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From Crisis to Care: Ebola-Era Humanitarian Governance, Trust, RACG, and Routine Health Service Use in Sierra Leone—A B-RACT Perception Study

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Abstract: **Introduction: Bull's Resource-to-Access Conversion Theory (B-RACT) proposes that governance signals foster trust, reduce the Resource-to-Access Conversion Gap (RACG), and enable healthcare utilization. This study examined whether perceptions of Ebola-era aid governance predict current trust, RACG, and routine service use in Sierra Leone.**

Methods: A community-clustered cross-sectional survey (N = 230) was conducted in Ebola-affected districts. Structural equation modeling (SEM) with robust maximum likelihood estimation tested direct, indirect, and sequential paths among PEAG, Trust, RACG, and utilization. Missing covariate data were handled via multiple imputation (m = 20). Indirect effects were estimated using 5,000-sample bias-corrected bootstrapping; moderation by gender and socioeconomic status (SES) was tested with interaction terms.

Results: PEAG significantly predicted Trust (β = .38, p < .001), and Trust significantly reduced RACG (β = –.41, p < .001). Trust increased the odds of routine utilization (OR = 1.47), while RACG decreased them (OR = 0.65). Both the simple indirect effect (β ≈ .09) and sequential indirect pathway (β ≈ .04) were significant, consistent with partial mediation. Community accountability showed theory-concordant but imprecise effects, and moderation analyses indicated no meaningful slope variation across gender or SES.

Discussion/Conclusion: Findings validate B-RACT's conversion mechanism: credible governance signals build trust, which lowers perceived access barriers and increases service use. Strengthening post-crisis health systems should prioritize accountability, trust repair, and friction-reducing service design to ensure that resources are converted into realized care.

Keywords: **Ebola, governance, trust, RACG, B-RACT, Sierra Leone, humanitarian aid, structural equation modeling.**

I. INTRODUCTION

Sierra Leone's 2014–2016 Ebola outbreak was simultaneously a public-health emergency and a complex humanitarian crisis. The West Africa epidemic, centered in Guinea, Liberia, and Sierra Leone, was the largest since Ebola's discovery, with more cases and deaths than all prior outbreaks combined, spreading rapidly after seeding in Guinea (WHO, 2016). Epidemiological syntheses report ~28,600 cases and ~11,300 deaths across the three countries, framing the exceptional scale, duration, and transborder dynamics that shaped both the emergency response and its social consequences (CDC, 2023). Beyond mortality, the crisis disrupted routine health services and eroded confidence in care. Systematic reviews and country analyses document substantial declines in facility deliveries, antenatal care, and outpatient visits during the epidemic months, with modeled excess deaths from malaria, HIV/AIDS, and TB attributable to reduced access, evidence that the outbreak expanded the effective distance between resources and realized care (WHO, 2016). Studies specific to

Sierra Leone found large drops in maternal and child health contacts and lingering effects beyond peak transmission, consistent with fear, staffing losses, and procedural unpredictability as proximate drivers (Jones et al., 2016).

Nationally, coordination through the National Ebola Response Centre (NERC) with UN partners and NGOs culminated in WHO's declaration that Sierra Leone was Ebola-free on November 7, 2015; the official "lessons learned" exercise led by NERC, the UN, and FOCUS 1000 catalogued achievements (safe burials, surveillance, social mobilization) and governance/communication gaps that influenced community compliance and care-seeking (WHO, n.d.). Humanitarian evaluations, such as UNICEF's corporate review, likewise emphasized accountability to affected populations and the centrality of risk communication and community engagement (RCCE) to sustain trust amidst rapidly changing operations (UNICEF, n.d.).

The Government of Sierra Leone's National Ebola Recovery Strategy (2015–2017) sought to convert emergency resources into resilient systems, prioritizing restoration of essential services and livelihoods (Government of Sierra Leone, 2015).Within health, Ministry of Health Services (MoHS) updated the Basic Package of Essential Health Services (2015–2020) and advanced strategic planning via the National Health Sector Strategic Plan 2017–2021, later extended in the NHSSP 2021–2025, anchoring reforms in financing, workforce, and service delivery to reduce procedural unpredictability and rebuild routine utilization (Government of Sierra Leone, 2015).

Trust emerged as a decisive determinant for both outbreak control and service restoration. Evidence from West Africa and Sierra Leone highlights how clear, credible messaging, community leadership, and visible fairness in decision-making affected willingness to seek care and accept interventions; conversely, rumor, stigma, and perceived unfairness undermined compliance and routine service use (Nuriddin et al., 2018). Contemporary work continues to show fluctuations in institutional trust shape care-seeking and engagement, underscoring the policy relevance of RCCE and governance signals during and after crises (Baldé et al., 2024).

