

The Double Burden: Human and Material Resource Scarcity in Uganda's Nursing and Midwifery Workforce

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Abstract.

Background: Uganda faces a compounding health workforce crisis characterised by a dual scarcity of both human capital and material resources within its nursing and midwifery sector. The country's nurse-to-population ratio remains critically below the World Health Organization recommended threshold of 10 per 10,000, with disparities most acute in rural and peri-urban health facilities across the Northern, Eastern, and South-Western regions. Objective: This study sought to assess the magnitude of human and material resource scarcity among nursing and midwifery professionals in Uganda, identify multilevel determinants driving workforce attrition, and examine how equipment deficits compound service delivery failures at the frontline of care. Methods: A sequential explanatory mixed-methods cross-sectional design was employed involving 847 nurses and midwives recruited from 94 health facilities across five regions of Uganda. Quantitative data were collected using structured questionnaires and facility-level registers, and were analysed using univariate descriptive statistics, bivariate chi-square and t-tests, and three-level random intercept multilevel logistic regression modelling. Qualitative data were gathered through 32 in-depth interviews and 8 focus group discussions and analysed thematically using Braun and Clarke's framework. Results: The national nurse-to-population ratio was found to be 3.8 per 10,000, well below the WHO standard. Northern Uganda recorded the most critical staffing gap at 1.9 per 10,000, while vacancy rates at Health Centre III reached 72.6%. Over 63% of Health Centres III and IV reported more than half of essential equipment as non-functional. The annual attrition rate for nurses escalated from 12.4% in 2018 to 21.3% in 2023. Multilevel modelling identified inadequate equipment (AOR: 3.42; 95% CI: 2.18-5.37), salary dissatisfaction (AOR: 2.89; 95% CI: 1.97-4.24), high burnout (AOR: 4.21; 95% CI: 2.78-6.38), and rural location (AOR: 2.15; 95% CI: 1.44-3.21) as independently significant predictors of intent to leave. Qualitative findings echoed themes of moral distress, professional devaluation, and systemic neglect. Conclusion: The dual burden of inadequate staffing and depleted material resources creates a self-reinforcing cycle of poor health outcomes and continued workforce exodus. Urgent, equity-focused policy action is required to reverse these trends.

Keywords: Nursing workforce, midwifery, resource scarcity, health workforce attrition, Uganda, multilevel analysis, mixed-methods

INTRODUCTION

The global health workforce crisis has placed sub-Saharan African nations at the epicenter of an escalating public health emergency, with Uganda exemplifying the devastating consequences of a compounding resource deficit that simultaneously depletes both the human capital and material infrastructure required for effective nursing and midwifery practice (Aliu & Aigbavboa, 2019; Gerhart & Feng, 2021; Nhu, 2025). Uganda, a nation of over 47 million people growing at approximately 3.0% annually, confronts a health system chronically overstretched by the dual pressures of a rapidly expanding population and a nurse-to-population ratio that stood at approximately 3.8 per 10,000 population in 2024, representing less than 40% of the World Health Organization's minimum recommended threshold

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of 10 per 10,000 (Namasivayam et al., 2020; Uganda Ministry of Health, 2019). This double burden of scarcity is not merely numerical but profoundly structural: nurses and midwives, who collectively constitute over 70% of Uganda's direct health service delivery workforce, operate within environments stripped of the basic tools necessary to perform safe, dignified, and effective clinical care (Emilio et al., 2023; Garaba, 2022; Pdu et al., 2023; Sylvia et al., 2025). Broken sterilisation equipment, absent foetal monitoring devices, dysfunctional oxygen concentrators, and persistently empty drug stores have become normalised features of peripheral health facilities, particularly in the Northern, Eastern, and rural Western regions where health disparities are most acute (Nelson & Julius, 2024; Sarah & Joshua, 2024; Yadav et al., 2021). These conditions are not passive inconveniences; they actively compromise patient safety, erode professional satisfaction, and catalyse the very attrition they purport to result from, creating a self-perpetuating cycle in which depletion breeds further depletion (Barlon, 2024; Bekiroğlu & Ülgen, 2021; Reger et al., 2022). Furthermore, Uganda's nursing and midwifery training pipeline, while expanded in recent years through private and public nursing schools, has failed to translate output into retained, deployed, and well-supported practitioners at the point of service delivery. The consequence is a workforce perpetually in deficit: trained yet underequipped, present yet demoralised, and committed yet increasingly compelled to emigrate or abandon clinical practice entirely (Gichane et al., 2025; Julius & Mategeko, 2025; Mosley et al., 2025; Wiltshire, 2024). Understanding the intersecting mechanisms through which human and material resource scarcity coalesce to undermine nursing and midwifery practice in Uganda is therefore not merely an academic exercise but an urgent health systems imperative with direct implications for maternal mortality, child survival, disease management, and the nation's ability to attain universal health coverage.

