Original Article

User Satisfaction with Technology-Enhanced Health Insurance among Community-Based Health Insurance Users: A Survey at one Selected Referral Hospital, Rwanda

Ferdinand Maniriho Maombi[1*], Erigene Rutayisire[1,2]

[1]*Department of Public Health, School of Health Sciences , Mount Kenya University, Kigali, Rwanda*
[2]*School of Public Health, College of Medicine and Health Sciences, University of Rwanda, Kigali , Rwanda*

***Corresponding author:** Department of Public Health, School of Health Sciences, Mount Kenya University, Kigali, Rwanda. Email: fmaombi@gmail.com. ORCID: https://orcid.org/0009-0009-4470-6324

Cite as: Maombi MF, Rutayisire E. User Satisfaction with Technology-Enhanced Health Insurance among Community-Based Health Insurance Users: A Survey at one Selected Referral Hospital, Rwanda. Rwanda J Med Health Sci. 2024;7(2): 286-301. https://dx.doi.org/10.4314/rjmhs.v7i2.16

Abstract

Background
Expanding health insurance coverage is crucial for improving access to healthcare services in Africa. While Rwanda has successfully implemented a community-based health insurance scheme (Mutuelle de Santé), the transition from traditional paper-based systems to Technology-based platforms presents a new challenge. Understanding user satisfaction with these new platforms is critical for their long-term success.

Objective
This study seeks to investigate the satisfaction level of community health insurance users attending the Outpatient Department at One selected Referral Hospital in Rwanda.

Methods
The mixed-methods study used an explanatory sequential design among 384 Community Based Health Insurance (CBHI) users. A structured questionnaire used for data collection; Analysis was done using Statistical Package for Social Sciences Version 21.

Results
The majority of participants (81.3%) expressed satisfaction. Young participants aged <20 years (AOR:1.96, 95% CI:1.037-2.718, p=0.003) Young participants are very satisfied. Limited medication availability and internet reliance hindered user experience. Healthcare providers faced increased workload from managing patient files and the CBHI system. Improved payment processes and patient verification streamlined billing, saving time and reducing errors.

Conclusion
The findings indicate a generally positive satisfaction and factors such as age, education, marital status, occupation, health insurance, and presence of under 5 children were found to be associated with satisfaction levels.

Rwanda J Med Health Sci 2024;7(2):286-301

Keyword: User Satisfaction, Technology-based health insurance, Community Health Insurance, Rwanda, Referral Hospital

Introduction

The World Health Organization and other international organizations such as the United Nations Children's Fund (UNICEF), World bank group, United Nations Population Fund (UNFPA), United Nations Development Program (UNDP),Gavi, The vaccine alliance are encouraging the government of different nations to meet universal health coverage by year 2030 as part of the Sustainable Development Goals.[1] The African continent has witnessed significant strides in recent years towards expanding health insurance coverage and improving access to healthcare services.[2] Rwanda, in particular, has emerged as a leader in the region in implementing a successful community-based health insurance (CBHI) scheme known as Mutuelle de Santé.[3] With, with the rise of technology, traditional paper-based systems are being replaced by the introduction of technology-based health insurance platforms.

Technology-based health insurance offers a multitude of potential benefits for both healthcare providers and patients. For providers, these platforms can streamline administrative processes, enhance data collection and analysis, and potentially reduce fraud and abuse. For patients, Technology can simplify enrollment, claims processing, and ultimately, improve access to healthcare services.[4, 5]

However, the success of any Technology-based solution hinges on user acceptance and satisfaction. Research in the field of human-computer interaction emphasizes that user satisfaction is crucial for the long-term success of Technology-based solutions. [6] Understanding user experiences is crucial for optimizing the design and functionality of these platforms, ensuring their long-term sustainability and effectiveness within the healthcare system.

Community Based Health Insurance (CBHI) was introduced globally to address the challenges of limited access to healthcare services, particularly among low-income and marginalized populations. It aims to provide financial protection against health expenses and improve health outcomes by ensuring that even the most vulnerable individuals can access essential medical care without facing financial hardship.[7] Additionally, CBHI schemes foster community solidarity and participation in healthcare decision-making, promoting equity and inclusivity in healthcare delivery. Overall, CBHI emerged as a response to the need for sustainable and inclusive healthcare financing models that prioritize universal health coverage and social justice.[8]

Since 2000, a number of nations, including Rwanda, have made a concerted effort to strengthen the Community Based Health Insurance scheme (CBHI), which provides healthcare for the underprivileged who are employed in the unorganized sector or reside in rural areas. In line to this, many nations have requested as a requirement to have different tools operationalized at decentralized levels with proper training to all stakeholders including end users, for quick and customer care services.[2,9]

Rwanda's CBHI scheme, plays a vital role in ensuring healthcare accessibility for a significant portion of the population.[10] The introduction of Technology-based health insurance platforms within this context presents a unique opportunity to explore user experiences and evaluate their impact on satisfaction levels.

With evolution of healthcare system service delivery, the Technology use has been integrated in healthcare service delivery for speeding up the customer care service. The use of technology in healthcare is paramount for enhancing efficiency, accuracy, and accessibility of medical services. Technology-based health insurance platforms offer a multitude of potential benefits for both healthcare providers and patients. For providers, these platforms can streamline administrative processes, enhance data collection and analysis, and potentially reduce fraud and abuse.

For patients, technology can simplify enrollment, claims processing, and ultimately, improve access to healthcare services by potentially reducing wait times and simplifying navigation of the healthcare system.[11,12] While technology offers these potential benefits, the success of any technology-based solution hinges on user acceptance and satisfaction. Research in the field of human-computer interaction emphasizes that user satisfaction is crucial for the long-term success of such solutions.[13] Understanding user experiences is essential for optimizing the design and functionality of these platforms, ensuring their long-term sustainability and effectiveness within the healthcare system.

