THE INFLUENCE OF FLOOD RISK PERCEPTION ON INSURANCE UPTAKE AMONG RESIDENTS IN FLOOD-PRONE AREAS OF LAGOS STATE

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ABSTRACT

This study examined the impact of flood risk perception on flood insurance uptake among residents in flood-prone areas of Lagos State, Nigeria. Utilizing a descriptive quantitative methodology, the study analysed responses from structured questionnaire focused on demographic characteristics, perceived flood risks, and insurance behaviours. Descriptive statistics, one-sample t-test and Logit regression model were used in analysing the data. Results revealed that the residents perceived flood risk a neither high nor low given that a significant portion of residents acknowledged a high probability of flooding (40.5%), a substantial number (36.7%) underestimated the risk with no clear-cut majority. Similar trend occurs in the resident perception of the severity (37.6% perceived severity as high against 42.6% perceiving it as low) and concern (39.4% highly concerned against 40.0% low concern) for flood risks in the study area. In terms of perceived control, the majority (66.5%) of the residents perceived they either had little or no control over flood risks. Against a priori expectation, perception of flood risks had no significant relationship (β = 0.273, OR = 1.314) with insurance uptake in the study area. The study recommends that flood insurance uptake strategies should inculcate education about dangers of flood and improve residents perceived control over flood risk through insurance uptake.

Keywords: *Flood risk perception, Insurance uptake, Lagos State, Logistic regression.*

INTRODUCTION

Flooding represents a globally prevalent natural hazard, with increasing severity driven by climate change, inadequate urban planning, and unsustainable land use practices. Accounting for over 45% of all water-related disasters worldwide (Petrochenko, 2023), flood poses a particularly significant threat to developing nations like Nigeria, where limited adaptive capacity exacerbates impacts (Fitriyati et al., 2024; Johnson et al., 2023). Nigeria's vulnerability is amplified by its tropical climate, prolonged seasonal rainfall (April–October), and major river systems like the Niger and Benue (Ndimele et al., 2024; Onafeso, 2023). The 2020 floods, which affected 97% of states, displayed 120,000 people and caused 68 fatalities, exemplify systemic risks from overwhelmed drainage and floodplain (Ndimele et al., 2024; Arijaje et al., 2022).

Despite this recurrent threat, flood insurance adoption in Nigeria remains notably low, partly attributed to socio-economic constraints and disparities in flood risk perception (Onafeso, 2023; Veigel et al., 2024). Residents in flood-prone areas predominantly rely on reactive, costly informal strategies like post-disaster borrowing (Veigel et al., 2024). While accurate

risk perception is a critical determinant of preparedness (Salazar-Baño et al., 2024), understanding these perceptions among residents, the first objective of this study, is essential to contextualize behavioural responses.

Besides, a critical gap persists in empirically establishing how these perceptions influence or fail to influence insurance decisions (the study's second objective). This knowledge deficit hinders evidence-based interventions by policymakers and insurers to mitigate communities' economic vulnerability, necessitating the conduct of this study.

Research Hypotheses

Hypothesis 1: The residents of the flood-prone areas do not perceive flood risk as significantly serious

Hypothesis 2: Flood risk perception does not significantly influence insurance uptake among residents of flood-prone areas.

LITERATURE REVIEW

Flood Risk Perception

Flood risk perception refers to the subjective evaluation by individuals or communities regarding the likelihood of flood occurrences and the potential damage such events may cause. This concept is crucial in shaping behaviour related to disaster preparedness, such as evacuation planning, structural mitigation, and insurance uptake (Bubeck et al., 2012). Flood risk perception is shaped by a range of personal, social, and contextual factors.

