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Modeling the socioeconomic determinants of health insurance coverage among boda-boda riders in Kenya

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ABSTRACT

Achieving universal health coverage remains a major challenge in low- and middle-income countries such as Kenya, especially for vulnerable groups like informal workers. This study focuses on boda-boda riders, an important part of Kenya's transport sector, who often do not have access to formal health insurance. The aim of the study was to examine how socioeconomic factors influence health insurance enrollment among boda-boda riders in Kenya, with the goal of supporting fair access to healthcare. A descriptive cross-sectional design was used, and data were collected from 370 boda-boda riders in Embu County, Kenya, using a structured questionnaire. The questionnaire gathered information on socioeconomic characteristics, insurance enrollment status, perceived affordability of health insurance, and demographic details. Logistic regression was used to assess the effect of these factors on the likelihood of enrolling in health insurance. Results showed that 62.2% of participants had health insurance. The analysis found that riders with higher income (OR = 1.000, $p < 0.001$), more working hours per week (OR = 1.655, $p < 0.001$), and older age (OR = 1.270, $p < 0.001$) were more likely to be enrolled. In contrast, having more dependents (OR = 0.385, $p < 0.001$) and more years of experience in the boda-boda business (OR = 0.118, $p < 0.001$) were linked to a lower chance of enrollment. Additionally, those who viewed health insurance as affordable were significantly more likely to enroll (OR = 4.529, $p < 0.001$) compared to those who saw it as expensive. These findings highlight that both socioeconomic status and the perceived cost of insurance are key factors affecting enrollment in health insurance among boda-boda riders in Kenya.

1. Introduction

Universal health coverage remains a critical global goal, yet it continues to elude many low- and middle-income countries (LMICs), including Kenya (Divan et al., 2021; Hanson et al., 2019; Meessen, 2018; Cerf, 2019). Despite healthcare availability improvement efforts many informal workers still cannot join existing health insurance, and they struggle to access necessary health services. Boda-boda riders make an important impact on Kenya's transport industry by delivering low-cost rides based on the findings of multiple researchers including Nyaga and Kariuki (2019). Despite their basic social needs, most boda-boda workers remain uninsured and unprotected by social security benefits (Barasa et al., 2017).

Research shows that people's household earning power along with their educational attainment and job position strongly affects their ability to get and use health insurance and medical treatment. People with low incomes find it hard to afford health insurance payments and medical bills (Munge et al., 2017). People with higher education levels better understand the value of all forms of health insurance coverage according to Kaur and Singh (2022). Employees have better opportunities to get health insurance through their employers according to studies by Buchmueller and Levy (2020), Chang (2019), and Keskimaki et al. (2019).

Previous researchers studied general health insurance coverage trends in Kenya but no one has thoroughly investigated how boda-boda riders choose health insurance plans and what affects their decisions. Despite facing special issues with healthcare finances this group remains understudied

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in how they select health insurance coverage and what drives their decisions. Accurate knowledge about this group helps us create better financial protection and healthcare access programs these people really need. The way boda-boda riders think about their health insurance payments controls whether they choose to buy coverage. Our research needs to examine how boda-boda riders view health insurance costs against their ability to enroll in coverage programs.

This research shows how basic social factors including income level, educational attainment, and work status drive boda-boda riders in Kenya to join health insurance plans. Our research studies how boda-boda riders decide to enroll in health insurance based on their personal assessment of insurance cost affordability. Our research answers major outstanding questions about health insurance barriers to help Kenya develop methods for better healthcare coverage for boda-boda riders and at-risk populations.

2. Literature review

Much research works explored the impact of social and financial background on boda-boda riders' decisions to get health insurance. Sirengo (2019) revealed that drivers in Bungoma County joined NHIF based on how much money they earned and their education, family structure, and job status while being married and saving with a group helped them become members. Nyaboga's (2019) research showed that previous work experience as well as higher education and having a motorcycle strongly influenced health insurance registration in Machakos County. Ngetich (2016) showed that Nandi County residents based NHIF enrollment decisions on income, work history, and expense perception while Nyorera and Okibo's (2020) research found that income combined with education level and awareness guided NHIF participation in Nyatike Sub-County.