In Rwanda, the Community-Based Health Insurance (CBHI) system is transitioning from paper membership cards to a digital system. This requires CBHI users to pay contributions electronically through various mobile money platforms like IREMBO or Mobicash. However, challenges exist, especially in rural areas with limited internet access and user knowledge. Untrustworthy agents and occasional internet outages can further delay healthcare service access for CBHI users. This highlights the need for improvements in digital infrastructure and user education to ensure a smooth transition and improved healthcare access.

Specifically, 65% of females and 66% of males aged 6 and over have no education (15% and 11%, respectively). Rural residents are twice as likely as urban residents to have no education. Sixteen percent of women and 12% of men in rural areas have no education, as compared with 7% of women and 6% of men in urban areas.[14] There are so many complains among end users due to varied reasons ranging from paying family members fees to complexity of hospital payment and checking up system. Studies were conducted on CBHI in Rwanda and its technological integrated in services delivery are limited.

This study aims to investigate the satisfaction level of community health insurance users at one selected Referral Hospital in Rwanda with the newly technology initiated in all process of pre and during hospital services payment countrywide. At the health facility level, the health insurance provider used the web-based application of Mutuelle Membership Management System (known as MMMS OR 3MS) along with Electronic Medical Record(EMR) used by hospital healthcare providers. On the premium pre-payment stage, the CBHI members use IREMBO, Mobicash, Mobile money among others. By analyzing user experiences, this research seeks to address the following key questions:

- To what extent are users satisfied with the functionality and ease of use of the Technology-based community-based health insurance system?
- What factors are most associated with the satisfaction regarding the efficiency of accessing healthcare services among CBHI users?
- What are the key challenges faced by users on satisfaction with the Technology-based community-based health insurance system?

By exploring these questions, this study contributes valuable insights into the user experience of Technology-based community-based health insurance users in Rwanda. These findings can inform policy decisions, platform development, and ultimately, improve healthcare access and satisfaction for CBHI users within the Rwandan healthcare system.

Methods

Study setting

One selected Referral Hospital is both a referral hospital and the only district hospital in District with 15 sectors, 68 cells and 432 villages it deserves a population of 476 522. It covers 16 health Centers, one prison dispensary and 13 health posts. The main mission is to improve the well-being of the population and promote the health of the population in the district

however the Hospital serves part of neighboring three districts. The population from those districts is estimated to 386,078 and covers 18 health centres from those District. One selected Referral Hospital is now recognized by government of Rwanda as Referral Hospital from 2013.[15]

Study Design

Cross-sectional research of CBHI users was carried out using mixed methods. In this study, CBHI patients who were attending the outpatient department at one selected referral Hospital in Rwanda were asked to rate their satisfaction with healthcare services using technology-enhanced health insurance and associated factors using quantitative and qualitative approaches.

Study population

The adult outpatients on exit who were CBHI scheme members and who were within the catchment area of the referral hospital, comprised the study's sample. The participants were also mentally competent outpatients in noncritical situations who were at least eighteen years old. At this age, people appear to be independent, responsible, and financially able to pay to CBHI membership.

Sample size estimation and sampling techniques

To estimate the sample size required to achieve a specified level of precision for a proportion in a population, The quantitative sample size was calculated using Sample Size Formula for Proportions using the following assumptions: $n= (Z\alpha/2)^2 P (1-P) / E^2$

Where:

n: the total sample size

Zα/2: 1.96, confidence interval 95%

E: 5% margin of error

P: The satisfaction level is unknown; thus we used 50%

Thus, the sample size was: $n= (1.96)^2 .0.50. (1-0.50) / 0.05^2 = 384$ CBHI users.

In the quantitative part, a sample size for this study is 384 CBHI users were investigated.

In a qualitative part, there is no need to be statistically representative. However, to obtain data that are reflecting the real situation on field, a total sample of twenty key informants were interviewed until the theory of saturation reached (i.e. no newer ideas coming out from participants). The purposive sampling method was used to select eight hospital healthcare service providers (Medical Doctor and Nurses), two CBHI staff (in charge of medical invoice verification) and ten OPD Patients service users.

Data collection tool and procedure

A structured questionnaire was used to gather quantitative data, inspired by earlier studies on the satisfaction levels. The survey comprised two sections: the first collected demographic data, and the second evaluated satisfaction levels and related factors among CBHI technology-based users

Respondents expressed their ideas along a continuum of satisfaction with labels reflecting levels of satisfaction or dissatisfaction using the widely utilized Likert scale.

In this survey, the Likert scale consisted of five response options, 5 = very satisfied, 4=satisfied, 3=neutral, 2=dissatisfied and 1=very dissatisfied. Participants were asked to select the response option that best represented their opinion for each statement. The overall satisfaction level was estimated as a proportion of patients who responded on average of 3-5 score which indicated good satisfaction level from Likert scale.

Based on the average score, the following cut-off points and ranges were used to categorize satisfaction levels:

- Satisfaction: Scores of 4.0 to 5.0 : Participants who averaged between 4 (satisfied) and 5 (very satisfied) on the Likert scale were classified as satisfied with the healthcare services.
- Neutral: Scores of 3.0 to 3.9: Participants who averaged around 3 (Neutral) on the Likert scale were classified as having a neutral or indifferent view about the healthcare services.

- Poor Satisfaction: Scores of 1.0 to 2.9: Participants who averaged between 1 (very dissatisfied) and 2.9 (Dissatisfied) on the Likert scale were classified as poorly satisfied with the healthcare services.