Against this backdrop, the present perception study examines how communities judge the effectiveness and fairness of Ebola-era humanitarian aid and how those judgments have produced a trust legacy that still conditions the Resource-to-Access Conversion Gap (RACG) and routine service use. By situating community perceptions within post-Ebola recovery policies and partner evaluations, and by explicitly modeling trust and governance as conversion mechanisms, the study applies B-RACT to test whether crisis-era governance continues to shape the conversion of resources into care years later.

Problem Statement

The 2014–2016 Ebola outbreak in West Africa, especially in Sierra Leone, was the largest ever recorded and created both a public-health emergency and a complex humanitarian response (WHO, 2016; CDC, 2023). During the crisis, routine services such as antenatal care, facility deliveries, and outpatient visits fell sharply and, in some cases, stayed low beyond the peak of transmission (Jones et al., 2016; Delamou et al., 2017). Fear, rumors, and unpredictable procedures further weakened people's trust in the health system, which is closely tied to whether they seek care (Morse et al., 2016; Nuriddin et al., 2018). After the outbreak, Sierra Leone's Ministry of Health (MoH) and partners launched recovery plans to restore services and improve community engagement, but evaluations noted uneven accountability and communication with affected communities (ReliefWeb/UNDP, 2015; ReliefWeb, 2015).

Today, service use can still rise or fall with trust and the perceived predictability of care. If communities view Ebola-era aid as ineffective or unfair, the Resource-to-Access Conversion Gap (RACG) may remain wide, meaning available staff, clinics, and medicines do not translate into actual use because people expect stockouts, poor treatment, or opaque processes (Jones et al., 2016; Nuriddin et al., 2018). There is limited empirical evidence that directly links perceptions of Ebola-era aid effectiveness/fairness to a lasting "trust legacy," (WHO, 2016; Jones et al., 2016; ReliefWeb/UNDP, 2015), to RACG, and to current routine service use in Sierra Leone, which is the gap this study addresses.

Purpose of the study

This study empirically tests how perceptions of Ebola-era humanitarian governance (PEAG) shape current health-seeking behavior in Sierra Leone, using Bull's Resource-to-Access Conversion Theory (B-RACT) as the guiding framework. I examine whether favorable PEAG increases trust in the health system; whether greater trust is associated with a smaller Resource-to-Access Conversion Gap (RACG); and how trust and RACG independently relate to routine service utilization. I also tested indirect and sequential pathways (PEAG → Trust → RACG → Utilization), assess the influence of community-level accountability signals on trust and RACG, and explore moderation by gender and socioeconomic status.

Research Questions

The focal constructs that form the research questions are perceived Ebola-aid governance (Perceived Ebola-Aid Governance - effectiveness and fairness; PEAG), current trust in the health system (Trust), the Resource-to-Access Conversion Gap (RACG), and current utilization of routine services (Utilization).

RQ1. To what extent are higher perceptions of Ebola-era aid effectiveness and fairness (PEAG) associated with higher current trust in the health system?

H1. Higher perceptions of Ebola-era aid effectiveness and fairness (PEAG) will be positively associated with higher current trust in the health system.

RQ2. To what extent does higher current trust in the health system predict a smaller Resource-to-Access Conversion Gap (RACG)?
H2. Higher current trust in the health system will be associated with a smaller RACG.

RQ3. To what extent do current trust and the RACG independently predict current utilization of routine health services?

H3a. A smaller RACG will be associated with higher current utilization of routine services.

H3b. Higher current trust will be associated with higher current utilization of routine services, independent of the RACG.

RQ4. To what extent is the association between PEAG and current utilization transmitted indirectly through higher trust and, sequentially, through lower RACG?

H4a. The association between PEAG and current utilization will be indirectly transmitted through higher trust.
H4b. The association between PEAG and current utilization will be sequentially and indirectly transmitted through higher trust and, in turn, through a smaller RACG.

H4c. The total effect of PEAG on current utilization will be positive, and the residual direct effect will be reduced in magnitude after accounting for the mediators, consistent with partial or full mediation.

RQ5. To what extent do community-level accountability signals (e.g., regular transparency meetings and accessible grievance redress) predict higher individual trust and a smaller RACG, net of individual perceptions?