Health insurance adoption depends strongly on how much users think they must pay for it. Boda-boda drivers from Kakamega County reported they would pay KES 393 monthly as per Mutua's (2019) findings though NHIF requires KES 500. Barasa et al. (2017) found that expensive premium rates stopped individuals from joining Homa Bay County's health insurance as the monthly payment costs reduced insurance participation. Indimuli et al. (2023) discovered that the unstable income plus penalties prevent informal workers from enrolling in NHIF.

A person's age, gender, and whether they are married impact their decision to get health insurance. Research conducted by Kariuki et al. (2018) demonstrated how NHIF membership in Nyeri County depended on member's gender, age group, marital status, and level of education. The findings of Lukorito and Muga (2014) showed that higher education levels and better income improve insurance registration in Murang'a and Siaya counties. According to Sundays et al. (2015), people with higher education and income in Kakamega County tended to join NHIF programs more often.

The literature demonstrates how boda-boda riders' health insurance decisions depend on their financial standing, how they view costs, and their demographic background. Despite existing studies health insurance patterns of Kenyan boda-boda riders need further investigation into multiple factors affecting their insurance decisions.

3. Materials and methods

3.1. Study design

Researchers conducted a cross-sectional study to determine how socioeconomic factors affect health insurance among boda-boda drivers in Embu County Kenya. This research design suited our study since it enabled analysis of target population traits and connections between our key variables.

3.2. Study population and sampling

The study targeted the 5000 boda-boda riders of Embu County. We used the simple random sampling method to select all study participants. The following Yamane formula was adopted for determining the sample size for each group:

$$n = N / (1 + N(e)^2) \quad (1)$$

where, the sample size requirement n depends on the total population N and the chosen error rate e which we assumed to be 0.05. Our study required a sample of 370 boda-boda riders in Embu County based on the statistical formula used.

3.3. Reliability and validity of data collection instruments

To ensure the reliability and validity of the data collection instruments, several steps were taken during the development and implementation of the questionnaire:

3.3.1. Reliability

The researchers tested how reliably the questionnaire results matched over time by using Cronbach's alpha coefficient. Twenty boda-boda riders from Embu County helped test how dependable our research instrument was through a pilot study. Each questionnaire section showed Cronbach's alpha value above the standard 0.7 level confirming that the questions work reliably together. The process validated that all questions measured their targets consistently for different survey participants.

Two weeks after the initial survey two separate sets of boda-boda riders completed the same questionnaire to test the reliability of consistent responses. The research team analyzed both test results to check if scores stayed stable during the

period. The test results showed high-reliability scores for our research tool which proved it gives repeatable and stable outcomes.

3.3.2. Validity

Health insurance and public health researchers evaluated the entire survey to confirm content validity. The experts validated that our questionnaire was detailed, easy to understand, and matched our research targets. Our study design allowed us to target important factors such as income level as well as education and work status while also assessing the relationship between the cost of health insurance and actual participant enrollment.

We verified face validity through expert boda-boda representatives and tested our questionnaire with early participant feedback. We made sure the questions stood up to relevance tests by getting feedback from boda-boda representatives before pretesting them with real users.

Our team tested construct validity by matching our survey questions against recognized models that explain how money affects health insurance decisions. Our questionnaire strongly matched theoretical health models which showed they measured our study variables effectively.

3.3.3. Pilot study adjustments

The research team enhanced specific questions in the study based on pilot test feedback to make them easier to understand and more exact. Our team modified the income levels in the survey to match how boda-boda riders earn money and added extra payment options when asking about their affordability perception. The testing process ensured our research tools function properly and yielded trustworthy results throughout the investigation.

