ISSN: 2524-1354 (Online), ISSN: 2519-7851 (Print)
Africa Habitat Review Journal
Volume 21 Issue 2 (May - August 2026)
http://uonjournals.uonbi.ac.ke/ojs/index.php/ahr

A Perception-Based Walkability Index for an Informal-Economy CBD Corridor:

Kenneth Matiba Road, Nairobi

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Received on 8th April, 2026; Received in revised form 6th May, 2026; Accepted on 2nd June, 2026.

Abstract

Pedestrians account for most road traffic fatalities in Sub-Saharan Africa, yet walkability frameworks developed in high-income countries do not capture the contested streetscape of informal-economy Central Business Districts or the systematic attribution biases between road users. This study develops and validates a perception-based Walkability Performance Index (WPI) using survey data from 1,248 respondents (614 pedestrians, 425 drivers including 218 matatu operators, and 209 vendors) along Kenneth Matiba Road, a 250-metre Central Business District corridor in Nairobi. The corridor scored 39.0/100, with infrastructure adequacy the weakest sub-dimension (32.4/100). A 1.57-point attribution asymmetry on driver yielding was documented (rank-biserial r = 0.68), with significant matatu–private differences. Pedestrians and vendors converged on designated vending areas as a priority intervention. The instrument showed strong reliability (Cronbach's α = 0.870) and offers a low-cost diagnostic for Central Business District corridors across Sub-Saharan Africa.

Keywords: UInformal vending, kerbside management, paratransit, pedestrian perception, walk audit, walkability index

INTRODUCTION

Pedestrians account for the largest share of road traffic fatalities in low- and middle-income countries (LMICs), with Sub-Saharan Africa bearing a disproportionate burden (World Health Organization [WHO], 2023). The WHO's Global Status Report on Road Safety identifies pedestrian vulnerability as a critical concern in rapidly urbanizing African cities (WHO, 2013). In Nairobi, Kenya's capital, non-motorized transport (NMT) accounts for approximately 47% of all trips, with walking as the dominant mode (Nairobi City County, 2015), yet pedestrians represented roughly 70% of road accident fatalities in the city (Nairobi City County, 2015; Okemwa et al., 2010). Despite this, basic pedestrian infrastructure remains severely under-provided or has deteriorated over the years.

The measurement of walkability has advanced substantially over the past two decades. Frameworks such as the Walk Score, Frank et al.'s 3Ds/5Ds model (Frank et al., 2005), the Pedestrian Level of Service in the Highway Capacity Manual (Transportation Research Board [TRB], 2016) and the Global Walkability Index (Krambeck, 2006) have provided standardized assessment approaches. However, these frameworks share two critical limitations when applied to SSA CBD contexts. First, they rely on spatial, built-environment and GIS data such as sidewalk inventories, intersection density and land-use mix, which are often unavailable or incomplete in SSA cities (Appelhans et al., 2020). Second, they fail to account for the informal-economy dynamics that dominate the streetscape, namely sidewalk encroachment by street vendors, kerbside occupation by paratransit vehicles (locally known as matatus) and the absence of designated vending or loading zones.

Both limitations come together along Kenneth Matiba Road (formerly Accra Road) in

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Nairobi's CBD, where the absence of measurable infrastructure data and the everyday dominance of informal economic activity coincide in a single short corridor. The 250-metre corridor between Tom Mboya Street and River Road serves as a major matatu terminus for upcountry routes, with operators such as Kukena SACCO and Naekana SACCO operating from informal kerbside stages (Nairobi City County, 2014). Vendors occupy much of the remaining sidewalk space with fixed stalls, mobile displays and merchandise storage. Pedestrians are frequently forced into the carriageway. This streetscape typology is common across SSA but rarely quantified.

This study adapts the walk-audit concept into a quantitative framework by converting structured perception data from multiple stakeholder groups into a composite Walkability Performance Index (WPI).

Two conceptual gaps motivate this study. First, existing walkability frameworks treat the streetscape as fixed infrastructure, yet in SSA CBDs the streetscape is dynamically contested: vendors, matatu operators and pedestrians compete for the same kerbside space, and the "walkability" of any given corridor depends on which group's claims prevail at any moment. No existing framework captures this contested-space dimension. Second, road safety interventions in these contexts rely heavily on self-reported behaviour data, yet if drivers and pedestrians systematically disagree about who yields, a phenomenon well documented in high-income traffic psychology (Bordel et al., 2020; Useche, 2022) but never tested in an African paratransit context, then single-stakeholder surveys cannot diagnose the true state of pedestrian-driver interaction.

The objectives of this study are: (i) to develop and validate a perception-based WPI from multi-stakeholder survey data (pedestrians, drivers including matatu operators, and street vendors) along Kenneth Matiba Road; (ii) to benchmark the corridor's walkability performance and identify the weakest dimensions; (iii) to test for systematic attribution asymmetry between road user groups on matched perception items, particularly driver yielding; and (iv) to identify convergent and divergent intervention priorities across stakeholder groups as a basis for participatory kerbside-allocation planning.

THEORY

Walkability Measurement Frameworks

Walkability measurement has evolved from single-indicator approaches to multi-dimensional composite indices. Frank et al. (2005) operationalised walkability through density, diversity and design, later expanded to 5Ds and 7Ds. The Highway Capacity Manual's Pedestrian Level of Service (TRB, 2016) assesses facility-level performance using geometric and traffic data. Krambeck (2006) introduced the Global Walkability Index combining spatial data with user perceptions, though its application in SSA has been limited. Perception-based approaches have gained traction where objective data is scarce. For example, studies in India, Nigeria, Ghana and South Africa have used Likert-scale surveys to capture user assessments of pedestrian infrastructure (Bivina & Parida, 2019; Leather et al., 2011). More recently, Valverde-Caballero et al. (2025) developed a microscale walkability index that integrates perceived safety and comfort with observed streetscape features, underscoring a broader shift towards composite, perception-informed measurement approaches.

Walkability in Sub-Saharan African Cities

The SSA walkability literature is growing but remains thin. Studies from Lagos, Accra, Addis Ababa and Johannesburg have documented the challenges of pedestrian environments in rapidly urbanizing African cities (Appelhans et al., 2020). Appelhans et al. (2020) provided a comprehensive overview of transport planning and mobility challenges in urban East Africa.

A consistent finding is that informal vending and paratransit operations significantly degrade walkability, yet these factors are rarely formalized in walkability frameworks. Rashid et al. (2025) used structural equation modelling in Srinagar, India to demonstrate that street-vendor density exerts a significant negative effect on pedestrian perceptions of safety, comfort and convenience, offering one of the first quantitative confirmations of vendor–pedestrian friction in a global-South CBD.

In Nairobi specifically, the Kenya Alliance of Resident Associations (KARA, 2020) baseline assessment of NMT facilities found inadequate pedestrian infrastructure and poor accommodation of persons with disabilities across the city. Wanjala (2019) evaluated the provision and usability of NMT infrastructure along nearby Tom Mboya Street, finding significant deficiencies. Mwangi et al. (2021) examined the impact of street layout design on NMT activities in Nairobi.