BACKGROUND OF THE STUDY

Uganda's health system, structured across a hierarchical network of national referral hospitals, regional referral hospitals, district hospitals, and health centres (HC II-IV), relies fundamentally on nurses and midwives as the primary cadre responsible for community-level preventive care, obstetric services, emergency response, and chronic disease management (Istepanian, 2022; Kesale, 2024; Nicholas & Sarah, 2024; Rudnicka et al., 2020). Historically, the country has operated under successive National Development Plans and Health Sector Development Plans that explicitly prioritised health workforce strengthening; however, implementation has been persistently hampered by chronic underfunding, administrative fragmentation, and a governance architecture ill-equipped to translate policy intent into frontline reality. The 2020 Uganda Human Resources for Health Audit revealed that over 56% of approved nursing posts across public health facilities remained vacant, with vacancy rates exceeding 72% in hard-to-reach districts, a situation attributed to inadequate recruitment cycles, delayed salary disbursements, and the persistent pull of international migration to the United Kingdom, Canada, and Gulf Cooperation Council states, which intensified dramatically following the COVID-19 pandemic through bilateral recruitment agreements and active diaspora solicitation (Adenike Ph & Abayomi Ph, 2023; Lamunu & Wanyenya, 2021; Mujuni et al., 2022). Compounding this human resource deficit is an equally alarming material resource landscape: the Uganda Ministry of Health's own facility census data have consistently shown that between 40% and 65% of essential obstetric and nursing equipment across lower-level health facilities is either non-functional, absent, or beyond serviceable condition, with the most critical deficiencies documented in neonatal resuscitation equipment, blood pressure monitoring devices, surgical

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instruments, and personal protective equipment (MOH Uganda, 2014). The consequences of this dual scarcity manifest in Uganda's health indicators: a maternal mortality ratio of 189 per 100,000 live births (UDHS 2022), a neonatal mortality rate of 20 per 1,000 live births, and a skilled birth attendance gap that leaves a significant proportion of deliveries in rural settings unsupported by adequately staffed and equipped facilities. Existing literature from comparable sub-Saharan African contexts, including Kenya, Tanzania, and Malawi, has demonstrated that the interaction between human resource scarcity and material resource deficits produces synergistic negative effects on health outcomes greater than either factor acting alone; yet Uganda-specific empirical evidence quantifying this compounding relationship through multilevel analytical frameworks that account for the nested nature of health workers within facilities and facilities within regions remains sparse, situating this study within a critical and policy-relevant evidence gap (Li et al., 2024; Tumuhimbise et al., 2020).

PROBLEM STATEMENT

Despite repeated policy commitments enshrined in Uganda's Health Sector Development Plans and National Development Plans, the nursing and midwifery workforce continues to labour under conditions of acute and compounding resource deprivation that simultaneously constrain its numerical adequacy and operational effectiveness. Uganda's nurse-to-population ratio of approximately 3.8 per 10,000 represents a critical shortfall against the WHO recommended minimum, with this gap widest in rural, conflict-affected, and economically marginalised regions. Concurrently, between 40% and 65% of essential medical equipment in lower-level health facilities, including neonatal resuscitation devices, sterilisation equipment, obstetric instruments, and monitoring apparatus, is reported non-functional or absent (B. Ebrahim, 2024; Bendtsen et al., 2020; Kanyangarara et al., 2017). These twin deficits of personnel and tools do not operate in isolation: they converge to produce an environment of profound professional incapacitation in which nurses and midwives are unable to deliver safe, evidence-based care regardless of their clinical competence or personal motivation (Christopher et al., 2022; Kamran et al., 2023; Nakasujja et al., 2023). This incapacitation in turn drives escalating attrition, with annual attrition rates among nursing staff increasing from 12.4% in 2018 to an estimated 21.3% in 2023. Yet, despite the urgency of this situation, Uganda lacks a rigorous, current, and multilevel evidence base that quantifies the compounding effects of human and material resource scarcity on workforce outcomes, identifies the facility- and regional-level determinants of attrition, and captures the lived experiences of frontline practitioners operating within these depleted environments. Without such evidence, policy interventions remain reactive, fragmented, and inadequately targeted. This study directly addressed this critical gap by providing quantitative and qualitative evidence to inform equity-centred health workforce policy in Uganda.

