

Geographic and Socioeconomic Disparities in Social Health Insurance Enrolment: Understanding the Barriers and Facilitators to Achieving Universal Health Coverage

Ebiakpor Bainkpo Agbedi^{1*} and Pere-Ere Glory Agbedi²

¹Department of Planning, Research, and Statistics, Bayelsa State Primary Healthcare Board, Yenagoa, Nigeria.
ORCID: 0009-0002-3102-1771

²Department of Medicine, Niger-Delta University, Wilberforce Island, Nigeria.

*Correspondence:

Ebiakpor Bainkpo Agbedi, MPH, PhD, Department of Planning, Research, and Statistics, Bayelsa State Primary Healthcare Board, Yenagoa, Nigeria.

Received: 30 Apr 2026; **Accepted:** 31 May 2026; **Published:** 10 Jun 2026

Citation: Ebiakpor Bainkpo Agbedi, Pere-Ere Glory Agbedi. Geographic and Socioeconomic Disparities in Social Health Insurance Enrolment: Understanding the Barriers and Facilitators to Achieving Universal Health Coverage. Int J Transl Sci Res. 2026; 2(2): 1-21.

ABSTRACT

Background: In recent years, the pursuit of universal health coverage (UHC) has become a global priority; however, significant geographic and socioeconomic disparities have hindered equitable enrolment in social health insurance (SHI) programs. In Bayelsa State, Nigeria, a social health insurance program was implemented with the aim of providing universal access, but various barriers constrained uptake, particularly among the most vulnerable populations. This study aimed to understand how geographic, socioeconomic, and administrative factors influenced enrolment in Bayelsa State's social health insurance program, with the ultimate goal of assessing implications for achieving universal health coverage.

Methods: A cross-sectional, mixed-methods design was employed, involving data collection from 600 residents across eight local government areas in Bayelsa State. The study utilized structured questionnaires to gather quantitative data on demographic characteristics, enrolment status, and perceived barriers, supplemented by qualitative insights from community stakeholders.

Results: The findings revealed significant geographic disparities, with 76% of respondents living more than 20 kilometers from enrolment centers. Socioeconomic factors, including income levels and education, were shown to significantly impact enrolment likelihood, with higher rates observed among those with stable employment and educational attainment. Administrative barriers, such as the requirement for national identity cards, further excluded marginalized groups from the program.

Conclusion: The study identified critical barriers to SHI enrolment in Bayelsa State, underscoring the need for targeted interventions to address geographic, socioeconomic, and administrative challenges. By implementing mobile enrolment units, simplifying documentation processes, and providing subsidies for low-income individuals, the potential to advance universal health coverage in Bayelsa could be enhanced, ensuring access for all residents, particularly the most vulnerable populations.

Keywords

Social health insurance, Enrolment uptake, Universal health coverage, Equity fund, Geographic disparities.

Introduction

In recent years, the pursuit of universal health coverage (UHC)

became a global priority, aiming to ensure that all individuals had access to essential health services without facing financial hardship. However, significant geographic and socioeconomic disparities continued to hinder equitable enrolment in social health insurance (SHI) programs, which were designed to pool resources and protect households from the financial risks associated with healthcare

costs. In various contexts, including regions characterized by diverse terrains and varying economic conditions, barriers to SHI enrolment emerged, reflecting the complex interplay of individual, community, and systemic factors. Research highlighted those geographic barriers, such as distance to enrolment centres and the accessibility of healthcare facilities, disproportionately affected residents in remote and underserved areas, where travel costs and time constraints often deterred potential enrollees [1]. Similarly, socioeconomic factors—including income levels, employment types, education, and gender roles—played a critical role in shaping individuals' ability to navigate the enrolment process and perceive the value of health insurance [2]. The requirement for documentation, such as national identity cards, further complicated the landscape, as marginalized groups often faced additional challenges, exacerbating existing inequalities. Through a comprehensive examination of these disparities, the understanding of the barriers and facilitators to SHI enrolment was deepened, revealing the urgent need for context-sensitive interventions. The findings underscored that without addressing the intertwined factors of geography and socioeconomic status, the goal of achieving universal health coverage would remain elusive. This exploration contributed to the ongoing discourse on health equity, emphasizing the importance of tailored strategies that could effectively target the needs of diverse populations, particularly those at the intersection of vulnerability and exclusion.

Statement of the Problem

Bayelsa State had implemented a social health insurance program that was open to all residents and required potential enrollees to pay the premium, with enrolment conducted through primary health centres where capitation payments were made. Despite the intention of universal access, a constellation of geographic, socioeconomic, and administrative challenges constrained uptake and, by extension, limited access to care. Geographically, Bayelsa's distinctive deltaic and riverine landscape created substantial barriers to enrolment and service delivery. Distance to enrolment points and health facilities, poor transport infrastructure, and seasonal navigation issues in the waterways increased travel times and opportunity costs for potential enrollees. These essentialist barriers disproportionately affected residents in hard-to-reach communities, undermining the premise of equitable access. Economically, the population faced widespread financial hardship, with per capita income below the poverty line. Even when premiums were affordable in theory, indirect costs—such as transportation to enrolment centres, time away from work, and other opportunity costs—translated into meaningful affordability constraints. Informal sector workers, the unemployed, and households with irregular incomes encountered heightened difficulty sustaining premium payments, which translated into lower enrolment and weaker financial protection against illness. Socioeconomic factors interacted with geographic barriers to magnify disparities. Education levels, employment type (formal vs. informal), and gender roles shaped awareness of the SHI program, trust in the system, and the capacity to navigate enrolment processes. Information asymmetries and limited health literacy further reduced the likelihood of enrolment among disadvantaged

groups. Additionally, the requirement that applicants possess national identity cards introduced an administrative barrier that excluded marginalized individuals who lacked documentation, thereby narrowing the pool of eligible enrollees and reinforcing inequities in coverage. Administrative weaknesses compounded these challenges. The rollout faced bureaucratic bottlenecks, paperwork complexity, and fragmented processes that delayed enrolment, renewal, and claims reimbursements. Governance gaps and limited transparency eroded trust in the program, potentially diminishing willingness to participate and sustain coverage over time. In practice, these constraints meant that even eligible residents who stood to benefit from coverage might have faced hurdles that discouraged enrolment or led to churn and discontinuity in enrolment. The confluence of these factors—geographic isolation, economic precarity, socio-cultural barriers, documentation requirements, and administrative inefficiencies—produced disparities in both enrolment and health care access. Rural and riverine communities, informal workers, women with mobility or decisional constraints, and individuals without formal identification were particularly at risk of being under-enrolled and under-protected, despite the policy intent of universal coverage. In light of these findings, several policy implications emerged. To move toward more equitable uptake, policymakers would have needed to implement outreach and enrolment strategies tailored to hard-to-reach areas, such as mobile enrolment units and community-based channels, while simplifying documentation requirements or providing identity alternatives. Subsidies, waivers, or income-based premium arrangements would have been critical to easing affordability barriers for the poor and those with irregular incomes. Strengthening administrative capacity, improving governance and transparency, and integrating civil registration with SHI enrolment would have been essential to prevent exclusion and build trust. Finally, aligning the SHI program with broader social protection initiatives and investing in the quality and availability of primary health care would have been necessary to ensure that increased enrolment translated into meaningful utilization and financial protection.

Justification of the Study

The study was justified by a recognized knowledge gap and empirical evidence surrounding Bayelsa State's social health insurance (SHI) program. Although the program had been proclaimed open to all residents and implemented through primary health centres with capitation payments, prior evidence failed to consistently illuminate how geographic, socioeconomic, and administrative factors translated into enrolment disparities and varied access to care. This lack of clear, context-specific understanding constituted a salient knowledge gap that the study aimed to address. Previous literature offered broad insights into SHI enrolment and equity at global or national levels, but it seldom captured the nuanced interplay of Bayelsa's unique deltaic geography, riverine communities, and socio-economic heterogeneity. There was insufficient evidence detailing how essentialist geographic barriers (distance, travel time, terrain) interacted with contextual factors (infrastructure, governance,

social norms) to shape enrolment decisions and renewal behaviour in Bayelsa. The existing scholarship had a tendency to generalize findings from other regions to Bayelsa, risking misalignment with local realities such as crisscross waterways, seasonal accessibility, and localized policy implementation challenges. This mismatch underscored a critical gap in knowledge about which barriers were most salient and which facilitators held the greatest potential in this setting. Empirical data documenting enrolment patterns at the district or local government area level were scarce or fragmented. Geospatial analyses linking enrolment rates to travel times, PHC density, and accessibility of enrolment centres were limited, hindering robust assessments of geographic disparities. Information on how socioeconomic factors—income levels, occupation types (formal vs. informal), education, gender roles—coupled with administrative requirements (e.g., national identity cards) influenced enrolment uptake and continuity was insufficient. There was a lack of rigorous, contextually grounded studies assessing the effectiveness of exemptions, subsidies, or equity funds within Bayelsa's SHI framework. Longitudinal evidence demonstrating how policy shifts, such as changes in premium affordability, enrolment channels, or PHC capacity, affected equity over time was notably scarce. This gap impeded understanding of whether observed disparities persisted, widened, or narrowed in response to programmatic adjustments. Filling the knowledge gap and empirical evidence held direct policy relevance. Without domestically grounded evidence, policymakers faced difficulties designing targeted interventions—such as geographic outreach, mobile enrolment, subsidization schemes, simplified documentation, or enhanced PHC readiness—that could meaningfully reduce inequities. Understanding the synergy (or tension) between essentialist geographic barriers and contextual social determinants was essential for crafting equity-enhancing features, including nuanced exemption criteria, cross-subsidization, and governance reforms aimed at transparency and accountability in enrolment and reimbursement processes. The study's design was justified as a means to triangulate quantitative geospatial analyses with qualitative insights from community stakeholders, health workers, and policymakers. This mixed-methods approach would have allowed for a more comprehensive mapping of barriers and facilitators, generating actionable, contextually resonant recommendations. By explicitly addressing the knowledge gap and empirical evidences, the research promised to contribute to the literature on SHI equity within deltaic, low-income, and administratively complex settings, offering transferable lessons for similar contexts within Nigeria and beyond. In summary, the justification of the study rested on a clearly identified knowledge gap and evident empirical studies concerning Bayelsa's SHI enrolment dynamics. Addressing these gaps was deemed essential to understanding how geography, socioeconomic status, administrative design, and documentation requirements interacted to produce inequities in enrolment and health care access. The ultimate aim was to inform policy and programmatic decisions that would advance more equitable universal health coverage for Bayelsa's diverse population.

General Objective

The general objective was to understand how geographic, socioeconomic, and administrative factors influenced enrolment in Bayelsa State's social health insurance and to assess the implications for achieving universal health coverage.

Specific Objectives

- a. To identify and describe the geographic barriers to enrolment, including distance to enrolment centres, deltaic and riverine terrain, travel time, and accessibility for hard-to-reach communities.
- b. To examine the socioeconomic determinants of enrolment, including income levels, employment type (formal vs. informal), education, gender, and household structure, and how these determinants affected affordability and participation.
- c. To analyze the role of the enrolment mechanism through primary health centres with capitation payments and how this design influenced uptake, retention, and perceived value among potential enrollees.
- d. To evaluate the impact of the national identity card requirement on enrolment eligibility and potential exclusion of marginalized groups.
- e. To assess the administrative processes surrounding enrolment, renewal, and claims, including documentation requirements, governance transparency, and bureaucratic efficiency, and how these processes affected enrolment disparities.
- f. To explore how indirect costs (transport, time away from work, opportunity costs) interacted with direct premium payments to shape enrolment decisions.
- g. To propose an evidence-based framework for monitoring equity in enrolment and utilization, incorporating geospatial indicators, socioeconomic stratifiers, and governance metrics.
- h. To suggest implications for the ongoing alignment of Bayelsa SHI with broader universal health coverage goals and social protection initiatives.