Insurance Uptake

Insurance uptake refers to the adoption of flood insurance, influenced by economic, behavioural, and institutional factors. Roder et al. (2020) frame it as a function of risk-based pricing and affordability, where rising premiums under climate change may trigger "socio-economic tipping points," reducing demand in vulnerable regions. Behavioural studies highlight trust in insurers, social norms (e.g., neighbours' adoption), and perceived fairness of premiums as critical determinants

Flood-Prone Areas

Flood-prone areas are defined through biophysical criteria (e.g., 100-year floodplains) and socio-spatial dynamics. Tabasi et al. (2024) categorize these zones using hazard metrics like river proximity and historical flood extents, emphasizing their role in urban planning and insurance underwriting.

Empirical review of factors influencing Flood Insurance Uptake

Onyike et al. (2023) investigated the factors influencing flood insurance decisions among homeowners in flood-prone areas of Imo State, Nigeria. Using discriminant analysis of survey data from 300 homeowners, the study identified behavioural, emotional, and attitudinal factors such as trust in insurance providers, insurance literacy, and availability of

information as key determinants of flood insurance uptake. A critical finding was the low awareness of insurance benefits and distrust in insurers, which significantly impeded adoption. The authors emphasized that improving insurance literacy, building trust through transparency, and introducing government-supported incentives are vital to increasing insurance penetration in Nigeria.

Yeom et al. (2019) assessed how risk perception influences flood insurance adoption in South Korea. Their survey of 500 coastal residents revealed that higher perceived risks significantly increased the intention to purchase insurance, with a 22% stronger adoption intention among those who experienced recent floods. The availability of disaster assistance created a moral hazard, discouraging many from buying insurance. To improve uptake, they recommended integrating disaster relief with insurance schemes and enhancing public risk awareness campaigns.

Lo (2013) examined factors influencing flood insurance adoption among 301 households in Brisbane, Australia, following the 2011 floods. The study found that only 47.8% of households had flood insurance, and traditional predictors such as perceived flood risk (only 17 respondents perceived “medium to extreme” risk) and affordability (not statistically significant) failed to explain insurance uptake. Instead, social expectations, such as perceiving that others also have insurance ($p < 0.05$) and affirmation from family or friends ($p < 0.01$), strongly predicted adoption. Lo concluded that addressing social influences could significantly enhance flood insurance coverage rates.

Seifert et al. (2013) examined how flood risk characteristics impact the demand for insurance in Germany and the Netherlands, countries with contrasting flood risk profiles. Based on surveys, the study revealed that willingness to pay (WTP) was higher in Germany, where residents face medium-probability, medium-impact floods, compared to the Netherlands, where low-probability, high-impact floods dominate. In the Netherlands, reliance on government compensation created a "charity hazard," reducing private insurance demand. German participants showed higher WTP due to greater flood frequency and direct experiences with moderate flooding. The study recommended compulsory flood insurance in both nations to address low market penetration, supplemented by public awareness campaigns to counter over-reliance on government aid.

Summarily, the foregoing studies revealed that flood insurance uptake is influenced by a complex interplay of risk perception, social influences, economic barriers, and institutional trust. Collectively, these studies underscore the need for integrated strategies that address social, psychological, and economic barriers - through improved risk communication, trust-building measures, and policy interventions - to enhance flood insurance participation and adaptive risk management.

Theoretical Framework

The theoretical framework for this study includes Protection Motivation Theory (PMT) developed by Ronald W. Rogers in 1975 and the Theory of Planned Behaviour (TPB) proposed by Icek Ajzen in 1985. These theories explain the cognitive, emotional, and social processes that shape individuals' decisions to adopt protective measures like purchasing flood insurance.

PMT posits that individuals are motivated to protect themselves based on their appraisal of the threat's severity and likelihood (threat appraisal) and their belief in the effectiveness of the protective action and their ability to execute it (coping appraisal). (Rogers, 1975). TPB complements PMT by focusing on attitudes toward the behaviour, subjective norms, and perceived behavioural control (Ajzen, 1985). Positive attitudes toward insurance increase uptake, while scepticism deters it. Together, PMT and TPB suggest that interventions should address both risk perceptions and socio-economic barriers to enhance flood insurance adoption in Nigeria (Ajzen, 1985; Rogers, 1975).

