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Predictive value of self-prioritized mobility factors on gait speed and life space in older nigerians: A cross-sectional study

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ABSTRACT

Background and Objectives: Eighty-two cognitive, environmental, financial, personal, physical, psychological, and social factors significantly influence mobility decline following hospital discharge. However, assessing all these factors during the fast-paced discharge process is impractical. This study aimed to identify the factors that Nigerian older adults consider most critical and determine which factors (in combination) most realistically predict gait speed and life space among these Nigerian older adults.
Research Design and Methods: This is data from a cross-sectional survey that recruited 400 Nigerian older adults, 60+ years old, to rank 82 factors influencing mobility. Older adults' gait speed and life-space mobility were collected using the 10-meter Walk Test and Life Space Assessment. Multivariate binary logistic regression was used to determine the most realistic predictor of gait speed and life-space mobility.
Results: No factors were considered critical by the older adults. The life space model indicates that increased street characteristics, social cohesion, occupation, hearing, gait speed, fear of falling, and conscientiousness accounts for approximately 50% of variations in life space. The gait speed model indicates that an increase in executive function, pain, respiratory system, body composition, fatigue, social factors, racial characteristics, marital status, social network, and fear of reinjury explain about 74 % of variation in gait speed.
Discussion and Implications: This study provides self-reported factors that could influence older adults' mobility following discharge that would allow clinicians to prioritize factors for assessment amidst multiple factors.

1. Introduction

Mobility, defined as an individual's ability to move with or without the aid of assistive devices, has been described as a key hallmark of aging as it is a strong indicator of overall health and quality of life in older adults (Webber et al., 2010; Freiberger et al., 2020). Older adults' ability to be mobile facilitates independence, physical activity, and capacity to safely perform everyday activities at home, all of which are linked to better health outcomes (Kalu et al., 2022). Conversely, mobility limitation has been associated with a decreased risk of cognitive decline, falls, mortality, social isolation, poor quality of life, among others (Freiberger et al., 2020). Mobility declines are readily noticeable during hospitalization.

Evidence has reported that between 30 % to 60 % of older adults experience mobility decline during hospitalization (Boyd et al., 2009; Hoogerduijn et al., 2012), which imposes significant burdens on older adults and their caregivers. In particular, a systematic review found that reduced mobility is one of the leading predictors of early hospital

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readmission in older adults (Cilla et al., 2023), contributing to a substantial financial burden of unplanned rehospitalization, which amounts to $17.4 billion in the United States in 2004 (Jencks et al., 2009), and increased healthcare expenditure in Canada (Rais et al., 2013), the United Kingdom (Vernon et al., 2019), and Australia (Considine et al., 2017).

Mobility decline following hospitalization is often assessed using life-space mobility and gait speed, as these measures are not only straightforward to administer but also exhibit well-documented reliability and validity, thereby providing valuable predictive insights into various health outcomes post-discharge. Life-space mobility measures the extent and frequency of individuals' movements across various life-space levels—encompassing travel routines ranging from within one's residence to the local community and beyond—with or without assistance following discharge (Baker et al., 2003; McCrone et al., 2019; Webber et al., 2010). Low life-space mobility is linked to a considerable number of health outcomes including declining physical function (Kimura et al., 2021), impaired performance of instrumental activities of daily living (ADL) after hospital discharge, increased likelihood of hospital readmission within 90 days (Fathi et al., 2017), higher risk of falls, cognitive decline (Caldas et al., 2020), and a mortality rate 4.5 times greater than that of individuals with unrestricted mobility (Watanabe et al., 2022). Similarly, gait speed, often considered the sixth vital sign, is a valid, reliable, and sensitive indicator of mobility and functional status that reflects the overall capacity and coordination of the body's structures and processes (Lusardi, 2012). A review has established walking speed cutoff values to assist clinicians in predicting outcomes; for example, a walking speed of less than 0.65 m/s suggests that older adults are at greater risk for readmission or falls following hospital discharge, highlighting the critical importance of gait speed in this population (Middleton et al., 2015). Additionally, a systematic review of 49 studies, reported that lower gait speed is associated with mobility disability, frailty, sedentary lifestyle, falls, muscular weakness, diseases, body fat, cognitive impairment, mortality, stress, lower life satisfaction, and lower quality of life (Binotto et al., 2018).

Mobility decline, often assessed by gait speed and life space, following hospitalization is associated with various factors, as conceptualized in Webber et al.'s comprehensive mobility framework, which identifies potential determinants including physical, cognitive, social, psychological, environmental, and personal variables (Webber et al., 2010). Individual determinants in the model, such as low self-efficacy or depression (Gayman et al., 2008; Perkins et al., 2008), can restrict mobility; however, the framework posits that these determinants are interrelated. For instance, impairments in vision or hearing (physical factors) may heighten anxiety about navigating difficult environments (e.g., crossing busy streets), leading individuals to self-restrict their mobility. Additionally, financial factors, such as low income, can affect access to public transportation, social connections, and recreational facilities, further limiting mobility. The interplay of these determinants complicates their overall influence on mobility. This framework provided a starting point to explicitly identifying what factors within each of the determinant that influence gait speed and life space; this framework guided the selection of factors included in this study.

Given the importance of these mobility measures, some studies have explored factors predicting gait speed and life-space mobility post-discharge in select populations. Factors shown to predict gait speed following discharge identified in previous studies include age, balance, and exercise dose among stroke patients (Nayak et al., 2024), and the number of chronic conditions, patients' physical activity and ability level, general health perception, lower limb strength among those with hip fracture (Heiberg et al., 2024; Mangione et al., 2008). Similarly, factors shown to predict life-space mobility following discharge among stroke and fracture patients include age, gender, fear of falling (Nakao et al., 2020; Saito et al., 2023), cognitive and physical function (as measured by balance, step count, timed up and go) (Kimura et al., 2021; Nakao et al., 2020; Werner et al., 2024), fear of falling (Kimura et al., 2021; Nakao et al., 2020; Saito et al., 2023), longer hospital stays, lower physical activity and poor nutritional status during hospitalization (Nakao et al., 2020; Werner et al., 2024).