H5a. Stronger community-level accountability signals will be associated with higher individual trust, net of individual perceptions.
H5b. Stronger community-level accountability signals will be associated with a smaller RACG, net of individual perceptions.

RQ6. To what extent do the PEAG to Trust to RACG to Utilization pathways proposed by B-RACT differ by gender and socioeconomic status (SES)?

H6. The PEAG to Trust to RACG to Utilization pathway coefficients will differ by gender and by SES, indicating statistically significant heterogeneity across these groups.

Significance of Study

This study shows that humanitarian governance during the Ebola crisis has lasting effects on routine health service use in Sierra Leone. Beyond immediate clinical response, communities' interpretations of fairness, transparency, and accountability continue to shape trust, perceived access barriers, and utilization years later. By modeling trust and the Resource-to-Access Conversion Gap (RACG) as the mechanisms linking crisis-era governance to behavior and highlighting the role of community accountability signals, the analysis identifies governance as a durable determinant of health system recovery. It also provides the first empirical test of B-RACT, validating its claim that resources improve health only when converted into trusted, usable care through relational and structural pathways.

Gap in Literature

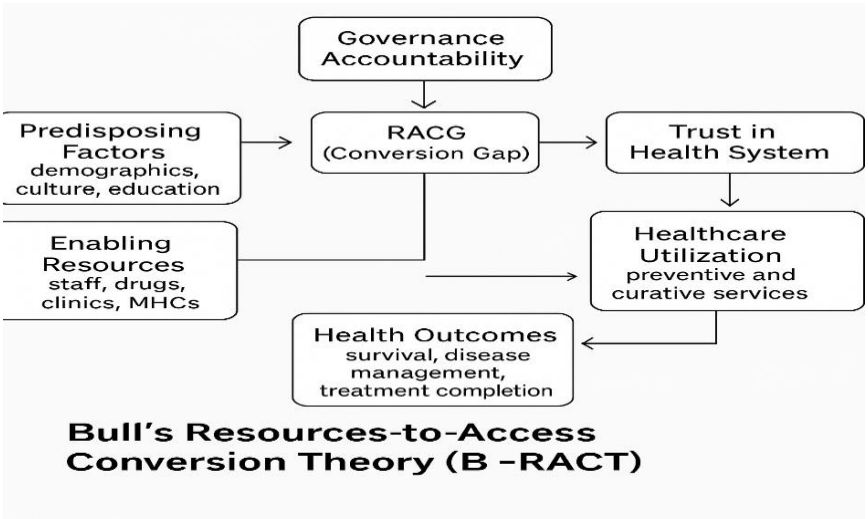
Although prior work documents decline in public trust and disruptions to routine services during the 2014–2016 Ebola epidemic (Blair et al., 2017; Vinck et al., 2019), far less is known about how communities' perceptions of humanitarian governance during the crisis shape long-term engagement with the health system. Much of the literature emphasizes immediate response or short-term recovery indicators (Barden-O'Fallon et al., 2015; Elston et al., 2015), leaving open

questions about the durable relational and structural effects of governance quality years after the emergency. While trust is recognized as a determinant of health-seeking behavior in fragile settings (Kruk et al., 2018; Ozawa & Sripad, 2013), studies have not tested whether crisis-era governance perceptions predict present-day trust, nor have they examined how trust interacts with perceived access barriers, operationalized as the Resource-to-Access Conversion Gap (RACG), to explain routine service utilization. Research on community accountability mechanisms (e.g., transparency forums, feedback channels, grievance systems) remains sparse in the West African post-Ebola context (Barmania, 2016; Denney et al., 2015), and little is known about whether governance and conversion processes vary by gender or socioeconomic status despite well-documented inequities in Sierra Leone (Wurie et al., 2016). To address these gaps, this study integrates humanitarian governance, trust, structural barriers, and utilization within Bull's Resource-to-Access Conversion Theory (B-RACT), testing how Ebola-era governance perceptions continue to shape trust, RACG, and routine healthcare utilization in Sierra Leone and whether these pathways differ across demographic groups.

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Bull's Resource-to-Access Conversion Theory (B-RACT) serves as the primary theoretical foundation for this study. B-RACT posits that health service utilization is best understood not as an automatic outcome of resource availability, but as a conversion process shaped by governance, trust, and perceived access barriers. The theory challenges traditional input-output models that assume that increasing health resources directly increases utilization. Instead, B-RACT argues that individuals must interpret those resources as legitimate, trustworthy, and accessible before they can be converted into actual health-seeking behaviors. (See Figure 1).

Figure 1: Bull's Resources-to-Access Conversion Theory (B-RACT).



