size of 6-11 people living in the same household at 51%.

16% of households surveyed live on less than $100/month and 8% live on more than $500/month.

Table 6: Socio-cultural characteristics and profile of patients in the city of Bukavu

Variables	Frequency	%
Ethnicity		
Other	44	18%
Rega	50	20%
Shi	156	62%
Religion		
Catholic	152	61%
Muslim woman	12	5%
Protestant	86	34%
Patient age		
<5	35	14%
5-25	120	48%
25-45	43	17%
>45	52	21%
Patient gender		
Woman	119	48%
Male	131	52%

Most households are of the shi ethnicity with 62% of cases and 61% of the religious denomination Catholic.

Children and young people are most affected by the diseases at 48% of cases and almost equally affected by gender with 48%, 52% female and male respectively.

Table 7: Ethnicity and therapeutic choice

		THERAPEUTIC CHOICE				Total	P - Value
		Self-medication	Modern medicine	Traditional medicine	Prayer		
ETHNIE	Shi	66	62	19	9	156	0,022
	Rega	16	18	12	4	50	
	Other	28	11	5	0	44	
TOTAL		110	91	36	13	250	

Ethnicity has a significant influence on the choice of treatment, and the table shows that the population of Bukavu is homogeneous, with a majority of Bashi.

Table 8: Treatment choice and disease type

		THERAPEUTIC CHOICE				Total	P – value
		Self-medication	Modern medicine	Traditional medicine	Prayer		
Type of Disease	Acute illness	64	36	0	4	104	< 0,001
	Chronic illness	36	45	9	7	97	
	Poisoning	10	10	27	2	49	
Total		110	91	36	13	250	

75% (27/36) of those who consulted traditional medicine were treated for intoxication and 58% (64/110) of those who had an acute illness resorted to self-medication. The type of illness is statistically significant at the < 0.001 level.

Table 9: Treatment choices and income

		Multiple Therapeutic Choices				Total	P - value
		Self-medication	Modern medicine	Traditional medicine	Prayer		
Income (In USD)	<100	19	15	3	4	41	0,002
	100-200	45	30	17	5	97	
	200-300	24	22	11	2	59	
	300-400	7	13	3		23	
	400-500	3	3	2	2	10	
	>500	12	8			20	
TOTAL		110	91	36	13	250	

Income has a significant influence on the choice of treatment. It follows from the table that more than 50% of households with less than US$200 per month used the different treatment options.