Assessing predictive mobility factors for older adults transitioning from hospital to home presents challenges due to the many factors identified, currently totaling 82 based on scoping reviews (Kalu et al., 2022, 2023a, 2023b). In response, our research team conducted surveys with 60 international experts, including older adults, family members, clinicians, and researchers from nine countries with universal or near-universal health coverage, to prioritize these cognitive, environmental, financial, personal, physical, psychological, and social factors influencing mobility (Kalu et al., 2024). Additionally, we engaged 151 Nigerian physiotherapists (Rayner et al., 2024) to identify which mobility factors should be assessed upon discharge. Notably, the responses from the Nigerian physiotherapists and international experts prioritized 43 factors but the factors differed. This prompted us to consult older adults to prioritize the mobility factors they believe clinicians should evaluate during discharge. Based on our previous findings, we hypothesize that Nigerian older adults will similarly prioritize a significant number of mobility factors, which will continue to complicate assessments during the hospital-to-home transition. To address this issue, we aim to employ statistical methods, specifically Model Selection as outlined in the methods section, to identify the most significant self-reported factors predicting gait speed and life space for older adults transitioning to community living in Nigeria from the 82 identified mobility factor variables. Therefore, this study focuses on two main research questions: (a) which of the 82 factors would older adults prioritize for evaluation during their hospital discharge? and (b) based on model selection, which of these 82 mobility factors are the most realistic predictors of gait speed and life space among community-dwelling older adults in Nigeria.

2. Methods

2.1. Study design and participants

This cross-sectional study recruited 400 community-dwelling older adults, aged 60 years or older, who had previous experience with hospital-to-home transitions, were able to walk independently with or without assistive mobility aids, and were able to speak, read, and understand English. Older adults with severe diseases (e.g., cardiovascular diseases, hearing loss, impaired vision or stroke), and those with cognitive or psychological impairments were not eligible to participate. We obtained informed consent from all participants who met the study eligibility criteria. Also, we obtained ethics approval from the Ethical and Research Committee of the College of Medical Sciences, University of Benin (CM/S/REC/01.vol2/442 & 444) and the Ministry of Health Edo State (HA/737/24/D150003229) before the start of study procedures.

2.2. Recruitment, sampling, and sample size

We recruited participants from select communities in the Egor Local Government Area, Benin City, Edo State, Nigeria between May and October 2023. The Egor Local Government Area is comprised of 10 wards (an administrative division within a city or municipalities), and each ward contains several communities (Egharevba & Edohen, 2020). We employed a three-stage sampling approach to identify wards, communities, and participants for our study. Firstly, we listed and numbered the 10 wards in the Egor Local Government Area, and we systematically selected two wards with even numbers due to feasibility and cost reasons. Secondly, the local communities in these two wards were listed and numbered, and communities with odd numbers were selected, resulting in a total of 4 communities being sampled. Thirdly, we organized health outreaches among these communities, and older adults who attended these health outreaches were screened against the eligibility criteria and conveniently sampled.

Multiple authors have suggested 10 events per variable for a logistic regression model (Riley et al., 2020; Peduzzi et al., 1996). We estimated that a sample size of 160 to 223 participants is sufficient to achieve 80 % power for the overall regression equation, based on adjusted R-squared of 0.267 (reduced model) and 0.313 (for full model) for gait speed in Nigerian older adults (Nwachuwku et al., 2023) and 0.028 (reduced model) and 0.108 (for full model) for life space mobility (Ndubuaku et al., 2023) while assuming a confidence interval of 95 % with a margin error of 5 % and at least 27 predictors.

2.3. Data collection, questionnaires, and mobility outcomes

All data used in this study was collected during the health outreaches, as described above. Health outreaches are a typical and effective approach for collecting data in Nigeria as participants simultaneously receive free medical and social care from qualified personnel when participating in a study. The purpose of the study was explained to all participants who attended the health outreaches and only those who provided consent were included in the study. Over 600 participants attended the outreaches across four communities, but only 400 provided consent to participate. Participants completed the following (in this order): a demographic questionnaire, a Comprehensive Mobility Discharge Assessment Framework (COMDAF) questionnaire, a Life Space Assessment (LSA) questionnaire, and a 10-meter walk.

2.3.1. Demographic variables

First, participants self-reported demographic data, including their age, sex at birth, highest education level, and time since their last hospital-to-home transition.

2.3.2. COMDAF questionnaire

Next, participants responded to an 82-item question developed by Kalu and colleagues through a series of scoping reviews that identify factors within each of the 7 mobility determinants - physical (Kalu et al., 2023a), cognitive, social, and psychological (Kalu et al., 2022) and personal, financial and environmental factors (Kalu et al., 2023b). This questionnaire has previously been used for an international e-Delphi process that aimed to prioritize critical mobility factors within each mobility determinant to be assessed during the hospital-to-home transition of older adults and its face and content validity have previous been assessed (Kalu et al., 2024; Rayner et al., 2024). The aim of this questionnaire was not to assess knowledge of these factors or their impact on mobility outcomes, but rather to ascertain whether older adults prioritized them during their transition from hospital to home. Therefore, advanced psychometric properties, such as inter-rater reliability and concurrent and convergent validity, were not integral to the questionnaire's development. The questionnaire contained 82 mobility factors (with plain language descriptions) across the 7 mobility determinants—7 cognitive, 17 environmental, 3 financial, 11 personal, 24 physical, 14 psychological, and 6 social factors. In this study, participants rated each of the 82 factors using a 9-point Likert scale divided into three categories for importance rating: "Not Important" (1–3), "Important but Not Critical" (4–6), and "Critical" (7–9) (Kalu et al., 2024). An "unable to score" response and instruction for its use were provided in the case that participants believed they could not rate a certain factor.

2.3.3. Mobility outcomes

Following completion of the questionnaires, participants took a 30-minute rest period before completing the mobility outcomes. Firstly, participants completed a valid and reliable LSA questionnaire (Baker et al., 2003). The LSA has participants self-report their community mobility and asks participants to quantify how far and how frequently they have moved across 5 life-space levels over the past 4 weeks, with or without assistance. These life-space levels include: (1) other rooms besides the room they sleep, (2) immediate outdoor areas, such as their yard, (3) their neighborhood, (4) outside their neighborhood and (5) outside their city or town. Scores on the LSA range from 0 to 120, with higher scores indicating greater life space mobility.

After participants completed the LSA questionnaire, participants' gait speed was assessed using a 10-meter walk test (Peters et al., 2013). With or without mobility devices, participants were asked to walk at their preferred walking speed along a 10-meter walkway without rest. To account for the impact of acceleration and deceleration, participants' gait speed was calculated using the time needed to traverse the middle 6-meter segment of the walkway. Participants performed the 10-meter walk test twice, with breaks in between, and the average was calculated as their walking gait speed.