Quantitative data collection

A questionnaire was used to gather primary data on satisfaction levels. Logistic regression analysis was then conducted to examine the factors associated with these levels. The Crude ratios (CR) and Adjusted Odds Ratios (AORs) and their corresponding 95% Confidence Intervals (CI) were calculated to assess the magnitude of association. The significance of each factor was determined using the p-value.

Qualitative Data Collection

Semi-structured interviews were conducted with key informants after obtaining their informed consent for audio recording. The interview guide, translated into Kinyarwanda and pre-tested, ensured cultural appropriateness and maintained its original meaning. The guide, developed in line with the survey's objectives, employed probing questions to encourage detailed participant insights relevant to the study. This helped in understanding the underlying reasons, motivations, and context behind the quantitative satisfaction data.

Data Collection procedure

Data were gathered by face-to-face interviews employing a pretested, structured questionnaire after the respondents gave their agreement. Face-to-face interviews were employed to prevent the exclusion of potential participants who lacked literacy skills or had poor educational attainment. The survey was initially administered in English, translated into the Kinyarwanda language, and then returned to English in order to preserve abstract consistency. A total of 384 people made up the sample size after the selection process was continued until the necessary sample was attained.

In the part of qualitative data collection, the researcher conducted the interview with the key informants.

Reliability and Validity of research instruments

To ensure the reliability of the content, a pilot study was conducted by administering questionnaires to 15 patients with characteristics similar to those of the intended participants of the main survey. Participants in the pilot study were excluded from the main study.

The pilot study results revealed that three out of the 15 participants found some of the questions confusing. Consequently, two of these confusing questions were removed, and one was reformulated for better clarity and understanding.

This preliminary testing also assessed the validity and reliability of the questionnaire, yielding an initial Cronbach's Alpha of 0.45. This low value indicated poor reliability, highlighting the need for further review, revision, and reformulation to improve internal consistency. After making the necessary revisions, the questionnaire was retested, resulting in a Cronbach's Alpha of 0.91, which indicated excellent reliability.

Content validity was maintained by translating the questionnaire into Kinyarwanda and the answers from Kinyarwanda to English. This was done to maintain the authenticity of asked questions and given answers from the respondents. Validity was also established through close consultations and expert judgment of the supervisor.

Data analysis

Data collected were entered into the computer software program SPSS 21 for statistical analysis. Descriptive statistics, bivariate, and multiple logistic regression analyses were performed. The P-value of 0.05 and 95% confidence intervals was used to determine associations between independent and dependent variables. Tables were used to present findings.

The qualitative data was analyzed using Thematic Analysis, following Braun and Clarke's framework.[22] This method was chosen for its flexibility and ability to provide detailed and nuanced insights. The analysis involved several key steps: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Integration with the quantitative data was also performed to ensure consistency and a comprehensive understanding of the results. Important quotations from the qualitative data were included in the results to highlight key findings.

In this study, the primary dependent variable was the satisfaction level with CBHI technology. This was measured using a Likert scale ranging from5 = very satisfied, 4=satisfied, 3=neutral, 2=dissatisfied and 1=very dissatisfied, those answers helped to obtain the overall satisfaction and dissatisfaction percentages. Participants were asked to select the response option that best represented their opinion for each statement. The independent variables were predominantly measured using categorical responses, indicating different demographic characteristics such as age, gender, residence, education level, marital status, occupation, economic category, presence of young children, and family size. Each variable is presented with its frequency and percentage, providing a clear view of the respondent distribution across these categories.

Ethical Considerations

The research proposal was approved by the School of Postgraduate Studies, Mount Kenya University Rwanda, and ethical clearance was obtained from the Institutional Research and Ethics Committee of Mount Kenya University (Ref: MKU/ETHICS/28/8/2023(12)). Permission to proceed with data collection was obtained from the Director General of the selected referral hospital (Ref: 396/RRH/DG/2023). Written informed consent was obtained from all participants after a thorough explanation of the study's objectives, procedures and potential benefits, and the right to withdraw at any time. Participation was voluntary, and participants were assured that they could withdraw from the study at any point without any potential risk. To ensure participant comprehension, the questionnaire was translated into Kinyarwanda. anonymity and confidentiality were observed. For anonymity the questionnaires had no identifying information such as names or medical record numbers. With confidentiality participants were assigned unique identification codes. All data was stored securely in a password-protected Excel-based database.

Results

The quantitative method generated numerical data through descriptive statistics, bivariate, and multiple logistic regression analyses.

Sociodemographic characteristics

The Table 1 shows the majority of participants fell into the age groups of 20-30 (35.7%) and 30-40 (19.8%). This indicates that the study had a relatively younger population, with a significant proportion of adults in their prime working and reproductive years.

In terms of gender, the study consisted of a higher proportion of female participants (64.6%) compared to male participants (35.4%). This indicates a higher engagement and representation of women in the study population, suggesting the importance of considering gender-specific perspectives and needs when evaluating satisfaction levels and healthcare accessibility.

Regarding residence, a significant majority of the respondents (57.3%) resided within the hospital catchment area, while the remaining 42.7% lived outside the catchment area. This information highlights the reach and accessibility of the healthcare services provided by one selected Referral Hospital, indicating that a considerable number of participants had easy access to the hospital for their healthcare needs.