***Source**: Bull, D. A. (2025). Resources-to-Access Conversion Theory (B-RACT) [Conceptual model]. A New Model for Understanding Service Utilization Failures and Resource Conversion Gaps in Healthcare Delivery in Third World Countries. International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online) ISSN 2348-1218 (print). 13(4), pp: (56-97). https://doi.org/10.5281/zenodo.17531557*

Central to B-RACT is that governance signals—fairness, transparency, accountability—tell communities whether institutions are trustworthy. These signals shape relational orientations toward the health system, with trust mediating governance's influence on behavior: when trust is present, people accept guidance, take health-related risks, and expect competent, respectful care. B-RACT also introduces the Resource-to-Access Conversion Gap (RACG), the perceived distance between available resources and usable care, spanning logistical, financial, relational, and informational barriers. Trust compresses RACG by lowering perceived risk and friction; low trust widens it, rendering even well-resourced systems inaccessible. The Ebola epidemic in Sierra Leone provides a salient context: crisis-era governance experiences—some transparent and effective, others uneven—likely shaped enduring perceptions of legitimacy, which B-RACT predicts continue to influence current trust, perceived barriers, and routine utilization.

Applying B-RACT to the post-Ebola setting, the framework maps Perceived Ebola-Aid Governance (PEAG) → Trust → RACG → Utilization, with trust and RACG also exerting independent effects on service use. Community-level accountability signals (e.g., transparency forums, grievance structures) are posited to shape both trust and RACG beyond

crisis memories, while gender and socioeconomic status may moderate these pathways given documented inequalities. Together, this model treats governance, trust, and structural barriers as central mechanisms of post-crisis health-seeking behavior, translating B-RACT into clear, testable pathways that reflect real recovery conditions in fragile systems.

Alignment of B-RACT, Variables, and Research Questions

B-RACT predicts a conversion chain in which governance signals foster trust, trust compresses RACG (Resource-to-Access Conversion Gap), and reduced frictions enable utilization. The study operationalizes these links with PEAG (Perceived Ebola-Aid Governance) as the upstream governance signal, Trust as the psychological gateway, RACG as perceived structural barriers, and Routine Utilization as the behavioral endpoint. Accordingly, the RQs map directly onto B-RACT's propositions: RQ1 tests whether PEAG → Trust; RQ2 tests whether Trust → (lower) RACG; RQ3 tests whether Trust and RACG independently predict Utilization; RQ4 tests the sequential pathway (PEAG → Trust → RACG → Utilization); RQ5 examines whether community accountability signals (contextual governance cues) shape Trust and RACG beyond individual PEAG; and RQ6 assesses moderation by gender and socioeconomic status, probing B-RACT's boundary conditions. This structure provides a direct, testable alignment between theory and empirical questions in the post-crisis Sierra Leone context.

Testable Structural Form of B-RACT

Bull's Resource-to-Access Conversion Theory (B-RACT) proposes a structured sequence in which governance signals shape trust, trust compresses the Resource-to-Access Conversion Gap (RACG), and reduced conversion frictions enable routine service utilization. To translate this conceptual model into a testable empirical form, each theoretical component was operationalized as a structural path linking the observed constructs.

At the first stage, perceptions of Ebola-aid governance (PEAG) function as upstream governance signals that are theorized to generate institutional trust. Accordingly, Trust was modeled as a function of individual-level PEAG and community-level accountability cues. At the second stage, Trust was modeled as a determinant of RACG, reflecting the theory's assertion that trusted systems lower informational, logistical, and procedural barriers to care. At the final stage, Trust and RACG were modeled as independent predictors of routine service utilization, capturing both psychological and structural conversion mechanisms. Formally, the B-RACT pathways were represented as:

1. Trust formation:

$$Trust_{(ij)} = a_0 + a_1(PEAG_{(ij)}) + a_2(Accountability_j) + a_xX_{(ij)} + u_j + e_{(ij)}$$

2. Conversion-gap compression:

$$RACG_{(ij)} = b_0 + b_1(Trust_{(ij)}) + b_2(PEAG_{(ij)}) + b_3(Accountability_j) + b_xX_{(ij)} + u_j + e_{(ij)}$$

3. Service utilization:

$$\text{logit}(Use_{(ij)} = 1) = c_0 + c_1(RACG_{(ij)}) + c_2(Trust_{(ij)}) + c_3(PEAG_{(ij)}) + c_xX_{(ij)} + u_j$$

The sequential indirect effect PEAG → Trust → RACG → Utilization, represents the core conversion mechanism posited by B-RACT. Cross-level effects ($Accountability_j$ → Trust and $Accountability_j$ → RACG) operationalize the theory's governance dimension, while moderation tests (gender, SES) evaluate the theory's equity-relevant boundary conditions. These equations provide a direct, testable translation of B-RACT and form the basis for the SEM analyses reported in the Results.