2.4. Data analysis

Data was analyzed using the statistical software R (version 4.4.2). The demographic characteristics of the participants were summarized using means for continuous variables and frequency/percentages for non-continuous variables. Frequency counts and percentages were employed to determine the prioritized levels for each factor. To answer the research question of which of the 82 factors would older adults prioritize for evaluation during their hospital discharge, we calculated the median and interquartile ranges to identify the prioritized level for each mobility factor. A factor was considered prioritized if at least 70 % of Nigerian older adults rated the factor as "Critical" (scores $\geq$7) and no more than 15 % of Nigerian older adults rated it as "Not Important" (scores $\leq$3). This criterion is consistent with prior studies focused on prioritization (Kalu et al., 2024; Rayner et al., 2024).

To answer the research question of which of these 82 mobility factors are the most realistic predictors of gait speed and life space among community-dwelling older adults in Nigeria, we performed a multivariate binary logistic regression model selection with the life space and gait speed variables to determine their predictors with AIC as the scale criterion. Due to errors following ties in the gait speed variable, Shapiro-Wick, and Anderson-Darling tests were used for normality, which returned $p < 0.001$, indicating non-normality. We applied several transformations, including logarithmic, square root, and inverse root, yet the residuals of gait speed remained non-normally distributed. Consequently, given the established cut-off of 0.5 m/s for discharge (Fritz et al., 2009), we coded gait speed at a probability of 0.5. To ensure consistency in model selection procedures and maintain statistical power across outcomes, we applied the same principle to life space scores. The coded variables consist of values above the median stratified as level "1″ and those below the median stratified as level "0". Our initial examination of the data set showed 31 missing values; hence, we tested the mechanism of which data is missing using Little's test (Little & Rubin, 1987). We found that data was missing completely at random [$\chi 2 = 8595.4630$, $p = 1.0000$) and that the variables involved were skewed. Following Jakobsen et al. (2017) recommendations about better imputation choice in skewed data, we perform data imputation using the medians. The non-demographic variables Age_1(not demographic) and Sex_1(not demographic sex) from the COMDAF questionnaire had 13 and 18 missing data points, median was used for data imputation since the variables were also not normally distributed. The predictor variables except for the categorical variables (Sex and Education) were standardized to enable comparison.

For a multivariate binary logistic regression model selection, the variables were selected through a stepwise selection method that combined both forward and backward selection processes, guided by the Akaike Information Criterion (AIC). Given concerns about the effect of our sample size on the stability of the model coefficients, we employed bootstrap methods to enhance the robustness of our models. Specifically, we used Bias-Corrected and Accelerated (BCa) bootstrapping with 5000 iterations to produce confidence intervals, bias, and standard errors for the coefficients. Our choice of BCa was because of its ability to address potential biases and improve accuracy in estimating the population parameter of interest.

Model diagnostics were conducted to assess the quality and robustness of the logistic regression models. Across-variable collinearity was checked using the Variance Inflation Factor (VIF), with a statistical significance threshold set at $p < 0.05$, and a value below 5 means that there is no collinearity (Marcoulides & Raykov, 2019). All variables had no collinearity except *residential characteristics* (VIF = 5.81), *gender* (VIF = 5.40), and *Sex_1* (VIF = 6.41) in the life space model, and *Social Attitude* (VIF = 5.39) in the gait speed, suggesting modest collinearity that should be interpreted with caution. Influence diagnostics based on standardized residuals, Cook's distance (ranged from 0.000 to 0.327), and leverage values identified a limited number of potentially influential observations, but no single case exerted disproportionate influence on model estimates. The Hosmer-Lemeshow goodness-of-fit test could not be interpreted due to a factor-level coding issue in the outcome variable; however, discrimination was assessed using Receiver Operating Characteristic curves. The Area Under the Curve was 0.87 for the Life-Space model and 0.95 for the Gait Speed model, reflecting excellent discrimination. Model explanatory power was further supported by Nagelkerke R^2 values of 0.50 and 0.74 for the Life-Space and Gait Speed models, respectively, indicating moderate to strong model fit.

3. Results

3.1. Descriptive statistics

A total of 400 participants, of whom 277 (69.1 %) are male and 123 (30.9 %) are female. A total of 392 participants completed the items for all the variables. Among these, 291 participants (72.8 %) reported no formal education, while 109 participants (27.2 %) had some form of formal education. Participants' ages range from 60 to 89 years, with a mean age of 66.50 years (SD = 6.30). A summary of the descriptive statistics presents the median, Q1, and Q3 of the continuous variables Age, Gait Speed, and Life space score of the participants. These were stratified across the different levels of sex, hospital-to-home transition, and education of the participants, see Table 1.

3.2. Prioritized factor

None of the 82 factors assessed in this study met our criteria for prioritization. However, over 50 % of the older adult participants identified only five factors as critical for evaluation during the hospital-to-home transition: age (55.5 %), muscle power (51.9 %), muscle strength (54.22 %), muscle endurance (51.28 %), and pain (52.51 %). The remaining 77 factors had less than 50 % of older adult participants ranking it as critical. For a detailed ranking of these mobility factors, please refer to Table 2.

Table 1
Descriptive Statistics.

	Gait speed (m/s)	Age (years)	Life Space Score
	Median (Q1, Q3)	Median (Q1, Q3)	Median (Q1, Q3)
Education			
No formal education	0.661 (0.500, 0.833)	65 (61.5, 70)	60 (41, 74)
Any formal education	0.769 (0.571, 0.964)	65 (62, 68)	64 (44, 80)
Sex			
Male	0.769 (0.571, 0.964)	65 (62, 69)	57 (40, 74)
Female	0.661 (0.500, 0.833)	65 (62, 69)	68 (47, 80)
Hospital			
1 Month ago	0.571 (0.500, 0.833)	67 (62, 72)	60 (40, 74)
3 Months ago	0.667 (0.600, 0.800)	63 (61, 67.8)	64 (41, 74)
6 Months ago	0.714 (0.650, 0.850)	65 (62, 68)	60 (44, 80)

Note. Values are presented as Median (Q1, Q3). Q1 = First Quartile, Q3 = Third Quartile.