Policy Context

Kenya's policy environment provides a supportive framework for pedestrian improvements. The Nairobi City County NMT Policy (Nairobi City County, 2015) aims to enhance the role of NMT and ensure safe NMT facilities. The Integrated National Transport Policy (Ministry of Transport, 2009) identifies inadequate NMT facilities as a key challenge.

The Nairobi Metropolitan Area Transport Authority (NaMATA), established in 2017, is mandated to oversee the establishment of an integrated, efficient, effective and sustainable public transport system within the Nairobi Metropolitan Area (Republic of Kenya, 2017). The National Transport and Safety Authority (NTSA) is mandated to ensure safe, reliable and efficient road transport services through regulation, enforcement and public education (Republic of Kenya, 2012).

The Street Design Manual for Urban Areas in Kenya (Institute for Transportation and Development Policy [ITDP], 2019) outlines design principles including safety, universal accessibility and modal hierarchy.

Attribution Bias in Road User Perceptions

A growing body of evidence from traffic psychology demonstrates that road users systematically overestimate their own safety-compliant behaviour while underestimating that of other groups. Bordel et al. (2020) documented self-serving attribution bias in road accident explanations, showing that drivers attribute near-misses to external factors while observers apply defensive attribution to protect their own sense of safety. Useche (2022) found significant discrepancies between self-reported and proxy-reported road safety behaviours, confirming that social desirability inflates self-assessed driving compliance. This actor-observer asymmetry has direct implications for walkability research: if the same crossing event is perceived as "I yielded safely" by the driver and "that was a near-miss" by the pedestrian, single-stakeholder surveys will systematically misrepresent the state of pedestrian-driver interaction.

Empirical studies of driver yielding behaviour in high-income countries have documented systematic disparities linked to pedestrian race, vehicle cost and intersection design. However, this literature is concentrated in the United States and Europe, and no study has examined attribution asymmetry in an African paratransit context where the driver population includes formal (private vehicle) and semi-formal (matatu) operators with distinct occupational cultures and regulatory environments. The present study addresses this gap by including matched driver-yielding items across pedestrian and driver questionnaires, enabling direct quantification of the attribution gap.

Theoretical Framework

Two theoretical perspectives frame this study. The first is the actor–observer attribution asymmetry derived from social and traffic psychology (Bordel et al., 2020; Useche, 2022), which holds that individuals explain their own behaviour with reference to situational constraints while attributing others' behaviour to dispositional traits. Applied to pedestrian–driver interactions, this predicts that drivers will over-report their own yielding behaviour while pedestrians will under-report it; the magnitude of the gap between the two provides an empirical measure of the asymmetry. This theoretical lens motivates the study's multi-stakeholder design and the use of matched perception items across the pedestrian and driver questionnaires.

The second perspective is the contested streetscape concept, drawn from informal-economy urbanism scholarship (Appelhans et al., 2020; Rashid et al., 2025). In contrast to the static, infrastructure-centred conceptualization of walkability embedded in frameworks such as Walk Score or the Pedestrian Level of Service (TRB, 2016), the contested streetscape view treats kerbside space as a dynamic arena in which pedestrians, street vendors and paratransit operators compete for the same surface area. Walkability is therefore understood not as a fixed property of the built environment but as an emergent outcome of ongoing negotiation between user groups, shaped in turn by the capacity of formal policy to regulate

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informal practice.

Together, these two lenses justify the study's analytical choices: (i) the inclusion of three stakeholder groups rather than pedestrians alone; (ii) the use of parallel, matched perception items to expose attribution asymmetries on driver yielding; and (iii) the treatment of vendor- and matatu-related encroachment as first-order walkability dimensions rather than externalities. The composite WPI operationalises this framework by aggregating perceptions across stakeholders and across dimensions that reflect the contested, attribution-sensitive nature of the corridor.

The conceptual framework in **Figure 1** illustrates how the study integrates two complementary theoretical perspectives to explain walkability within informal-economy urban corridors. The actor–observer attribution asymmetry theory explains the perceptual differences between pedestrians and drivers, particularly regarding yielding behaviour and road safety interactions. At the same time, the contested streetscape concept demonstrates how pedestrians, vendors, and matatu operators compete for limited kerbside and sidewalk space, thereby shaping the quality of the walking environment. These theoretical foundations inform the study's multi-stakeholder survey design and the use of matched perception variables to assess infrastructure adequacy, safety, and behavioural interactions. Ultimately, the framework shows how aggregated stakeholder perceptions are operationalized into the Walkability Performance Index (WPI), which provides evidence-based guidance for pedestrian planning, vendor management, road safety improvements, and sustainable urban transport policy.

Research Gap

The foregoing review reveals two interconnected gaps. Substantively, existing walkability frameworks do not account for the dynamically contested streetscape of informal-economy CBDs, where vendor encroachment, matatu operations and pedestrian movement compete for the same kerbside space.

Methodologically, walkability assessments in SSA rely on single-stakeholder data, typically pedestrian surveys or infrastructure audits, that cannot reveal systematic attribution biases between road user groups. When drivers and pedestrians are asked the same question about yielding behaviour, the gap between their answers exposes a perception asymmetry that has direct policy implications, yet no SSA walkability study

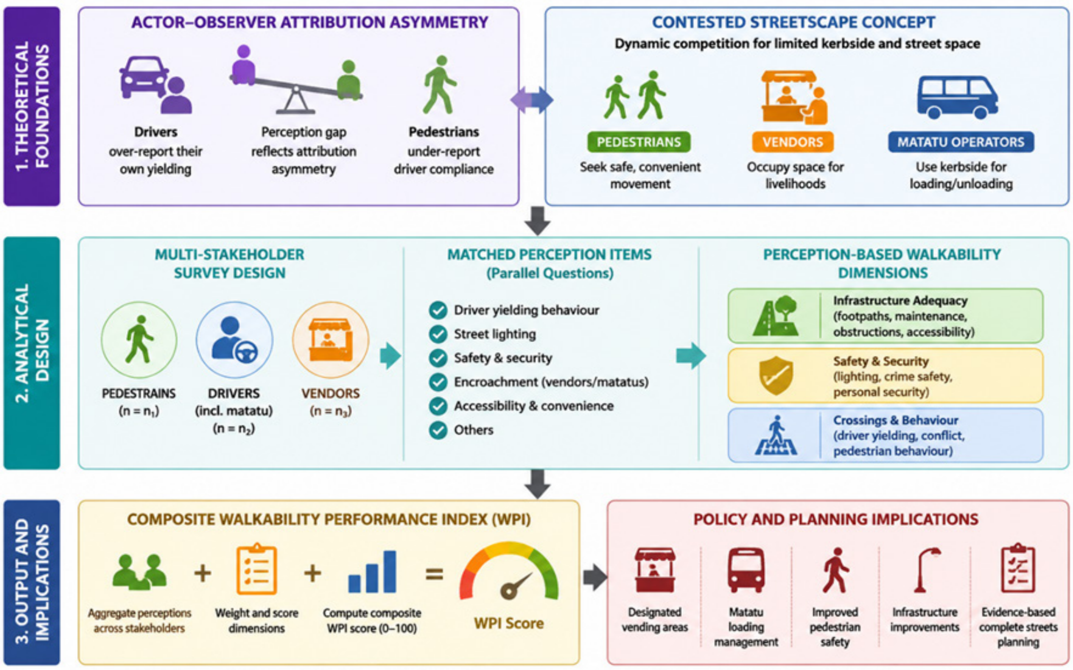

FIGURE 1

Conceptual framework for perception-based walkability performance assessment

Source: Authors' conceptualization, 2026 has tested for this.