Literature Review

A targeted literature search was conducted to identify scholarship relevant to Ebola-era humanitarian governance, institutional trust, access barriers, and healthcare utilization in fragile settings. The purpose of this search was to position the study within established theoretical and empirical work rather than to provide a systematic review. Major academic databases (PubMed, Embase, Web of Science, Scopus, CINAHL, Global Health) and key policy sources (WHO, UNICEF, World Bank, ReliefWeb, and Sierra Leone's Ministry of Health) were searching for information focusing on peer-reviewed articles published from 2000 onward, with emphasis on studies conducted during and after the West African Ebola outbreak (2014–2016). Boolean search strings combined governance, trust, access barriers, and use-of-care constructs (e.g., *"Ebola" AND "governance" AND "trust", "health system trust" AND "utilization", "barriers" AND "healthcare access" AND "Africa"*).

Inclusion criteria prioritized empirical studies examining (a) perceived governance or fairness in crisis responses, (b) trust in health systems, (c) access constraints analogous to the Resource-to-Access Conversion Gap (RACG), and (d) determinants of healthcare utilization. Exclusion criteria removed commentaries, editorials, clinical-focused articles without a governance or trust component, and studies unrelated to fragile or post-crisis health systems. Titles and abstracts were screened for relevance, and full texts were reviewed where conceptual overlap with B-RACT was evident. Literature on key variables are discussed below.

Effectiveness, fairness, and accountability

The Ebola complex humanitarian emergency in Sierra Leone, emphasizes effectiveness, fairness, and accountability as upstream signals in the B-RACT pathway. Evidence consistently shows that communities judged the effectiveness of the response through the quality and timeliness of engagement, the credibility of messengers, and the visibility of results. Large-scale documentation of Sierra Leone's Community-Led Ebola Action (CLEA) under the Social Mobilization Action Consortium (SMAC) links structured, locally brokered engagement to safer practices and cooperation, while also noting that uneven coverage and monitoring created pockets where perceived effectiveness lagged (Bedson et al., 2020; Jalloh et al., 2020). Where engagement was early, iterative, and two-way, communities were more likely to describe the response as "working"; where it was late or one-way, skepticism persisted (Assessment Capabilities Project [ACAPS], 2015).

Fairness, who received services, on what terms, and how rules were enforced, was a decisive lens for community compliance. Qualitative assessments from mid- and late-outbreak phases show that perceptions of inequitable quarantines, stigmatization of survivors, and opaque eligibility criteria eroded willingness to cooperate (Nuriddin et al., 2018). Conversely, visible impartiality and consistent rules bolstered confidence that the system would treat people justly, even under uncertainty (ACAPS, 2015; Bedson et al., 2020).

Formal accountability mechanisms shaped whether communities believed their concerns mattered. Independent humanitarian evaluations of the Ebola response highlight variability in "accountability to affected populations" (AAP) across districts and partners, concluding that weak feedback loops and inconsistent grievance redress diminished perceptions of responsiveness and undercut trust (UNICEF, 2017). At the policy level, Sierra Leone's National Ebola Response Centre (NERC) "lessons learned" exercise explicitly traces early communication and coordination gaps to public confidence deficits and recommends institutionalizing accountability and community engagement to sustain cooperation in future emergencies (NERC/WHO AFRO/FOCUS 1000, 2016).

These governance signals also operated within a hybrid authority environment, state, customary, and international actors, creating both coordination gains and legitimacy challenges. Studies of information ecosystems during the outbreak show that communities relied on locally credible intermediaries (faith leaders, CHWs) and judged system credibility by the predictability of messages about risks, safe burials, and service availability (ACAPS, 2015; Jalloh et al., 2020). Complementary quantitative work finds that perceived responsiveness to unmet needs was associated with behavior change, underscoring the behavioral salience of governance cues (Skrip et al., 2020). Collectively, the literature positions effectiveness (did it work?), fairness (was it impartial?), and accountability (could we question it and be heard?) as empirically grounded upstream signals through which communities evaluated the response. In B-RACT terms, these signals shape trust and expectations of procedural predictability, thereby influencing whether resources are converted into realized utilization during and after crisis.