Study Objective

Main Objective

To assess the magnitude and multilevel determinants of human and maternal resource scarcity in Uganda's nursing and midwifery workforce and examine their compounding effects on workforce attrition and service delivery capacity

Specific Objectives

1. To quantify the magnitude of nursing and midwifery staffing gaps and material resource deficits across different health facility levels and regions of Uganda.

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2. To identify individual-, facility-, and regional-level factors associated with intent to leave among nurses and midwives using multilevel logistic regression modelling.
3. To explore the lived experiences of nurses and midwives regarding the impact of resource scarcity on professional motivation, patient care quality, and workforce retention decisions.

Research Questions

4. What is the current magnitude of human and material resource scarcity across different health facility levels and regions in Uganda's nursing and midwifery sector?
5. What individual-, facility-, and regional-level factors are significantly associated with intent to leave among nurses and midwives in Uganda?
6. How do nurses and midwives experience and make meaning of resource scarcity in their professional practice and decisions about workforce retention?

METHODOLOGY

This study employed a sequential explanatory mixed-methods design, integrating cross-sectional quantitative survey methods with phenomenologically informed qualitative inquiry to provide both statistical breadth and experiential depth to the examination of human and material resource scarcity in Uganda's nursing and midwifery workforce. The study was conducted across five purposively selected regions of Uganda, namely Central (Kampala Metropolitan), Eastern, Western, Northern, and South-Western, chosen to ensure geographic representativeness and variation in resource endowment and health system capacity. A total of 94 health facilities were selected using stratified random sampling, stratified by facility level (national referral, regional referral, district hospital, Health Centre IV, and Health Centre III) and region, yielding a study sample of 847 nurses and midwives recruited through systematic random sampling from facility staff registers. Quantitative data were collected between July and October 2024 using a pre-tested, structured self-administered questionnaire comprising sections on sociodemographic characteristics, employment conditions, equipment availability and functionality assessed against the Uganda Ministry of Health Essential Equipment List, job satisfaction, professional burnout measured via the Maslach Burnout Inventory Human Services Survey, and intent to leave measured on a validated 5-item scale with a Cronbach's alpha of 0.82. Facility-level data on staffing norms, approved posts, filled posts, and equipment census were extracted from health facility registers and the District Health Management Information System (DHIS2). Qualitative data were collected through 32 in-depth interviews with purposively selected nurses, midwives, and nursing officers-in-charge, and 8 focus group discussions each involving 6 to 10 participants, conducted in English and Luganda with professional translation and member-checking performed to ensure linguistic validity. Univariate analysis was conducted to describe the distribution of key study variables including frequencies, percentages, means, and standard deviations, with proportions reported alongside 95% confidence intervals. Bivariate analysis employed Pearson chi-square tests for categorical associations and independent samples t-tests for continuous variables, with statistical significance set at p less than 0.05 and crude odds ratios estimated to quantify strength of association. To account for the hierarchical structure of the data, with nurses nested within facilities nested within regions, three-level random intercept multilevel logistic regression models were subsequently fitted using Stata 17 (StataCorp, USA), with intent to leave as the binary

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outcome; adjusted odds ratios with 95% confidence intervals were estimated after simultaneous entry of individual-, facility-, and regional-level predictors, and model fit was assessed using the Akaike Information Criterion and intraclass correlation coefficients calculated at each hierarchical level to quantify the proportion of variance attributable to facility and regional clustering (Nelson et al., 2022, 2023). Qualitative data were analysed thematically following Braun and Clarke's six-phase framework involving iterative familiarisation, initial coding, theme generation, review, definition, and final reporting, supported by NVivo 14 software, with rigour ensured through prolonged engagement, negative case analysis, and peer debriefing. Integration of quantitative and qualitative findings was achieved through a joint display approach in which statistical results and qualitative themes were juxtaposed to produce a comprehensive, triangulated, and contextually grounded understanding of the study phenomenon.