The present study addresses both gaps simultaneously: it deploys a multi-stakeholder, perception-based WPI that captures the informal-economy dimension alongside traditional walkability factors, and it uses matched items across stakeholder questionnaires to test for systematic attribution asymmetry in pedestrian-driver interaction.

RESEARCH METHODS

Study Area

Kenneth Matiba Road is located in the heart of Nairobi's CBD, running approximately 250 metres from its junction with Tom Mboya Street on the southern end to the River Road roundabout on the northern end. The corridor includes seven intersections, namely Tom Mboya Street, Timboroa Lane, Taveta Road, Taveta Lane, Tsavo Road, River Road and Munyu Road.

Adjacent land uses are predominantly commercial such as retail shops, food vendors, electronics dealers and wholesale distributors. It serves as a major matatu terminus for long-distance routes to destinations including Mombasa, Nanyuki, Kilifi and Malindi (Nairobi City County, 2014). Sidewalks on both sides are nominally present but heavily encroached by fixed stalls, mobile vendors, matatu cargo and parked vehicles (**Figure 2**).

Research Design and Instrument

Three stakeholder groups were deliberately selected to capture the full range of perspectives on corridor walkability. Pedestrians are the primary users of the walking environment and the group most directly affected by walkability deficiencies. Drivers, particularly matatu operators who dominate the kerbside, are the primary source of pedestrian-vehicle conflict and the group whose self-reported compliance is most likely to diverge from pedestrian experience, based on the attribution bias literature reviewed above (Bordel et al., 2020; Useche, 2022).

Vendors are the primary occupants of pedestrian space and a stakeholder group whose perspective is essentially absent from the walkability literature. Matched items were deliberately included across questionnaires (e.g., driver yielding, street lighting, crime/harassment) to enable direct between-group comparisons and to test for systematic attribution asymmetry rather than merely to compare aggregate scores.

A cross-sectional perception survey was conducted using three structured questionnaires adapted from the AARP Walk Audit Tool Kit (AARP, 2016) and tailored to pedestrians, drivers and vendors. All perception items used 5-point Likert-type scales (Likert, 1932) with context-appropriate anchoring. The pedestrian questionnaire contained 16 Likert items organized

a) b) c)

FIGURES 2a-c
Pedestrian Obstruction and Vendor Encroachment along Kenneth Matiba Road
Source: Authors' field photographs, 2026

into three sections: (1) infrastructure adequacy (6 items; sidewalk width, continuity, maintenance, accessibility, blockages, amenities), (2) safety and security (6 items: daytime safety, night safety, lighting, crime, enforcement, environmental comfort), and (3) crossing behaviour (4 items: driver yielding, crosswalk use, distracted driving, mutual respect).

Driver and vendor questionnaires contained 8 and 7 Likert items, respectively, with matched items enabling between-group comparisons. Additionally, each group selected up to three priority interventions.

Sampling and Data Collection

Data was collected over a two-week period in February 2026 by a team of enumerators using a digital survey platform recording GPS coordinates, timestamps and structured responses. Respondents were recruited on-site along the corridor during weekday peak and off-peak hours. The final sample comprised 1,248 respondents: 614 pedestrians, 425 drivers (218 PSV/matatu, 151 private vehicle, 33 taxi/e-hailing, 23 delivery/commercial), and 209 vendors (95 fixed stall, 59 hawkers, 55 mobile).

Variable Coding and Index Construction

All Likert items were recoded to a uniform 1-5 scale where 5 represents the best walkability outcome. Negatively framed items (sidewalk blockages, crime/harassment, distracted driving and environmental discomfort) were reverse-coded so that higher scores consistently indicate better walkability.

Internal consistency was assessed via Cronbach's alpha, (Cronbach, 1951) for each sub-dimension and overall. Corrected item-total correlations were computed with a 0.30 retention threshold. One item ("How often do you use designated crosswalks when crossing?") was excluded because its corrected item-total correlation was 0.16 and it measures behavioural compliance rather than environment perception.

The final WPI comprised 15 items. Sub-dimension scores were computed as constituent-item means. The overall WPI was computed as the unweighted mean of all 15 items and normalized to a 0-100 scale: WPI = (mean - 1) / 4 × 100.

Statistical Analysis

Shapiro-Wilk tests confirmed non-normality for all sub-dimensions (all $p < 0.001$), justifying non-parametric methods. Between-group comparisons used Kruskal-Wallis H tests (Kruskal & Wallis, 1952) with Dunn's post-hoc test (Dunn, 1964) and Bonferroni correction, or Mann-Whitney U tests. Effect sizes were reported as epsilon-squared (ε^2) for Kruskal-Wallis tests and rank-biserial correlation $r = 1 - 2U/ (n_1 \times n_2)$ for Mann-Whitney U tests (Kerby, 2014). Sensitivity analysis compared equal-weight, PCA-derived-weight (with KMO (Kaiser, 1974) and Bartlett's pre-tests), and reliability-weight aggregation. Spearman's ρ assessed rank-order consistency.

Statistical analyses were conducted in Python, using SciPy 1.14 for descriptive statistics, reliability testing (Cronbach's α) and non-parametric comparisons, and scikit-learn 1.6 for Principal Component Analysis (PCA). A significance threshold of $\alpha = 0.05$ was applied throughout.

Ethical Considerations

The study was conducted in compliance with Kenya's research regulations. A research licence was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) prior to fieldwork, and the study also complied with the research policies of the University of Nairobi. Before completing the questionnaire, each respondent received a brief information statement in English or Kiswahili describing the study's purpose, procedures, anticipated duration and voluntary nature. Verbal informed consent was then obtained, with pedestrians and drivers approached at the kerbside and vendors approached at their stalls. No personally identifying information was recorded on the instruments, responses are reported only in aggregate form, and participants were free to decline or to withdraw at any stage without consequence. No financial inducement was offered.

RESULTS

The principal findings are summarised in the **Table 1** before the detailed results are presented in the subsections that follow.