Research Questions

- a. How do geographic factors (distance to enrolment centres, travel time, and deltaic/riverine terrain) influence enrolment uptake and renewal rates in Bayelsa State's social health insurance, after controlling for socioeconomic status?
- b. What is the relationship between socioeconomic characteristics (income, occupation, education, and gender) and enrolment likelihood, premium affordability, and continued participation in the Bayelsa SHI?
- c. How does the requirement for national identity cards affect eligibility, enrolment, and retention among marginalized groups (informal workers, unemployed, women, and rural/riverine communities) within Bayelsa?
- d. What administrative and governance factors (documentation complexity, processing times, transparency, and stakeholder trust) moderated enrolment rates and perceived value of the SHI program?
- e. To what extent does the capitation mechanism at primary health centres influence enrolment decisions, service utilization, and

financial protection outcomes, and which supply- or demand-side interventions could mitigate observed inequities?

Scope and Limitation of the Study

Scope

- a. The study centred on Bayelsa State, paying close attention to its distinctive deltaic and riverine landscapes. It included both urban and rural communities, as well as hard-to-reach settlements that depended on primary health centres (PHCs) for healthcare access and enrolment in the state social health insurance (SHI) program.
- b. The analysis considered how enrolment occurred through PHCs with capitation payments to providers.
- c. It looked at premium-based enrolment and assessed whether the requirement to pay premiums affected who could enroll.
- d. It also examined the potential impact of national identity card requirements on eligibility and inclusion, recognizing that documentation needs could exclude some residents.
- e. Distance to enrolment points, travel time, and the physical barriers posed by the terrain and waterways.
- f. Levels of income, the type of employment (formal versus informal), education, gender, and household composition.
- g. The ease or difficulty of the enrolment process, the speed and efficiency of processing, governance practices, transparency, and trust in the system.
- h. Enrolment uptake and renewal rates: who enrolled, who renewed, and who dropped out over time.
- i. Equity in enrolment: whether enrolment varied across geographic areas and socioeconomic groups.
- j. Service use and financial protection: whether enrolment translated into the use of PHC services and reduced out-of-pocket costs.
- k. The study planned to combine different methods: geospatial analyses to map travel times and the distribution of PHCs; descriptive statistics and regression analyses to identify associations; and qualitative insights from stakeholders to deepen understanding of barriers and facilitators, where feasible.
- l. The findings were intended to inform practical interventions aimed at reducing barriers to enrolment and access. Examples include targeted subsidies, outreach programs, simplifying documentation, and strengthening PHCs, all with the goal of advancing universal health coverage in Bayelsa.

Limitations

- a. There might have been gaps or inconsistencies in geocoded enrolment data, locations of PHCs, and up-to-date socioeconomic indicators.
- b. Administrative records on enrolment, renewals, and claims might have been incomplete or not standardized, potentially biasing results.
- c. Accurately capturing informal-sector income, non-monetary costs (like time away from work), and health literacy levels could be difficult.
- d. Estimating true travel times in the delta region could be

complicated by seasonal changes and the use of waterways, which might not be consistently recorded.

- e. The Modifiable Areal Unit Problem (MAUP) could affect the robustness of spatial findings, meaning results might change depending on how geographic areas are defined.
- f. There could be challenges in capturing cross-border movements or movement within the state that influence enrolment patterns.
- g. If the study relied on cross-sectional data, it would limit the ability to make strong causal inferences about determinants of enrolment. Longitudinal data or quasi-experimental designs would improve causal interpretation.
- h. While the requirement for national identity cards could exclude some residents, precisely measuring how many and which groups were affected would require detailed documentation data that might be hard to obtain.
- i. Some important influences—such as cultural beliefs, social networks, political dynamics, and variations in local governance—might not be fully captured.
- j. There could be privacy and consent considerations when collecting sensitive information, especially from vulnerable groups, and these needed careful management.

Literature Review

Social health insurance was a financing system that pooled funds to spread financial risk, financed through premiums or contributions from individuals, employers, and sometimes governments, and used those funds to pay for essential health services; it played a central role in advancing universal health coverage by pooling resources across populations, protecting households from catastrophic health expenditures, and tying financing to service delivery and equity [3,4]. The significant role of social health insurance in addressing inequalities within the broader pursuit of universal health coverage was multifaceted and historically consequential. It emerged as a mechanism to pool financial risk, redistributing resources across populations so that illness and medical needs did not precipitate catastrophic financial hardship for households [5]. By organizing funding through premiums, payroll taxes, government subsidies, or mixed revenue streams, social health insurance sought to shield individuals from the unpredictable costs of care and to reduce the financial barriers that kept many people from seeking timely services. A central aspect of its impact rested on income-related equity. Social health insurance programs often include cross-subsidization or targeted exemptions that protected the poorest and most vulnerable groups, thereby narrowing the stark disparities in out-of-pocket spending observed in systems dominated by direct payments. In countries where SHI extended coverage to informal workers, unemployed individuals, or rural residents through subsidized premiums or government contributions, the poorest households benefited from reduced financial barriers to essential services [6]. This redistribution helped diminish the regressive nature of user fees and contributed to more progressive financing structures, where wealthier segments did not disproportionately bear the burden of financing care for the entire population [7]. Geographic equity also featured prominently

in the narrative of SHI's influence on inequalities. By pooling resources at a national or regional level, funded schemes could channel investments toward under-served areas through facility upgrades, provider incentives, and unified purchasing arrangements. In settings where enrolment and benefit packages were designed to be expansive and standardized, the likelihood increased that residents in distant or marginalized regions could access essential services without incurring unmanageable costs or facing discriminatory practices at the point of care. While geographic disparities persisted in many contexts, SHI provided a framework within which resource allocation could be more systematically linked to need and coverage goals, rather than being driven solely by market dynamics or local wealth. From a service delivery perspective, social health insurance shaped incentives within health systems in ways that could either mitigate or exacerbate inequalities. When SHI linked financing to performance, access to care, and adherence to standardized essential service packages, it encouraged uniformity in the quality and range of services offered across facilities. This standardization helped reduce variation in care that arose from differentiations in ability to pay, thereby supporting more equitable access to a defined set of interventions. Conversely, in contexts where eligibility, enrolment processes, or reimbursement schemes favoured certain groups or local government areas, disparities could widen if protected populations received faster access or broader benefit coverage than marginalized communities [8]. Policy design proved critical in determining the extent to which SHI addressed inequalities. Programs that incorporated universal or near-universal eligibility, clear exemptions for the poor, and robust governance mechanisms tended to advance equity by reducing financial barriers and ensuring consistent benefit provision. In contrast, schemes with complicated enrolment procedures, fragmented risk pools, or differential treatment based on employment status or sector could reproduce or intensify existing inequities. Thus, the historical record showed that the equity-enhancing potential of SHI depended not only on the conceptual appeal of pooling and cross-subsidization but also on the concrete features of implementation, governance, and the socio-political context within which these schemes operated. Finally, the broader implications for universal health coverage rested on the extent to which SHI integrated with broader social protection strategies and health system strengthening [9]. When aligned with other policy instruments—such as taxation, subsidies for the poor, and investments in primary health care, essential medicines, and workforce capacity—SHI contributed to a more comprehensive approach to reducing health disparities [10]. It demonstrated that financial protection, when designed with explicit attention to equity, could complement improvements in service availability and quality, thus advancing the overarching goal of universal health coverage: that all individuals and communities enjoyed access to the health services they needed without facing financial hardship. Globally, the significant role of social health insurance in addressing inequalities within universal health coverage lay in its capacity to pool resources, subsidize or exempt the poor, and influence both financing and service delivery toward more equitable outcomes. Its impact depended on

thoughtful design, strong governance, and integration with a broader health and social protection framework, all of which determined the extent to which it could reduce financial, geographic, and social disparities in access to care. Conversely, the interplay of geographic, socioeconomic, administrative, and identity-related factors in Bayelsa State shaped the trajectory toward universal health coverage in profound, interwoven ways. In a context where the social health insurance was open to all residents and enrolment occurred through primary health centres with capitation payments, the environment presented both enabling opportunities and formidable barriers to achieving UHC. Geography and terrain mattered first and foremost. Bayelsa's crisscross delta and hard-to-reach communities created significant travel and access costs, which translated into delayed or foregone enrolment and utilization [11]. Distance to enrolment points and PHCs, coupled with challenging transport networks, meant that even individuals who could afford premiums might not have timely or reliable means to enroll or renew coverage. Geographic disparities thus reflected and amplified inequities in access, undermining the premise of universal eligibility and equal opportunity to use essential services [12,13]. Socioeconomic conditions compounded these geographic hurdles. With per capita income near or below the poverty line, many residents faced affordability constraints beyond the prospective premium payments. The cost of travel to enrolment sites, time away from work, and potential indirect costs deterred enrolment and renewal, particularly among the poorest households. Such economic strain did not merely limit enrolment; this had also influenced health-seeking behaviour, as anticipated out-of-pocket costs remained a looming threat even for those who managed to enroll. The result was a regressive tilt where wealthier individuals, by virtue of greater disposable income and easier access, enrolled and utilized services more readily than poorer residents, thereby widening inequities within the universal health coverage objective [2,14]. Administrative and governance challenges further shaped the inclusivity and effectiveness of the program. The rollout encountered bureaucratic complexities that slowed enrolment, verification, and claims processing. Administrative bottlenecks, potential inefficiencies, and governance gaps could erode trust, reduce enrolment speed, and hinder beneficiaries from receiving timely reimbursements or adequate provider incentives [15]. When enrolment hinged on documentary prerequisites such as national identity cards, the requirement itself created gatekeeping that excluded marginalized or stateless individuals who were unable to obtain the necessary documentation, thereby compromising universal reach. These administrative barriers risked transforming a universal-sounding policy into a selective program in practice, especially for those at the intersection of poverty, remoteness, and limited documentation [16,17]. The capitation arrangement at PHCs linked financing to service delivery but also carried risk of unintended access barriers. If capitation payments did not adequately reflect the costs of serving remote communities or if provider availability and supply chains were strained, vulnerabilities could emerge in both the demand and supply sides. Enrollees might experience longer wait times, reduced quality, or limited-

service options, which in turn could dampen enrolment renewals and deter new participants. When geographic and socioeconomic barriers overlapped with administrative inefficiencies, the policy's capacity to deliver equitable access through primary care diminished, challenging the equity aims embedded in universal health coverage. Identity verification requirements, including the national identity card prerequisite, interacted with all previous factors. Those without secure identification faced practical barriers to enrolment, even if they resided in proximity to enrolment centres or stood to benefit economically from participation. This intersection of identity, geography, and income magnified exclusion risks for vulnerable groups, including migrants, informal sector workers, and rural residents, thereby undermining the inclusivity modal that a universal health coverage framework sought to realize. Nevertheless, the program's structure offered avenues for progress toward universal health coverage. The reliance on PHCs for enrolment and capitation created a direct link between financing and primary care provision, potentially reinforcing and strengthening of primary health systems and equitable resource allocation. If leveraged effectively, targeted subsidies or waivers for the poor, mobile enrolment strategies to reach remote communities, and streamlined administrative processes could mitigate barriers. Community engagement and information campaigns, tailored to local languages and cultural contexts, could enhance trust and understanding, thereby improving enrolment uptake and timely renewals. Additionally, integrating SHI with broader social protection initiatives could help address the underlying poverty and vulnerability that constrained enrolment, aligning financial protection with actual service availability at the PHCs. In this context, the interplay of geographic constraints, economic hardship, administrative inefficiencies, and identity requirements collectively influenced the extent to which Bayelsa's social health insurance could advance universal health coverage. The convergence of these factors tended to produce; geographic and socioeconomic inequities in enrolment and access, administrative bottlenecks that delayed or blocked participation, and potential inequities rooted in identity prerequisites. Addressing these interlinked barriers through targeted geographic outreach, subsidization for the poor, simplified enrolment and documentation processes, supply-side strengthening at PHCs, and integrated social protection measures would have been essential to realize a more inclusive realization of universal health coverage in Bayelsa. The mix of geographic distance, delta and riverine conditions, travel time disparities between urban and rural areas, and the varied income derivations, occupations, education levels, and gender roles collectively contributed to adverse disparities in insurance uptake in the past. Each factor intersected with the others to shape access, affordability, and motivation to enroll, producing uneven participation across populations. Geographic distance and the riverine environment stood out as primary barriers. Communities located far from enrolment centres or PHCs faced higher travel costs, longer journey times, and greater reliance on unreliable waterways or limited roads. These logistical hurdles increased the opportunity costs of enrolment, such as days lost from work and expenses for