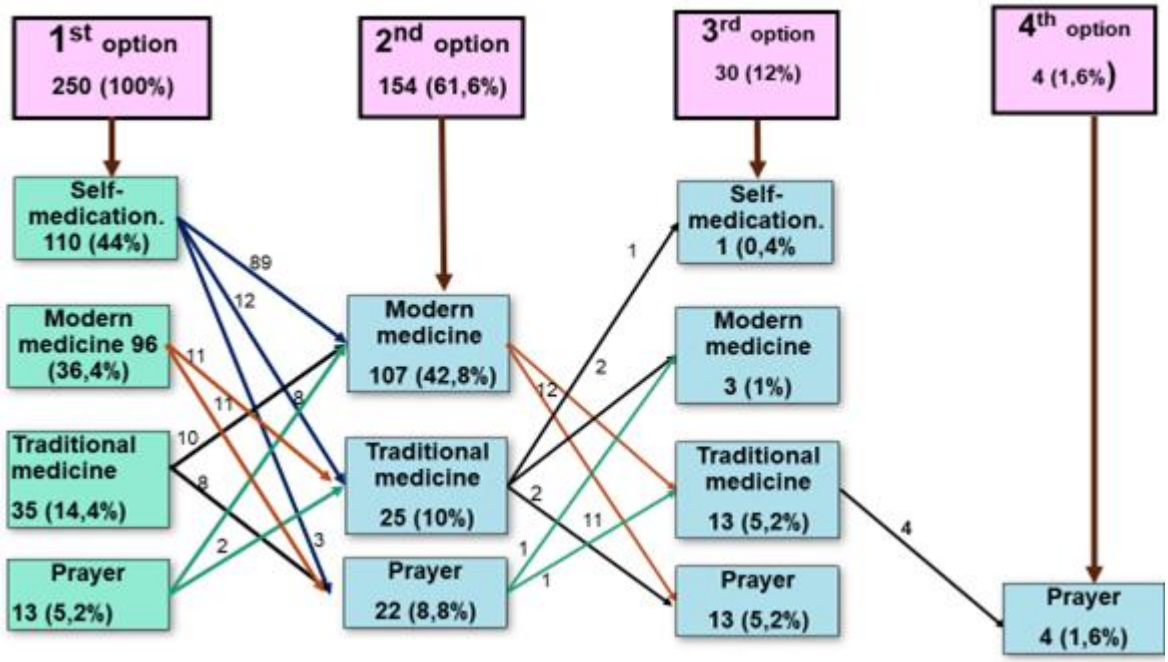

Figure 1: Treatment option and household itinerary in Bukavu city, June 2014

Figure 1 shows the different treatment options and describes the different routes households take to seek care.

Self-medication was the most widely used option (44%), followed respectively by modern medicine (36.4%), traditional medicine (14.4%) and prayer (5.2%).

Traditional medicine as an initial treatment option accounted for less than 15% of households.

We also note that 154 out of 250 households (61.6%) used more than one treatment option; the households described made up to 9 different paths from the first to their second treatment option.

Of the 154 households, 74% used informal care as their initial treatment option.

In 65.6% of cases (101/154), the shift from the first to the second treatment option is consistent with what health system planners consider to be 'rational' care-seeking behaviour (i.e. starting with self-medication, progressing to the use of outpatient care provided by an individual health professional or a primary health care facility, and subsequently to the use of a hospital).

Table 10: Types of disease and treatment options

Type of disease/therapeutic use	Self-medication	Modern medicine	Traditional medicine	Prayer	Frequency	%
Malaria/Fever	60	35		4	99	40%
Poisoning	10	10	27	2	49	20%
Diarrhoea	5	12	4		21	8%
Respiratory diseases	16	5		4	25	10%
Other	19	29	5	3	56	22%
Frequency	110	91	36	13	250	100%
%	44%	36%	14%	5%	100%	

The frequencies of the five groups of health problems reported by the respondents are presented in Table 9 above.

Of the 250 patients, 40% (n = 99) of the patients presented with malaria/fever and of these 60/99 or 60% of the patients resorted to self-medication.

20% of the cases think they have intoxication and 27/49 have resorted to traditional medicine.

10% (n = 25) had an airway syndrome.

Table 11: Reasons for using the different treatment options

Reasons for self-medication	Frequency	%
Lack of money	22	20
Known disease	30	27
Poor reception of health personnel	1	1
Absence of health personnel	2	2
Not trusting healers	5	4
Third party advice	36	32
Habit	11	10
Other	5	4
Reasons for using modern medicine		
Proximity to the health structure	20	10
Effectiveness of treatments	82	41
Not trusting healers	12	6
Serious illnesses/Pain	50	25
Habit	19	9
Other	19	9
Reasons for using traditional medicine		
Affordable price	10	13
Proximity of the healer	14	19
Nature of the disease	26	35
Poor reception by health care staff	10	13
Easy to pay	1	1
Habit	12	16
Other	2	3
Reason for resorting to prayer		
Faith	29	57
Lack of money	5	10
Nature of the disease	3	6
Habit	10	20
Not trusting healers	1	2
Minor illness	1	2
Other	2	4

32% of the cases that resorted to self-medication stated that they had received advice from a third party on which pharmaceutical products to take. 27% knew how to treat the disease and 20% because they did not have the money to pay for a consultation.

41% of households recognised the effectiveness of modern medicine, 25% used it because of a serious illness or unbearable pain and only 9% because of habit.

35% of households that used traditional medicine thought it was a condition that could only be cured by a traditional practitioner, 16% by habit and 13% because it was affordable.

By faith 57% (29/51) of households resorted to therapeutic prayer, 20% (10/51) by habit and 10% by lack of financial means.