3.3. Most realistic self-prioritized mobility factors predicting life space mobility

The bootstrapped binomial multivariate stepwise logistic regression model was statistically significant ($\chi^2 = 187.32$, df = 25, $p < 0.001$), indicating that the model fits the data well. The Nagelkerke R squared value was 0.50, showing that the model explained approximately 50 % of the life space outcome variable variation; See Table 3. The Life Space Model indicates that an increase in street characteristics, social cohesion, occupation, hearing, gait speed, fear of falling, and conscientiousness will increase older adults' life-space mobility following discharge by at least 50 % (see Fig. 1, blue positive percentage change in life space). Conversely, certain negative associations exist; increases in age, being male, having a lower personal income, exhibiting religious behaviors, experiencing difficulties with self-care, poor proprioception, suboptimal residential characteristics, and limited access to public transit can reduce life-space mobility in older adults by at least 39 % (see Fig. 1, red negative change in life space).

3.4. Most realistic self-prioritized mobility factors predicting gait speed

Similarly, the bootstrapped binomial multivariate stepwise logistic regression model was statistically significant ($\chi^2 = 324$, df = 22, $p < 0.001$), indicating that the model fits the data well. The Nagelkerke R squared value was 0.74, showing that the model explained approximately 74 % of the variation in gait speed, See Table 4. The gait speed Model indicates that an increase in executive function, pain, respiratory system, body composition, fatigue, social factors, racial characteristics, marital status, social network, and fear of reinjury will increase older adults' gait speed following discharge by at least 50 % (see Fig. 2, blue positive percentage change in life space). Conversely, certain negative associations exist; increases in age, attention, range of motion, dizziness, social attitudes, religion, poor residential characteristics, and living arrangements can reduce life-space mobility in older adults by at least 37 % (see Fig. 2, red negative change in life space).

4. Discussion

Despite increasing recommendations for clinicians to adopt performance-based measurements of mobility factors, our findings contribute to the discourse on self-prioritized mobility factors that should be assessed during the transition from hospital to home. This discourse stem from the evidence indicating that various factors have significantly influence older adults' mobility following discharge (Nayak et al., 2024; Heiberg et al., 2024; Mangione et al., 2008; Kimura et al., 2021; Nakao et al., 2020). Kalu and colleague further identify 84 factors that influences mobility (Kalu et al., 2022, 2023a, 2023b). Given the rapid pace of hospital discharges, we engaged older adults in identifying which factors clinicians should prioritize when evaluating their mobility following discharge. Contrary to our expectations and following the prioritization criteria established in previous studies (Kalu et al., 2024; Rayner et al., 2024), older adults in our study did not prioritize any of the 82 mobility factors. This finding is particularly surprising given that Nigerian physiotherapists (Rayner et al., 2024) and international experts, including older adults (Kalu et al., 2024), identified 43 mobility factors (although different factors) as critical for evaluating mobility during the hospital-to-home transition. The divergence in findings between our study and that of Rayner et al. underscores the variability in perceived importance of mobility factors among different

Table 2
Older Adults Prioritization Table.