Table 1. Demographic Characteristics of Respondents

Characteristics	Frequency (N)	Percent (%)
Age of participant		
Below 20 years	57	14.8
20-30 years	137	35.7
30-40 years	76	19.8
40-50 years	51	13.3
Above 50 years	63	16.4
Gender of participants		
Male	136	35.4
Female	248	64.6
Residence		
In hospital catchment area	220	57.3
Out of Hospital catchment area	164	42.7
Education Level		
No formal education	93	24.2
Primary education	151	39.3
Secondary Education	120	31.3
Tertiary education	20	5.2
Marital Status		
Single	133	34.6
Married	236	61.5
Separated	9	2.3
Divorced	6	1.6
Occupation		
Government employee	16	4.2
NGO's employee	12	3.1
Student	47	12.2
Home worker	7	1.8
Retired	2	0.5
Farmer	21	5.5
Self-employed	176	45.8
Other	103	26.8
Type of Health insurance		
Mutuelle/Community Health Insurance	362	94.3
RSSB	14	3.6
MMI	8	2.1
UBUDEHE Category(with 5 reserved for the wealthiest and 1 the poorest)		
Category I	41	10.7
Category II	162	42.2
Category III	179	46.6
Category IV	2	0.5
Presence of under 5 children		
No	161	41.9
Yes	223	58.1
Family size		
1-3	105	27.3
3-5	157	40.9
More than 5	122	31.8

Source: Primary data, 2023

The educational distribution among the respondents indicates that the majority had either primary education (39.3%) or secondary education (31.3%). This suggests that a significant proportion of the study population had basic literacy and numeracy skills, which could potentially influence their interaction and utilization of Technology-based healthcare services.

Marital status among the respondents varied, with the majority being married individuals (61.5%). Single individuals accounted for 27.1% of the population, followed by widowed individuals (7.6%). This distribution reflects the diversity of marital statuses within the study population, which could impact their healthcare decision-making processes and utilization of healthcare services.

Occupationally, the study involved a diverse mix of respondents. The largest proportion consisted of self-employed individuals (45.8%), followed by unemployed individuals (26.8%) and students (12.2%). This suggests that the study population comprised individuals from various occupational backgrounds, potentially leading to differences in their healthcare service needs, utilization, and perspectives on Technology enabled healthcare accessibility.

In terms of health insurance coverage, the majority of participants (94.3%) were covered under Mutuelle/Community Health Insurance, indicating a high level of insurance coverage within the study population. This suggests that a significant proportion of the respondents had access to health insurance, which could positively influence their utilization of healthcare services and satisfaction levels.

The UBUDEHE category distribution among the respondents shows that the highest proportion belonged to Category III (46.6%), followed by Category II (42.2%). Category I had a smaller representation (10.7%), while Category IV was the least represented (0.5%). This information provides insights into the socio-economic stratification within the study population,

which could influence their healthcare-seeking behavior, preferences, and perceptions of healthcare accessibility using Technology.

Finally, regarding family characteristics, a slight majority of the respondents (58.1%) Treported having at least one child below the age of 5, while 41.9% reported not having any under 5 children. his indicates that a significant proportion of the study population had young children, which could potentially affect their healthcare service needs, preferences, and utilization patterns.

Table 2.The satisfaction level toward healthcare services using Technology

Characteristics	Very satisfied N(%)	Satisfied N(%)	Neutral N(%)	Dissatisfied N(%)	Very dissatisfied N(%)	Mean	SD
The overall quality of services is satisfactory	6 (16.1)	194 (50.5)	0 (0.0)	107 (27.9)	21 (5.5)	3.44	1.208
The availability of drugs is excellent.	70 (18.2)	195 (50.8)	0 (0.0)	81 (21.1)	38 (9.9)	3.46	1.278
Patients receive their prescribed treatment in a timely manner.	163 (42.4)	191 (49.7)	0 (0.0)	25 (6.5)	5 (1.3)	4.26	0.86
Diagnostic services are readily available when needed.	73 (19)	267 (69.5)	0 (0.0)	39 (10.2)	5 (1.3	3.95	0.844
The use of ICT has improved the relationship between healthcare providers and clients.	54 (14.1)	248 (64.6)	0 (0.0)	74 (19.3)	8 (2.1)	3,69	1.004
Paying premiums using ICT is challenging.	70 (18.2)	74 (19.3)	0 (0.0)	147 (38.3)	93 (24.2)	2.69	1.478
Similarly, paying copayments is also difficult.	53 (13.8)	55 (14.3)	0 (0.0)	198 (51.6)	78 (20.3)	2.11	1.332
Technological advancements have led to lower healthcare costs.	0 (0.0)	209 (54.4)	0 (0.0)	80 (20.8)	95 (24.7)	3.182	1,312
Waiting time to see a medical provider has been reduced.	47 (12.2)	199 (51.8)	0 (0.0)	116 (30.2)	22 (5.7)	3.637	1.233
There has been a decrease in waiting time between different services.	31 (8.1)	199 (51.8)	0 (0.0)	115 (29.9)	39 (10.2)	3.83	0.672

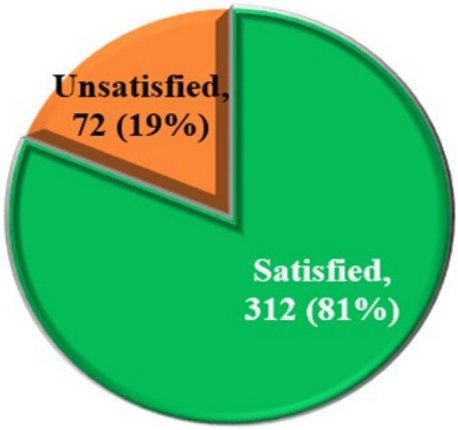
Source: Primary data, 2023

The results as indicated in Table 2 shows the evaluated satisfaction levels of respondents regarding healthcare services accessibility using technology at one selected Referral Hospital. Overall, the findings demonstrate a mixed response to the satisfaction levels among the respondents. When considering the overall quality of services, a considerable proportion of 200 out of 384 participants (66.6%) expressed satisfaction, either very satisfied or moderately.