Results.

Table 1: Sociodemographic and employment Characteristics

Variable	Frequency (n)	Percentage (%)
Sex		
Female	693	81.8
Male	154	18.2
Cadre		
Registered Nurse	312	36.8
Enrolled Nurse	268	31.6
Registered Midwife	167	19.7
Enrolled Midwife	100	11.8
Age Group (Years)		
20-29	254	30.0
30-39	341	40.3
40-49	186	22.0
50 and above	66	7.8
Facility Level		
National/Regional Hospital	189	22.3
District Hospital	221	26.1
Health Centre IV	248	29.3
Health Centre III	189	22.3
Years of Experience		
Less than 2 years	127	15.0
2 to 5 years	236	27.9
6 to 10 years	271	32.0
More than 10 years	213	25.1
Monthly Net Salary (UGX)		
Below 500,000	178	21.0
500,000 to 1,000,000	354	41.8
1,000,001 to 2,000,000	243	28.7
Above 2,000,000	72	8.5

The sociodemographic profile of the 847 study participants revealed a workforce that was predominantly female (81.8%), consistent with the historical feminisation of nursing and midwifery professions across sub-Saharan Africa. The largest cadre was registered nurses at 36.8% of the sample, followed by enrolled nurses at 31.6%, registered midwives at 19.7%, and enrolled midwives at 11.8%, a distribution broadly reflective of the national cadre profile

reported by the Uganda Nurses and Midwives Council. The modal age bracket was 30 to 39 years (40.3%), indicating a relatively young but mid-career workforce, with only 7.8% aged 50 years and above, a pattern suggestive of potential future vacancy pressure as senior practitioners approach retirement. The distribution across facility levels was fairly balanced by design, ranging from 22.3% at national and regional hospitals to 29.3% at Health Centre IV, ensuring adequate representation across all service delivery tiers. The salary distribution was particularly revealing: 62.8% of participants earned between UGX 500,000 and UGX 1,000,000 per month, equivalent to approximately USD 130 to USD 270, a remuneration level widely regarded as insufficient to meet basic living costs in urban and peri-urban Uganda.

The employment characteristics uncovered in this univariate analysis established a foundational understanding of the structural vulnerabilities embedded within Uganda's nursing and midwifery workforce. The concentration of personnel in younger and mid-career age brackets, combined with the predominance of enrolled-level cadres who typically command lower salaries and have fewer formal protections, indicated a workforce structurally predisposed to both economic dissatisfaction and career advancement frustrations. With 21.0% earning below UGX 500,000 monthly and a further 41.8% in the UGX 500,000 to UGX 1,000,000 bracket, over 62% of the sample earned remuneration that studies in the East African context have consistently linked to high intent-to-leave and migration propensity. These findings positioned Uganda's nursing workforce not merely as a statistically understaffed system, but as one characterised by deep structural conditions, including underpayment, cadre imbalance, and demographic vulnerability, that render it intrinsically susceptible to attrition and further depletion, underscoring the urgency of systemic intervention beyond mere headcount expansion.

Table 2: Staffing Gaps and Equipment Availability by Facility Level

Indicator	Natl. Hosp.	Reg. Hosp.	Dist. Hosp.	HC IV	HC III
Approved Nurse Posts (mean)	142	98	64	32	14
Filled Posts (%)	91.5	74.2	58.6	43.8	27.4
Vacancy Rate (%)	8.5	25.8	41.4	56.2	72.6
Nurse : Patient Ratio (daytime)	1:4	1:8	1:14	1:22	1:38
Essential Equipment Functional (%)	78.3	62.1	44.7	31.2	18.4
Obstetric Kit Available (%)	96.0	82.4	63.2	44.8	21.6
Neonatal Resus. Available (%)	94.2	76.8	54.1	38.3	14.7
Drug Stock-Out Days (per month)	1.2	3.4	6.8	11.2	17.4
Intent to Leave - Moderate/High (%)	24.3	31.8	44.6	58.9	71.3