Factors	Median (IQR)	Not Important F(%)	Important F (%)	Critical F (%)
Cognitive Factors (n = 7)				
Attention	5 (1–9)	150 (38.27)	75 (19.13)	167 (42.60)
Executive Function	5 (1–9)	172 (44.33)	70 (18.04)	146 (37.63)
Memory	5 (1–9)	156 (39.8)	65 (16.58)	171 (43.62)
Visuospatial	5 (1–9)	151 (38.82)	77 (19.79)	161 (41.39)
Processing Speed	5 (1–9)	150 (38.36)	83 (21.23)	158 (40.41)
Global Cognition	5 (1–9)	161 (40.97)	75 (19.08)	157 (39.95)
Language	5 (1–9)	175 (44.3)	58 (14.68)	162 (41.01)
Environmental Factors (n = 17)				
Street Characteristics	5 (1–9)	159 (40.46)	57 (14.5)	177 (45.04)
Residential Characteristics	5 (1–9)	165 (41.98)	64 (16.28)	164 (41.73)
Land Use Mix	4 (1–9)	174 (44.5)	78 (19.95)	139 (35.55)
Sidewalk Characteristics	5 (1–9)	161 (41.71)	75 (19.43)	150 (38.86)
Crime-Related Safety	5 (1–9)	147 (38.18)	72 (18.7)	166 (43.12)
Traffic-Related Safety	5 (1–9)	163 (42.12)	67 (17.31)	157 (40.57)
Access to Recreational Facilities	3 (1–8)	211 (54.1)	65 (16.67)	114 (29.23)
Access to Destinations	3 (1–8)	207 (53.21)	60 (15.42)	122 (31.36)
Access to Rest Areas	3 (1–8)	217 (55.5)	59 (15.09)	115 (29.41)
Access to Public Transit	4 (1–9)	192 (49.74)	50 (12.95)	144 (37.31)
Natural Scenery	3 (1–8)	204 (52.85)	60 (15.54)	122 (31.61)
Weather	5 (1–9)	154 (40.21)	57 (14.88)	172 (44.91)
Environmental Quality	4 (1–8)	187 (48.45)	51 (13.21)	148 (38.34)
Social Factors	3 (1–8)	199 (51.55)	63 (16.32)	124 (32.12)
Social Attitude	3 (1–8)	200 (51.81)	61 (15.8)	125 (32.38)
Social Capital	4 (1–9)	178 (46.11)	61 (15.8)	147 (38.08)
Social Cohesion	3 (1–8)	200 (51.81)	58 (15.03)	128 (33.16)
Social Factors (n = 6)				
Social Isolation	3 (1–7)	214 (55.3)	56 (14.47)	117 (30.23)
Social Participation	3 (1–8)	198 (50.64)	69 (17.65)	124 (31.71)
Social Network	3 (1–8)	196 (50.39)	65 (16.71)	128 (32.9)
Social Support	3 (1–7)	209 (53.59)	69 (17.69)	112 (28.72)
Living Arrangement	1 (1–7)	242 (62.37)	48 (12.37)	98 (25.26)
Loneliness	1 (1–6)	239 (62.4)	54 (14.1)	90 (23.5)
Financial Factors (n = 3)				
Household Income	6 (2–9)	142 (36.41)	65 (16.67)	183 (46.92)
Personal Income	6 (1–9)	139 (35.82)	57 (14.69)	192 (35.82)
Family Income	6 (2–9)	137 (35.04)	67 (17.14)	187 (47.83)
Personal Factors (n = 11)				
Age	7 (1–9)	133 (34.82)	37 (9.69)	212 (55.5)
Gender	1 (1–5)	269 (68.80)	39 (9.97)	83 (21.23)
Sex	1 (1–5)	272 (70.28)	43 (11.11)	72 (18.6)
Culture	1 (1–4)	284 (73.2)	40 (10.31)	64 (16.49)
Ethnicity	1 (1–4)	280 (72.16)	50 (12.89)	58 (14.95)
Race	1 (1–3)	291 (75.19)	41 (10.59)	55 (14.21)
Educational Level	1 (1–5)	268 (70.71)	33 (8.71)	78 (20.58)
Occupation	2 (1–8)	218 (57.37)	38 (10)	124 (32.63)
Marital Status	1 (1–5)	259 (68.16)	45 (11.84)	76 (20)
Religion	2 (1–8)	228 (60)	34 (8.95)	118 (31.05)
Smoking and Drinking	1 (1–2)	297 (79.41)	17 (4.55)	60 (16.04)
Physical Factors (n = 24)				
Muscle Strength	7 (2–9)	129 (32.99)	50 (12.79)	212 (54.22)
Muscle Power	7 (2–9)	142 (36.5)	45 (11.57)	202 (51.93)
Muscle Endurance	7 (2–9)	132 (33.85)	58 (14.87)	200 (51.28)
Range of Motion	6 (2–9)	134 (34.81)	66 (17.14)	185 (48.05)
Body Composition	5 (1–9)	148 (37.85)	75 (19.18)	168 (42.97)
Proprioception	4 (1–9)	176 (45.48)	61 (15.76)	150 (38.76)
Muscle Coordination	4 (1–9)	177 (46.21)	49 (12.79)	157 (40.99)
Sensation	4.5 (1–9)	177 (45.85)	46 (11.92)	163 (42.23)
Pain	7 (1–9)	134 (35.36)	46 (12.14)	199 (52.51)
History of Falls	3 (1–9)	193 (51.19)	40 (10.61)	144 (38.20)
Balance	5 (1–9)	171 (44.53)	46 (11.98)	167 (43.49)
Vision	5 (1–9)	156 (40.63)	54 (14.06)	174 (45.31)
Number and Type of Comorbidities	6 (1–9)	147 (38.08)	54 (13.99)	185 (47.93)
Gait Speed	5 (1–9)	171 (43.96)	57 (14.65)	161 (41.39)
Respiratory System	3 (1–8)	208 (53.75)	41 (10.59)	138 (35.66)
Hearing	3 (1–8)	210 (54.55)	41 (10.65)	134 (34.81)
Speech Impairments	1 (1–8)	231 (61.11)	29 (7.67)	118 (31.22)
Frequency of Exercise/ Physical Activity	4 (1–9)	182 (48.02)	53 (13.98)	144 (37.99)
Fatigue	4 (1–9)	171 (43.73)	67 (17.14)	153 (39.13)
Dizziness	4 (1–8)	191 (48.97)	64 (16.41)	135 (34.62)
Self-Care Activities of Daily Living	3 (1–7)	217 (55.64)	57 (14.62)	116 (29.74)
Instrumental Activities of Daily Living	2 (1–8)	216 (55.67)	57 (14.69)	115 (29.64)
Frailty	3 (1–8)	204 (53.13)	63 (16.41)	117 (30.47)
Use of Assistive Device	1 (1–6)	243 (65.68)	35 (9.46)	92 (24.86)
Psychological Factors (n = 14)				
Depression	2 (1–7)	221 (56.81)	55 (14.14)	113 (29.05)
Self-Efficacy	2 (1–7)	230 (59.13)	54 (13.88)	105 (26.99)
Motivation	3 (1–7)	225 (57.84)	60 (15.42)	104 (26.74)

(continued on next page)

Table 2 (*continued*)

Factors	Median (IQR)	Not Important F(%)	Important F (%)	Critical F (%)
Fear of Fall	2 (1–8)	223 (58.38)	45 (11.78)	114 (29.84)
Emotional Wellbeing	3 (1–7)	217 (56.07)	60 (15.5)	110 (28.42)
Self-Perceived Fatigue	3 (1–7)	217 (28.09)	62 (15.98)	109 (28.09)
Anxiety	2 (1–7)	227 (58.21)	62 (15.9)	101 (25.9)
Apathy	1 (1–7)	231 (60.16)	49 (12.76)	104 (27.08)
Fear of Reinjury	2 (1–8)	209 (55.44)	50 (13.26)	118 (31.3)
Affect	2 (1–7)	225 (58.75)	55 (14.36)	103 (26.89)
Extraversion	2 (1–6)	215 (56.43)	73 (19.16)	93 (24.41)
Openness	2 (1–6)	237 (61.56)	52 (13.51)	96 (24.94)
Agreeableness	2 (1–6)	240 (61.70)	59 (15.17)	90 (23.14)
Conscientiousness	2 (1–6)	244 (63.05)	54 (13.95)	89 (23)

Note. None of the factors was prioritized. A factor was considered prioritized if at least 70 % of Nigerian older adults rated the factor as "Critical" (scores ≥7) and no more than 15 % of Nigerian older adults rated it as "Not Important" (scores ≤3). Data are presented as Median (IQR) for numerical values.

stakeholders—older adults versus physiotherapists, even in the same practice context. This further emphasizes the necessity of incorporating the perspectives of older adults in care management to ensure that care aligns with their needs and preferences (Castro et al., 2016).

Despite older Nigerians not prioritizing specific factors, we proceeded with the model selection analysis, believing that identifying the combination of variables that best predicted gait speed and life-space mobility would yield valuable insights for the transition from hospital to home and be beneficial in clinical practice. Based on our model selection, we identified 15 and 18 factors as the most relevant self-prioritized mobility predictors for life space and gait speed among Nigerian older adults, albeit with variations in direction and strength. These findings highlight the complex and multifaceted nature of mobility factors in older adults, particularly during the transition from hospital to home, consistent with prior research (Kalu et al., 2024; Rayner et al., 2024). In the context of the seven key determinants of mobility—cognitive, environmental, financial, personal, physical, psychological, and social (Webber et al., 2010)—our results revealed that at least one factor from six of these determinants was included in the predictive model, excluding cognitive and financial factors for life space and gait speed, respectively. Notably, the factors predicting life space and gait speed varied within each determinant; for instance, muscle strength and range of motion were associated with gait speed, while normal gait speed and proprioception were linked to life-space mobility. This study finding may inform the assessment priorities during the discharge of older adults, especially given the constraints of a busy hospital environment, where evaluating all factors within each determinant may be impractical. Importantly, age, residential characteristics, and fall-related concerns—such as fear of falling or reinjury—were factors included in the models for both life space and gait speed. This aligns with existing literature that identifies age (Kalu et al., 2024) and fear of falling (Ayoubi et al., 2015; Kalu et al., 2022) as independent predictors of mobility outcomes in the older adult population. The inclusion of residential characteristics in both models further underscores the increasing recognition of environmental influences on mobility among older adults in Nigeria (Rayner et al., 2024; Ezeukwu et al., 2021; Osimade et al., 2020).