3.4. Data collection

Questionnaires were used to gather the data since they were considered the most suitable to elicit information from the target population. The questionnaire comprised only closed-type questions, including multiple-choice questions with specific responses intended to generate data about the study aims and research questions. The questionnaire comprised questions on the following socio-demographic factors: income, education level, employment status, enrollment status to a health insurance scheme, perceived affordability of scheme, age and gender, and size of family.

The questionnaire was divided into sections according to the research objectives; each section had the appropriate questions to enable the researcher to collect all the information that was deemed important for the study regarding the variables of interest. A pilot study was conducted involving twenty boda-boda riders to assess the validity and reliability of the developed questionnaire. Considering the findings of the pilot test, improvements were made as a way of fine-tuning the questionnaire. To establish the internal consistency of the questionnaire, Cronbach's alpha coefficients were used. Reliability was also given maximal attention since a validity validation process was also done to test the accuracy of the research tool in measuring the desired constructions.

3.5. Data analysis

The odds ratio for each of the predictors was calculated by administering a logistic regression test in a bid to determine the effects of responses to the demographic variables (monthly household income, education level, and employment status), on the likelihood of health insurers enrolling boda-boda riders in Kenya. This statistical method was selected because it enables estimation of the association between a set of predictor variables and a binary dependent variable, which here is the health insurance enrolment status. The logistic regression model was expressed as follows:

$$P(y = 1 \mid X, \beta) = \frac{1}{1 + e^{-X\beta}} \quad (2)$$

where, P(y = 1 | X, β) is the probability of the dependent variable (y) being 1 (success) given the matrix of independent variables (X) and the vector of model parameters (β). The logistic function transforms the linear combination of the independent variables and coefficients (Xβ) into a probability between 0 and 1.

Additionally, the chi-square test for independence was employed to examine the relationship between the perceived affordability of health insurance contributions and the likelihood of health insurance coverage uptake among boda-boda riders in Kenya. The influence of demographic factors (age, gender, and family size) on health insurance enrollment among boda-boda riders in Kenya was also explored using logistic regression models.

4. Results and discussion

The study involved 370 boda-boda riders, with a majority (62.2%) having some form of health insurance coverage as shown in Table 1. The gender distribution was skewed towards males (67%), which is typical of the boda-boda industry in Kenya.

As shown in Table 2, insured riders had a higher mean age of 35.89 years (SD=7.649) compared to 33.07 years (SD=7.343) for the uninsured, suggesting that older riders were more likely to enroll in health insurance plans. There was a substantial income disparity between the two groups, with insured riders earning a mean monthly income of KES 21,356.52 (SD=7608.535) while the uninsured earned KES 18,007.14 on average (SD=5834.031). This income difference could

potentially influence the affordability and uptake of health insurance. Furthermore, insured riders had been in the boda-boda business for a longer period, with a mean of 5.62 years worked (SD=1.653) compared to 5.17 years for the uninsured (SD=1.493). This could indicate that riders with more experience in the industry were more likely to appreciate the importance of health insurance and have the financial means to enroll. Interestingly, insured riders also worked longer hours per week, with a mean of 36.70 hours (SD=7.114) compared to 33.54 hours (SD=6.772) for the uninsured. This could be attributed to the need to generate higher incomes to afford health insurance premiums or a higher level of commitment to their work among the insured group.