In terms of drug availability, the majority of 265 out of 384 respondents (69%) were satisfied with the availability of drugs and improvement was due to the technology utilization. Regarding timely receipt of prescribed treatment, the findings indicate a high level of satisfaction among the 354 out of 384 participants, with a portion of (92.1%). The timely availability of diagnostic services was perceived positively by the majority of 340 out of 384 respondents (88.5%).

The utilization of technology to improve the provider and clients' relationship received mixed responses of 302 out of 384 with a portion of (78.7%) indicating a moderate level of satisfaction. Payment-related aspects were areas of concern for the respondents. The payment of premiums using technology was perceived as challenging by a significant portion (37.5%) from 144 out of 384 of the respondents. Similarly, the ability to pay copayments was identified as an issue by a considerable proportion of (27.1%) from 108 out of 384 of the participants.

Lower healthcare costs as a result of technology received a mixed response, with a portion of (54.4%) from 209 out of 384 of the respondents. Regarding waiting time, the reduction in waiting time to see a medical provider was acknowledged by a majority of 246 out of 384 respondents (64.2%).



Source: Primary data, 2023

Figure 1. Overall satisfaction level toward healthcare services accessibility using Technology among CBHI users.

The majority of 312 out of 384 participants (81.2%) expressed satisfaction with the healthcare services, while a smaller proportion of 72 out of 384 (18.8%) indicated dissatisfaction.

Factors related to the satisfaction

The results presented in Table 3 reveal significant associations between demographic factors and satisfaction levels among CBHI users who utilize technology-based services. Age emerged as a notable factor, with younger participants generally expressing higher satisfaction levels compared to their older counterparts. Gender differences were also apparent, as females reported a satisfaction rate of 83.5%, slightly higher than males at 77.2%.

Education level exhibited a clear gradient in satisfaction, with participants holding tertiary education reporting the highest satisfaction rate at 90%, while those with secondary education reported the lowest at 75%. Marital status played a role as well, with separated individuals indicating the highest satisfaction (88.9%), followed by single individuals (80.8%) and married individuals (78.4%).

Occupation showed marked variations, with students reporting the highest satisfaction rate (93.6%) and homemakers the lowest (42.9%). Additionally, satisfaction levels varied based on health insurance type, with RAMA or MMI users reporting a 100% satisfaction rate, compared to Mutuelle/ Community Health Insurance users at 80.1%.

These findings underscore the significance of demographic and socioeconomic factors in influencing satisfaction with healthcare services accessibility through technology among CBHI users. They highlight the potential for targeted interventions and policy adjustments to enhance service delivery and user satisfaction in this context.

Table 3. Bivariate Analysis

Characteristics	Satisfied		Unsatisfied			
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	Chi-Square	P-Value
Age of participant					1.233	**0.037**
Below 20 years	48	84.2	9	15.8		
20-30	112	81.8	25	18.2		
30-40	61	80.3	15	19.7		
40-50	39	76.5	12	23.5		
Above 50	52	82.5	11	17.5		
Gender of participants					2.261	0.0726
Male	105	77.2	31	22.8		
Female	207	83.5	41	16.5		
Education Level					4.978	**0.013**
No formal education	78	83.9	15	16.1		
Primary education	126	83.4	25	16.6		
Secondary Education	90	75	30	25		
Tertiary education	18	90	2	10		
Marital Status					9.705	**0.046**
Single	84	80.8	20	19.2		
Married	185	78.4	51	21.6		
Separated	8	88.9	1	11.1		
Divorced	6	100	0	0		
Widowed	29	100	0	0		
Occupation					28.72	**0.000**
Government employee	14	87.5	2	12.5		
NGO's employee	12	100	0	0		
Student	44	93.6	3	6.4		
Homemaker	3	42.9	4	57.1		
Retired	2	100	0	0		
Farmer	21	100	0	0		
Self-employed	144	81.8	32	18.2		
Unemployed	72	69.9	31	30.1		
Health insurance					5.385	**0.028**
Mutuelle/Community Health Insurance	290	80.1	72	19.9		
RAMA	14	100	0	0		
MMI	8	100	0	0		
Presence of under 5 children					7.286	**0.004**
No	141	87.6	20	12.4		
Yes	171	76.7	52	23.3		
Family size					2.944	0.229
1-3	82	78.1	23	21.9		
3-5	134	85.4	23	14.6		
More than 5	96	78.7	26	21.3		

Source: Primary data, 2023

Table 4. Logistic regression analysis results of dependent variables for satisfaction level among technology-based CBHI users