Respondent Profile

Table 2 presents the demographic profile of all the respondents. The pedestrian sample

TABLE 1
Summary of key findings

Indicator	Value
Overall walkability score	WPI = 39.0/100 (95% CI 37.7–40.3)
Weakest sub-dimension	Infrastructure adequacy (32.4/100)
Strongest sub-dimension	Safety and security (44.4/100)
Attribution-asymmetry effect (driver yielding)	1.57-point gap on a 1–5 scale; rank-biserial r = 0.68 (large)
Cross-stakeholder consensus priority	Better street lighting (selected by 42–51% in every group)

Source: Authors, 2026

TABLE 2
Respondent demographic profile

Characteristic	Pedestrians (n=614)	Drivers (n=425)	Vendors (n=209)
Gender: Male	360 (58.6%)	392 (92.2%)	128 (61.2%)
Gender: Female	253 (41.2%)	29 (6.8%)	81 (38.8%)
Modal age group	18-35: 73.8%	36-45: 40.2%	26-35: 52.2%
Daily usage	260 (42.3%)	298 (70.1%)	Majority all day
Sub-types		Matatu: 218 (51.3%); Private: 151 (35.5%); Taxi: 33; Delivery: 23	Fixed: 95 (45.5%); Hawker: 59 (28.2%); Mobile: 55 (26.3%)

Source: Authors, 2026

Note: Ped. = Pedestrian; Drv. = Driver; Ven. = Vendor. One pedestrian respondent did not report gender. Percentages are rounded to one decimal place.

was predominantly male (58.6%) and aged 18–35 (73.8%), consistent with CBD pedestrian demographics in Nairobi (Nairobi City County, 2015). Most pedestrians use the corridor daily (42.3%) or several times per week (27.2%), primarily for work (39.9%) or shopping (25.1%). Among drivers, PSV/matatu operators comprised 51.3%, and 70.1% reported daily use. The driver sample was overwhelmingly male (92.2%), reflecting the matatu industry's gender composition. Twenty-six pedestrians (4.2%) reported mobility challenges. Vendors were more gender-balanced (61.2% male), and 54.5% had a designated trading space.

Internal Consistency

The overall 15-item WPI demonstrated excellent internal consistency (α = 0.870). The infrastructure sub-dimension was the most reliable (α = 0.815), followed by safety (α = 0.744). The crossing sub-dimension had lower reliability (α = 0.546) with only three items, acknowledged as a limitation but retained because all three items exceeded the 0.30 item-total threshold and the overall scale reliability is excellent. Corrected item-total correlations ranged from 0.361 (environmental comfort) to 0.676 (street lighting). The excluded crosswalk-use item had r = 0.16.

Walkability Performance Index Scores

The corridor scored 39.0/100 on the overall WPI (95% Confidence Interval: 37.7 - 40.3), well below a 50/100 midpoint threshold. Infrastructure adequacy was the weakest sub-dimension at 32.4/100 (95% CI: 30.8–34.0), followed by crossings at 41.3/100 and safety at 44.4/100 (**Table 3**).

Table 4 presents item-level descriptive statistics for all 15 items. The three lowest-rated items were pedestrian amenities, sidewalk blockages

TABLE 3
WPI Scores by Sub-Dimension (Pedestrians, n = 614)

Sub-dimension	Items	Mean (1–5)	SD	Score (0–100)	SD	95% CI
Infrastructure Adequacy	6	2.296	0.793	32.4	19.8	30.8-34.0
Safety & Security	6	2.777	0.737	44.4	18.4	43.0-45.9
Crossings & Behaviour	3	2.650	0.771	41.3	19.3	39.7-42.8
Overall WPI	15	2.559	0.654	39.0	16.4	37.7-40.3

Source: Authors, 2026

TABLE 4
Item-Level Descriptive Statistics (Pedestrians, n = 614)

Item	Mean	SD	Score (0–100)	Key Finding
INFRASTRUCTURE ADEQUACY (α = 0.815)				
Sidewalk width	2.720	1.028	43.0	-
Sidewalk continuity	2.660	1.224	41.5	-
Sidewalk maintenance	2.336	1.089	33.4	57.0% poorly/very poorly maintained
Disability accessibility	2.153	1.119	28.8	67.3% inaccessible/very inaccessible
Sidewalk blockages (R)	2.055	1.111	26.4	69.4% often/always blocked
Sub-dimension mean	**2.296**	**0.793**	**32.4**	81.1% inadequate/very inadequate
SAFETY & SECURITY (α = 0.744)				
Daytime safety	3.262	0.972	56.6	41.5% safe/very safe
Night safety	2.179	1.067	29.5	68.6% unsafe/very unsafe
Street lighting	2.642	1.130	41.0	43.6% inadequate/very inadequate
Crime/harassment (R)	3.236	1.121	55.9	-
Enforcement visibility	2.637	1.087	40.9	-
Environmental comfort (R)	2.704	1.276	42.6	52.8% significantly/extremely affected
Sub-dimension mean	**2.777**	**0.737**	**44.4**	-
CROSSINGS & BEHAVIOUR (α = 0.546)				
Driver yielding	2.684	1.124	42.1	49.2% rarely/never
Distracted driving (R)	2.417	1.080	35.4	-
Mutual respect	2.850	0.986	46.3	-
Sub-dimension mean	2.650	0.771	41.3	-
OVERALL WPI (α = 0.870)	**2.559**	**0.654**	**39.0**	-

Source: Authors, 2026

Note: (R) = reverse coded. Excluded item: crosswalk use (corrected item-total r = 0.16). All items scored 1-5 where 5 = best walkability outcome and disability accessibility, each rated negatively by more than two-thirds of respondents. Daytime safety was the only item with a mean above 3.0.

Figure 3 presents item-level WPI scores graphically, while **Figure 4** shows response distributions for key items using a diverging Likert chart.

Demographic Subgroup Analysis

Significant WPI differences emerged by gender, age and usage frequency as shown in **Figure 5.** Female pedestrians reported lower WPI (36.1

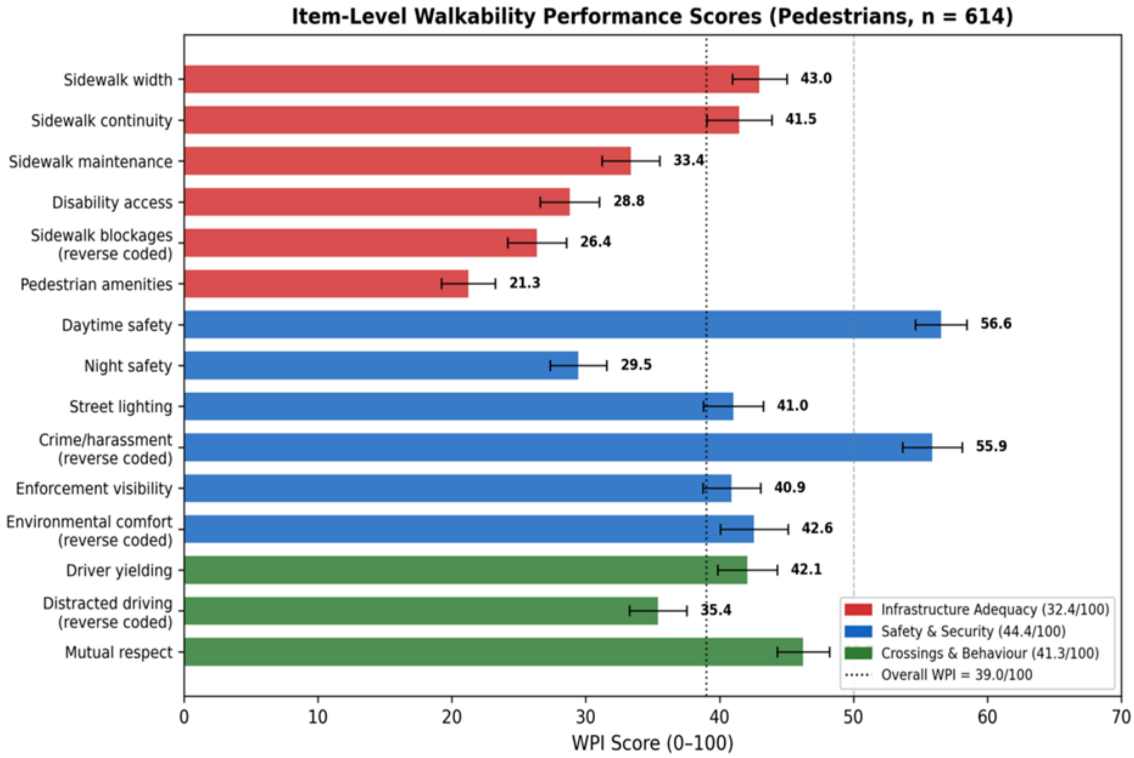

FIGURE 3
Item-level walkability scores across key pedestrian dimensions
Source: Authors, 2026