transport, which disproportionately affected low-income earners and households with limited means. The physical remoteness also delayed communications about enrolment windows and created information gaps, further dampening uptake in hard-to-reach areas. The deltaic terrain exacerbated travel and supply challenges, making routine enrolment activities and ongoing renewals cumbersome. In such settings, even residents who could theoretically afford premiums encountered practical difficulties in maintaining loyalty to the program, especially when transportation options were sparse or seasonal. The complexity of navigating enrolment procedures under arduous conditions muted enthusiasm for participation and contributed to lower uptake among rural and riverine communities. Urban-rural dynamics introduced additional layers of inequality. Urban residents typically faced shorter travel times, better access to enrolment kiosks, and more frequent interactions with outreach programs, all of which facilitated higher uptake. In contrast, rural dwellers encountered fragmented service networks, fewer enrolment points, and inconsistent outreach, leading to delayed or foregone enrolment. This urban advantage reinforced disparities, as geographic proximity translated into easier access to insurance mechanisms, while remote populations remained comparatively marginalized [18,19]. Income derivation and occupation intersected with geography to influence enrolment decisions. Those with stable, salaried employment or formal sector incomes often had better-paying jobs that implicitly supported premium payments, yielding higher uptake in areas with robust economic activity. Conversely, informal sector workers, smallholder farmers, or day laborers—common in riverine and delta regions—faced irregular earnings and higher income volatility, making premium payments less affordable and enrolment riskier. The necessity to prioritize immediate daily survival over long-term financial commitments meant that insurance uptake lagged among these groups. Education and gender roles further modulated participation. Higher levels of education generally correlated with greater awareness of insurance benefits, understanding of enrolment processes, and perceived value of coverage, leading to higher uptake. Lower educational attainment, prevalent in marginalized communities, contributed to information asymmetries and hesitation about the legitimacy and utility of enrolment. Gender dynamics also played a critical role; in some contexts, women faced constraints related to mobility, decision-making autonomy, and time use within households. These constraints reduced women's access to enrolment opportunities and limited timely renewals, thereby widening gender disparities in uptake. The cumulative effect of these interlinked factors manifested as pronounced disparities in insurance uptake. Geographic isolation compounded by environmental barriers limited enrolment in many riverine areas, while urban residents enjoyed relatively easier access. Economic precariousness associated with informal work and low income constrained premium payment and sustained participation. Educational gaps diminished knowledge about benefits and enrolment steps, and gendered expectations constrained women's ability to engage with enrolment processes fully. Together, these factors created a landscape in which coverage remained unevenly distributed, with

the most vulnerable groups—those in remote delta communities, informal workers, the less educated, and women—experiencing the greatest barriers to joining and remaining enrolled in the insurance program. Addressing these disparities would have required a multifaceted approach: expanding enrolment outreach to remote riverine communities, simplifying documentation and payments, offering subsidies or waivers for low-income earners, aligning enrolment services with work and family schedules, and integrating gender-sensitive strategies to empower women to participate. Investment in riverine transportation networks, mobile enrolment units, and robust information campaigns tailored to local languages and cultures could have mitigated geographic and informational barriers. Strengthening educational opportunities and workforce development would also have helped bridge knowledge gaps about insurance benefits, while targeted support for informal workers could have stabilized premium contributions. In summary, the confluence of distance, environmental constraints, urban-rural divides, and socio-economic and socio-cultural factors historically converged to impede equitable insurance uptake, underscoring the need for comprehensive, context-sensitive policy responses to achieve broader universal health coverage goals.

Theoretical Framework

The Aday–Andersen Behavioural Model posited that enrolment decisions emerged from a dynamic interplay among predisposing characteristics, enabling resources, and perceived or evaluated need. Predisposing factors included demographic attributes such as age, gender, education, and cultural beliefs about formal insurance; these shaped individuals' awareness, attitudes, and willingness to enroll. Enabling resources — notably income, affordability of premiums, availability of enrolment channels (through PHCs), transportation, and administrative efficiency — determined whether potential enrollees could practically enact enrolment and maintain coverage. Need factors, which encompassed perceived health status and baseline risk awareness, influenced the perceived value of enrolment; individuals who perceived greater health needs or who faced ongoing health risks were more likely to pursue coverage. At the policy and system level, context such as the design of capitation payments, the availability of subsidies, and the clarity of enrolment rules also moderated uptake by shaping incentives and perceived benefits [20,21]. The Levesque et al. framework treated access as a process shaped by five dimensions of health system accessibility and the five corresponding individual abilities. Approachability and the ability to perceive together determined whether potential enrollees recognized the existence and value of the Bayelsa SHI and understood enrolment options. Acceptability and the ability to engage captured the alignment between the program's design and individuals' cultural values, trust, and expectations, including perceptions about government programs and the legitimacy of enrolment through PHCs. Availability and accommodation, paired with the ability to reach, reflected the logistical realities of rotor networks, enrolment site proximity, operating hours, and the physical ability to travel to PHCs, particularly for those in remote delta and riverine communities. Affordability and the ability to pay addressed premiums, travel

costs, time away from work, and other opportunity costs that intersected with local livelihoods, while appropriateness and the ability to engage encompassed the perceived quality and relevance of benefits, as well as the sense of empowerment in navigating enrolment processes and making informed choices. In Bayelsa, the need to examine how geographic and socioeconomic conditions constrained the five abilities helped reveal where barriers to uptake existed and where targeted interventions might yield improvements [22,23]. Using the Aday–Andersen lens, researchers identified that geographic distance to enrolment points, riverine and delta terrain, and transportation barriers reduced enabling resources and modified the perceived need by altering access to information and the ease of enrolment. Socioeconomic factors—income level, employment type (informal sector), educational attainment, and gender roles—refracted through enabling resources and affected the ability to perceive value, seek enrolment, and pay premiums. The *Levesque framework* clarified how these same factors operated through multiple dimensions of accessibility. Geographic isolation compromised availability and accommodation, while informational barriers diminished approachability and the ability to perceive. Income constraints and opportunity costs undermined affordability, narrowing the ability to pay and the willingness to engage. Cultural norms and gender dynamics influenced acceptability and the ability to engage, particularly for women who faced mobility or decision-making constraints. The interaction of these factors resulted in pronounced disparities in uptake and ongoing enrolment, with rural and riverine communities and economically vulnerable groups experiencing lower participation. From the *Aday–Andersen* perspective, policy implications emphasized expanding enabling resources and addressing need perceptions. Potential measures included subsidizing premiums for the poor, expanding flexible premium arrangements, and simplifying enrolment procedures to reduce administrative barriers. Enhancing outreach and information dissemination would address predisposing factors, while ensuring that the perceived value of coverage aligned with actual health needs would support uptake. From the *Levesque framework*, practical implications focused on modifying both system design and individual capacities. Interventions might include mobile enrolment units and catchment-area PHCs to improve availability and accessibility, targeted outreach to improve approachability and perceived benefits, culturally sensitive communication to enhance acceptability, and the removal of financial and non-financial barriers to enrolment to strengthen affordability and the ability to engage. Importantly, aligning the benefits package and reimbursement mechanisms with local needs could improve the appropriateness of care and the overall attractiveness of enrolment. The combined use of these theories offered a holistic view: the *Aday–Andersen model* helped identify who enrolls and why, while Levesque's framework illuminated how the health system's design and its interactions with individuals shape access to enrolment and subsequent utilization. Together, they highlighted that achieving universal health coverage in Bayelsa required interventions that addressed both individual-level determinants and system-level accessibility constraints, particularly in remote delta regions and for economically vulnerable populations. In applying these models

to Bayelsa, researchers acknowledged limitations. The *Aday–Andersen model*'s focus on utilization could underemphasize broader structural determinants such as governance quality and macroeconomic instability. Levesque's framework, though comprehensive, depended on accurate measurement of subjective dimensions (e.g., acceptability, perceived appropriateness), which could be challenging in practice. Therefore, combining quantitative assessments with qualitative insights was recommended to capture contextual nuances and ensure robust interpretation. In this context, the uptake and enrolment in Bayelsa's social health insurance were better understood when viewed through the prism of both the *Aday–Andersen model* and the *Levesque et al. framework*. The interplay of predisposing characteristics, enabling resources, and perceived need (Aday–Andersen) alongside the five dimensions of accessibility and corresponding abilities (Levesque) explained why disparities persisted and what kinds of policy and programmatic adjustments would have been necessary to move closer to universal health coverage. Researchers concluded that a coordinated strategy—addressing affordability, information accessibility, geographic reach, cultural acceptability, and enrolment process efficiency—would have been essential to advancing equitable enrolment outcomes in Bayelsa.

Conceptual Framework

Social health insurance (SHI) was shaped by geographic and socioeconomic realities that influenced eligibility criteria for enrolment, access to information, and ultimately uptake. In historical narratives, the spatial distribution of health facilities, enrolment offices, and provider networks created uneven opportunities to enroll, with remote, riverine, upland, or coastal communities facing longer travel times, higher transportation costs, and information gaps that constrained their ability to participate. Urban areas, by contrast, often enjoyed closer proximity to enrolment centres and insured facilities, yet they were frequently characterized by informal employment, high population density, and facility crowding, which sometimes translated into perceived barriers rather than clear advantages. Geography was repeatedly intertwined with health system access and financial considerations. Communities situated far from administrative hubs tended to experience stock-outs or delays in processing enrolments and subsidies, while geographically clustered populations benefited from feeder programs, outreach efforts, and easier maintenance of continuous coverage. Environmental factors such as climate variability, flood, drought, and seasonal migration shaped health service needs and the perceived value of SHI, influencing decisions about enrolment, premium payments, and renewal. Moreover, geopolitical boundaries and jurisdictional fragmentation sometimes created duplicative or conflicting enrolment rules across states or districts, complicating the journey from eligibility to actual enrolment. Socioeconomic status operated as a fundamental determinant of eligibility interpretation and enrolment behaviour. Households with higher incomes and stable formal employment frequently accessed automatic or straightforward enrolment through payroll deductions, benefiting from predictable premium contributions and subsidized employer

support. In contrast, households reliant on informal employment, subsistence livelihoods, or irregular earnings confronted barriers to eligibility recognition, premium affordability, and administrative documentation, which limited their ability to enroll or renew coverage. Education and health literacy further shaped enrolment trajectories; individuals with greater awareness of SHI benefits tended to navigate enrolment processes more effectively, while those with limited literacy faced informational barriers that impeded timely registration. Occupation type, sectoral dynamics, and age structures within communities contributed to differential access to subsidies and means-tested support, reinforcing geographic and socioeconomic gradients in coverage. The interaction between geography and socioeconomic factors was particularly evident in the design of subsidies and eligibility rules. Where subsidies were geographically targeted or means-tested, administrative capacity, accuracy of income assessment, and local governance quality determined the effectiveness of fiscal protection for vulnerable populations. In settings where cross-subsidization or universal subsidies were implemented, geographic disparities persisted if outreach and enrolment channels did not adequately reach remote communities or if digital tools remained inaccessible to populations with limited connectivity. Conversely, strategies that integrated mobile enrolment, community health workers, and local enrolment drives often mitigated geographic obstacles by bringing information and enrolment assistance closer to where people lived and worked, thereby broadening eligibility translation into actual enrolment. From a policy and system perspective, the alignment of geographic targeting with socioeconomic inclusion was essential for equity and efficiency. Jurisdictions that combined spatially aware enrolment infrastructure with means-based subsidies tended to observe higher enrolment rates, better renewal continuity, and more stable risk pools. When geographic and socioeconomic barriers were addressed in tandem—through decentralized administration, culturally appropriate communication, and targeted outreach—coverage expanded in a manner consistent with universal health coverage (UHC objectives). In contrast, neglecting spatial accessibility or misaligning subsidies with local economic realities often resulted in leakage, under-enrolment, and persistent inequities across communities. In a nutshell, the eligibility criteria for SHI enrolment historically reflected a dynamic interplay between where people lived and how much they earned, with geography shaping access to enrolment channels and health services, while socioeconomic status determined affordability, administrative capability, and the ability to maintain coverage. Effective SHI systems translated geographic proximity and financial capacity into timely enrolment, sustained participation, and meaningful financial protection, contributing to progress toward UHC when designed with attention to local spatial and economic realities [24].