Trust Formation and Repair

Across West Africa, and specifically in Sierra Leone, studies show that trust is the proximal converter that turns available services into use under conditions of uncertainty. Community accounts from the 2014–2016 crisis describe how two-way communication, credible local messengers, and visible responsiveness increased people's willingness to engage with health services, whereas rumor, stigma, and opaque procedures eroded confidence (Nuriddin et al., 2018). Importantly, trust is not monolithic: people differentiate trust in institutions (e.g., the health ministry, facilities' reliability) from trust in frontline actors (e.g., nurses, CHWs, faith leaders). Evidence from border communities reinforces that these facets operate together: institutional predictability and respectful interpersonal encounters both mattered for vaccine confidence and access (Enria et al., 2021).

System (institutional) trust is strongly shaped by procedural signals, transparency, fairness, timeliness, and predictability. Evaluations and communication analyses during Ebola emphasize that when authorities shared consistent information, acknowledged uncertainty, and responded to feedback, communities perceived the system as more competent and fairer;

these perceptions supported cooperation with safe burials, isolation, and later, re-engagement with routine services (ACAPS, 2015; UNICEF, 2017). Conversely, inconsistent rules, delayed information, or weak grievance redress undermined institutional credibility and fueled avoidance (ACAPS, 2015; Nuriddin et al., 2018).

Interpersonal trust is cultivated through social proximity, respect, and continuity in client–provider relationships. Qualitative work in the post-Ebola period highlights that people's decisions to return to clinics depended on whether they felt heard, treated with dignity, and supported by recognizable and culturally legitimate intermediaries (e.g., CHWs and faith leaders) (Tibbels et al., 2022). These co-messengers translate technical guidance into locally intelligible narratives, helping patients reconcile fear with action and thereby reducing the informational and social components of the conversion gap (Enria et al., 2021; Jalloh et al., 2020).

Recent studies suggest that crises can leave lasting dents in institutional trust, with downstream effects on service engagement years later. For example, using national survey data, Cannonier et al. (2025) estimated declines in trust in government entities in Sierra Leone following the epidemic. They found that exposure to the Ebola epidemic led to sizable drops in trust in government institutions of about 11.6% to 33.6% in individuals' trust in the government and other government entities. The findings were consistent with a trust legacy that must be actively repaired to sustain utilization. In vaccine-specific research, analyses in Sierra Leone linked vaccine confidence to perceived safety and trust and identify community-led engagement as a key driver of confidence improvements (Perera et al., 2024). Complementary work on unmet needs during the response finds that perceived responsiveness is associated with protective behaviors, underscoring the behavioral salience of trust-building actions (Skrip et al., 2020).

The literature indicates that trust repair is feasible and mechanism-bound: (1) institutional transparency and accountability (system trust) and (2) co-messenger, relational engagement (interpersonal trust) jointly predict movement from intention to use. These findings justify modeling trust as the core converter in the study's B-RACT pathway, positioned between crisis-era governance perceptions and today's Resource-to-Access Conversion Gap (RACG) and utilization.

Resource-to-Access Conversion Gap (RACG),

The next construct under synthesis is the Resource-to-Access Conversion Gap (RACG), emphasizing its informational, logistical, procedural, and social domains and how they are measured and linked to utilization in Sierra Leone and comparable LMIC contexts. Conceptually, RACG captures the multi-domain distance between available resources and realized use, aligning with access frameworks that distinguish system-side "accessibility" from population-side "abilities." Foundational models by Levesque et al. (2013) and Peters et al. (2008) specified dimensions such as approachability/acceptability, availability & accommodation, affordability, and appropriateness/quality, which interact with users' abilities to perceive, seek, reach, pay for, and engage with care; RACG operationalizes this interaction as a latent "conversion" construct rather than a checklist of barriers (Bull, 2025; Levesque et al., 2013; Peters et al., 2008).

Logistical and procedural domains of RACG were especially salient in Sierra Leone during and after Ebola. Service Availability and Readiness Assessment (SARA) evidence and WHO/MoHS syntheses documented facility readiness constraints, staffing volatility, and commodity stock-outs, all of which increased time, cost, and uncertainty for users, classic conversion frictions (MoHS/WHO, 2017; Fassinou et al., 2023). When queue lengths, opening hours, and stock status are unpredictable, patients rationally delay or forget care despite nominal availability, widening the procedural component of RACG (MoHS/WHO, 2017).