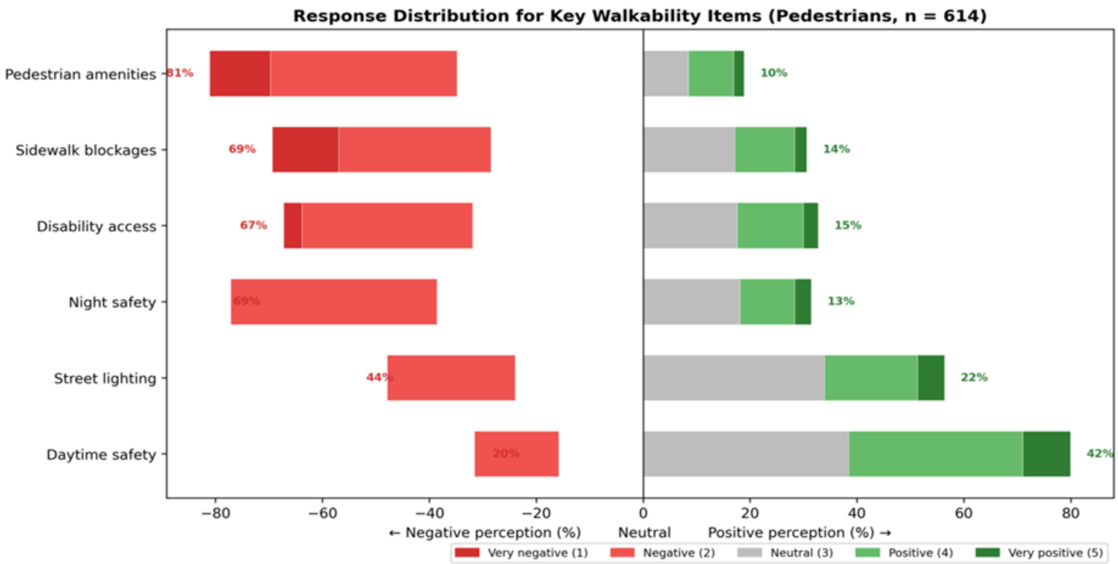

FIGURE 4
Response distributions across selected pedestrian walkability indicators
Source: Authors, 2026

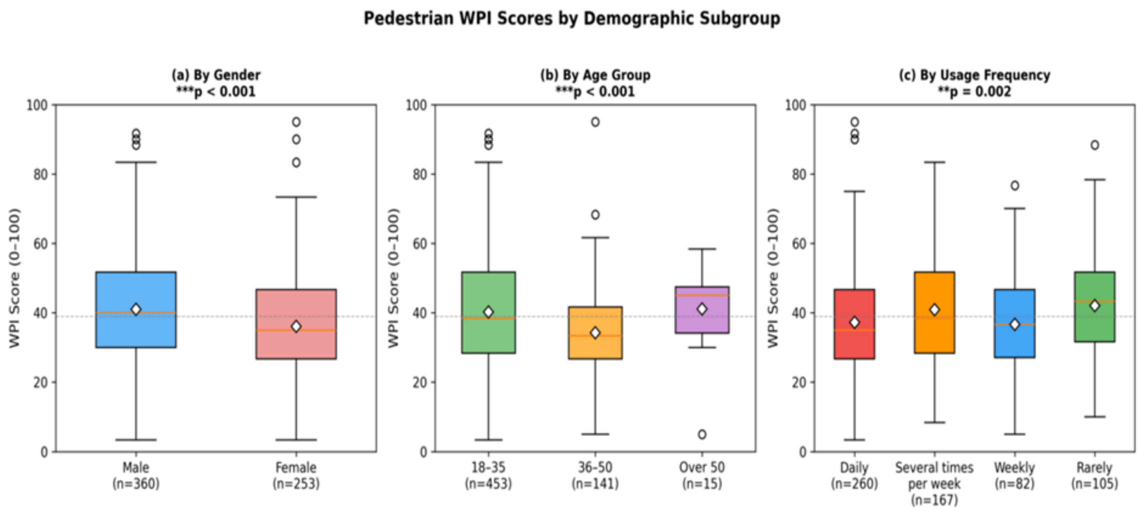

FIGURE 5
Walkability index variations across demographic respondent subgroups
Source: Authors, 2026

± 15.4) than males (41.0 ± 16.7; U = 37,750, $p < 0.001$, rank-biserial r = 0.17). Respondents aged 36-50 reported the lowest WPI (34.2 ± 13.4; H = 18.7, $p < 0.001$, $\varepsilon^2 = 0.023$). Daily users rated walkability lower (37.2 ± 17.2) than infrequent users (42.0 ± 15.0; H = 14.3, p = 0.002, $\varepsilon^2 = 0.020$).

Between-Group Comparisons

Pedestrians perceived that drivers rarely yield (mean = 2.68; 49.2% "rarely" or "never"), while drivers self-reported near-universal compliance (mean = 4.25; 80.0% "always" or "often"). The gap of 1.57 points represents a large effect (U = 41,888, $p < 0.001$, rank-biserial r = 0.68). Within the driver group, matatu operators reported significantly lower yielding than private-vehicle drivers (4.13 vs. 4.46, U = 13,538, p = 0.001, r = 0.18). Matatu drivers also reported more distracted driving among peers (U = 19,283, p = 0.004, r = 0.17) and perceived enforcement as more effective (U = 18,765, p = 0.017, r = 0.14) than private drivers.

Street lighting was the only item with near-identical wording across all three questionnaires. Vendors rated it most favourably (2.95), followed by drivers (2.79) and pedestrians (2.64; H = 12.60, p = 0.002, $\varepsilon^2 = 0.009$), driven primarily by the pedestrian-vendor gap (p_{adj} = 0.002, r = 0.15). Crime/harassment frequency did not differ significantly between pedestrians and vendors (p = 0.501) as shown in **Table 5**.

Figure 6 illustrates the perceptual differences between pedestrians and drivers regarding yielding behaviour along the corridor.