The finding that cognitive factors were not prioritized as critical for assessing life space aligns with previous studies that among community-dwelling older Canadians (Kuspinar et al., 2020), older Americans (Dunlap et al. 2022) and Germans (Giannouli et al. 2019; Ullrich et al., 2019). It is of no surprise that a scoping review highlighted that only five studies found significant associations between executive functioning

Table 3
Model for Life Space Prediction.

	ES	OR	SE	Bias	z-value	2.5 %	97.5 %	Pr(>|z|)
Age	−0.10	0.53	0.03	−0.01	−4.06	−0.98	−0.21	0.00***
SexM	−0.89	0.41	0.35	−0.07	−2.97	−1.51	−0.17	0.00**
Normal_Gait_Speed	2.49	1.76	0.83	0.30	3.84	0.18	0.87	0.00***
Street_Characteristics	0.17	1.77	0.11	0.02	2.13	−0.12	1.22	0.03*
Residential_Characteristics	−0.28	0.38	0.11	−0.04	−3.09	−1.55	−0.18	0.00**
Sidewalk_Characteristics	0.12	1.51	0.08	0.02	1.64	−0.17	0.92	0.10
Crime_Related_Safety	−0.10	0.73	0.05	−0.01	−1.87	−0.63	0.09	0.06
Access_to_Public_Transit	−0.14	0.61	0.06	−0.01	−2.61	−0.86	−0.05	0.01**
Natural_Scenery	−0.08	0.77	0.06	−0.02	−1.44	−0.61	0.21	0.15
Social_Cohesion	0.15	1.67	0.07	0.02	2.53	−0.01	0.91	0.01*
Personal_Income	−0.24	0.45	0.07	−0.02	−4.46	−1.17	−0.35	0.00***
Gender	0.17	1.67	0.14	0.01	1.72	−0.43	1.22	0.09
Sex_1	−0.21	0.54	0.15	−0.03	−1.86	−1.32	0.40	0.06
Culture	−0.16	0.65	0.10	0.00	−1.76	−0.98	0.11	0.08
Occupation	0.39	3.79	0.08	0.04	5.93	0.75	1.78	0.00***
Religion	−0.17	0.57	0.08	−0.02	−2.71	−1.01	−0.05	0.01**
Proprioception	−0.17	0.58	0.07	−0.01	−3.09	−0.98	−0.08	0.00**
Hearing	0.20	1.95	0.09	0.02	2.35	0.03	1.22	0.02*
Speech_Impairments	0.12	1.52	0.08	0.01	1.95	−0.10	0.91	0.05
Self_Care_Activities_of_Daily_Living	−0.25	0.44	0.09	−0.04	−3.07	−1.30	−0.12	0.00**
Use_of_Assistive_Device	0.08	1.31	0.06	0.02	1.44	−0.20	0.64	0.15
Fear_of_Fall	0.13	1.52	0.07	0.02	2.15	−0.07	0.80	0.03*
Extraversion	−0.14	0.66	0.10	0.00	−1.45	−1.03	0.22	0.15
Conscientiousness	0.18	1.76	0.10	0.01	2.10	−0.06	1.15	0.04*
Social_Support	0.09	1.33	0.06	0.01	1.60	−0.14	0.64	0.11

Note. ES = estimate; OR = Odds Ratio; Std. Error = Standard Error; Pr(>|z|) = *p*-value.
*** = $p < 0.001$ (highly significant),.
** = $p < 0.01$ (significant),.
* = $p < 0.05$ (marginally significant), 2.50 % = lower bound of 95 % confidence interval, 97.50 % = upper bound of 95 % confidence interval. SexM = (demographics), Sex_1 = prioritized factors.

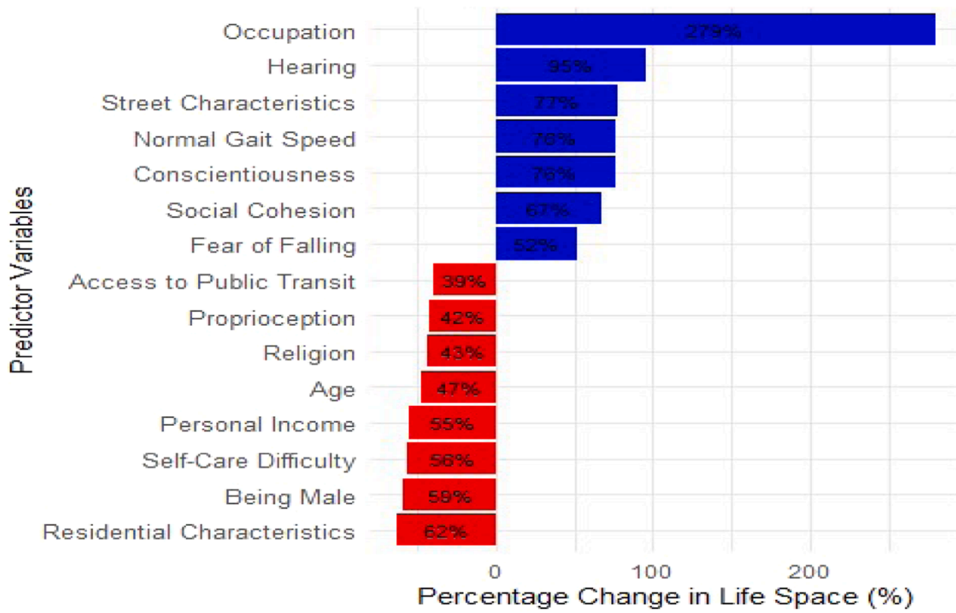

Fig. 1. Life space Model and Loaded parameters, blue is positive, and red is negative.