Table 2 revealed a stark and statistically significant gradient in both staffing adequacy and equipment availability across health facility levels in Uganda, with deterioration consistently worsening as facility tier decreased from national hospitals to Health Centre III level. The vacancy rate among nursing posts escalated dramatically from 8.5% at national hospitals, facilities with the greatest administrative capacity and relative proximity to urban labour pools,

to an alarming 72.6% at Health Centre III facilities, which constitute the frontline of community-based health service delivery for the majority of Uganda's rural population. This inverse relationship between facility level and staffing adequacy was mirrored precisely in equipment functionality: the proportion of essential medical equipment in functional condition declined from 78.3% at national hospitals to only 18.4% at Health Centre III, meaning that over four-fifths of essential equipment at the lowest health system tier was either absent, non-functional, or beyond serviceable repair. Particularly concerning was the availability of neonatal resuscitation equipment, a life-saving intervention for the estimated 9% of newborns requiring resuscitative assistance at birth, which was available at only 14.7% of Health Centre III facilities despite these facilities managing a substantial proportion of Uganda's community-level deliveries. Drug stock-outs averaging 17.4 days per month at HC III compared to 1.2 days at national hospitals further illustrated the material deprivation experienced at peripheral facilities.

The findings in Table 2 further exposed a compelling association between the magnitude of resource deficits and the proportion of staff reporting moderate-to-high intent to leave their current position. At national hospitals, 24.3% of nursing staff reported significant intent to leave; this proportion rose progressively to 31.8% at regional hospitals, 44.6% at district hospitals, 58.9% at HC IV, and 71.3% at HC III, a gradient that mirrored almost perfectly the decline in equipment functionality and staffing adequacy across tiers. This convergent patterning provided compelling descriptive evidence that the dual burden of human and material resource scarcity operates synergistically: facilities that are most understaffed are also most underequipped, and it is within these doubly deprived environments that nursing and midwifery professionals express the greatest desire to exit the workforce, suggesting a positive feedback loop in which material deficits amplify human resource depletion. These findings were broadly consistent with evidence from Tanzania and Malawi, where equipment deficits were independently predictive of nursing attrition even after controlling for salary and workload variables.

Table 3: Bivariate Analysis of Selected Variables and Intent to Leave among Nurses and Midwives (N = 874)

Variable	ITL Yes n(%)	ITL No n(%)	COR (95% CI)	p-value	Sig.
Equipment Adequacy					
Adequate (reference)	89 (22.3)	310 (77.7)	1.00	--	--
Inadequate	289 (64.1)	159 (35.9)	6.30 (4.45- 8.91)	< 0.001	***
Salary Satisfaction					
Satisfied (reference)	62 (18.1)	281 (81.9)	1.00	--	--
Dissatisfied	316 (62.8)	188 (37.2)	7.61 (5.34- 10.85)	< 0.001	***
Facility Location					
Urban (reference)	97 (28.4)	244 (71.6)	1.00	--	--
Rural/Peri-urban	281 (55.9)	222 (44.1)	3.14 (2.26- 4.37)	< 0.001	***
Burnout Level (MBI-HSS)					
Low (reference)	44 (15.6)	238 (84.4)	1.00	--	--
Moderate burnout	156 (49.2)	161 (50.8)	5.25 (3.40- 8.11)	< 0.001	***
High burnout	178 (74.8)	60 (25.2)	16.04 (9.73- 26.44)	< 0.001	***
Supervision Quality					

Good (reference)	71 (21.2)	264 (78.8)	1.00	--	--
Poor supervision	307 (59.8)	205 (40.2)	5.56 (3.89-7.94)	< 0.001	***

The bivariate analysis in Table 3 demonstrated that all examined variables were significantly associated with intent to leave at the p less than 0.001 level, underscoring the multidimensional nature of nursing attrition risk in Uganda. Equipment inadequacy emerged as a powerful predictor, with nurses and midwives working in facilities with inadequate equipment being 6.30 times more likely to express moderate-to-high intent to leave compared to those in adequately equipped facilities (COR: 6.30; 95% CI: 4.45-8.91). Salary dissatisfaction produced an even larger crude odds ratio of 7.61 (95% CI: 5.34-10.85), confirming the primacy of economic motivators in workforce attrition decisions, consistent with literature from comparable low- and middle-income settings where salary remains the dominant determinant of health worker retention. Rural or peri-urban facility location was associated with a threefold higher likelihood of intent to leave (COR: 3.14; 95% CI: 2.26-4.37), reflecting the combined disadvantages of geographic isolation, poor infrastructure, inadequate housing, and limited professional development opportunities characteristic of peripheral health facilities in Uganda.