Sensitivity Analysis

The KMO measure was 0.896 (meritorious) and Bartlett's test was significant (χ^2 = 3,141.9, $p < 0.001$), confirming PCA suitability. The equal-weight WPI (39.0/100), PCA-weight WPI (39.0/100) and reliability-weight WPI (38.5/100) were virtually identical (**Figure 7**). Spearman correlations exceeded 0.995 in all pairwise comparisons, demonstrating robustness to aggregation method.

Intervention Priorities

Lighting improvement was the only consensus intervention, selected by roughly half of every stakeholder group (**Table 6 and Figure 8**). Outside that consensus, the priorities diverged. Pedestrians most often selected wider sidewalks, vendors most often selected designated vending areas, and drivers most often selected clearer crossings or signals and parking management. The pedestrian and vendor lists overlapped on designated vending areas, while vendor management appeared on the driver list but had no equivalent item on the vendor list.

DISCUSSION

Walkability Performance in Context

The corridor's overall walkability score places it in the lowest band that the instrument can register, and the radar profile in **Figure 8** shows that this is driven mostly by the infrastructure

TABLE 5
Between-Group comparisons

Comparison	Group 1	Group 2	Test	Statistic	p-value	Effect size
Attribution Asymmetry						
Driver yielding	Ped. M=2.68	Drv. M=4.25	M-W U	41,888	<0.001	r=0.68
Yielding (within)	Matatu 4.13	Private 4.46	M-W U	13,538	0.001	r=0.18
Distraction (within)	Matatu 2.86	Private 2.51	M-W U	19,283	0.004	r=0.17
Enforcement (within)	Matatu 3.27	Private 2.97	M-W U	18,765	0.017	r=0.14
Street Lighting						
3-group comparison	Ped.=2.64	Drv.=2.79, Ven.=2.95	K-W H	12.60	0.002	ε^2=0.009
Post-hoc: Ped. vs Ven.	Ped. 2.64	Ven. 2.95	Dunn		0.002*	r=0.15
Crime: Ped. vs Ven.	Ped. 3.24	Ven. 3.16	M-W U	66,089	0.501	r=0.03
Demographic Subgroups						
Gender	Male WPI=41.0	Female WPI=36.1	M-W U	37,750	<0.001	r=0.17
Age group	-	-	K-W H	18.7	<0.001	ε^2=0.023
Usage frequency	-	-	K-W H	14.3	0.002	ε^2=0.020

Source: Authors, 2026

*Note: M-W = Mann-Whitney; K-W = Kruskal-Wallis. Effect sizes: rank-biserial r for Mann-Whitney U (Kerby, 2014); ε^2 for Kruskal-Wallis. * Bonferroni-adjusted. All tests two-sided, α = 0.05.*

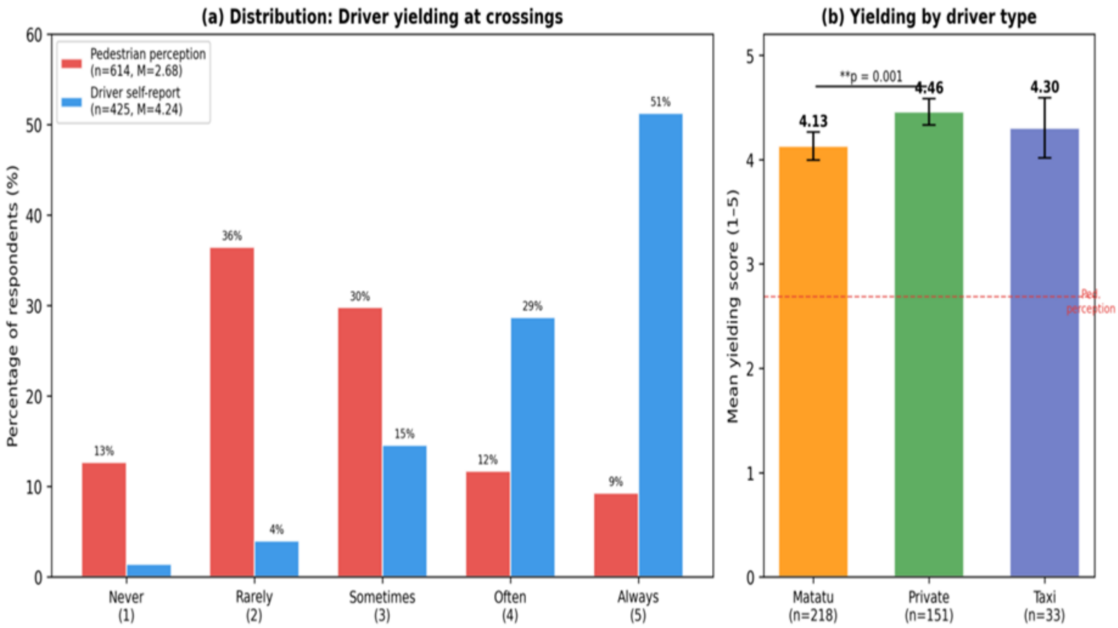

FIGURE 6
Driver yielding perceptions across pedestrian and driver groups
Source: Authors, 2026

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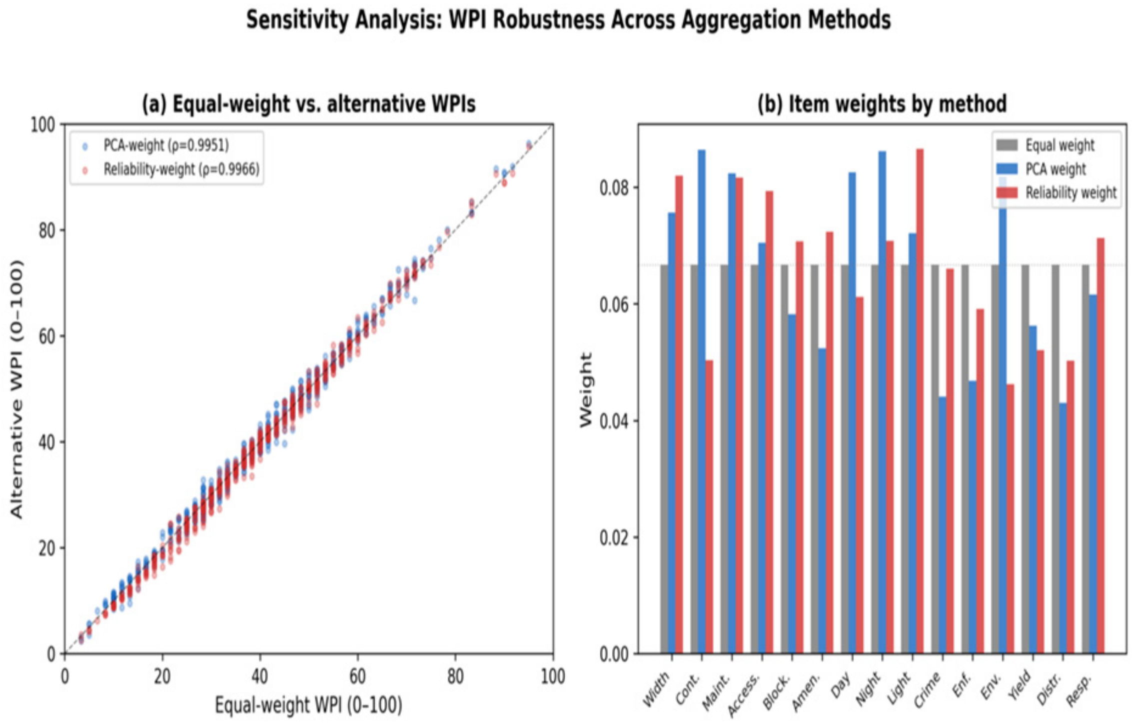