RESEARCH METHODOLOGY

The study adopts a descriptive quantitative research design utilizing structured questionnaire. Targeting individuals over 18 years old including homeowners, tenants, and business owners the research focuses on those with decision-making authority regarding household insurance and flood preparedness. Three highly flood-prone Local Government Areas (LGAs) including Eti-Osa, Amuwo-Odofin, and Badagry were purposively selected based on Geographical Information System (GIS) flood vulnerability assessments from the Lagos State Emergency Management Agency (LASEMA, n.d.). The estimated population of the LGAs are captured in Table 1.

Table 1: Population of the study area

LGA	Population estimate	Proportion
Badagry	351,900	0.2795
Amuwo-Odofin	487,000	0.3868
Total	1,259,000	1

Source: *Brinkhoff (2022)*

To determine the appropriate sample size, Taro Yamane's sample size determination formular cited in Onugu et al. (2024) and specified below was used.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = sample size

N = population = 1,259,000

e = sampling error assumed as 5% or 0.05

1 = unity (constant)

n is estimated as ≈ 400 respondents. Actual sample sizes for each of the LGAs determined proportional to their population sizes as evident in Table 2 below.

Table 2: Proportional sample size determination

LGA	**Population estimate**	**Proportion (P)**	**Sample size (P x 400)**
Badagry	351,900	0.2795	112

Etiosa	420,100	0.3337	133
Amuwo-Odofin	487,000	0.3868	155
Total	**1,259,000**	**1**	**400**