Table 4
Model For Gait Speed Prediction.

	ES	OR	SE	Bias	z-values	2.50 %	97.50 %	Pr(>|z|)
Age	−0.46	0.63	0.19	−0.05	−2.36	−0.95	0.07	0.02*
Attention	−0.67	0.51	0.36	−0.14	−1.86	−1.50	0.26	0.06
Executive_Function	0.78	2.19	0.37	0.18	2.12	−0.16	1.56	0.03*
Social_Factors	1.15	3.15	0.43	0.20	2.66	−0.17	2.13	0.01**
Social_Attitude	−1.06	0.35	0.46	−0.16	−2.29	−2.15	0.16	0.02*
Age_1	0.50	1.66	0.20	0.07	2.57	−0.04	0.91	0.01*
Race	1.02	2.77	0.33	0.18	3.11	0.07	1.82	0.00**
Marital_Status	0.68	1.97	0.35	0.15	1.97	−0.32	1.57	0.05*
Religion	−0.80	0.45	0.28	−0.16	−2.89	−1.32	−0.07	0.00**
Smoking_and_Drinking	−0.50	0.61	0.24	−0.08	−2.06	−1.10	0.24	0.04*
Muscle_Strength	0.48	1.62	0.29	0.11	1.63	−0.57	1.27	0.10
Range_of_Motion	−1.26	0.28	0.40	−0.26	−3.19	−2.14	−0.11	0.00**
Body_Composition	0.89	2.44	0.38	0.15	2.37	−0.14	1.75	0.02*
Pain	0.66	1.93	0.21	0.11	3.12	0.02	1.14	0.00**
Number_and_Type_of_Comorbidites	0.83	2.30	0.20	0.12	4.11	0.22	1.27	0.00***
Respiratory_System	1.28	3.61	0.24	0.21	5.34	0.56	1.62	0.00***
Fatigue	0.82	2.28	0.32	0.15	2.56	−0.20	1.44	0.01*
Dizziness	−0.61	0.54	0.34	−0.11	−1.79	−1.40	0.41	0.07
Fear_of_Reinjury	0.41	1.50	0.23	0.04	1.80	−0.19	0.91	0.07
Social_Network	1.20	3.33	0.29	0.18	4.09	0.29	1.77	0.00***
Living_Arrangement	−0.55	0.58	0.29	−0.05	−1.89	−1.25	0.15	0.06
Residential_Characteristics	−0.51	0.60	0.25	−0.10	−2.02	−0.97	0.15	0.04*

Note. ES = Estimate; OR = Odds Ratio; Std. Error = Standard Error; Pr(>|z|) = *p*-value.
*** = $p < 0.001$ (highly significant),.
** = $p < 0.01$ (significant),.
* = $p < 0.05$ (marginally significant), 2.50 % = lower bound of 95 % confidence interval, 97.50 % = upper bound of 95 % confidence interval. Age, . SexM = (demographics), Sex_1 = prioritized factors.

and attention with greater life space, in contrast to over 50 studies linking these factors to gait speed (Kalu et al., 2024). A similar trend was observed with financial factors, which were more closely associated with self-reported measures, such as life space, than with gait speed (Kalu et al., 2024). This suggests that the influences on mobility may vary based on the measurement approach, distinguishing between self-reported measures (e.g., life space) and capacity-based measures (e.g., gait speed). Clinicians should consider this distinction; however, further investigation is warranted, as the self-rated nature of our study may introduce selection or recall bias associated with self-reported measures.

Our findings indicate that the variables accounted for 50 % of the variance in life-space mobility, which is notably higher than the 13.5 % variance reported in the study by Kuspinar et al. (2020). Several factors may account for these differences in findings: Kuspinar's study assessed factors included in their model, while our study asked participants to rate mobility factors based on their preferences regarding hospital-to-home transitions. Additionally, the participants came from different populations—older Canadians versus older Nigerians. Nevertheless, the self-prioritized mobility factors predicting life space in our study, such as age, normal gait speed, gender (male vs. female), residential characteristics, social cohesion, personal income, and fear of falling, align with existing literature (Dunlap et al., 2022; Auais et al., 2017), all in the expected direction. This underscores the importance of

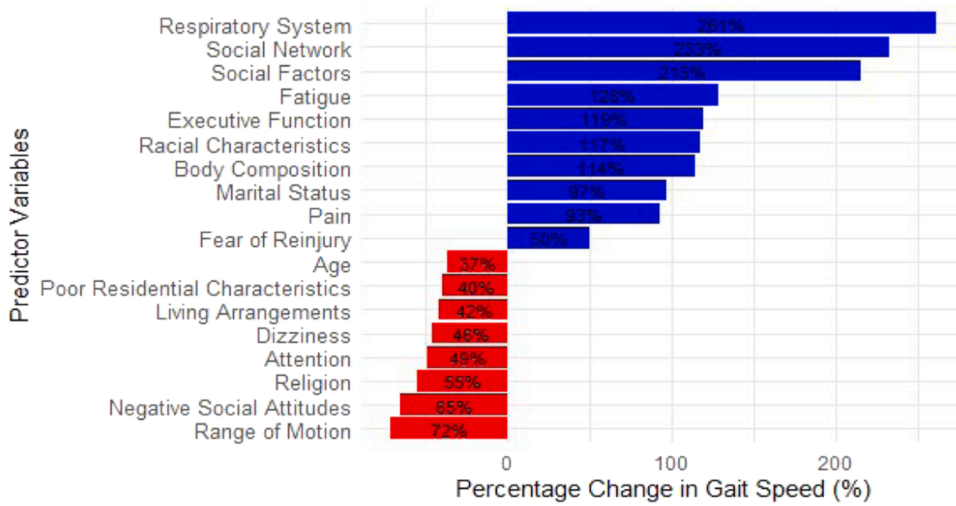

Fig. 2. Gait Speed Model and Loaded parameters, blue is positive, and red is negative.

considering the preferences of Nigerian older adults when evaluating mobility during the hospital-to-home transition, suggesting that these factors should be prioritized during hospital discharge planning.