FIGURE 7
Pedestrian and driver perceptions of yielding behaviour
Source: Authors, 2026

TABLE 6
Top Intervention Priorities by Stakeholder Group (% selecting)

Intervention	Ped. (%)	Drv. (%)	Ven. (%)
Wider sidewalks	64.5	-	-
Better/improved lighting	50.7	42.1	50.2
Designated vendor areas	46.9	-	62.2
Safer signalized crossings	38.3	47.3	-
Benches/shade/trees	35.7	-	23.4
Waste management	-	-	46.9
Parking management	-	41.6	-
Traffic calming	12.9	39.0	-
Vendor management	-	37.1	-
Stronger enforcement	-	33.8	-
Tactile paving/ramps	16.0	-	-
Dedicated loading bays	-	27.0	-
Clear sidewalk markings	-	-	26.0
Loading time slots	-	-	24.0

Source: Authors, 2026

Note: "-" = intervention not listed for that group. Bold = consensus item (lighting). Percentages reflect respondents selecting each item (up to three selections).

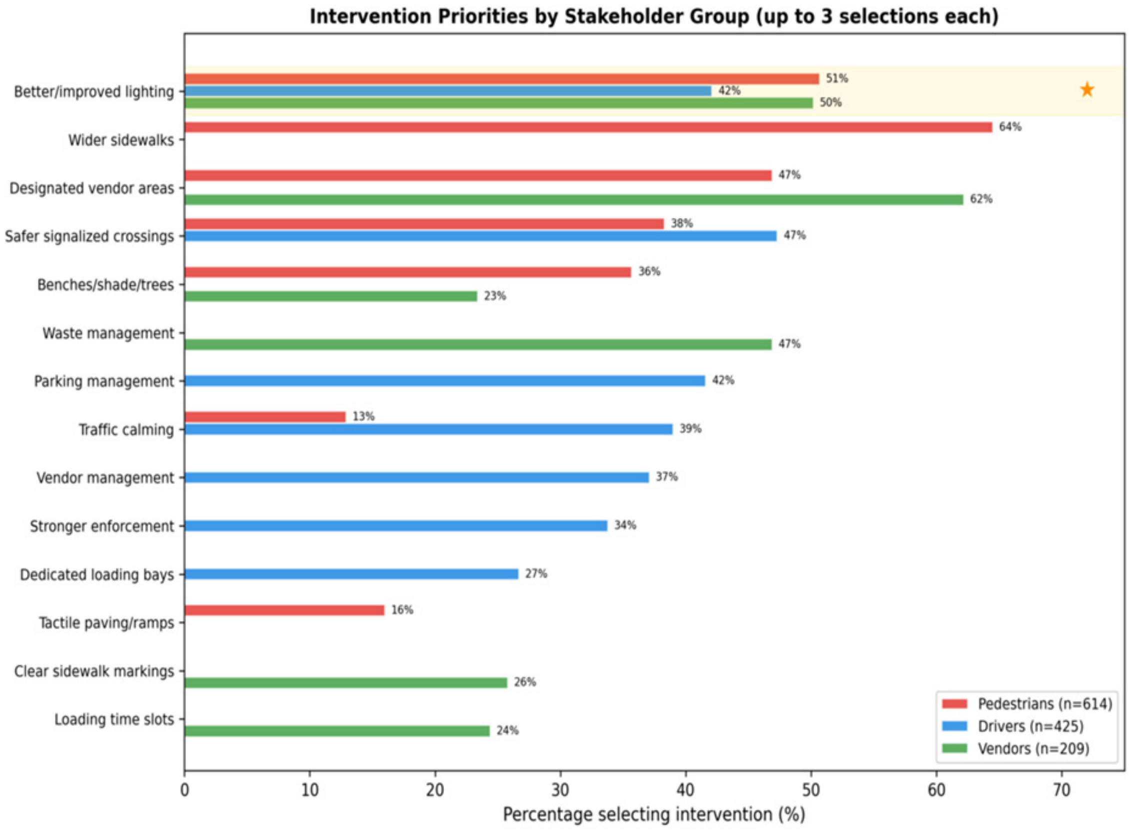

FIGURE 8
Stakeholder priorities for proposed walkability improvement interventions
Source: Authors, 2026

sub-dimension. Two patterns within that profile deserve interpretive attention.

The first is that the lowest-rated items, namely pedestrian amenities, sidewalk blockages and disability accessibility, are precisely those that conventional engineering audits tend to under-weight relative to carriageway condition or signal timing. In a tropical CBD with high pedestrian volumes and long dwell times at matatu stages, the absence of shade, rest facilities and barrier-free passage is a first-order accessibility issue rather than a finishing detail.

The second is that pedestrian priorities surfaced in the survey, such as benches, shade and trees, align with the items that score lowest, which supports the case for retaining amenity items in walkability frameworks designed for SSA contexts (KARA, 2020). **Figure 9** presents the comparative performance of key walkability dimensions along the corridor.

Attribution Asymmetry and Road Safety

The 1.57-point yielding gap (rank-biserial r = 0.68) maps directly onto the actor–observer asymmetry set out in Section 2.5. Drivers explain their own behaviour with reference to situational pressures such as time, traffic and passenger demand, while pedestrians read the same events as near-misses caused by driver disposition.

Two practical points follow. Self-reported driver compliance cannot substitute for actual yielding behaviour, and road-safety education in paratransit contexts needs to address driver awareness of this gap rather than treat it as a simple compliance problem.

Within the driver group, matatu operators reported lower yielding than private-vehicle drivers (4.13 vs. 4.46, $p = 0.001$, $r = 0.18$), which supports matatu-specific training modules rather than generic driver education in the BRT corridor transition planned under NaMATA and NTSA.