Bayelsa State presented a diverse population characterized by formal-sector workers (government employees, corporate employees in oil, banking, private education, and health institutions), informal-sector earners (petty traders, farmers, fishermen, cattle rearers, artisans), and residents without formal

employment. In the literature on social health insurance and equity, scholars analyzed financing designs (progressive vs. regressive), the dynamics of risk pooling, and the role of exemptions and dedicated equity funds in shaping access to care. In applying these concepts to Bayelsa, researchers considered how employment patterns, geographic isolation, and income volatility influenced enrolment, premium affordability, and financial protection, all within the broader pursuit of universal health coverage. Progressive financing was defined as a burden that rose more than proportionally with income and aimed to redistribute resources to shield lower-income groups, whereas regressive financing imposed a relatively higher burden on poorer households despite similar absolute contributions. In a population with stark income heterogeneity, a progressive design had the potential to reduce inequities in enrolment and out-of-pocket expenditures if subsidies, exemptions, and income-based premiums were implemented. Conversely, a regressive design—such as flat premiums or flat co-payments—risked concentrating costs on informal workers and the unemployed, thereby widening financial protection gaps. Progressive financing was anticipated to improve equity in financial protection by pooling risk across formal and informal streams, provided that administrative systems could accurately determine affordability, deliver subsidies, and prevent leakage. Regressive arrangements were expected to heighten coverage disparities and deter enrolment among the most vulnerable groups, undermining the equity objectives of universal health coverage. In designing Bayelsa's financing, scholars suggested deploying subsidies for the poor, income-tested contributions, and scaling premiums with ability to pay, while ensuring administrative capacity to determine eligibility and prevent exploitation. Risk pooling merged funds across diverse populations to dilute the financial impact of illness and reduce inequities in access. A broad risk pool that included formal and informal workers, unemployed residents, and students would have been essential to dampen catastrophic expenditures among the poor [25,26]. However, disparities could have persisted if enrolment hinged on stable income or formal employment, or if incentives favoured those with easier access to enrolment channels. Measures that were proposed or implemented to strengthen pooling: cross-subsidies from higher-income groups to lower-income groups, exemptions for vulnerable populations, and mandatory or semi-mandatory enrolment to enlarge the pooled population. Where governance and transparency remained weak, pooling could have suffered from adverse selection, fragmentation, or underfunding. In settings similar to Bayelsa, effective risk pooling correlated with reduced out-of-pocket spending and more uniform service utilization across socioeconomic groups, while weak pooling schemes tended to perpetuate disparities in access and financial protection. The Bayelsa Equity Fund was envisioned as a designated pool of resources aimed at subsidizing premiums or covering services for the poorest and most vulnerable residents, thereby enhancing affordability and enrolment across income groups. Exemption mechanisms targeted at the poor, the unemployed, women, the elderly, and residents in remote or riverine communities could have mitigated affordability barriers and information gaps. When

effectively designed and administered, Equity Funds and exemptions were expected to narrow income-based disparities in enrolment and utilization, particularly for informal-sector workers and those living in hard-to-reach areas. If mismanaged, they risked creating gaps through misallocation, leakage, or exclusion criteria that were too stringent. Administrative complexity, accurate means-testing, fraud risk, and political economy concerns could have undermined the effectiveness of Equity Funds and exemptions. In Bayelsa's context, ensuring timely disbursements, protecting the integrity of subsidy pathways, and coordinating with local governance structures were critical to success. In the formal sector workers, given the higher incomes and stable employment, these groups often had better access to enrolment and premium payments; however, without subsidies, their contributions might have contributed to a regressive overall design if not balanced by cross-subsidies. The informal sector earners with income volatility, these residents faced affordability challenges; targeted subsidies and flexible premium arrangements would have been essential to preserve enrolment. The unemployed and marginalized population if without targeted exemptions or equity funds, these groups would likely face the highest barriers to enrolment and the greatest risk of financial hardship due to illness. Gender roles and education levels influenced awareness, trust, and ability to engage with enrolment processes; equity-focused policies would have needed gender-sensitive communication and health literacy initiatives. In this context, the interplay among *progressive versus regressive financing*, risk pooling, the Bayelsa Equity Fund, and exemptions shaped the trajectory toward equitable health coverage. The equity outcomes depended on the design choices, governance, and administrative capacity that translated policy concepts into practice. When *progressive financing*, robust cross-subsidization, and well-administered exemptions aligned with comprehensive risk pooling, Bayelsa's insurance uptake and financial protection could have been more equitable; conversely, *regressive designs*, weak pooling, and poorly implemented exemptions risked entrenching disparities across formal and informal populations. In examining barriers and facilitators to achieving universal health coverage, scholars recognized that geographic location matters not only through fixed physical characteristics but also through the social, economic, and political contexts that shaped access. The discourse distinguished two complementary strands—*essentialist geographic factors* and *contextual geographic factors*—and used them to interpret the disparities in insurance uptake and service utilization that persisted in many settings. *Essentialist geographic factors* were understood as the tangible, material distances and physical barriers inherent in particular environments. In the study of Bayelsa and similar deltaic regions, researchers noted that geographic distance to enrolment centres and health facilities, coupled with the delta and riverine terrain, created clear, immutable barriers. Travel time was long and costly, transportation options were irregular, and seasonal changes could render routes impassable. These characteristics directly increased the opportunity costs of enrolment and renewal, discouraging participation among low-income earners and households with precarious livelihoods. The *essentialist perspective* thus explained why even willing

individuals faced practical obstacles to joining and maintaining coverage [27-29]. Contextual geographic factors, by contrast, were understood as the spatially embedded social, economic, and institutional conditions that interacted with physical space to influence access. In Bayelsa, the urban-rural dynamic did not merely reflect distance; it reflected differences in infrastructure quality, health workforce distribution, information channels, governance capacity, and social networks. The density of roads and mobile connectivity, the availability of enrolment points, and the efficiency of administrative procedures varied by locality, amplifying or mitigating the effects of physical distance. Socioeconomic composition—income levels, occupation types (formal vs. informal), education, and gender roles—shaped how people navigated enrolment processes, perceived value, and willingness to pay premiums [2,30]. In contexts where poverty was pervasive and education levels limited, contextual barriers such as mistrust in institutions, language barriers, and opaque administrative rules compounded physical distances to create substantial impediments to uptake. The interaction between *essentialist and contextual factors* was crucial for understanding disparities in insurance uptake. For example, the delta's challenging geography (an essentialist barrier) overlapped with weak transportation networks and limited health facility density (contextual factors), reinforcing unequal access for remote communities. Similarly, urban areas benefited from shorter travel times (essentialist) but potentially faced contextual advantages in terms of information dissemination, governance capacity, and targeted outreach, which facilitated enrolment. Conversely, rural and riverine communities faced a double burden: high material costs of travel and enrolment (essentialist) and limited social capital, lower health literacy, and weaker administrative support (contextual). Policy implications derived from this dual lens emphasized the need for targeted, multi-dimensional interventions. Essentialist solutions included mobile enrolment teams, satellite enrolment centres, and transport subsidies to reduce physical barriers. Contextual responses entailed strengthening governance and accountability in hard-to-reach areas, expanding digital enrolment tools while preserving non-digital pathways, conducting multilingual information campaigns, and tailoring subsidies to local economic realities. Moreover, addressing gender norms and educational gaps was recognized as essential to converting geographic proximity into actual access, since contextual factors often mediating women's participation and informed decision-making. In merging these perspectives, researchers concluded that progressing toward universal health coverage required simultaneously addressing the concrete, unavoidable distances people faced and the broader social and institutional environment that either enabled or impeded access. The essentialist dimension clarified where the sorted physical impediments lay, while the contextual dimension illuminated why similar distances produced different outcomes across communities. Policymakers who effectively bridged these dimensions—by reducing travel and enrolment frictions while strengthening local governance, information flows, and cultural acceptability—were better positioned to expand coverage and reduce inequities. Limitations

in applying these concepts included potential measurement challenges, as essentialist factors could be difficult to quantify precisely (e.g., seasonal travel constraints) and contextual factors could be dynamic and sensitive to governance changes. Nevertheless, the dual framework offered a robust, comprehensive approach to diagnosing barriers and identifying facilitators to universal health coverage in settings characterized by geographic diversity and socioeconomic heterogeneity.

Materials and Methods

Study Design

The study employed a cross-sectional, mixed-methods design to investigate geographic and socioeconomic determinants of Bayelsa State's social health insurance (SHI) enrolment. Data were collected from individuals and households across eight local government areas (LGAs) to examine how location, income proxies, education, occupation, and enrolment processes related to uptake, retention, and access to primary health centres (PHCs) under capitation.

Study Area

Bayelsa State is located in the southern part of Nigeria, in the Niger-Delta region. It is bordered by Rivers State to the West and Delta State to the East with a long span of Atlantic Ocean at the south. The capital city is Yenagoa. Bayelsa has a population of about 2,537,400 with a landscape area of 9,391 km² [31]. Demographic data for Bayelsa State indicates that most of the population belongs to the Ijaw ethnic group, which is the dominant ethnic group in the state. Other minority ethnic groups include the Ogbia, Nembe, and Epie-Atissa. The main languages spoken in Bayelsa State are Ijaw, Epie-Attisa, Isoko, Urhobo and English. Bayelsa State has a predominantly Christian population, with Christianity being the major religion practiced in the state. However, there are also adherents of other religions, including traditional Africans religions and Islam. The economy of Bayelsa State is predominantly petroleum resources, as the state is in the oil-rich Niger Delta region. Bayelsa has one of the largest crude oil and natural gas deposits in Nigeria, with the Oloibiri Oilfield being the site of the country's first oil discovery. Other mineral raw materials found in the state include salt, agro raw materials include cassava, plantain, rice, and fish.

Study Population

The study population in Bayelsa State had been characterized by pronounced socioeconomic and geographic diversity, comprising both the rich and the poor, with a clear distinction between those engaged in formal employment—encompassing government workers and staff of corporate organizations and private companies—and those working in the informal sector, including petty traders, artisans, farmers, fishermen, clergy men and women. A high density of the population resided in rural areas, while a smaller proportion inhabited urban centres, reflecting an urban-rural gradient in livelihoods and access to services. The geographic landscape featured very difficult terrains and waterways in many communities, contrasting with motorable towns and cities in

others, which translated into heterogeneous levels of mobility, enrolment opportunities, and health service access. Enrolment in the social health insurance program varied across individuals, with some residents already enrolled and actively contributing, while others remained unenrolled due to affordability constraints, administrative barriers, lack of documentation, or skepticism about the program's benefits. The intersection of income levels, occupation type, education, gender, and household structure interacted with geographic location to shape enrolment decisions, retention, and utilization patterns, producing a mosaic of inclusion and exclusion across the population. The study population thus encompassed a broad spectrum of socioeconomic strata and geographic contexts, ensuring that findings could illuminate how policy design and implementation affected equity in enrolment and access to primary health care services through Bayelsa's SHI framework.

Sample size determination

To calculate the sample size for the study on geographic and socioeconomic disparities in Bayelsa State social health insurance program, we used a formula suitable for unknown population sizes. Given that the population size was unknown and infinite, we applied Cochran's formula for sample size estimation. The formula is as follows:

$$n_o = \frac{Z^2 \times p(1-p)}{E^2}$$

Where:

n_o = required sample size

Z = Z -value (the number of standard deviations from the mean for a given confidence level)

p = estimated proportion

E = margin of error

Given:

$p = 0.5$ (5%)

$Z = 1.96$ (confidence interval of 95%)

$E = 0.04$ (margin of error of 4%)

Calculation:

Using the assumed margin of error of 0.04, we can calculate the sample size:

Substitute the values into the formula:

$$n_o = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.04)^2}$$

Calculate:

$Z^2 = (1.96)^2 \approx 3.8416$

$(1-p) = 1-0.5 \approx 0.5$

$p(1-p) = 0.5 \times 0.5 \approx 0.25$

$E^2 = (0.04)^2 = 0.0016$

$$n_o = \frac{3.8416 \times 0.25}{0.0016} = \frac{0.9604}{0.0016} = 600.25 \approx 600$$

Thus, the final sample size calculated for the study was 600 participants.