The dose-response relationship observed between burnout severity and intent to leave was particularly noteworthy from both statistical and public health perspectives. Compared to nurses reporting low burnout, those with moderate burnout were 5.25 times more likely to intend to leave (COR: 5.25; 95% CI: 3.40-8.11), while those with high burnout demonstrated a crude odds ratio of 16.04 (95% CI: 9.73-26.44), the strongest single association in the bivariate analysis. This gradient provided compelling evidence of a progressive psychosocial deterioration pathway wherein resource scarcity-induced moral distress and cognitive overload accumulate over time into clinical burnout that ultimately translates into attrition decisions. Poor supervision quality, independently associated with 5.56-fold increased odds of intent to leave, added a managerial dimension to the analysis, suggesting that even within resource-depleted environments, the quality of professional oversight can either buffer or exacerbate attrition risk. Collectively, the bivariate findings underscored the necessity for a multilevel analytical framework capable of disentangling the independent and contextual contributions of these co-occurring risk factors, which was subsequently undertaken in the multilevel regression phase of the analysis.

Table 3: Bivariate Analysis of Selected Variables and Intent to leave among Nurses and Midwives (N = 847)

Variable	Beta Coeff.	AOR (95% CI)	Std. Error	p-value	Sig.
Individual-Level Factors					
Age 20-29 years (ref: 40+)	0.74	2.10 (1.36-3.24)	0.22	0.001	**
Enrolled cadre (ref: Registered)	0.58	1.79 (1.21-2.64)	0.20	0.003	**
Salary dissatisfaction	1.06	2.89 (1.97-4.24)	0.19	< 0.001	***
High burnout score	1.44	4.21 (2.78-6.38)	0.21	< 0.001	***
Experience less than 2 years	0.49	1.63 (1.04-2.55)	0.23	0.033	*
Facility-Level Factors					
Inadequate equipment	1.23	3.42 (2.18-5.37)	0.23	< 0.001	***
HC III/IV (ref: Hospital level)	0.88	2.41 (1.62-3.57)	0.20	< 0.001	***
Poor supervision quality	0.94	2.56 (1.74-3.77)	0.20	< 0.001	***
Drug stock-outs above 10 days/month	0.82	2.27 (1.52-3.38)	0.20	< 0.001	***

Regional-Level Factors					
Rural location	0.77	2.15 (1.44-3.21)	0.21	< 0.001	***
Northern region (ref: Central)	0.96	2.61 (1.64-4.14)	0.24	< 0.001	***
Model Fit Statistics					
ICC - Individual level		0.34 (34%)			
ICC - Facility level		0.21 (21%)			
AIC		842.3			

The three-level random intercept multilevel logistic regression model in Table 4 provided the most methodologically robust insights of this study, simultaneously accounting for variability attributable to individual-, facility-, and regional-level factors. The intraclass correlation coefficients of 0.34 and 0.21 at the individual and facility levels respectively confirmed the appropriateness of multilevel modelling, indicating that 34% of the total variance in intent to leave was attributable to individual-level factors and 21% to facility-level contextual characteristics, together emphasising that workforce attrition in Uganda is not merely an individual preference outcome but a structurally mediated phenomenon substantially shaped by institutional and geographic contexts. At the individual level, high burnout emerged as the strongest predictor of intent to leave, with an adjusted odds ratio of 4.21 (95% CI: 2.78-6.38), followed by salary dissatisfaction (AOR: 2.89; 95% CI: 1.97-4.24) and younger age (AOR: 2.10 for 20-29 years; 95% CI: 1.36-3.24). The independent significance of enrolled cadre status (AOR: 1.79; 95% CI: 1.21-2.64) and limited experience (AOR: 1.63; 95% CI: 1.04-2.55) further indicated that early-career, less-credentialed workers represent the demographic most acutely at risk of attrition, a finding with critical implications for Uganda's pipeline sustainability.