Self-prioritized mobility factors accounted for 74 % of the variance in participants' gait speed, indicating a stronger relationship compared to the 50 % variance observed in life space. Gait speed is often referred to as the "sixth vital sign" due to its independent predictive ability for various health outcomes (Lusardi, 2012; Middleton et al., 2015; Bortone et al., 2021), and evidence suggests that gait speed alone is comparable to composite walking tests that assess walking, balance, and endurance (Pamoukdjian et al., 2015). Furthermore, gait speed has been identified as an independent predictor of hospital stay duration (Hertzberg et al., 2020; de Melo et al., 2023), underscoring its significance during the transition from hospital to home discharge. Because several factors explained the variations in gait speed, there is need to reinforce interdisciplinary collaboration among healthcare providers with expertise in these factors to ensure that discharge planning includes discussions about mobility priorities. By addressing the factors that patients deem essential, healthcare teams can better support successful transitions from hospital to home, reduce the risk of readmissions, and promote healthier aging outcomes.

Our initial objective was to compare the prioritized mobility factors identified by older adults in this study with those prioritized by Nigerian physiotherapists in a previous study (Rayner et al., 2024), aiming to identify composite mobility factors relevant to the Nigerian context. However, older adults in our study did not prioritize any of the 82 factors. In an additional analysis not reported in this paper (available when requested), we adjusted the prioritization criteria to require that at least 50 % of older adults rate each factor as critical, with a minimum of 15 % rating the factor as unimportant. This modification still resulted in no factors being prioritized, indicating that the level of prioritization was not the reason for the absence of prioritized factors. Nonetheless, our model selection offers valuable insights for clinicians in similar healthcare settings regarding which mobility factors to evaluate during the hospital-to-home transition. The identified factors encompass key determinants of mobility—cognitive, environmental, financial, personal, physical, psychological, and social (Webber et al., 2010)—highlighting the necessity of interdisciplinary teams, including experts in these areas, during hospital discharge, which is often lacking in many developing countries. To further understand the lack of prioritized factors in our study, qualitative exploration of the rating patterns would be beneficial. Additionally, future studies could solicit ratings of mobility factors from Nigerian older adults or those from similar cultural backgrounds, but without focusing specifically on the hospital-to-home context.

Our study presents several notable strengths. Our study is the first to report preliminary findings on older adults' perspectives on constructs likely to improve mobility assessment during the hospital-to-home transition in Sub-Saharan Africa. The use of bootstrapping techniques to enhance the reliability and validity of the variable estimates in the model further underscores its robustness. However, some limitations should be acknowledged. The sample size in our current study could be considered a constraint. While fitting the initial model may have required a larger sample, the final model was adequately fitted within the given sample size. Additionally, the application of bias-corrected accelerated bootstrapping, known for its ability to address potential biases and improve the accuracy of population parameter estimates, contributed to the stability of the model coefficients, thus mitigating concerns related to sample size. Moreover, the decision to use the Akaike Information Criterion (AIC) instead of the small-sample equivalent AIC could be seen as a limitation. This choice might have posed a greater issue if the final model had retained the initial number of predictors. Nevertheless, the adjustments made during the modeling process alleviated potential biases, thereby reinforcing the validity of our findings (Brewer et al., 2016). Moreover, the use of convenience sampling at health outreach events may have introduced selection bias, as it is likely to recruit participants who are more health-conscious or mobile than the general older population in Nigeria. Another limitation of this study is its cross-sectional design, which precludes the establishment of cause-and-effect relationships between the mobility factors and outcomes. Additionally, this design may be susceptible to confounding variables, thereby complicating the inference of causal links. Given these limitations, we advise readers and users to interpret and apply the findings with caution.

5. Study implications

The findings of this study carry important implications for both healthcare policy and clinical practice in Nigeria. First, at the municipal level, our results underscore the necessity for strategic urban planning policies that prioritize the mobility needs of older adults. Nigerian cities typically lack infrastructure specifically designed to accommodate older populations, such as accessible sidewalks, pedestrian-friendly street layouts, and reliable public transportation systems. Existing research emphasizes that enhancing urban design by investing in elder-friendly infrastructure including ensuring safer pedestrian pathways and expanding accessible transportation services, can directly promote mobility, independence, and social engagement among older adults (Odeyemi et al., 2024; Odufuwa, 2006). Given the resource limitations often faced by Nigerian municipalities, may consider targeted investment in these key environmental factors identified in this study, such as improved street accessibility and community social cohesion op enhance older adults' mobility. These implications can be applied for countries in developing regions with similar socio-geopolitical landscape.

Also, from a clinical perspective, the practical realities of patient assessments in Nigeria's time constrained healthcare settings necessitate a focused approach. Clinicians often encounter a high volume of caseloads coupled with limited consultation times, necessitating rapid yet precise assessments of patient need upon hospital discharge. In this context, the results of the current study indicate clinicians may prioritize assessments of executive function, fear of falling, social cohesion, and environmental accessibility, as these emerged as highly significant predictors of mobility outcome for Nigerian older adults. The importance of environmental and social conditions influencing older adults' gait speed and life space have highlighted the need for clinicians to develop targeted intervention and assess these conditions for improved post discharge mobility outcomes.

Nonetheless, healthcare infrastructure, particularly the absence of a comprehensive discharge team—consisting of physicians, nurses, rehabilitation professionals, and discharge officers (often social workers)—can significantly limit the effective assessment of these factors influencing mobility (Okoh et al., 2020). The lack of such a multidisciplinary team may impede the support necessary for a smooth transition from hospital to home, ultimately challenging the implementation of the identified predictors in practice.

6. Conclusion

This study contributes to a comprehensive understanding of the factors influencing life space and gait speed in older adults, particularly in a developing world context. Also, our study highlights the intricate interplay of various factors influencing mobility outcomes in older adults during the hospital to home transition. Understanding these factors from the perspective of older adults themselves is crucial for designing effective interventions to enhance their mobility and overall quality of life. Therefore, by addressing the identified predictors, healthcare providers and policymakers can better support the mobility and overall well-being of older adults.

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Divine Esohe Eghomwanre: Writing – review & editing, Project administration, Methodology, Investigation, Data curation. **Freeman Ojeikere Ahonsi:** Project administration, Methodology, Investigation, Data curation. **Isreal Adandom:** Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Formal analysis. **Tyler Sun:** Writing – review & editing, Writing – original draft, Software, Resources. **Daniel Rayner:** Writing – review & editing, Software, Resources, Methodology, Formal analysis. **Francis Kolawole:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Data curation. **Henrietta Fawole:** Writing – review & editing, Supervision. **Soroush Shirazi:** Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis. **Michael Kalu:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interests

There is no conflict to declare If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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