Sampling Technique

The study employed a multi-stage, stratified sampling design to capture the geographic and socioeconomic diversity of Bayelsa State among residents aged 19 years and above across all eight local government areas (LGAs), selected to reflect rural-urban contrasts, deltaic and riverine environments, and varied enrolment patterns. Stage 1 involved purposive selection of the eight LGAs to ensure inclusion of hard-to-reach communities, motorable towns, and areas with differing levels of SHI enrolment. Stage 2 within each LGA applied stratified sampling to categorize communities by urbanicity (urban centres, rural settlements) and by accessibility (easy-to-reach versus hard-to-reach riverine communities), thereby achieving proportional representation of formal-sector workers (government and corporate employees), informal-sector earners (petty traders, artisans, farmers, fishermen, clergy), and the unemployed. Stage 3 within each stratum utilized systematic sampling to select households from updated lists, with probability proportional to size where feasible to reflect population density. Stage 4 within households identified one or more eligible respondents aged 19 years and above, and used a simple random method to select the respondent most knowledgeable about SHI enrolment decisions. Stage 5 ensured quality control through field supervision, pilot testing of instruments, and interviewer retraining to minimize sampling bias and nonresponse. Stage 6, the framework permitted estimation of SHI enrolment prevalence, disparities across geographic and socioeconomic strata, and examination of associations between enrolment status, age cohorts, and occupational groups, while upholding ethical standards including informed consent and confidentiality.

Selection Criteria

Inclusion Criteria

- Residents within Bayelsa State and aged 19 years or older at the time of data collection.
- Individuals who were eligible for Bayelsa State's social health insurance program, including those employed in formal sectors (government, corporate organizations, private companies) and those engaged in the informal sector (petty traders, artisans, farmers, fishermen, clergy members, and other informal workers), as well as unemployed individuals connected to enrolment through primary health centres.
- Participants from all eight local government areas (LGAs) who provided informed consent to participate in the study.
- Individuals who had information or experiences relevant to SHI enrolment, renewal, or utilization, including those currently enrolled, previously enrolled, or never enrolled but eligible.

-
- e. Respondents representing diverse geographic contexts (urban centres, peri-urban areas, rural communities, and riverine/delta settlements) to capture variation in accessibility and service delivery.

Exclusion Criteria

- a. Individuals younger than 19 years old at the time of data collection.
- b. Non-residents of Bayelsa State or residents temporarily away from the state for extended periods (e.g., long-term travel) during the study window.
- c. Persons who did not provide informed consent or who declined to participate in either the questionnaire.
- d. Respondents with cognitive impairments or language barriers that precluded reliable comprehension of survey questions and consent, where suitable accommodations could not be provided.

Method of Data Collection

Data collection was conducted using a structured questionnaire administered by trained enumerators across the eight local government areas in Bayelsa State. The study population comprised residents aged 19 years and above, including individuals from formal sectors (government and corporate organizations, private companies) and those from the informal sector (petty traders, artisans, farmers, fishermen, clergy men and women), as well as unemployed individuals connected to enrolment through primary health centres. The questionnaire was configured in KoboToolbox, enabling data collection both online and offline to accommodate the deltaic and often connectivity-challenged environment. Enumerators received a comprehensive training program covering interview techniques, ethical considerations, informed consent procedures, privacy and data security, and cultural sensitivity to ensure consistent data collection across diverse communities. The instrument was pre-tested to assess clarity, relevance, and reliability, and revisions were implemented before field deployment. Households within selected communities were approached, and one or more adult respondents were invited to participate; where appropriate, both the individual and the primary household respondent contributed responses to enable cross-validation of enrolment status, renewal history, and experiences with enrolment processes. Data collection proceeded under close supervision by field coordinators who conducted daily checks for completeness, consistency, and accuracy, and who performed random spot-checks and re-interviews to ensure reliability. To address geographic and infrastructural challenges typical of Bayelsa's deltaic regions, field teams alternated between paper-based instruments for areas with limited connectivity and KoboToolbox-based digital forms where internet access was available, ensuring timely data capture and synchronization when feasible. Informed consent was obtained from all participants prior to interview, and confidentiality was maintained by assigning unique identifiers and securely storing identifiable information. Quality assurance measures included daily debriefings, supervisor validation of a subset of questionnaires, and data-entry verification to minimize

transcription errors. The questionnaire captured sociodemographic information, socioeconomic indicators, geographic accessibility metrics, SHI enrolment history, and awareness and perceptions of enrolment processes and barriers, producing robust data for subsequent quantitative analyses.

Validity and Reliability Test

Validity

Content validity: The measurement instruments were reviewed by experts in health policy, epidemiology, and survey research to ensure that items adequately represented the constructs of enrolment, barriers and facilitators, geographic accessibility, socioeconomic status, and administrative processes within Bayelsa's SHI context. The instrument was revised to reflect the local deltaic setting, including riverine transport constraints, urban-rural diversity, and the variety of employment sectors (formal and informal) present in the population.

Construct validity: The survey items and indicators were aligned with established theoretical frameworks (Aday-Andersen and Levesque) to capture predisposing, enabling, and need factors, as well as the five dimensions of access and corresponding abilities. Factor analyses (where feasible) were planned to verify that grouped items loaded onto the intended latent constructs, such as perceived value of coverage, affordability, and trust in administration.

Criterion-related validity: When possible, enrolment status and renewal data from SHI administrative records were used as an external criterion to assess the accuracy of self-reported enrolment behaviour. Convergence with facility utilization data and premium payment histories was examined to gauge criterion validity.

Face validity: The instrument underwent pilot testing in a subset of the population to ensure clarity, relevance, and cultural appropriateness. Feedback from respondents and field enumerators guided minor wording adjustments to prevent misinterpretation and to improve comprehension across diverse socioeconomic and educational backgrounds.

Ecological validity: Given the deltaic and rural-urban heterogeneity, the study design sought to ensure that findings could be interpreted within realistic settings, including riverine travel constraints, seasonal accessibility, and local governance practices. The scope encompassed a broad range of geographic contexts to enhance external relevance.

Reliability

Internal consistency: For composite scales (e.g., perceived value of SHI, trust in administration, and health insurance literacy), Cronbach's alpha coefficients were calculated to assess internal consistency, with a threshold of 0.70 or higher indicating acceptable reliability.

Test-retest reliability: In a sub-sample, a subset of respondents was re-administered key items after a short interval to examine

stability over time; intraclass correlation coefficients (ICCs) were used to evaluate consistency of responses.

Instrument reliability: Data collection procedures emphasized standardized training for enumerators, use of a detailed field manual, and quality control checks (e.g., double data entry, range and logic checks) to minimize measurement error and ensure consistent data across enumerators and LGAs.

Missing data handling and robustness: Planned strategies included pre-specifying imputation methods for missing values where appropriate and conducting sensitivity analyses to determine whether missing data might bias results.

Documentation and transparency: All psychometric properties (validation steps, reliability statistics, and decisions about item inclusion) were documented in the methods section to enable reproducibility and critical appraisal.

Data Management and Analysis

Data management and analysis were conducted using a structured, multi-software workflow to ensure rigorous handling of the Bayelsa SHI dataset. Data were collected with structured questionnaires administered to residents aged 19 years and above across the eight local government areas, and responses were entered into a Microsoft Excel workbook for initial data cleaning and descriptive summaries. The Excel workbook served as the primary platform for data cleaning steps, including range checks, consistency checks, and the creation of derived variables such as geographic accessibility indices, socioeconomic status proxies, and enrolment status categorization. Descriptive analyses, including frequencies, means, and cross-tabulations, were performed in Excel to characterize the sample and to obtain baseline indicators of enrolment uptake, renewal, and perceived barriers. For more advanced inferential analyses, the cleaned dataset was exported to SPSS Version 23, where supplementary analyses were conducted. In SPSS, bivariate analyses such as chi-square tests and t-tests examined associations between enrolment status and key predictors, while multivariate modeling utilized logistic regression to estimate adjusted odds ratios for enrolment and renewal as functions of geographic, socioeconomic, and administrative factors. Model specification accounted for clustering at the community level by employing robust standard errors or random-effects specifications where appropriate, to mitigate potential intra-cluster correlation. Spatial data, where available, were integrated by linking geocoded household locations to enrolment centres and PHCs; travel-time and catchment-area metrics were derived from geographic information system outputs and appended to the analytic dataset for inclusion in regression analyses and interaction terms to explore geographic socioeconomic status interactions. KoboToolbox outputs were imported to verify field data integrity and to cross-validate a subset of responses against paper-based forms during data quality checks. For citation management and scholarly referencing, Mendeley Reference Manager was used to organize sources, generate in-text citations, and produce reference lists consistent with the target

style guide; version control and documentation were maintained through a project file repository, with metadata indicating data provenance, variable definitions, and codebooks. Missing data were examined, and appropriate handling strategies—such as listwise deletion for missing, completely at random or multiple imputation for missing at random—were described and applied where justified. Data privacy and ethical standards were enforced throughout, with de-identified datasets used for analysis and access restricted to authorized personnel. The analysis culminated in a set of results comprising prevalence estimates of enrolment, odds ratios for geographic and socioeconomic determinants, assessments of the impact of the identity-card requirement, and sensitivity analyses validating model robustness.

Timeline for the Study Research Planning and Proposal

The research planning and proposal phase was completed in July 2025. During this period, objectives were refined, a literature review was conducted, a conceptual framework was selected, a sampling strategy was designed, and a preliminary data collection plan and budgeting were prepared for submission.

Institutional Ethical Approval

The institutional ethical approval was obtained from the Ethics Committee, Bayelsa Primary Health Care Board, with reference number PHCB/AD/172/Vol.1/p.20, in August 2025. The approval process included preparing and submitting the ethics application, addressing committee queries, and securing written clearance to proceed with data collection.

Data Collection Preparation

Data collection preparation occurred in September 2025. Preparations included finalizing questionnaires and data collection instruments (including KoboToolbox configurations), training field enumerators, developing data management protocols, piloting instruments, and establishing logistical arrangements for fieldwork across the eight LGAs.

Data Collection

Data collection was conducted from October to November 2025. Field teams implemented household and individual interviews across the eight LGAs, adhered to ethical protocols, ensured informed consent, and performed quality checks on collected data. Data were collated, back-checked, and prepared for cleaning.

Report Writing and Dissemination

Report writing and dissemination took place in January 2026. The draft final report was prepared, results were synthesized, policy implications were discussed, and dissemination activities—such as stakeholder workshops and presentations to policymakers and partners—were organized.

Ethical Considerations

Ethics Committee Approval

The study secured ethical approval from the Ethics Committee

of the Bayelsa State Primary Health Care Board, with reference number PHCB/AD/172/Vol.1/p.20, in August 2025. The approval process entailed preparing a comprehensive protocol outlining study aims, methodology, participant protections, data management, and dissemination plans; responding to committee inquiries; and obtaining written clearance to proceed with data collection. The approved protocol specified procedures for informed consent, confidentiality, risk minimization, and the handling of sensitive information, and it mandated adherence to national and institutional ethical guidelines throughout fieldwork.

Community Consent

Community-level consent processes were conducted prior to commencing data collection. Gatekeepers and community leaders were engaged to explain the study’s purpose, methods, potential benefits, and risks, and to address concerns about privacy and cultural appropriateness. Community assent was sought through informational meetings, and community-level agreements or endorsements were documented as part of the ethical documentation. Researchers ensured that community expectations were clarified, that participation would be voluntary, and that individuals would not face any form of coercion or negative consequences for choosing not to participate. Where applicable, community approvals complemented individual informed consent, reflecting respect for local governance structures and social norms.