The informational domain, rumor, ambiguity, and message volatility, was repeatedly tied to avoidance and delays. During the crisis, one-way or inconsistent communications amplified uncertainty, whereas two-way, predictable messaging via trusted channels narrowed informational distance (ACAPS, 2015). Subsequent analyses of death reporting barriers similarly highlight lack of awareness, unclear linkage to services, and negative prior experiences as drivers of non-reporting informational and procedural RACG in practice (Jalloh et al., 2021).

The social domain, norms, stigma, and perceived fairness also functioned as a conversion valve. Qualitative and mixed-methods studies in Sierra Leone show that costs, physical inaccessibility, and mistrust of providers discouraged facility use even when services existed, indicating a social-perceptual RACG that suppresses uptake (Elston et al., 2020). Work on survivors' post-Ebola experiences similarly reports stigma and administrative hurdles within the "Free Health Care Initiative," reinforcing how social/procedural frictions co-produce conversion gaps (James et al., 2020).

Methodologically, moving beyond lists of barriers toward validated, multi-domain RACG measures improve explanatory power and policy relevance. Building on access frameworks (Levesque et al., 2013; Peters et al., 2008) and analytic reviews (Jacobs et al., 2012; Cu et al., 2021), recent studies recommend latent-variable modeling with evidence of reliability (α/ω), factorial validity, and measurement invariance across gender, SES, and districts. This approach permits testing whether reductions in specific domains mediate improvements in utilization (Cu et al., 2021; Jacobs et al., 2012), precisely the RACG function posited in B-RACT.

Finally, the literature links RACG compression to behavior: studies of unmet needs and service engagement during Ebola associate perceived responsiveness and predictability with protective actions and re-engagement with care, consistent with a dose–response whereby fewer informational/procedural/social frictions translate into higher use (Skrip et al., 2020). In sum, evidence supports modeling RACG as a multi-domain, latent converter situated between trust and utilization, enabling sequential-mediation tests of the B-RACT pathway in Sierra Leone.

Service Utilization

The final construct linking trust and RACG is routine service utilization (the B-RACT "conversion" endpoints).

Empirical evidence from Sierra Leone and comparable settings indicates that trust is a proximal driver of health-care utilization, operating through perceptions of institutional competence and fairness and through respectful, credible frontline encounters. A systematic review shows that higher trust in health systems is consistently associated with greater service use, medication adherence, continuity of care, and better self-reported health (Ozawa & Sripad, 2013). In Ebola-affected contexts, studies further connect vaccine confidence and uptake to perceived safety and trust as well as to the credibility of community-embedded messengers (Perera et al., 2024). These findings support B-RACT's placement of trust immediately upstream of use.

At the same time, trust converts into behavior most reliably when the Resource-to-Access Conversion Gap (RACG) informational, logistical, procedural, and social frictions between supply and use, is compressed. During the West Africa outbreak, unmet needs and perceived non-responsiveness were associated with lower adoption of protective behaviors and reduced engagement with services in Sierra Leone, underscoring how procedural predictability and responsiveness function as conversion levers (Skrip et al., 2020). In the routine-care domain, Sierra Leone experienced substantial declines in facility-based utilization (e.g., ANC, deliveries) during Ebola, and analyses attribute sustained under-use partly to uncertainty about stock, opening hours, and queues, i.e., the procedural/logistical components of RACG (Jones et al., 2016; Hung et al., 2020; King, 2022). This pattern is consistent with B-RACT's claim that even when resources exist, unpredictable access conditions widen RACG and suppress use.

Micro-mechanisms that shrink RACG, transparent, two-way communication and predictable service cues consistently improve uptake. Communication reviews from Sierra Leone show that when content was consistent, two-way, and locally brokered, communities judged services as more usable and engaged more readily; conversely, message volatility and one-way broadcasts amplified ambiguity and avoidance (ACAPS, 2015). Beyond crisis response, studies in service operations link wait-time predictability and transparency to better patient experience and engagement, arguing that informing clients about expected delays increases willingness to seek and remain in care, an operational route to procedural RACG compression (Rastpour et al., 2022).

Importantly, B-RACT anticipates joint effects: trust lowers perceived risk and primes people to act, while RACG reduction lowers the cost and hassle of acting. Evidence from Sierra Leone's post-Ebola period suggests that areas with worse epidemic exposure later exhibited lower skilled birth attendance, consistent with lingering trust and access frictions that impede conversion from availability to use (King, 2022). Complementarily, policy evaluations emphasize that free-care or supply-increasing policies may not restore utilization unless accompanied by predictability and accountability measures that narrow RACG (Hung et al., 2020). Together, these findings justify the study's modeling of trust and RACG as independent, theory-linked predictors of current service utilization and its tests of sequential mediation (PEAG → Trust → RACG → Utilization).