Characteristics	COR	[CI at 95%]	P-value	AOR	[CI at 95%]	P-value
Age of participant						
Below 20 years	1.65	[1.002 - 2.502]	0.041	1.96	[1.037 - 2.718]	0.003
20-30	1.22	[1.015 - 1.462]	0.028	1.31	[1.104 - 1.503]	0.018
30-40	0.71	[0.523 - 1.271]	0.192	0.63	[0.613 - 1.508]	0.167
40-50	0.58	[0.182 - 1.118]	0.307	0.52	[0.103 - 1.002]	0.273
Above 50	*Reference*			*Reference*		
Education Level						
No formal education	Reference			Reference		
Primary education	1.1	[0.682 - 1.902]	0.762	1.024	[0.629 - 1.842]	0.831
Secondary Education	1.33	[0.982 - 1.692]	0.456	1.283	[0.921 - 1.562]	0.532
Tertiary education	2.12	[1.124 - 4.216]	0.034	2.319	[1.103 - 4.782]	0.027
Marital Status						
Single	*Reference*			*Reference*		
Married	1.21	[1.032 - 2.003]	0.043	1.104	[1.002 - 1.921]	0.032
Separated	0.75	[0.602 - 1.392]	0.309	0.703	[0.528 - 1.283]	0.281
Divorced	0.68	[0.392 - 1.112]	0.194	0.629	[0.327 - 1.038]	0.163
Widowed	0.53	[0.332 - 0.843]	0.049	0.492	[0.281 - 0.824]	0.041
Occupation						
Government employee	2.33	[1.102 - 4.291]	0.014	2.612	[1.032 - 4.391]	0.001
NGO's employee	2.04	[1.392 - 3.282]	0.033	2.193	[1.293 - 3.628]	0.028
Student	1.74	[1.083 - 2.892]	0.021	1.829	[1.032 - 2.793]	0.013
Homeworker	0.31	[0.213 - 0.471]	0.267	0.273	[0.12 - 0.402]	0.249
Retired	0.45	[0.293 - 0.573]	0.342	0.392	[0.183 - 0.509]	0.321
Farmer	0.32	[0.201 - 0.410]	0.481	0.283	[0.192 - 0.310]	0.472
Self-employed	0.89	[0.732 - 1.512]	0.293	0.827	[0.672 - 1.482]	0.281
Unemployed	*Reference*			*Reference*		
Health insurance						
Mutuelle/Community Health Insurance	*Reference*			*Reference*		
RAMA	0.51	[0.362 - 0.702]	0.048	0.482	[0.291 - 0.628]	0.042
MMI	0.71	[0.602 - 1.032]	0.192	0.682	[0.581 - 1.002]	0.176
Presence of under 5 children						
No	*Reference*			*Reference*		
Yes	1.32	[1.202 - 1.793]	0	1.446	[1.283 - 1.943]	0.003

The participants below 20 years (AOR: 1.96, 95% CI: 1.037-2.718, p = 0.003) and those in the age group of 20-30 (AOR: 1.31, 95% CI: 1.104-1.503, p = 0.018) were more likely to report higher satisfaction levels compared to the reference group. However, there was no significant association between satisfaction and the age groups of 30-40, 40-50, and above 50.

Among the education levels, participants with tertiary education showed a significantly higher likelihood of satisfaction (AOR: 2.319, 95% CI: 1.103-4.782, p = 0.027). No significant associations were found between satisfaction and primary education or secondary education. Married participants had a slightly higher likelihood of satisfaction compared to the reference group (AOR: 1.104, 95% CI: 1.002-1.921, p = 0.032).

However, there were no significant associations between satisfaction and separated, divorced, or widowed marital status. Government employees (AOR: 2.612, 95% CI: 1.032-4.391, p = 0.001) and NGO's employees (AOR: 2.193, 95% CI: 1.293-3.628, p = 0.028) showed a significantly higher likelihood of satisfaction compared to unemployed participants. Students also had a higher likelihood of satisfaction (AOR: 1.829, 95% CI: 1.032-2.793, p = 0.013). No significant associations were found for other occupation categories.

Participants with RAMA insurance had a lower likelihood of satisfaction compared to those with Mutuelle/Community Health Insurance (AOR: 0.482, 95% CI: 0.291-0.628, p = 0.042). No significant association was observed for MMI insurance. The participants with under 5 children had a higher likelihood of satisfaction compared to those without under 5 children (AOR: 1.446, 95% CI: 1.283-1.943, p = 0.003).

Qualitative findings

The challenges and benefits of CBHI technology for service users and providers

The qualitative data collection aimed to provide deeper insights and explanations for the findings from the quantitative phase into the priorities of patients and clinicians, offering background information to interpret quantitative results

The Community-based Health Insurance (CBHI) system in Rwanda aims to provide accessible healthcare services to its members. However, despite the benefits brought about by technology based CBHI, there are still challenges that both users and healthcare providers face.

From the user's perspective, one user expressed their frustration, saying, *'I faced difficulties when I needed a specific medication that was not covered by CBHI. It was frustrating because I rely on the system to access affordable healthcare, but when certain medications are not available, it hinders my treatment and adds to my financial burden.'* This highlights the challenge of medication availability and the need for comprehensive coverage under CBHI.

Another user highlighted the issue of poor internet connectivity, stating, *'Sometimes, the internet connection is poor, especially in remote areas. This affects my ability to access the CBHI system and retrieve essential information about my membership and healthcare coverage. It becomes frustrating when I must wait or travel long distances to find a reliable internet connection.'* This highlights the digital divide and the need for improved infrastructure and connectivity to ensure seamless access to healthcare services through the CBHI system, especially in remote areas.

On the side of healthcare providers, the introduction of technology based CBHI has brought about changes in their workflow. One provider shared their experience, saying, *'Since the implementation of the technology based CBHI, our workload has increased significantly. We now must manage patient files and simultaneously interact with the CBHI system to input and retrieve information. It can be overwhelming and time-consuming, affecting our efficiency in providing timely care.'* This highlights the challenge faced by providers in managing increased workload and the need for adequate support and training to effectively navigate the system.

Despite these challenges, service provider from the health insurance side: also acknowledged the benefits of the technology based CBHI system. One provider noted, *'Despite the challenges, the technology based CBHI system has greatly improved the payment process. It allows us to accurately verify patients' CBHI membership and streamline billing procedures. It saves us time and reduces errors compared to the previous manual payment system.'* This highlights the positive impact of the system in terms of facilitating efficient and accurate payment processes, ensuring transparency and accountability.

The technology based CBHI system has brought both benefits and challenges to users and providers. Issues related to medication availability and reliance on internet connectivity can hinder the user experience, while healthcare providers face an increased workload due to the dual responsibilities of managing patient files and interacting with the CBHI system. Addressing these challenges, such as expanding medication coverage and improving internet infrastructure, while providing adequate support and training for providers, will be crucial for optimizing the CBHI system's efficiency and enhancing healthcare services for its members attending the OPD at one selected referral Hospital.