Individual Informed Consent

Individual participants provided informed consent prior to participation. Researchers provided clear information about the study’s aims, procedures, potential risks and benefits, data confidentiality, and the voluntary nature of participation, using language accessible to participants and, when needed, local languages. Participants were informed that they could withdraw at any time without penalty or loss of benefits. For respondents under any form of legal constraint or who lacked capacity, appropriate guardians or proxies were identified in accordance with ethical guidelines, and consent obtained from the guardians when required. All consent processes were documented through signed consent forms or electronic equivalents, and participants’ privacy and data protection rights were upheld by de-identifying data and securely storing identifiable information. The consent procedures were designed to minimize any potential distress and to ensure that participation was entirely voluntary and based on informed understanding.

Results and Discussion

Table 1: Demographic characteristics of respondents.

Variable	Category	Frequency (n=600)	Percent (%)
Settlement	Urban	175	29%
	Rural	425	71%
Nature of terrain	Upland	471	78%
	Coastal	83	14%
	Riverine	46	8%

Religion	Christianity	590	99%
	Islam	4	0%
	Traditional	6	1%
Age	19-34 years	171	28%
	35-54 years	286	48%
	55-60 years	107	18%
	61-70 years	27	4%
	71 years and above	9	2%
Gender	Male	274	46%
	Female	326	54%
Marital status	Single	114	19%
	Married	413	69%
	Divorce	20	3%
	Separated	31	5%
	Widow	22	3%
Educational level	No formal education	32	5%
	Primary education	77	13%
	Secondary education	323	54%
	Tertiary education	168	28%
Occupation	Artisans	34	
	Civil servants	151	25%
	Clergy men	2	0%
	Farmers	83	14%
	Fishermen/women	59	10%
	Petty traders	171	28%
	Students	43	7%
	Retirees	16	3%
	Taxi driver/Keke driver	41	7%
Employment status	Self-employed	93	15%
	Unemployed	345	58%
	Government employed	162	27%

Table 1 presented the demographic characteristics of respondents in a study on geographic disparities of social health insurance enrollment. The total number of respondents was 600. In terms of settlement, a majority of the respondents, 425 (71%), resided in rural areas, while 175 (29%) lived in urban settings. The nature of the terrain indicated that most respondents, 471 (78%), were in upland areas, followed by 83 (14%) in coastal regions, and 46 (8%) in riverine zones. Regarding religion, the overwhelming majority identified as Christians, totaling 590 (99%), with only 4 (0%) identifying as Muslims and 6 (1%) adhering to traditional beliefs. The age distribution revealed that 286 (48%) of respondents were aged between 35 to 54 years, 171 (28%) were between 19 to 34 years, 107 (18%) were aged 55 to 60 years, 27 (4%) were aged 61 to 70 years, and 9 (2%) were 71 years and above. In terms of gender, the sample consisted of 274 (46%) males and 326 (54%) females. The marital status of respondents showed that 413 (69%) were married, 114 (19%) were single, 31 (5%) were separated, 20 (3%) were divorced, and 22 (3%) were widowed. Educational levels indicated that 323 (54%) had completed secondary education, while 168 (28%) had tertiary education. A smaller number had primary education (77, 13%) or no formal education (32, 5%). Occupationally, the respondents were diverse, with 151 (25%) as civil servants, 171 (28%) as petty traders, 83 (14%) as farmers, and 59 (10%) as fishermen/women. Other occupations included

artisans (34), students (43), taxi or Keke drivers (41), retirees (16), and clergy (2). Lastly, employment status showed that 345 (58%) of respondents were unemployed, 162 (27%) were government employed, and 93 (15%) were self-employed.

In Figure 1, the enrollees' opinions about premium affordability were presented. A majority of the respondents, 226 individuals or 81%, found the premiums to be very affordable. Additionally, 29 respondents, accounting for 10%, considered the premiums somewhat affordable. A smaller portion of the participants expressed neutral feelings about the affordability, with 18 individuals, or 6%, selecting that option. Only 5 respondents, representing 2%, deemed the premiums somewhat unaffordable, while 3 individuals, or 1%, found them to be very unaffordable. Overall, the figure indicated a strong perception of affordability among the enrollees in the social health program.

Figure 1: Enrollees’ opinion about premium affordability.

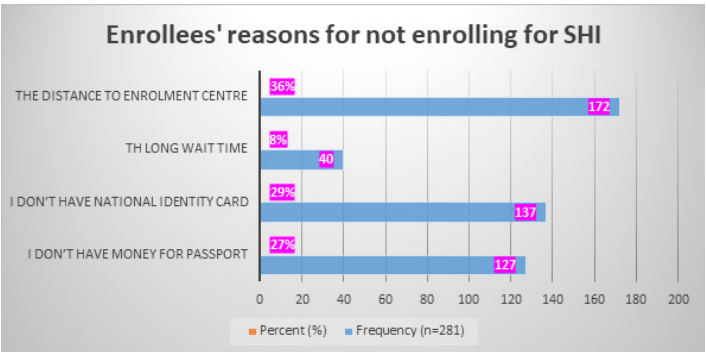
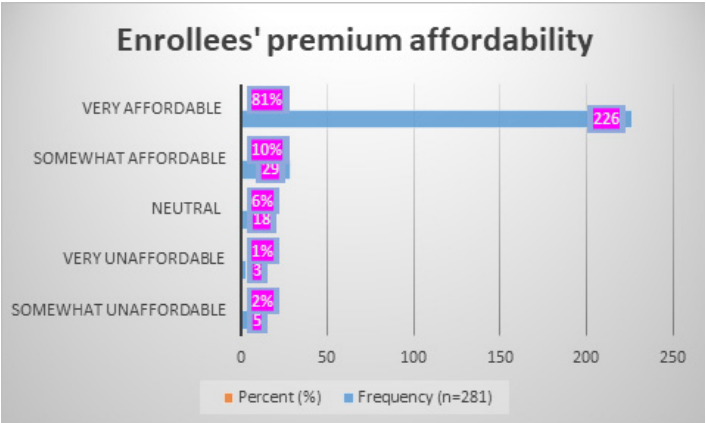


Figure 2: Respondents’ reasons for not enrolling for social health insurance program.

Figure 2 illustrated the various reasons that respondents cited for not enrolling in the social health insurance program, highlighting significant geographic and socioeconomic disparities. A notable 36% of participants identified the distance to the enrolment center as a barrier, suggesting that individuals living in remote or underserved areas faced additional challenges that hindered their access to essential health services. This geographic factor likely contributed to the lower enrolment rates among populations residing far from urban centers where these services are more

readily available. Additionally, socioeconomic factors played a crucial role in enrolment disparities. The data revealed that 27% of respondents cited the lack of money for a passport as a reason for not enrolling, while 29% mentioned the absence of a national identity card. These financial and administrative barriers disproportionately affected lower-income individuals, who might have struggled more than their wealthier counterparts to meet the necessary requirements for enrollment. The long wait times, though mentioned by only 8% of respondents, could also be indicative of systemic inefficiencies that affected those with limited time or resources, further exacerbating inequities in access to social health insurance. In summary, the findings from Figure 2 underscored the challenges faced by marginalized groups in accessing social health insurance, emphasizing the need for targeted interventions to address both geographic and socioeconomic barriers to enrollment.

Table 2: Respondents who couldn’t enrolled by reason of the distance to enrolment centre.

Variable	Frequency (n=172)	Percent (%)
Within 20km or greater than 60 minutes distance	131	76%
Within 5-10km or 15-30 minutes distance	40	23%
Within 5km or 15 minutes distance	1	1%

Table 2 illustrated the geographic disparities that existed in the enrolment of social health insurance among respondents who could not enroll due to the distance to the enrolment center. A significant majority, accounting for 76% (n=131), reported that they lived within a distance of 20 kilometers or greater than 60 minutes from the enrolment center. This indicated that a considerable portion of the population faced substantial barriers related to accessibility, which likely hindered their ability to participate in the social health insurance program. In contrast, 23% (n=40) of respondents lived within a distance of 5 to 10 kilometers or a travel time of 15 to 30 minutes, suggesting that while they were still affected by distance, their situation was relatively more manageable. Only 1% (n=1) of respondents resided within 5 kilometers or 15 minutes of the enrolment center, highlighting that very few individuals had easy access to the location. Overall, the data underscored the significant challenges posed by geographic factors in the enrolment process, revealing that distance played a critical role in limiting access to social health insurance for a large segment of the population.

Table 3: Respondents’ terrain and enrolment status.

Variable	Enrolment status (n=600)	
	No	Yes
Coastal terrain	48	35
Riverine terrain	27	19
Upland terrain	236	235

Table 3 illustrated the geographic disparities in the enrolment status of respondents in social health insurance based on the nature of their terrain. Among the 600 respondents, those from upland terrain showed a nearly equal distribution between enrolment statuses, with 236 individuals not enrolled and 235 enrolled. This indicated

a relatively balanced situation in upland areas regarding access to social health insurance. In contrast, the coastal and riverine terrains displayed significant disparities. Among respondents from coastal terrain, 48 individuals were not enrolled compared to only 35 who were enrolled, highlighting a challenge in accessing social health insurance in these areas. Similarly, in riverine terrain, 27 respondents were not enrolled while only 19 were enrolled, further emphasizing the difficulties faced by individuals in these geographic locations. Overall, the data revealed that geographic disparities significantly impacted enrolment in social health insurance, with upland terrain respondents faring better than those from coastal and riverine terrains. This suggested that terrain type played a crucial role in determining access and participation in social health insurance programs.

Table 4 provided a chi-square test of independence that examined the relationship between the utilization of social amenities in households and the enrolment status in social health insurance among respondents. The results revealed a highly significant p-value of 3.99×10^{-31} , indicating a strong association between the type of social amenities utilized and the enrolment status of individuals in social health insurance. The observed frequencies demonstrated

that among respondents who used various social amenities, such as cell phones, radios, and borehole water, there was a notable difference in enrolment status. For instance, a higher proportion of individuals who reported using cell phones (281 enrolled vs. 299 not enrolled) were more likely to be enrolled in social health insurance compared to those who did not use this amenity. In contrast, the utilization of amenities like river water showed that a significant number of respondents (130) who relied on this resource were not enrolled in social health insurance, highlighting a potential socioeconomic disparity. The expected frequencies further illustrated these disparities, with certain amenities like cell phones and borehole water having higher expected enrolment rates compared to others. This suggested that access to better social amenities could be linked to improved enrolment in social health insurance, reflecting underlying socioeconomic factors influencing these outcomes. Overall, the findings from Table 4 indicated that socioeconomic disparities significantly impacted enrolment in social health insurance, with those utilizing more advanced social amenities being more likely to be enrolled. This highlighted the critical role that socioeconomic status played in determining access to health insurance, as individuals from lower socioeconomic backgrounds tend to have less access to essential

Table 4: Chi-square test of independence of social amenities used in households and enrolment status of social health insurance.

Variable	OBSERVED		
	ENROLMENT STATUS		
	Yes	No	Grand Total
<i>SOCIAL AMENITIES USED IN HOUSEHOLDS</i>			
Cell phone	281	299	580
Radio	243	155	398
Television	176	72	248
Generator	72	11	83
vehicle	9	1	10
Borehole water	215	140	355
Piped borne water	27	21	48
Rain water	0	2	2
Well water	12	18	30
River water	35	130	165
Grand Total	1070	849	1919
Variable	EXPECTED		
	ENROLMENT STATUS		
	Yes	No	Grand Total
<i>SOCIAL AMENITIES USED IN HOUSEHOLDS</i>			
Cell phone	323.40	256.60	580
Radio	221.92	176.08	398
Television	138.28	109.72	248
Generator	46.28	36.72	83
vehicle	5.58	4.42	10
Borehole water	197.94	157.06	355
Piped borne water	26.76	21.24	48
Rain water	1.12	0.88	2
Well water	16.73	13.27	30
River water	92.00	73.00	165
Grand Total	1070	849	1919

$p\text{-value} = 3.99 \times 10^{-31}$

social amenities and, consequently, lower enrolment rates in social health insurance programs.

Table 5: Chi-square test of independence of monthly household income and enrolment into social health insurance program.