Table 1: Gender and insurance coverage distribution of boda-boda riders

Variable	Category	Frequency	Percent	Cumulative percent
Gender	Male	248	67.0	67.0
	Female	122	33.0	100.0
Insurance cover	No	140	37.8	37.8
	Yes	230	62.2	100.0

Table 2: Summary statistics

Variables	Insurance cover	N	Mean	SD
Age	No	140	33.07	7.343
	Yes	230	35.89	7.649
Income	No	140	18007.14	5834.031
	Yes	230	21356.52	7608.535
Experience	No	140	5.17	1.493
	Yes	230	5.62	1.653
Hours worked/weekly	No	140	33.54	6.772
	Yes	230	36.70	7.114

SD: Standard deviation

4.1. Inferential statistics

The independent samples t-test revealed statistically significant differences in age ($p = 0.01$), monthly income ($p = 0.00$), years worked/experience ($p = 0.09$), and weekly working hours ($p = 0.00$), between the insured and uninsured groups as shown in Table 3. These findings suggest that older age, higher income, longer work experience, and more weekly working hours were associated with a higher likelihood of having health insurance coverage among boda-boda riders.

Table 3: Independent sample t-test

		Levene's test for equality of variances		T-test for equality of means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Standard error difference
Age	Equal variances assumed	.12	.729	-3.49	368	.001	-2.82	.81
	Equal variances not assumed			-3.52	303	.000	-2.82	.80
Income	Equal variances assumed	31.33	.000	-4.47	368	.000	-3349.38	749.44
	Equal variances not assumed			-4.76	349	.000	-3349.38	703.43
Experience	Equal variances assumed	4.60	.033	-2.63	368	.009	-.45	.17
	Equal variances not assumed			-2.70	317	.007	-.45	.17
Hours worked/weekly	Equal variances assumed	.27	.607	-4.21	368	.000	-3.16	.75
	Equal variances not assumed			-4.27	305	.000	-3.16	.74

Pearson's correlation analysis provided insights into the relationship between the perceived affordability of health insurance and various socioeconomic factors. A positive correlation (r = 0.377) was observed between affordability rating and monthly income, indicating that riders with higher incomes were more likely to perceive health insurance as affordable. Conversely, negative correlations were found between affordability ratings and age (r = -0.166), years worked (r = -0.155), and the number of dependents (r = -0.161) as shown in Table 4. These findings suggest that older riders, those with more years of experience, and those with more dependents were more likely to perceive health insurance as less affordable, potentially due to increased financial obligations and responsibilities.

The chi-square tests revealed significant associations between health insurance coverage and affordability rating ($\chi2 = 106.618$, $p < 0.01$), education level ($\chi2 = 36.587$, $p < 0.01$), and marital status ($\chi2 = 23.430$, $p < 0.01$). A higher proportion of insured riders perceived health insurance as affordable, had higher levels of education, and were

married. These findings highlight the potential influence of education, marital status, and perceived affordability on health insurance enrollment decisions among boda-boda riders.

Table 4: Correlation matrix

		Income	Affordability	Age	Dependents	Experience
Income	Pearson correlation	1	.377**	.020	.096	.075
	Sig. (2-tailed)		.000	.698	.065	.150
	N	370	370	370	370	370
Affordability	Pearson correlation	.377**	1	-.166**	-.161**	-.155**
	Sig. (2-tailed)	.000		.001	.002	.003
	N	370	370	370	370	370
Age	Pearson correlation	.020	-.166**	1	.662**	.856**
	Sig. (2-tailed)	.698	.001		.000	.000
	N	370	370	370	370	370
Dependents	Pearson correlation	.096	-.161**	.662**	1	.617**
	Sig. (2-tailed)	.065	.002	.000		.000
	N	370	370	370	370	370
Experience	Pearson correlation	.075	-.155**	.856**	.617**	1
	Sig. (2-tailed)	.150	.003	.000	.000	
	N	370	370	370	370	370

**: Correlation is significant at the 0.01 level (2-tailed)

The logistic regression analysis further quantified the impact of socioeconomic factors on health insurance enrollment. As shown in Table 5, older age (OR = 1.270, $p < 0.001$), higher monthly income (OR = 1.000, $p < 0.001$), and longer weekly working hours (OR = 1.655, $p < 0.001$) were positively associated with a higher likelihood of having health insurance coverage. On the other hand, the findings showed that an increased number of dependents (OR = 0.385, $p < 0.001$) and increased years of experience in boda-boda business (OR = 0.118, $p < 0.001$) indicated a decreased likelihood of health insurance among boda-boda operators.