5. Discussion, Model Estimation, Analysis and Interpretation of Results

As in other similar studies [5,51], the merit of this work lies in its simple random sampling frame of health areas in strata, which makes our study representative of the population studied, and in the rigour of the survey's conduct. In addition, this survey offers a detailed and innovative description of patients' treatment pathways in an urban health care system.
However, two limitations of this study should be noted. First, the recruitment of interviewers from among self-reported modern health professionals (nurses) may under-report the use of traditional medicine. Further investigation using appropriate techniques is needed to accurately assess the importance of traditional medicine in Bukavu in particular and South Kivu in general. Second, we did not examine the severity of the reported illnesses, a variable that could have helped explain the choice of care.

- **Types of diseases and treatment options**

The pattern of health problems reported in this study is consistent with what has been described elsewhere in urban populations in developing countries [52]. Malaria and fever of unknown origin and diseases of the respiratory and digestive tracts predominate [5, 2, 52]. In this study, more than one third of all patients interviewed had suffered from malaria and/or fever during the study period. Although malaria syndrome is a frequently reported health problem, its frequency in our study is half that reported by Kakoma [16]. This difference can be explained by seasonal variations in the incidence of the disease: the study took place during the dry season (June), a period of low malaria transmission, while the Kakoma study was conducted during the rainy season (March-April), a period of high transmission. Our study period can also explain the high frequency of respiratory tract syndrome, which was dominated by acute respiratory infections. The dry season in Bukavu is characterised by cold and dust, the two factors that favour the development of these infections.

- **Treatment options and patient pathways**

Figure 1 shows that patients used four different treatment options, either exclusively or in combination (sequentially) in the two weeks prior to the survey. Self-medication with modern medicines was the treatment option initially chosen by the majority of Bukavu residents (44%) when faced with a health problem. This result is not very comparable to the frequencies of 55.6% and 58.5% observed in Ouagadougou [5] and Cotonou [51] respectively. This practice is widespread in both rural areas in Benin and Mexico [52, 53] and urban areas in Cambodia, Abidjan and Conakry [5, 2, 56].

The main reason for this practice is its affordability; it concerns only the cost of the drugs that are purchased; the patient is therefore exempted from other costs related to transport, consultation of health professionals, and various technical examinations [57]. Another reason for the high level of self-medication in the specific context of Bukavu may be the intrusive marketing of all kinds of drugs through posters. These posters are present in almost every single waiting room of a health professional, and are associated with easy access to drugs without prescription. In this context, self-medication is more likely to be harmful for the patient as well as the economic consequences (spending money on sometimes unhelpful drugs).

Table 12: Description of variables

The central and dispersion characteristics (mean, standard deviation and coefficient of variation) of each of the explanatory and explained variables are presented in the following table

Variables	Description	Average	Type Gap	Coefficient of Variation	P - Value
Choicetherap (dependent)	Choice of treatment	0,51	0,501	0,98	
Age	**Age of the head of household**	**47,43**	**14,534**	**0,31**	**< 0.001**
SEXEnc	Gender of the head of household	0,87	0,335	0,39	0.072
REVDOL	Household income	235,29	173,32	0,74	0.002
Levelinstr	Level of education	2,96	0,866	0,29	0.072
ETACIVEnc	Civil status	1,05	0,412	0,39	0.015
Sizemen	Household size	5,64	2,294	0,41	0.628
RELIGIONEnc	Religion	1,56	0,586	0,38	0.897
Profesion	Profession	2,12	0,882	0,42	0.205
ETHNIEnc	Ethnicity	0,55	0,776	1,41	0.022
TYPEMALDEnc	Type of diseases	0,78	0,752	0,96	< 0.001
CouttotEnc	Total cost of care	6729,64	8016,09	1,19	< 0.001

Source: Based on our survey results.
N.B. For the modalities of these variables, see Table 4.

The data in this table show that overall the variables have a huge variation around their mean, reflecting the huge heterogeneity of the sample.

II - Estimation of models

1) Chi-square test
Not all variables were included in the estimates after the chi-square test. We therefore simplified the models by eliminating certain variables that were not significant at the 0.05 level, after which the following variables were retained: age, ETHNIEnc, TYPEMALDEnc, CouttotEnc, ETACIVEnc and REVDOL.