OBSERVED			
Variable	ENROLMENT STATUS		
	No	Yes	Grand Total
MONTHLY HOUSEHOLD INCOME			
N500-N1,000	25	3	28
N5,000-N10,000	54	13	67
N10,000-N20,000	83	49	132
N20,000-N50,000	63	70	133
N50,000-N100,000	21	31	52
N100,000-N200,000	2	45	47
N200,000 and above	1	50	51
Nil income	62	28	90
Grand Total	311	289	600
EXPECTED			
Row Labels	No	Yes	Grand Total
N500-N1,000	14.51	13.49	28
N5,000-N10,000	34.73	32.27	67
N10,000-N20,000	68.42	63.58	132
N20,000-N50,000	68.94	64.06	133
N50,000-N100,000	26.95	25.05	52
N100,000-N200,000	24.36	22.64	47
N200,000 and above	26.44	24.57	51
Nil income	46.65	43.35	90
Grand Total	311	289	600

$p\text{-value} = 1.48 \times 10^{-29}$

Table 5 illustrated the results of a chi-square test of independence, which examined the relationship between household income and enrolment in a social health insurance program among respondents. The p-value of 1.48×10^{-29} indicated a highly significant association between the two variables, suggesting that socioeconomic status played a crucial role in determining enrolment in the program. The observed frequencies of enrolment status revealed that individuals with higher household incomes tend to have higher enrolment rates in the social health insurance program. For instance, among respondents with a monthly household income of N200,000 and above, 50 out of 51 individuals enrolled in the program, contrasting sharply with the lowest income category (N500-N1,000), where only 3 out of 28 enrolled. In the income brackets between N5,000-N10,000 and N10,000-N20,000, there were also notable disparities, with enrolment rates increasing as household income rose. Conversely, those in the lowest income category and those reporting nil income exhibited the lowest enrolment figures, with a significant number remaining uninsured. The expected frequencies indicated what enrolment would look like if there were no association between income and enrolment status. However, the actual observed data deviated significantly from these expected values, underscoring the influence of socioeconomic disparities on access to health insurance. Overall, the findings showcased a clear

trend: as household income increased, so did the likelihood of enrolment in the social health insurance program. This highlighted systemic inequalities in health insurance access, reflecting broader socioeconomic disparities that affected individuals' ability to secure health coverage.

Table 6 provided a comprehensive analysis of the relationship between various demographic characteristics and the likelihood of enrolment in social health insurance. The analysis revealed significant insights regarding sociodemographic disparities in enrolment patterns. The overall regression model was significant, as indicated by an F-statistic of 32.3823 with a p-value of 0.0000, suggesting that the demographic variables collectively had a strong influence on enrolment status. Among the coefficients, the intercept value of 1.6033 indicated a baseline likelihood of enrolment. The urban-rural divide emerged as a significant factor, with a coefficient of 0.2118, highlighting that individuals from urban areas were more likely to enroll compared to their rural counterparts. This disparity underscored the potential barriers faced by rural populations in accessing social health insurance. Gender and age did not show significant effects, with p-values of 0.4499 and 0.4245 respectively, suggesting that these characteristics did not substantially influence enrolment decisions in this context. Conversely, educational attainment surfaced as a critical variable, with a coefficient of 0.1037 and a significant p-value of 0.0000, indicating that higher education levels were positively associated with enrolment likelihood. This finding pointed to the importance of education in understanding and accessing health insurance options. Religion, however, did not display a significant effect on enrolment, as evidenced by its p-value of 0.1740, demonstrating that religious affiliation was not a determinant in this specific analysis. Employment status emerged as the most influential demographic factor, with a coefficient of 0.3754 and a t-statistic of 9.5516, confirming that individuals who were employed were significantly more likely to participate in social health insurance programs. This finding suggested that employment not only provided financial means but also possibly increased awareness and access to health insurance options. Overall, the analysis illuminated the intricate relationship between demographic characteristics and enrolment in social health insurance, revealing significant disparities that could inform targeted interventions to enhance coverage, particularly among underrepresented groups.

Discussion

The findings from (Table 1) highlighted significant demographic characteristics and barriers to enrolment in social health insurance, revealing notable geographic and socioeconomic disparities. The predominance of respondents residing in rural areas (71%) and upland terrains (78%) underscored the challenges faced by populations living in remote regions. Previous studies had indicated that rural residents often encounter more significant barriers to healthcare access than their urban counterparts [18,19]. This geographical divide not only affects access to healthcare services but also influences health outcomes, as rural areas frequently lack the necessary infrastructure and resources. The

Table 6: Regression Analysis of demographic characteristics and enrolment status in social health insurance program.

ANOVA	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	7	41.4764	5.9252	32.3823	0.0000	
Residual	592	108.3220	0.1830			
Total	599	149.7983				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.6033	0.1684	9.5219	0.0000	1.2726	1.9340
Urban-rural	0.2118	0.0395	-5.3633	0.0000	-0.2893	-0.1342
Gender	0.0276	0.0366	0.7560	0.4499	-0.0442	0.0994
Age	-0.0186	0.0233	-0.7992	0.4245	-0.0643	0.0271
Marital status	0.0135	0.0247	0.5469	0.5847	-0.0349	0.0619
Educational	0.1037	0.0239	-4.3342	0.0000	-0.1507	-0.0567
Religion	-0.1138	0.0836	-1.3612	0.1740	-0.2781	0.0504
Employment	0.3754	0.0393	9.5516	0.0000	0.2982	0.4526

overwhelming majority of respondents identified as Christians (99%), which aligns with the demographic trends noted in similar studies conducted in predominantly Christian regions [32]. This homogeneity might reflect cultural influences on health-seeking behavior and perceptions of health insurance. Additionally, the age distribution of respondents indicated that nearly half (48%) were between the ages of 35 to 54 years, a demographic often associated with increased health needs. However, the underrepresentation of younger individuals (ages 19 to 34) and older adults (ages 61 and above) suggests potential gaps in outreach and enrolment strategies targeting these specific age groups.

The respondents' perceptions of premium affordability were predominantly positive (Figure 1), with 81% finding premiums very affordable. This finding contrasts with other studies where affordability was frequently cited as a barrier to enrolment [33,34]. The results suggest that the social health insurance program might have effectively communicated its value to a majority of potential enrollees. Nevertheless, the small percentage of individuals who considered premiums somewhat or very unaffordable highlights the necessity for ongoing assessment of affordability as economic conditions fluctuate. The barriers to enrolment identified in this study were significant, particularly the geographic barrier of distance to enrolment centers (Figure 2), reported by 36% of respondents. This finding is consistent with previous research indicating that physical distance to healthcare facilities could deter individuals from seeking necessary services [27,28]. Furthermore, administrative barriers, such as the lack of a national identity card (29%) and funds for a passport (27%), aligned with the socioeconomic challenges that often inhibit access to health services [35,36]. These factors particularly affect lower-income individuals, reflecting systemic inequities that necessitate targeted interventions to facilitate access to social health programs. Despite the relatively low percentage of respondents reporting long wait times (8%), this issue remains pertinent, as it might disproportionately impact those with limited time or resources—factors that are critical in determining healthcare access [37]. This underscores the importance of addressing systemic inefficiencies in the enrolment process to improve access for marginalized groups. The findings of (Table 2) highlighted significant geographic

disparities in the enrolment of social health insurance among respondents, underscoring the critical role that distance and terrain type played in access to healthcare services. As indicated in Table 2, a substantial majority of respondents, 76% (n=131), reported living more than 20 kilometers from the enrolment center, which posed a notable barrier to their participation in social health insurance programs. This finding is consistent with previous research that identified distance as a primary factor influencing healthcare access [1,38]. The implications of these geographic barriers are profound, as they suggest that individuals who are farther from enrolment centers are less likely to participate in social health insurance, leading to inequities in health access. The data also revealed that only 1% (n=1) of respondents resided within 5 kilometers of the enrolment center, indicating that very few individuals had easy access. This aligns with the findings of a study by [1], which also emphasized the link between proximity to healthcare facilities and enrolment rates. Accessibility issues, therefore, appear to be a significant deterrent to enrolment in social health insurance programs, corroborating the assertion that geographic location could greatly influence health outcomes [39]. Table 3 examined the relationship between terrain type and enrolment status, the study found that respondents from upland areas exhibited a relatively balanced distribution between those enrolled and not enrolled. This contrasted sharply with the coastal and riverine terrains, where enrolment disparities were more pronounced. The coastal respondents reported 48 individuals not enrolled compared to only 35 enrolled, while riverine respondents showed even lower enrolment rates. These findings are consistent with previous literature indicating that socio-economic factors and environmental conditions, such as terrain types, could affect healthcare access and utilization [35]. The challenges faced in coastal and riverine areas might include not only physical distance but also socio-economic disadvantages that disproportionately affect these populations. The research illuminated how geographic disparities significantly impacted the enrolment processes in social health insurance programs, suggesting that tailored interventions are necessary to address these barriers. Previous studies had recommended the implementation of mobile enrolment units or decentralized enrolment processes to mitigate the effects of distance [40]. Additionally, enhancing the infrastructure in

underserved areas could further facilitate access to social health insurance.

The results of (Table 4) provided compelling evidence of the significant relationship between the utilization of social amenities, household income, and enrolment in social health insurance programs. The findings from the chi-square tests highlighted the influence of socioeconomic factors on health insurance accessibility, echoing previous studies that established a strong correlation between economic status and health outcomes [35]. The analysis revealed a highly significant association between the type of social amenities utilized and individuals' enrolment status in social health insurance. Respondents who had access to modern amenities such as cell phones and borehole water exhibited higher enrolment rates compared to those relying on less reliable resources. This observation aligns with the findings which suggested that improved access to social amenities is indicative of better socioeconomic conditions, which in turn facilitates greater access to health resources, including insurance. The disparities identified in amenity usage reflect underlying socioeconomic inequalities that had been documented in numerous studies. Moreover, in Table 5, the results demonstrated a clear trend linking household income to enrolment in social health insurance. As indicated by the data, individuals within higher income brackets consistently showed greater enrolment rates, while those in lower income categories faced substantial barriers to insurance access. This trend corroborated the research finding [41], [42], which highlighted that lower income is often associated with poorer health outcomes and limited access to healthcare services. The stark contrast between the enrolment rates of individuals with high income and those with minimal or no income underscores the systemic inequalities that pervade health insurance access in many regions. The findings also pointed to the need for targeted interventions aimed at improving health insurance enrolment among lower-income populations. By addressing the socioeconomic barriers that hinder enrollment, policymakers could enhance access to health coverage for marginalized groups. This aligns with recommendations from the research findings which emphasized the importance of addressing social determinants of health to improve health equity [12].

The findings of (Table 6) provided valuable insights into the factors influencing enrolment in social health insurance, highlighting significant demographic disparities that warrant attention. The overall significance of the regression model, evidenced by an F-statistic of 32.3823 and a p-value of 0.0000, underscored the collective impact of demographic variables on enrolment decisions. This aligns with previous studies that had asserted the importance of socioeconomic and demographic factors in health insurance uptake [35,36]. One of the most noteworthy findings was the urban-rural divide, with urban residents exhibiting a higher likelihood of enrolling in social health insurance compared to their rural counterparts, as indicated by a coefficient of 0.2118. This disparity echoed the work of scholars, who noted that rural populations often faced barriers such as limited access to information and resources regarding health insurance options [18,19]. Such

barriers could impede awareness and understanding, ultimately affecting enrolment rates. Future interventions must consider these geographical disparities to enhance access and education in rural settings. Educational attainment emerged as a significant factor with a coefficient of 0.1037 and a p-value of 0.0000, implying that individuals with higher levels of education were more likely to engage with social health insurance systems. This observation corroborated findings from previous research, which suggested that education plays a crucial role in individuals' health literacy and their ability to navigate complex insurance systems [43,44]. Consequently, initiatives aimed at improving educational outcomes might also enhance enrolment rates by empowering individuals with the knowledge necessary to make informed health insurance decisions. In contrast, the analysis revealed that gender and age did not significantly influence enrolment decisions, with p-values of 0.4499 and 0.4245, respectively. This finding diverged from some literature that suggested demographic characteristics such as gender could affect health insurance uptake. The lack of significant effects in this study might suggest a shift in societal attitudes towards health insurance or could reflect the specific context of the study population. Employment status emerged as the most influential demographic factor, with a coefficient of 0.3754 and a t-statistic of 9.5516, indicating a strong correlation between being employed and the likelihood of enrolling in social health insurance. This finding aligns with the assertions of research findings, who noted that employment not only provides financial resources but also facilitates greater awareness and access to health insurance programs [45,46]. In light of this, policies aimed at increasing employment opportunities might also serve to enhance health insurance enrolment, thereby improving overall health outcomes within the population. Religion, while often cited as a potential influencing factor in various health-related behaviours, did not show a significant effect on enrolment in this analysis, as indicated by a p-value of 0.1740. This lack of correlation suggests that, in this context, religious affiliation did not play a determinative role in enrolment decisions, which resonates with findings from other studies indicating that factors such as socioeconomic status might overshadow religious influences in health insurance uptake.