Discussion

The findings of this study provide insights into the overall satisfaction level of respondents regarding healthcare services accessibility using technology at one selected Referral Hospital. The majority of participants (81.3%) expressed satisfaction with the healthcare services, while a smaller proportion (18.8%) indicated dissatisfaction. These results show a positive overall perception of the technology-based healthcare system among the study participants,[16] which also highlighted the influence of age on satisfaction levels.

Furthermore, participants with tertiary education showed a significantly higher likelihood of satisfaction compared to other education levels. This finding implies that individuals with higher levels of education may have a better understanding and utilization of the technology -based healthcare system, leading to increased satisfaction. Similar results have been reported in previous studies,[17] which emphasized the positive relationship between education level and satisfaction with technology -based healthcare services . It is essential for policymakers to consider expanding educational programs that enhance understanding and utilization of technology-based healthcare services to improve overall satisfaction.

Marital status also emerged as a factor associated with satisfaction. Married participants had a slightly higher likelihood of satisfaction compared to the reference group. Although the difference is small, it suggests that marital status may influence the perception of healthcare services. This finding is in line with studies that have examined the impact of marital status on healthcare satisfaction,[18] highlighting the role of social support and companionship in the healthcare experience. Healthcare providers should consider marital status when designing and delivering healthcare services, potentially incorporating family-inclusive policies to enhance satisfaction.
Regarding occupation, government employees and NGO's employees showed a significantly higher likelihood of satisfaction compared to unemployed participants. This suggests that individuals with stable employment and a structured work environment may have a more positive experience with the technology-based healthcare system. Similarly, students also had a higher likelihood of satisfaction, possibly due to their relatively younger age and fewer healthcare needs compared to other occupation categories. These findings align with previous research on the influence of occupation on healthcare satisfaction.[19]. Employers and educational institutions should support initiatives that facilitate access to and understanding of technology-based healthcare services for their employees and students.

In terms of health insurance, participants with RAMA insurance had a lower likelihood of satisfaction compared to those with Mutuelle/Community Health Insurance. This discrepancy may be attributed to differences in coverage, benefits, or perceived quality of services between the two insurance schemes. The findings suggest that further investigation and improvement in the provision of healthcare services under different insurance schemes are warranted.

Health insurance providers should review and enhance their coverage and service quality to meet user expectations and improve satisfaction levels.

Lastly, participants with under 5 children had a higher likelihood of satisfaction compared to those without under 5 children. This finding may be attributed to the availability of specialized services for children or the perception of enhanced care for families with young children. Similar results have been reported in studies focusing on pediatric healthcare satisfaction.[20] Healthcare services should continue to prioritize and expand specialized care for families with young children to maintain and improve satisfaction.

In comparison with other relevant studies, our findings are consistent with previous research that has highlighted the influence of demographic factors such as age, education, and marital status on healthcare satisfaction.[21]

Overall, the findings suggest that while the technology-based healthcare system at one selected Referral Hospital is generally perceived positively, there are certain factors that influence satisfaction levels among users. Strengthening these factors, such as improving medication availability, ensuring reliable internet connectivity, and tailoring services to meet the needs of different demographic groups, can contribute to enhancing overall satisfaction and optimizing the effectiveness of the technology-based healthcare system.

Strengths and limitations of the study

Bridging the Gap in Knowledge

This survey addresses the lack of research on user experiences with technology-based health insurance in Africa, specifically within Community-Based Health Insurance (CBHI) schemes. By focusing on Rwanda, a leader in CBHI, it fills this knowledge gap.

Informing Policy and Platform Development

The survey identifies factors influencing user satisfaction and access efficiency, which can guide policy decisions and improvements to the technology-based platform. This ensures the platform meets user needs and enhances its effectiveness in the Rwandan healthcare system.

Addressing the Digital Divide

By exploring user challenges, the research highlights potential issues related to the digital divide between urban and rural users. These insights can help bridge this gap, ensuring equitable access and satisfaction for all CBHI users.

Improving Healthcare Access and Satisfaction

Understanding user experiences and satisfaction can lead to improvements in the platform, increasing user satisfaction, healthcare access efficiency, and supporting a robust and sustainable CBHI scheme in Rwanda.

Guiding Future Research and Policy

The results promote interdisciplinary research, offering guidance to future researchers and aiding institutions like the Rwanda Social Security Board (RSSB). This supports the assimilation of research methods and enhances public and professional understanding.

Limitations

The survey was conducted at only one referral hospital in Rwanda's Northern Province, limiting generalizability to the national population. Additionally, focusing solely on patients at Ruhengeri Referral Hospital might introduce selection bias.

Conclusion

The findings demonstrate a generally positive satisfaction level among CBHI users with healthcare service accessibility via technology at the selected Referral Hospital. Key factors influencing satisfaction included age, education, marital status, and occupation, with younger participants and those with higher education levels reporting

greater satisfaction. Challenges such as medication availability and internet connectivity were also identified, particularly in remote areas. Future research should explore strategies to address these challenges, such as enhancing medication coverage under CBHI and improving internet infrastructure to ensure equitable access to healthcare services. Additionally, further studies could investigate occupation-specific interventions to boost satisfaction and usage of technology-based CBHI services.

Authors' contribution

MMF, ER contributed to the conception, development of the manuscript and will work on reviewer's comment until its publication.

Conflict of interest

No conflict of interest declared.