Gender and Exposure Effects

Female pedestrians' lower WPI compared to males (36.1 vs. 41.0, $p < 0.001$, $r = 0.17$) aligns with international evidence on gendered safety

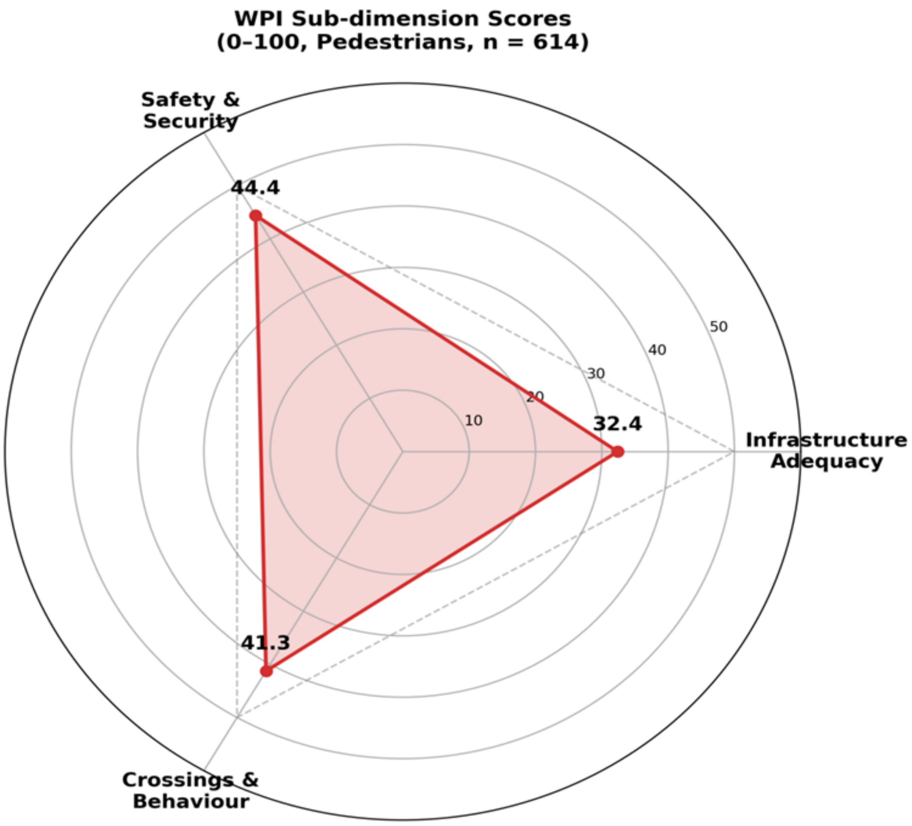

FIGURE 9
Radar chart of WPI sub-dimension scores across walkability dimensions
Source: Authors, 2026

perceptions and reinforces the importance of gender-responsive pedestrian design (WHO, 2023). The lower WPI among daily users suggests a dose-response relationship: greater exposure produces more critical assessments, validating regular users as the most informative respondent group. **Figure 4** illustrates these demographic patterns through distributional comparisons.

Methodological Contribution

The near-perfect correlations among aggregation methods (ρ > 0.995) demonstrate that the equal-weight WPI is robust (**Figure 6**). The KMO of 0.896 and Cronbach's α of 0.870 confirm a coherent underlying construct. The methodology's reliance on structured Likert surveys makes it replicable without spatial data infrastructure, a critical advantage for SSA cities (Appelhans et al., 2020).

Policy Implications

The infrastructure score of 32.4/100 provides quantitative justification for capital investment in sidewalk widening, surface repair and obstruction removal along corridors. This requires joint effort from the National Government agencies like NaMATA, NTSA, National Police Service and the Nairobi City County Government.

Transferability and Generalizability

The methodology's primary value lies not in the specific WPI score of 39.0/100, which is context-bound, but in the diagnostic pattern it reveals: attribution asymmetries and stakeholder convergences that would be invisible in single-group surveys or infrastructure-only audits.

Kenneth Matiba Road's typology, matatu terminus, vendor encroachment, high pedestrian volume, weak enforcement, is representative of numerous CBD streets across Nairobi and across SSA (Appelhans et al., 2020). Similar conditions have been documented in Addis Ababa, Lagos and Accra, suggesting that the attribution asymmetry and stakeholder convergence patterns identified here are likely transferable to analogous corridors.

The WPI's reliance on structured Likert surveys rather than spatial or GIS data makes it replicable without the data infrastructure that constrains most walkability assessments in SSA cities. The instrument can be administered with minimal training and equipment, and the multi-stakeholder matched-item design provides a built-in cross-validation mechanism.

CONCLUSION

This study developed and validated a perception-based Walkability Performance Index (WPI) using data from 1,248 respondents along Kenneth Matiba Road, Nairobi. The corridor scored 39.0/100, with infrastructure adequacy emerging as the weakest dimension (32.4/100). Pedestrian amenities, sidewalk blockages, and disability accessibility were identified as the most critically deficient components of the walking environment. A large attribution asymmetry was documented on driver yielding (rank-biserial $r = 0.68$), while the within-driver contrast between matatu operators and private drivers was also statistically significant.

The index demonstrated strong internal reliability (Cronbach's $\alpha = 0.870$) and produced near-identical rankings under alternative weighting schemes ($\rho > 0.995$), confirming the robustness of the methodology. The findings further revealed that lighting was the only intervention priority consistently selected across pedestrians, drivers, and vendors, making it the most defensible first-mover intervention for the corridor.

Beyond the specific case of Kenneth Matiba Road, the study contributes methodologically by demonstrating the applicability of a low-cost, perception-based and multi-stakeholder walkability framework for informal-economy CBD corridors in Sub-Saharan Africa. The WPI therefore provides a practical diagnostic and monitoring tool for evidence-based pedestrian planning, kerbside management, and sustainable urban transport interventions in data-constrained urban environments.

RECOMMENDATIONS

The study's findings translate into practical recommendations across three interrelated domains: policy and planning, road safety and behaviour, and future research.

Policy and Planning

i) Nairobi City County and NaMATA should adopt Complete Streets guidelines for the Kenneth Matiba corridor that formally designate vending zones, loading and alighting bays for matatus, and continuous barrier-protected pedestrian space, consistent with the Street Design Manual for Urban Areas in Kenya (ITDP, 2019).
ii) The NaMATA mandate (Republic of Kenya, 2017) should be operationalised through a participatory kerbside-allocation scheme co-designed with Kukena SACCO, Naekana SACCO, vendor representatives, and pedestrian stakeholders, drawing on the convergence observed between pedestrian and vendor priorities around designated vending areas.
iii) Lighting and CCTV infrastructure along the corridor should be upgraded as an immediate intervention, given their status as the only cross-stakeholder consensus priority identified in the study.
iv) Universal-access standards should be strengthened through the provision of kerb ramps, audible-tactile crossing signals, and unobstructed sidewalk widths of no less than 2.0 metres, consistent with KARA's (2020) recommendations for persons with disabilities.

Road Safety and Behaviour

i) Given the significant matatu-versus-private-vehicle yielding gap, the National Transport and Safety Authority (Republic of Kenya, 2012) should integrate matatu-operator-specific yielding and pedestrian-respect modules into Public Service Vehicle (PSV) driver re-testing curricula.
ii) Future road-safety monitoring frameworks should incorporate matched perception items across stakeholder groups so that attribution asymmetries can be tracked over time rather than being masked by single-stakeholder self-reporting.
iii) Engineering interventions should be complemented by community-based pedestrian awareness and behavioural change campaigns that acknowledge both driver and pedestrian contributions to near-miss events, thereby reducing the perception gap and improving shared road safety culture.

Further Research

The WPI methodology should be replicated on additional Nairobi corridors and in other Sub-

Saharan African CBDs to establish cross-city benchmarking norms and strengthen external validity. Future studies should also incorporate longitudinal pre- and post-intervention evaluations around planned Bus Rapid Transit (BRT) and Complete Streets projects to test the WPI's sensitivity to real infrastructure and policy changes over time. In addition, future research may integrate observational and GIS-based measures with perception-based indicators to strengthen multidimensional assessment of walkability in informal urban environments.

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