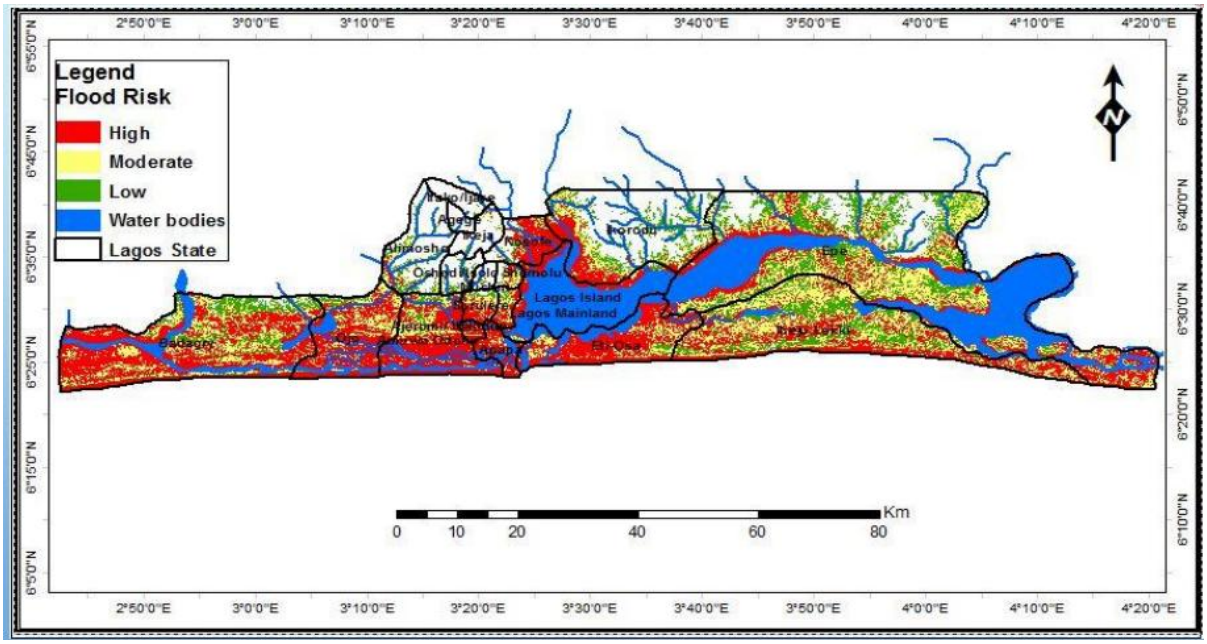

Figure 1: Flood Risk Map of Lagos State Showing All Local Government Areas

Source: *(LASEMA, n.d.)*

Data collection was done through face-to-face administration of structured questionnaire. Out of the 400 questionnaires distributed only 343 were good enough and used for analysis. Both descriptive (frequency distribution tables, percentages and measures of central tendencies) and inferential statistics (logit, one sample t-test and logistic regression) were applied in analysing the study data. Ethical considerations include obtaining informed consent and maintain participant confidentiality through anonymized data collection and analysis.

Logit Regression

The decision to uptake flood insurance represents a binary outcome, where individuals either uptake or refrain from uptaking it. In this framework, the observed dependent variable y_i (flood insurance uptake) is coded as y=1 for individuals who uptook flood insurance and y=0 for an individual who did not. Underlying this observable outcome is a latent variable y_i^*, which represents the unobserved propensity or likelihood of an individual uptaking flood insurance. This latent variable serves as the foundation for modelling the probability of uptake. The latent variable is defined as;

$$y_i^* = \beta x_i + \varepsilon_i$$

where x_i is a vector of explanatory variables determining y_i^*, β is a vector of unknown parameters and ε_i is the random error term. The unobserved latent variable is related to the observed response variable as follows:

$$y_i = \begin{cases} 1 \; if \; y_i^* = 0 \\ 0 \; if \; y_i^* = 1 \end{cases}$$

The empirical logit model for the study, adapted from Alesane & Anang (2018) was specified as follows:

$$y_i^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11}$$

Where:
y_i^* = a latent continuous variable for uptake of flood insurance, such that y=1 if $y_i^* > 0$, and y=0 if $y_i^* \leq 0$.
Predictor Variables:
X_1 : Respondent's age in years.

X_2 : Gender of the respondent (1 if male, 0 otherwise).

X_3 : Years of formal education completed.

X_4 : Monthly or annual income of the respondent in Nigerian Naira (₦).

X_5 : Number of people in the respondent's household.

X_6 : Duration of residency in the flood-prone area, in years.

X_7 : Property ownership status (1 if respondent owns property, 0 otherwise).

X_8 : Respondent's perceived likelihood of future flood events on a scale from 1 to 5 (1 = low likelihood, 5 = high likelihood).

X_9: Perceived severity of potential flooding on a scale from 1 to 5 (1 = low severity, 5 = high severity).

X_{10}: Level of concern regarding flood risks, also measured on a scale from 1 to 5.

X_{11}: Perception of control over flood risk (1 if respondent feels they have control, 0 otherwise). All other variables as previously defined.

Test of Hypotheses

H_{01}: Residents do not perceive flood risk as significantly serious.

One-Sample t-test was used in testing this hypothesis**.** Average perceived flood risk (measured on a 1–5 Likert scale) is the dependent variable. The sample mean was compared to a theoretical neutral value (3) on a 5-point scale. If the mean is statistically greater than 3, the null hypothesis is rejected, if otherwise, we fail to reject the null hypothesis.

H_{02}: Flood risk perception does not significantly influence insurance uptake among residents of flood-prone areas.

This hypothesis was tested using binary logistic regression model where dependent variable was Insurance uptake (Y: 0 = no, 1 = yes) and independent variable was flood risk perception (X: collapsed into binary: low [1–3] vs. high [4–5]). The model is specified thus;

$$Logit\ (P(Y = 1) = \beta_0 + \beta_1 X + \beta_i C_i$$

Where β_0 is the intercept or constant term, β_1 is the coefficient of the flood risk perception, C_i is any control variable introduced into the equation and β_i is the coefficient of any of the control variables.