Specifically, the affordability rating (OR = 4.529, $p < 0.001$) revealed a considerable and positive effect on the probability or likelihood of health insurance. This study further shows how the level of perceived affordability can influence the extent of health insurance uptake among the boda-boda riders.

The findings of the study can be useful in understanding the determinants of boda-boda riders regarding their enrollment in the health insurance scheme in Kenya. This study acknowledges age, income, working hours, number of dependents, experience in duration, and perceived cost as the factors affecting the probability of health insurance among the vulnerable group of people. These outcomes can be used in designing measures and programs, which can effectively boost the affordability and availability of health insurance to such motorists.

Table 5: Binary logistic regression

		B	Standard error	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	Dependents	-.954	.184	26.837	1	.000	.385	.269	.553
	Age	.239	.045	27.634	1	.000	1.270	1.162	1.389
	Income	.000	.000	16.015	1	.000	1.000	1.000	1.000
	Experience	-2.137	.392	29.729	1	.000	.118	.055	.254
	Weekly work hours	.504	.081	39.118	1	.000	1.655	1.413	1.937
	Affordability rating	1.511	.194	60.744	1	.000	4.529	3.098	6.622
	Constant	-19.282	2.241	74.055	1	.000	.000		

a. Variable(s) entered on step 1: Dependents, age, income, experience, weekly work hours, affordability rating

4.2. Discussion

The research of this study reveals the socio-economic predictors of health insurance uptake among the boda-boda riders within Embu County, Kenya. The findings are consistent with earlier findings stressing that income, education, and perceived cost affect the uptake of health insurance. This section discusses the implications of these findings to previous work, discusses the practical implications, and presents policy recommendations.

4.2.1. Influence of socioeconomic factors

Income emerged as a key determinant of health insurance uptake in line with Sirengo (2019), Nyorera and Okibo (2020), and Lukorito and Muga (2014). These studies stress higher income levels can help in the purchasing of premiums and other costs such as out-of-pocket expenses. In the same manner, Munge et al. (2017) and Li et al. (2020) observed that people who have stable and higher income levels are more likely to purchase health insurance because they can afford to set their priorities on health expenditure.

The analysis also showed that education level significantly influenced the uptake of health insurance, a finding that is consistent with the studies by Nyaboga (2019), Kariuki et al. (2018), and Sundays et al. (2015). Health education is one of the ways through which individuals learn about the need for health insurance and the advantages of health insurance in the future according to Kaur and Singh (2022). Nevertheless, different findings from Nyaboga (2019) and Ngetich (2016) who also found

a positive relationship between the number of years worked in the boda-boda sector and health insurance uptake indicate that there may be variance in the socioeconomic status between different regions and subjects.

4.2.2. Perceived affordability and health insurance uptake

This study finds that perceived affordability is a key determinant of health insurance uptake as supported by Barasa et al. (2017) and Indimuli et al. (2023). The findings also show that the riders who think that the premiums are cheap are willing to enroll, which strengthens the argument that affordability is significant for informal workers. This is in concurrence with the study by Mutua (2019) that established that the boda-boda riders' willingness to pay (WTP) for NHIF premiums is relatively low and therefore calls for appropriate pricing strategies.

Possible solutions to the problem of affordability may include providing affordable premium rates for low-income clients, allowing periodic contributions (daily or weekly), or introducing community-based health insurance for this group. Such measures may eliminate the costs and help in enhancing enrolment among the boda-boda riders.

4.2.3. Demographic factors and health insurance enrollment

The findings on demographic factors such as age and family size are consistent with Kariuki et al. (2018), who found that older individuals are more likely to enroll in health insurance due to increased awareness of its importance. However, the negative correlation between the number of dependents and health insurance enrollment aligns with Ngetich (2016), indicating that financial constraints associated with larger families may hinder insurance uptake.