Conclusion

In conclusion, the research conducted on the social health insurance (SHI) program in Bayelsa State revealed significant geographic and socioeconomic disparities that influenced enrolment and access to health services. The findings highlighted the critical role of geographic barriers, such as distance to enrolment centers and the challenges posed by the deltaic and riverine terrain, which disproportionately affected residents in remote communities. Additionally, socioeconomic factors, including income levels, employment status, education, and gender, were found to significantly impact individuals' ability to enroll and maintain coverage. The study identified that many potential enrollees faced affordability challenges, particularly due to indirect costs associated with travel and time away from work, which further exacerbated the inequities in access to health insurance. Administrative barriers, such as the requirement for national identity cards, also limited

enrolment among marginalized groups, including informal workers and those without formal documentation. Overall, the research underscored the necessity for targeted interventions to address the multifaceted barriers to SHI enrolment. Recommendations included the implementation of mobile enrolment units, simplified documentation processes, and the provision of subsidies for low-income individuals. By addressing these barriers, the study aimed to contribute to advancing universal health coverage in Bayelsa State, ensuring that all residents, particularly the most vulnerable populations, could access essential health services without facing financial hardship. The insights gained from this research were intended to inform policymakers and stakeholders in designing more equitable health insurance systems that effectively meet the needs of diverse communities within the state.

Acknowledgement

We would like to express our sincere gratitude to the Ethics Committee of the Bayelsa State Primary Health Care Board for their invaluable support and guidance throughout this research. Their thorough review and approval were instrumental in ensuring the ethical integrity of our study. We also extend our heartfelt appreciation to the community leaders and stakeholders from the Bayelsa Health Insurance Authority, whose insights and cooperation significantly enriched our research process. Their commitment to health insurance accessibility and community welfare played a vital role in facilitating our engagement with the local population. Finally, we are deeply grateful to the individual participants who generously shared their time and experiences with us. Their contributions provided essential perspectives that shaped our understanding of the social health insurance landscape in Bayelsa State. This research would not have been possible without their willingness to participate and offer their invaluable insights. Thank you all for your support in advancing this important work.

References

1. Stock R. Distance and the utilization of health facilities in rural Nigeria. *Soc Sci Med*. 1983; 17: 563-570.
2. Olaosun OM. Socio-Economic Factors and the Demand for Insurance: A Study of Selected Sole-Proprietorship in Lagos Metropolis. *International Journal of Finance, Insurance, and Risk Management*. 2025; XV: 37-52.
3. Jamal MH, Abdul Aziz AF, Aizuddin AN, et al. Successes and obstacles in implementing social health insurance in developing and middle-income countries: A scoping review of 5-year recent literatures. *Front Public Health*. 2022; 10: 919188.
4. Hosseinpoor AR, Victora CG, Bergen N, et al. Towards universal health coverage: The role of within-country wealth-related inequality in 28 countries in sub-Saharan Africa. *Bull World Health Organ*. 2011; 89: 881-890.
5. Sultana MS, Ali MS. Hardship Financing in Healthcare among Rural Residents in the Gaibandha District: An Application of Binary Logistic Regression. *Am. J. Econ. Bus. Innov*. 2025; 4: 280-290.
6. Alnajjar MI. The Impact of Unified Medical Insurance System Implementation (Nphies) on Healthcare Service Quality: Applied Research Case Study in Arrawdha General Hospital Dammam, Saudi Arabi. *Am. J. Med. Sci. Innov*. 2024; 3: 118-133.
7. Williams JU, Tesunbi S. Strategic Financial Risk Management and Organizational Effectiveness in NEM Insurance Plc Lagos Nigeria. *J. Entrep. Bus. Strateg*. 2025; 1: 29-37.
8. Anarwat SG. Health Insurance for Economically Disadvantaged People in LMICs: What are the Best Options?. *Health Insurance*. 2022.
9. Hone T, Gonçalves J, Seferidi P, et al. Progress towards universal health coverage and inequalities in infant mortality: an analysis of 4.1 million births from 60 low-income and middle-income countries between 2000 and 2019. *Lancet Glob Health*. 2024; 12: e744-e755.
10. Nay O, Béjean S, Benamouzig D, et al. Achieving universal health coverage in France : policy reforms and the challenge of inequalities. *Lancet*. 2016; 387: 2236-2249.
11. Banke-Thomas A, Olubodun T, Olaniran AA, et al. Optimising availability and geographical accessibility to emergency obstetric care within a sub-national social health insurance scheme in Nigeria. *Front Health Serv*. 2024; 4: 1460580.
12. Adekunle W, Vincent O. Analysing the determinants of healthcare insurance uptake in Nigeria. *BMC Health Serv Res*. 2025; 25: 1310.
13. Chizoba E, Bamidele BE, Nda MM. Analysis of Factors that Enhance Insurance Penetration in Rural Areas in Imo State Nigeria. *International Journal of Insurance, Risk and Management Sciences*. 2023; 1: 106-125.
14. Handayani R, Nurmiati N, Susanti S, et al. The Impact of Economic And Social Factors On Demand For Health Insurance: Case Study of Metropolitan Cities. *International Journal of Health and Pharmaceutical*. 2025; 5: 112-122.
15. Elomari R. The Long-Term Relationship between Insurance Customers and Agents: The Importance of Full Disclosure for Optimal Coverage. *Am. J. Econ. Bus. Innov*. 2025; 4: 11-19.
16. Fadun OS. Corporate Governance and Insurance Company Growth: Challenges and Opportunities. *International Journal of Academic Research in Economics and Management Sciences*. 2013; 2: 286-305.
17. IAIS. Insurance Core Principles on Corporate Governance. 2004.
18. Zhou Y, Ping J. Impact of urban–rural resident basic medical insurance on consumption quality of middle-aged and older adult residents: evidence from rural China. *Front Public Health*. 2024; 12: 1374552.
19. Yuan Z, Zhang F, Li Z, et al. Urban-Rural Health Insurance Integration and China's Rural Household Savings. *Risk Manag Healthc Policy*. 2024; 17: 587-601.
20. Radhamony R, Cross WM, Townsin L, et al. Culturally and Linguistically Diverse Community Access and Utilisation of

- the Mental Health Service: An Explanation Using Andersen's Behavioural Model. *Issues Ment Health Nurs*. 2024; 45: 758-765.
21. Krzyż EZ, Antunez Martinez OF, Lin HR. Uses of Andersen health services utilization framework to determine healthcare utilization for mental health among migrants—a scoping review. *Front Public Health*. 2023; 11: 1284784.
22. Cu A, Meister S, Lefebvre B, et al. Assessing healthcare access using the Levesque's conceptual framework—a scoping review. *Int J Equity Health*. 2021; 20: 116.
23. Levesque JF, Harris MF, Russell G. Patient-centred access to health care: Conceptualising access at the interface of health systems and populations. *Int J Equity Health*. 2013; 12: 18.
24. www.bctreaty.ca
25. Marquis MS, Buntin MB. How much risk pooling is there in the individual insurance market?. *Health Serv Res*. 2006; 41: 1782-1800.
26. Smith PC, Witter SN. Risk Pooling in Health Care Financing: The Implications for Health System Performance. 2004.
27. Raichle WM. Insurance Geographies. 2023: 141-152.
28. Asabere NY, Asare IO, Lawson G, et al. Geo-Insurance: Improving Big Data Challenges in the Context of Insurance Services Using a Geographical Information System (GIS). *Human Behavior and Emerging Technologies*. 2024; 1-21.
29. Aboagye RG, Boateng ENK, Okyere YM, et al. Spatial distribution and factors associated with health insurance subscription among women in Ghana. *Int Health*. 2023; 16: 610-624.
30. Ellegård LM, Laberge M. Risk Adjustment in Capitation Payments to Primary Care Providers Does It Matter How We Account for Patients' Socioeconomic Status?. *Med Care*. 2025; 63: 430-435.
31. https://citypopulation.de/en/nigeria/admin/NGA006_bayelsa/
32. Franke MA, Adzeley Boi-Dsane NA, Lubajo R, et al. Faith-based organisations and religious affiliation and their interactions with financial risk protection in health in Sub-Saharan Africa: A systematic review. *Public Health*. 2026; 250: 106014.
33. Manan N, Hasan NIA, Jamal NF, et al. Development of VBA Program for Affordable Premium and Coverage for Lower Income Group in Malaysia. *International Journal of Academic Research in Business and Social Sciences*. 2021; 11: 1819-1831.
34. Eibner C, Cordova A, Nowak SA, et al. The Affordable Care Act and Health Insurance Markets: Simulating the Effects of Regulation. *Rand Health Q*. 2013; 3: 5.
35. Wagstaff A. Social health insurance reexamined. *Health Econ*. 2010; 19: 503-517.
36. Meenaghan TM, Washington RO. Social Policy and Social Welfare Structure and Applications, First Edition. New York: The Free Press. 1980.
37. Limiri DM. The Impact of Long Wait Times on Patient Health Outcomes: The Growing NHS Crisis. *Premier Journal of Public Health*. 2025; 3: 1-7.
38. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Soc Sci Med*. 1994; 38: 1091-1110.
39. Tanser F, Gijsbertsen B, Herbst K. Modelling and understanding primary health care accessibility and utilization in rural South Africa: An exploration using a geographical information system. *Social Science and Medicine*. 2006; 63: 691-705.
40. Gharakhani M, Pourhashemi SO. Adoption of Mobile insurance technology using TAM: A Case Study. *International Journal of Industrial Engineering & Management Science*. 2020; 8: 45-54.
41. Adegboye OD, Fasiku MM, Ibirongbe DO, et al. Experience of Health Shocks and Uptake Of Health Insurance in Rural and Urban Communities, North Central Nigeria: A Qualitative Study. *International Journal of Health Sciences*. 2023; 11: 2372-5079.
42. Galárraga O, Sosa-Rubi SG, Salinas-Rodríguez A, et al. Health insurance for the poor: Impact on catastrophic and out-of-pocket health expenditures in Mexico. *Eur J Health Econ*. 2010; 11: 437-447.
43. Ajemunigbohun SS, Banjo KA, Saka TS. Insurance Literacy and Risk Appetite: Evidence from Selected Small and Medium-Sized Enterprises in Lagos, Nigeria. *A UNIVERSITATIS DANUBIUS*. 2022; 18: 123-140.
44. Yusuf HO, Kanma-Okafor OJ, Ladi-Akinyemi TW, et al. Health Insurance Knowledge, Attitude and Uptake of the Community Based Health Insurance Scheme Among Residents of a Suburb in Lagos, Nigeria. *West Afr J Med*. 2019; 36: 103-111.
45. Magambo J, Warue B, Mbugua L, et al. Social Capital and Health Micro-Insurance Uptake by the Informal Sector Workers in Kenya. *The University Journal*. 2022; 4: 77-94.
46. Mhoja N, Lihoya C. Factors Influencing Civil Servants' Perceptions of National Health Insurance Schemes: A Case Study of the Tanzania Industrial Research and Development Organization (TIRDO), Tanzania. *African Journal of Empirical Research*. 2024; 5: 1257-1267.