DISCUSSION OF RESULTS

The socio-economic characteristics of respondents, presented in Table 3, revealed that the respondents were diverse in age, with a significant portion being young adults (42.9% aged 18-34) and a considerable number of older adults (27.1% aged 55 and above). This age distribution suggests a possible varying levels of risk awareness and asset accumulation, which can affect decisions related to insurance. The predominance of males (66.5%) may influence household decision-making dynamics, as men often hold primary responsibility for financial decisions in certain cultural contexts. Educational attainment varies, with a substantial number holding secondary (23%) and tertiary (20.7%) qualifications, indicating a potential for understanding complex information about flood risks and insurance options.

Income levels reveal that a significant proportion of respondents earn less than ₦50,000 monthly (33.8%) which may limit uptake of flood-induced insurance (Bubeck et al., 2023). Homeownership was low (23.3%), and many residents were tenants or lived with family, which can decrease the perceived need for property insurance, as non-owners may not feel directly responsible for structural assets (Poussin et al., 2014). The length of residence indicated that nearly half were newer residents (48.1% lived there for less than five years), potentially lacking historical knowledge of local flood risks, which can influence preparedness behaviors (Kellens et al., 2013).

Table 3: Socio-Economic Characteristics of Respondents (n = 343)

Variable	Category	Frequency	Percent (%)
Age	18-24	53	15.5
	25-34	94	27.4
	35-44	50	14.6
	45-54	53	15.5
	55-64	45	13.1
	65 and above	48	14.0
Sex	Male	228	66.5
	Female	115	33.5
Education	No formal education	63	18.4
	Primary	66	19.2
	Secondary	79	23.0
	Tertiary	71	20.7
	Postgraduate	64	18.7
Occupation	Unemployed	64	18.7
	Self-employed	59	17.2

	Private sector	55	16.0
	Public sector	57	16.6
	Retired	51	14.9
	Other	57	16.6
Income (₦)	Less than 20,000	62	18.1
	20,001 - 50,000	54	15.7
	50,001 - 100,000	70	20.4
	100,001 - 200,000	53	15.5
	Above 200,000	52	15.2
	Prefer not to say	52	15.2
Household Size	1	60	17.5
	2-3	68	19.8
	4-5	67	19.5
	6-7	77	22.4
	8 or more	71	20.7
Home Ownership	Living with family	96	28.0
	Tenant	83	24.2
	Other	84	24.5
	Homeowner	80	23.3
Length of Residence	Less than 1 year	80	23.3
	1-5 years	85	24.8
	6-10 years	81	23.6
	More than 10 years	97	28.3

Source: *Field Survey, 2024*

The residence perceptions of flood risks

Perception of food risk

Understanding how residents perceive flood risks is crucial for analysing their preparedness behaviours and decisions regarding insurance uptake. From the Table 4, it is evident that a combined 40.5% of respondents perceive the likelihood of flooding as high (ratings 4 and 5), with 21.3% rating it as 4 and 19.2% as 5. Conversely, 36.7% perceive the likelihood as low (ratings 1 and 2). The largest single category is those who rated the likelihood as 3 (neutral), accounting for 22.8% of respondents. These distributions suggest that while 3

Table 4: Distribution of Respondents by Perceived Likelihood of Flood

Perceived Likelihood	Frequency	Percent	Cumulative Percent
1	56	16.3	16.3
2	70	20.4	36.7
3	78	22.8	59.5
4	73	21.3	80.8
5	66	19.2	100.0
Total	**343**	**100.0**	

Source: *Field Survey, 2024*

Perceived severity of flood

The Table 5 shows that 37.6% of respondents perceived the severity of potential floods as high (ratings 4 and 5). Specifically, 17.2% rated it as 4 and 20.4% as 5. In contrast, 42.6% perceived the severity as low (ratings 1 and 2). The remaining 19.8% held a neutral view (rating 3). This suggests that a significant number of residents underestimated the potential impact of flooding.