Addressing this issue requires targeted interventions, such as expanding subsidies or offering family coverage plans at discounted rates, to ensure that larger households are not excluded from health insurance programs.

4.2.4. Practical implications

The findings of this study may help improve health insurance enrollment among informal workers, particularly boda-boda riders. In particular, providing targeted subsidies for health insurance premiums could significantly reduce the financial burden for low-income riders. Additional strategies may include offering flexible payment plans, such as daily or weekly contributions based on income levels, to make it easier for individuals with irregular earnings to afford insurance premiums.

Furthermore, education and awareness campaigns are important for improving understanding of health insurance and its benefits. These efforts could effectively use boda-boda associations, community leaders, and peers to reach and encourage riders to enroll. Improving the affordability and availability of microinsurance or community-based health insurance designed for the informal sector may also increase participation.

4.2.5. Recommendations for policymakers

The following recommendations are proposed for consideration by policymakers to address the challenges identified in this paper: To keep low-income passengers from being left behind, the company can offer sliding-scale premium systems according to income. Extending the measures that help to minimize the penalties for late payments and excluding the additional costs would also contribute to the development of participation.

Additionally, family-centered health insurance policies which are designed to cover riders who have dependents can consider the financial challenges that large families face. Using advanced technologies such as mobile money, it could be easier to collect premiums, minimize the costs of transactions, and increase convenience to the boda-boda riders. Finally, policies encouraging collaboration with boda-boda organizations and other groups could enhance the perceptions of health insurance programs and enhance the enrolment and renewal rates.

5. Conclusions

The main objective of this study was to examine how riders' income, education level, and employment status relate to their enrollment in health insurance in Kenya. It also aimed to explore how the perceived affordability of health insurance contributions influences the likelihood of using health insurance among boda-boda riders. The study found that riders who earned more than 300,000 Kenyan shillings per month, had formal education, or believed health insurance was affordable were more likely to be enrolled. In contrast, having more dependents and more years of experience in the boda-boda business were associated with lower enrollment in health insurance.

These results suggest that socioeconomic factors and perceived costs play a key role in determining access to health insurance—and therefore access to healthcare—for this high-risk group. The study offers valuable insights for designing targeted policies and interventions that can lower the cost of health insurance and make it more accessible. This would help boda-boda riders gain access to quality healthcare and avoid serious financial hardship, contributing to better financial protection in health.

Despite these findings, some important questions remain. Further research is needed, especially on the negative relationship between years of experience in the boda-boda sector and health insurance enrollment. Understanding the specific challenges

experienced riders face may help in developing better support strategies. Using qualitative methods alongside quantitative data could also provide deeper insight into the perceptions, attitudes, and decision-making processes related to health insurance in this population.

Moreover, examining the role of community-based or micro-insurance schemes could help identify ways to improve coverage and demand. Investigating the influence of social networks, peer pressure, and community mobilization could also reveal how existing social structures can be used to promote health insurance enrollment.

Finally, comparisons across regions or counties could highlight differences in socioeconomic status and perceptions of affordability, helping tailor interventions to specific areas. Long-term (longitudinal) studies could also provide more information on how health insurance affects the health, economic well-being, and overall welfare of boda-boda riders and their families.

Compliance with ethical standards

Ethical considerations

We followed ethical guidelines throughout this study to protect participants and keep our data honest. Each participant provided informed consent and received assurance that they could stop participating at any time without consequences. The study used unique personal identifiers for each participant and put the gathered information in protected storage. Through this research, we followed the Kenya Data Protection Act 2019 to use data only for academic study. Questions were designed to avoid discomfort or harm, and efforts were made to represent diverse participants fairly through random sampling. Findings will be shared with stakeholders and participants to promote transparency and inform policy development.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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