2) Results of the estimates
After eliminating the multicollinearity between variables, we dropped some systematically non-significant variables, which led us to estimate the more restricted models whose results are presented in the following table where the estimated coefficients, the significance and the odds ratio are shown.

Table 13: Model Estimation

Multiple Therapeutic Choice [a]		Coefficient	Std. error	Wald	Sign.	Exp (B)
Modern Medicine	Constant	1,477	,762	3,760	,053	
	age	-,020	,010	3,600	,058	,981
	ETHNIEnc	-,441	,201	4,816	,028	,643
	TYPEMALDEnc	,601	,236	6,464	,011	1,824
	CouttotEnc	,000	,000	6,080	,014	1,000
	ETACIVEnc	-,569	,412	1,907	,167	,566
	REVDOL	,001	,001	,644	,422	1,001
Traditional Medicine	Constant	-3,644	1,437	6,427	,011	
	age	-,043	,020	4,579	,032	,958
	ETHNIEnc	-,383	,333	1,322	,250	,682
	TYPEMALDEnc	3,404	,518	43,144	,000	30,071
	CouttotEnc	,000	,000	,000	,998	1,000
	ETACIVEnc	,688	,556	1,533	,216	1,990
	REVDOL	,000	,002	,063	,802	1,000
Therapeutic Prayer	Constant	,791	1,448	,299	,585	
	age	-,067	,026	6,943	,008	,935
	ETHNIEnc	-1,176	,575	4,190	,041	,309
	TYPEMALDEnc	,793	,457	3,011	,083	2,211
	CouttotEnc	,000	,000	5,071	,024	1,000
	ETACIVEnc	,946	,785	1,452	,228	2,575
	REVDOL	,001	,002	,174	,677	1,001

[a] **The reference modality is: Self-medication**

Source: Based on SPSS 20 estimates.

6. Analysis of the results

1) Analysis of the survey results
The survey results we have presented give rise to the following analyses:

The various therapeutic remedies (self-medication, modern medicine, radiotherapy and therapeutic prayer) are generally used by the people of Bukavu. The majority of those who resort to modern medicine first resort to self-medication and those who resort to traditional medicine, the majority of them first resort to modern medicine especially for a diagnosis; this is proof that even if individuals appreciate very much the effectiveness of traditional medicine, they resort to modern medicine with the aim of knowing what ailments they are suffering from before coming to undergo traditional treatments; here is already the complementarity between traditional medicine and modern medicine

Another finding is that overall, individuals value self-medication 44% opt for this type of treatment.

Overall, we find that income is not a determining factor in treatment choices, as only 30% of households surveyed mention financial reasons for choosing self-medication and prayer. This can be confirmed by the fact that care in modern health centres is more expensive than the other three health care options. The joint use of traditional and modern medicine by the populations is also one of the findings revealed by the results of our surveys.

2) Interpretation of model coefficients

Statistical interpretation
The aim here is to see whether the explanatory variables are relevant in explaining the choice of treatment.

The results of models 1, 2 and 3 presented above (Table 13) show that:

Ethnicity, total cost of care and type of illness are the only significant variables (at the 5% level) in the choice of modern health care facilities.

The level of education of the care decision maker, his belief in the effectiveness of traditional care and skin diseases are the only significant variables (at the 5% threshold) in the use of traditional medicine.

Age and cost are the significant variables (at the 5% threshold) in the use of therapeutic prayer.

Economic interpretations
The different coefficients obtained in the model lead to the following interpretations:

The Use of Modern Medicine
The coefficients assigned to the variables type of illness (TYPEMALDEnc) and total cost of care (CouttotEnc) are significant and positive. The sign obtained for the coefficients of the variables type of illness (TYPEMALDEnc) and total cost of care (CouttotEnc) are in line with what we expected. These variables are therefore, according to our work, those that determine the use of modern medicine in the Bukavu health district. Audibert estimates a positive and significant effect of the cost of treatment on the demand for modern care among the Senufo of Côte d'Ivoire [22]. Studies have shown a significant effect of the cost of care on the use of curative care services, such as a study in Ghana [29] which found that a price increase resulted in a sharp drop in the use of curative care services.