Table 5: Distribution of Respondents by Perceived Severity of Flood

Perceived Severity	Frequency	Percent	Cumulative Percent
1	72	21.0	21.0
2	74	21.6	42.6
3	68	19.8	62.4
4	59	17.2	79.6
5	70	20.4	100.0
Total	**343**	**100.0**	

Source*: Field Survey, 2024*

Concerns about flood risk

The distribution presented in Table 6, indicates that **39.4%** of respondents were highly concerned about flood risks (ratings 4 and 5), while **40.0%** expressed low concern (ratings 1 and 2). The remaining **20.7%** had a moderate level of concern (rating 3). The nearly even split between high and low concern levels highlights ambiguity in the level of flood risk concerns in the study area.

Table 6: Distribution of Respondents by Concern About Flood Risk

Concern Level	Frequency	Percent	Cumulative Percent
1	72	21.0	21.0
2	65	19.0	39.9
3	71	20.7	60.6
4	61	17.8	78.4
5	74	21.6	100.0
Total	**343**	**100.0**	

Source: *Field Survey, 2024*

Awareness of flood causes

The majority (**65.6%)** of respondents recognized that flooding results from a combination of factors, reflecting a comprehensive understanding of the issue. However, **34.4%** of respondents identified only a single cause, which might be indicative of a limited understanding of the complexities involved in flood occurrences.

Table 7: Distribution of Respondents by Awareness of Flood Causes

Flood Causes Identified	Frequency	Percent
Climate change	35	10.2
Illegal structures blocking waterways	31	9.0

Poor drainage systems	20	5.8
Overflow of rivers or lagoons	17	5.0
Heavy rainfall	15	4.4
Various combinations of the above causes	225	65.6
Total	**343**	**100.0**

Source: *Field Survey, 2024*

Perceived control over flood risk

Results revealed that only **33.5%** of respondents believed they had control over flood risks. A larger proportion either felt they had no control (**28.9%**) or were unsure (**37.6%**)**.** This indicates that a majority (**66.5%)** of residents may not feel empowered to take actions that could mitigate flood risks.

Table 8: Distribution of Respondents by Perceived Control Over Flood Risks

Perceived Control	Frequency	Percent
No	99	28.9
Unsure	129	37.6
Yes	115	33.5
Total	**343**	**100.0**

Source: *Field Survey, 2024*

Influence of flood risk perception on insurance uptake

The logit regression analysis results presented in Table 9 provides a comprehensive look at the factors influencing flood insurance uptake among residents in flood-prone areas, offering valuable insights aligned with the study's objectives of assessing socio-demographic and risk perception influences.

The baseline model (Block 0), which included only a constant, achieved 62.1% accuracy by correctly classifying 213 non-uptake cases but no uptake cases, reflecting low insurance adoption despite flood risks. Adding predictors like income, household size, and perceptual variables in Block 1 significantly improved the model, as shown by a Chi-square of 281.584 ($p < 0.001$), a -2 Log Likelihood of 173.629, and high pseudo-R^2 values (Cox & Snell = 0.560; Nagelkerke = 0.762), explaining 76.2% of variance. The overall accuracy rose to 94.5%, with 97.2% of non-uptake and 90.0% of uptake cases correctly classified, confirming the predictors' strong explanatory and predictive power for insurance decisions.

Significant Predictors of Insurance Uptake

The analysis identifies income (X_4) and length of residence (X_6) as strong positive drivers of flood insurance adoption. Higher income (X_4: Wald = 19.074, $p < 0.001$) correlates with greater uptake, reflecting financial capacity to prioritize insurance. Residents with longer tenure (X_6: $\beta = 0.331$, $p < 0.001$; odds ratio [OR] = 1.393) are 39.3% more likely to purchase insurance, likely due to heightened awareness of local flood risks. Conversely, household size

(X_5) has a negative effect (β = -0.213, p = 0.024; OR = 0.808), suggesting larger households may forgo insurance due to financial strain from dependents. This aligns with studies linking family size to budget constraints.