References

1. Habte A, Tamene A, Ejajo T, Dessu S, Endale F, Gizachew A, et al. Towards universal health coverage: The level and determinants of enrollment in the Community-Based Health Insurance (CBHI) scheme in Ethiopia: A systematic review and meta-analysis. PLoS One. 2022;17. https://doi.org/10.1371/journal.pone.0272959
2. PAHO/WHO . World Health Day 2023 - Health for All .*Pan American Health Organization website.* https://www.paho.org/en/campaigns/world-health-day-2023-health-for-all. Accessed 4 July 2024
3. Wade RH. The World Development Report 2022: Finance for an Equitable Recovery in the Context of the International Debt Crisis. *Wiley Online Library* . 2023;54:1354–73.https://doi.org/10.1111/dech.12796
4. OECD.Technology and innovation in the insurance sector. *OECD Publishing, Paris.* 2017. https://doi.org/10.1787/ddf9df41-en
5. Lanfranchi, D., Grassi, L. Examining insurance companies' use of technology for innovation. *Geneva Pap Risk Insur Issues Pract.* 2022; 47, 520–537 . https://doi.org/10.1057/s41288-021-00258-y
6. Frans Sudirjo, Dominica Maria Ratna Tungga Dewa, Lucky Indra Kesuma, Lilik Suryaningsih, Eva Yuniarti Utami. Application of The User Centered Design Method To Evaluate The Relationship Between User Experience, User Interface and Customer Satisfaction on Banking Mobile Application. Jurnal Informasi dan Teknologi .2024. https://doi.org/10.60083/jidt.v6i1.465
7. Umeh CA, Feeley FG. Inequitable Access to Health Care by the Poor in Community-Based Health Insurance Programs: A Review of Studies From Low-and Middle-Income Countries. *Global Health: Science and Practice.* 2017, 5(2):299-314; https://doi.org/10.9745/GHSP-D-16-00286
8. Niang M, Gélinas É, Samb OM, Tessier L, Mailfert M, Iradukunda A, et al. The role of mutuals and community-based insurance in social health protection systems: International experience on delegated functions. *Int Soc Secur Rev.* 2023;76:3–29. https://doi.org/10.1111/issr.12323
9. Adebayo EF, Uthman OA, Wiysonge CS, Stern EA, Lamont KT, Ataguba JE. A systematic review of factors that affect uptake of community-based health insurance in low-income and middle-income countries. *BMC Health Serv Res.* 2015;15:1–13. https://doi.org/10.1186/s12913-015-1179-3
10. University of Rwanda, Rockefeller Foundation,Management Sciences for Health, Ministry of Health. The Development of Community-Based Health Insurance in Rwanda: Experiences and Lessons.*msh website.* 2016; https://msh.org/wp-content/uploads/2016/04/the_development_of_cbhi_in_rwanda_experiences_and_lessons_-_technical_brief.pdf. Accessed 2 July 2024

11. Stoumpos AI, Kitsios F, Talias MA. Digital Transformation in Healthcare: Technology Acceptance and Its Applications. *Int J Environ Res Public Health.* 2023 ;20. doi: 10.3390/ijerph20043407
12. Almeman A. The digital transformation in pharmacy: embracing online platforms and the cosmeceutical paradigm shift. J Health Popul Nutr . 2024 ;43:1–22. https://doi.org/10.1186/s41043-024-00550-2
13. Slaughter L, Norman KL, Shneiderman B. Assessing Users' Subjective Satisfaction with the Information System for Youth Services (ISYS). *Institute for Systems Research Technical Reports.* 1998; http://drum.lib.umd.edu/handle/1903/431
14. National Institute of Statistics Rwanda. Demographic and Health Survey (2019/20). *National Institute of Statistics Rwanda website.*https://www.statistics.gov.rw/datasource/demographic-and-health-survey-201920
15. Akarere ka Musanze.Igishushanyo mbonera cy' Akarere ka Musanze. *Akarere ka Musanze website* . https://www.musanze.gov.rw/about/menya-akarere-1.Accessed 4 July 2024
16. Biresaw H, Mulugeta H, Endalamaw A, Yesuf NN, Alemu Y. Patient satisfaction towards health care services provided in Ethiopian health institutions: a systematic review and meta-analysis. *Health Serv Insights* . 2021. doi: 10.1177/11786329211040689
17. Duplaga M, Turosz N. User satisfaction and the readiness-to-use e-health applications in the future in Polish society in the early phase of the COVID-19 pandemic: A cross-sectional study. *Int J Med Inform* . 2022 ;168. doi: 10.1016/j.ijmedinf.2022.104904
18. Pandey KR, Yang F, Cagney KA, Smieliauskas F, Meltzer DO, Ruhnke GW. The impact of marital status on health care utilization among Medicare beneficiaries. Medicine. 2019;98. doi: 10.1097/MD.0000000000014871
19. Shi Y, Xue H, Ma Y, Wang L, Gao T, Shi L, et al. Prevalence of occupational exposure and its influence on job satisfaction among Chinese healthcare workers: A large-sample, cross-sectional study. *BMJ Open.* 2020;10. doi: 10.1136/bmjopen-2019-031953.
20. Money NM, Schroeder AR, Quinonez RA, Ho T, Marin JR, Morgan DJ, et al. 2019 Update on Pediatric Medical Overuse: A Systematic Review. *JAMA Pediatr* . 2020;174:375–82. doi: 10.1001/jamapediatrics.2019.5849
21. Adhikari M, Paudel NR, Mishra SR, Shrestha A, Upadhyaya DP. Patient satisfaction and its socio-demographic correlates in a tertiary public hospital in Nepal: a cross-sectional study. *BMC Health Serv Res.* 2021 ;21:1–10. https://doi.org/10.1186/s12913-021-06155-3
22. Braun, V, Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* 2006. 3(2), 77–101 .https://doi. org/ 10. 1191/ 14780 88706 qp063 oa