The other variables are not significant, but apart from ethnicity (ETHNIEnc) which is significant and negative.

The age of the patient, the education level of the care decision maker, his/her income, and the size of the household do not have a significant influence on the decision to opt for modern care facilities.

The non-significance of age and the negative sign of its coefficient that we obtained corroborate the results obtained by Audibert M and Mathonnat J (1998) in their study among the Senufo of Côte d'Ivoire and also those obtained by Bolduc (1996) in rural Benin, but contradict the results of Dor and Van der Gaag (1998) in Côte d'Ivoire.

The non-significance of the ETACIVEnc variable and the negative sign, which is an indicator of the marital status of the care decision-maker, is in line with the results of Bolduc (1996) for Benin, and those of Audibert M and Mathonnat J (1998) for the Senufo of the Ivory Coast, the latter also having a negative sign

Contrary to what one would expect, the non-significance of the variable INCOME and the positive sign, i.e. the income of the health care decision-maker, does not have a significant effect on the use of modern health care structures, even if it appears with a positive coefficient; this situation can be explained by the efforts made by the public authorities to make health care accessible to all by encouraging the integration of non-state structures into the reinforcement of the health care system for universal health coverage, in the context where health is an integral part of the quality of human resources, which is a necessary prerequisite for the development of nations.

The use of traditional medicine
Here, two variables are significant at the 5% level; age and disease type.

These results corroborate those found by Chenge et al. in Lubumbashi where type of disease was significantly associated with choice of therapy ($p = 0.007$). [58]

The significance and negative sign of the coefficient of the age variable means that the use of traditional healers is more common for children and young people than for adults. This sign is not what we expected. But contrary to the work of Audibert M. et al, Bolduc et al. obtain a non-significant effect of age on the use of traditional medicine and a non-significant effect of level of education on the choice of this type of care.

The variables level of education (Levelinstr) and ethnicity (ETHNIEnc) on the effectiveness of local resources in treating diseases. These two variables have the expected effects (negative effect for Levelinstr and positive for ETHNIEnc). This result reflects the fact that the more educated individuals are, the less likely they are to opt for the use of traditional healers and the more they believe in the effectiveness of local resources in treating illnesses, the more likely they are to use traditional healers.

7. Conclusion

Self-medication as a widespread practice needs to be rationalised. This process must be part of a more comprehensive pharmaceutical policy programme that should promote the effective use of generic medicines. It should be noted that the danger of self-medication needs to be further explained to people in order to reduce the risks they face. Although modern medicine is not the first and most widely used therapeutic option in Bukavu, it is the last resort for most households. The main lesson to be learned from this study is that it is essential to consider the role of traditional medicine in the effectiveness of health systems in African countries in general and in Bukavu in particular. If we recognise that a more open and constructive collaboration between endogenous traditional medicine and exogenous modern medicine is

increasingly felt to be necessary, given their respective limitations and competences on the one hand, and the complexity of the morbidity situations encountered by the populations on the other, we must also think about the measures to be taken to achieve this. Indeed, as we have seen, the therapeutic itineraries of the people of Bukavu depend on the characteristics of the populations and the types of illnesses. This is why, despite the hunt against traditional medicine, deployed by the coloniser to make western medicine the absolute master in the name of a supposed mission of modernisation and civilisation, efforts must still be made by the public authorities and NGOs to ensure the effectiveness of local medical practices by acting on the variables likely to provoke greater use of this medicine insofar as its virtues are recognised by the competent international bodies.

It should be noted, however, that this study has limitations, including difficulties in approaching the characteristics of the supply of care in order to better identify their impact on care alternatives, and the restriction to sick individuals only, leaving individuals' preventive behaviour unaddressed.

We hope that future work will take these limitations into account and that the study we have just carried out will contribute to the development and implementation of more appropriate strategies for the realisation of collaboration between modern and traditional medicine in the DRC.

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10. Conflicts of interest

The authors declare no conflicts of interest in relation to this study.

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