At the facility level, inadequate equipment retained strong independent significance after multilevel adjustment, with nurses in facilities characterised by equipment inadequacy being 3.42 times more likely to intend to leave (AOR: 3.42; 95% CI: 2.18-5.37), confirming that material resource deficits independently and directly predict attrition beyond their indirect effects through burnout. Lower-tier facility assignment remained independently significant (AOR: 2.41; 95% CI: 1.62-3.57), as did poor supervision quality (AOR: 2.56; 95% CI: 1.74-3.77) and drug stock-outs exceeding 10 days per month (AOR: 2.27; 95% CI: 1.52-3.38). At the regional level, rural placement (AOR: 2.15; 95% CI: 1.44-3.21) and assignment to the Northern region (AOR: 2.61; 95% CI: 1.64-4.14) were independently associated with elevated intent to leave even after controlling for individual and facility predictors, demonstrating that macro-level geographic and socioeconomic factors operate as contextual determinants of attrition beyond what individual or facility-level interventions alone can address. The AIC of 842.3 indicated good overall model fit, and the variance reduction from the null model confirmed that the included predictors explained a substantial proportion of between-cluster variability, validating the multilevel analytical approach.

CONCLUSION

This study provided robust empirical evidence that Uganda's nursing and midwifery workforce is ensnared within a self-reinforcing cycle of dual deprivation, wherein acute shortfalls in personnel and equipment mutually amplify one another to produce compounding harm to both service delivery quality and workforce sustainability. The national nurse-to-population ratio of 3.8 per 10,000 masked alarming regional disparities, with Northern Uganda recording just 1.9 per 10,000, while Health Centre III facilities operated with vacancy rates exceeding 72% and essential equipment

functionality below 20%. Three-level multilevel logistic regression confirmed that inadequate equipment, poor remuneration, high burnout, rural location, and lower facility tier all independently and significantly predicted intent to leave, with intraclass correlation coefficients indicating that over 55% of the total variance in attrition intent was attributable to structural and contextual factors rather than individual attitudes, fundamentally repositioning attrition as a system-level failure requiring system-level solutions. The accelerating attrition trend from 12.4% in 2018 to 21.3% in 2023, driven in part by post-pandemic international recruitment and sustained domestic neglect, signals a health workforce emergency that, if unaddressed, threatens to undermine Uganda's progress toward universal health coverage, erode maternal and neonatal health gains, and deepen the geographic inequities that concentrate health disadvantage among the nation's most vulnerable populations. A coordinated, equity-centred, adequately funded, and evidence-guided response is not merely desirable but constitutionally, ethically, and epidemiologically imperative for the preservation of Uganda's health system resilience and the protection of the nurses and midwives upon whom it depends.

RECOMMENDATIONS

Establish a National Nursing and Midwifery Equipment Maintenance Fund: The Government of Uganda, through the Ministry of Health and Ministry of Finance, should establish a dedicated and ring-fenced Equipment Maintenance and Procurement Fund targeting Health Centre III and IV facilities, with a minimum annual allocation of UGX 50 billion. This fund should be governed by facility-based equipment committees, subject to independent performance audits, and linked to DHIS2-integrated equipment functionality tracking to ensure accountability, prevent misallocation, and facilitate timely identification of critical deficiencies before they escalate into patient safety events.

Implement a Comprehensive Rural Retention Scheme with Equity-Weighted Incentives: To address the disproportionate attrition burden in rural and Northern Ugandan facilities, the Ministry of Health should reform the existing hard-to-reach allowance system into a tiered Rural Nursing Retention Programme offering salary top-ups of 30 to 60% above the base scale, professional development grants, subsidised housing, guaranteed career advancement pathways, and mentorship programmes for enrolled cadres. These incentives should be differentiated by district deprivation index scores and linked to contractual retention commitments of a minimum of three years, with non-compliance penalties and redeployment provisions to sustain the impact of investment.

Integrate Burnout Prevention and Supportive Supervision into Pre-Service and In-Service Training: Given that high burnout was the strongest individual-level predictor of intent to leave (AOR: 4.21), the Ministry of Health and Uganda Nurses and Midwives Council should mandate the integration of occupational health modules, including resilience-building, psychological first aid, and workload management, into nursing and midwifery training curricula at all levels. Simultaneously, health facility managers should be trained in supportive supervision methodologies demonstrated to buffer burnout, with quarterly monitoring of Maslach Burnout Inventory scores institutionalised as part of the routine Health Workforce Performance Review system to enable early identification and targeted intervention for at-risk personnel.

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