Non-Significant and Marginal Factors

Demographic variables like age (X_1), sex (X_2), and property ownership (X_7) show no significant impact, implying insurance decisions depend less on these traits than economic or experiential factors. Perceived flood likelihood (X_8) (β = 0.273, OR = 1.314) weakly aligns with uptake but is statistically insignificant (p = 0.281), hinting that abstract risk perception alone may not drive action. Overall, the results emphasize income (X_4), household size (X_5), and length of residence (X_6) as central to insurance behavior, with financial means and long-term risk exposure outweighing demographics or subjective risk assessments.

Table 9: Logistic Regression Results

Predictor Variable	Coefficient (β)	Standard Error (S.E.)	p-value (Sig.)	Odds Ratio (Exp(β))
Constant	-3.857	1.306	0.003	0.021
X_1 (Age)	0.002	0.013	0.857	1.002
X_2 (Sex)	-0.234	0.446	0.600	0.791
X_4 (Income)	0.000	0.000	0.000	1.000
X_5 (Household Size)	-0.213	0.095	0.024	0.808
X_6 (Length of Residence)	0.331	0.064	0.000	1.393
X_7 (Property Ownership)	-0.155	0.471	0.743	0.857
X_8(Flood risk perception)	0.273	0.254	0.281	1.314
Model Diagnostics				
-2 Log Likelihood	173.629			
Cox & Snell R Square	0.560			
Nagelkerke R Square	0.762			
Omnibus Test of Model Coefficients	Chi-square = 281.584, df = 7, p = 0.000			

Source: *Field Survey, 2024*

Test of Hypotheses

H_{01}: *The residents of the flood-prone areas do not perceive flood risk as significantly serious*

The one-sample t-test results (Table 10) indicate that residents' perceived seriousness of flood risk does not statistically differ (t = 0.450, p = 0.653) from the neutral midpoint (test value = 3). The mean difference of 0.019 (95% CI: -0.065 to 0.104) suggests negligible deviation from neutrality, as the confidence interval straddles zero. This supports Hypothesis 1, implying residents, on average, do not perceive flood risk as markedly serious.

Table 10: One sample t-test of resident perception of seriousness of flood risk

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Flood Risk Perception	.450	342	.653	.01938	-.0653	.1040

H02: Flood risk perception does not significantly influence insurance uptake among residents of flood-prone areas.

A binary logistic regression was conducted to test the effect of flood risk perception (X8) on insurance uptake. The model showed no significant influence of perceived risk (B=0.153, p=0.276), with an odds ratio of 1.165 (Table 9). These results support Hypothesis 2, indicating flood risk perception alone does not drive insurance decisions.

Table 11: Binary logistic regression test of effect of perception on flood risk intake

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	X_8	.153	.140	1.188	1	.276	1.165
	Constant	-.956	.440	4.718	1	.030	.384

a. Variable(s) entered on step 1: X_8.

CONCLUSION

This study explored the relationship between flood risk perception, socio-economic factors, and flood insurance uptake among residents in flood-prone areas of Lagos State. The findings indicate that residents, on average, do not perceive flood risk as significantly severe; their views tend to hover around a neutral level. Importantly, while a heightened perception of flood risk is associated with an increased likelihood of purchasing insurance, this factor alone is not a strong driver of insurance uptake.

RECOMMENDATIONS

1. Implementing community-based flood education programs since residents' average perception of flood risk hovered around neutrality, targeted outreach can shift understanding toward the seriousness of local hazards.

2. Leverage local experience by integrating long-term residents' flood narratives into newcomer orientation given that longer residency was linked to greater insurance adoption.

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