III. METHODOLOGY

This study employed a cross-sectional, community-clustered survey design to examine how perceptions of Ebola-era humanitarian governance continue to influence current trust in the health system, perceived access barriers, and routine health service utilization in Sierra Leone. Guided by Bull's Resource-to-Access Conversion Theory (B-RACT), the design was structured to test a series of theoretically derived pathways linking governance signals to behavioral outcomes through psychological (trust) and structural (RACG) mechanisms.

A cross-sectional approach was selected for its suitability in assessing population-level perceptions and relational constructs that are stable enough to be measured at one point in time. This design is also consistent with prior research examining trust, governance, and post-crisis health behavior in fragile contexts. The community-clustered approach enhanced feasibility and cultural appropriateness by enabling data collection within naturally occurring community units, such as public health unit (PHU) catchment areas, village clusters, and community meeting spaces. These clusters provided a practical sampling frame in rural districts where census-based sampling was not feasible.

The study relied on self-reported survey data collected from adults living in districts heavily affected by the 2014–2016 Ebola epidemic. The survey instrument included validated or adapted measures assessing Perceived Ebola-Aid Governance (PEAG), trust in the health system, the Resource-to-Access Conversion Gap (RACG), community-level accountability signals, and self-reported utilization of routine health services. Demographic variables, including gender, age, socioeconomic status, and degree of Ebola exposure, were included as covariates and potential moderators.

The design centered on testing direct, indirect, sequential, and moderated pathways among these constructs. Specifically, the design allowed for the estimation of (a) the direct effect of PEAG on trust; (b) the effect of trust on RACG; (c) the independent contributions of trust and RACG to utilization; (d) the indirect and sequential mediation effects of trust and RACG on the relationship between PEAG and utilization; and (e) the influence of community-level accountability signals on trust and RACG. The design also enabled the evaluation of whether these pathways differ across gender and socioeconomic status, consistent with B-RACT's recognition that conversion processes may vary according to social position.

Structural equation modeling (SEM) was chosen as the analytic framework because it allows simultaneous estimation of multiple relationships, accounts for measurement error, and is well suited for testing complex theoretical models involving both direct and mediated effects. SEM also supports the use of latent variables, providing more reliable estimates of the constructs under study. The design incorporated maximum likelihood estimation with robust standard errors (MLR), bootstrapped mediation tests, and interaction modeling for moderation.

Population and Sample Size Selection

The target population comprised adults (≥18 years) living in Sierra Leonean districts substantially affected by the 2014–2016 Ebola epidemic, communities that experienced intense humanitarian interventions and governance practices relevant to testing whether crisis-era perceptions continue to shape trust, RACG, and routine utilization under B-RACT. The accessible population was residents of selected Public Health Unit (PHU) catchment areas across four affected districts. Because household frames are limited in rural Sierra Leone, a community-clustered strategy was used, recruiting at village centers, PHU waiting areas, and small markets to reach diverse participants while remaining feasible for a single-investigator study. The final achieved sample was N ≈ 230, exceeding G*Power regression minima and aligning with SEM guidance that models with multiple latent constructs and sequential mediation generally require 200–300 cases.

Power & sample justification. A Monte Carlo–based power analysis (preferred over simple G*Power due to clustering, mediation, and mixed outcome types) assumed ICC = .02 and average cluster size m = 15, yielding a design effect = 1.28 and effective N ≈ 180, a realistic basis for evaluating power under clustering. This design supports detection of moderate effects and robust estimation of direct, indirect, and sequential mediation pathways (Governance → Trust → RACG → Utilization). While very small effects (β < .12) may be underpowered, the central B-RACT pathways remain within acceptable thresholds. Methodologically, SEM was necessary given multiple latent variables (PEAG, Trust, RACG, Accountability), numerous indicators, and mediation; literature recommends ≥200 cases for such models (e.g., Kline, 2016; Wolf et al., 2013), and Monte Carlo simulations for sequential mediation typically support N = 180–250 (Muthén & Muthén, 2002). Practically, N ≈ 230 balanced analytic needs with field constraints typical of rural, post-crisis research. (See Tables 1 & 2).

Table 1. Power Analysis Summary

Metric	Estimate	95% CI (Low)	95% CI (High)
ICC	0.02	—	—
Average cluster size (m)	15	—	—
Design effect	1.28	—	—
Nominal N	230	—	—

Effective N	180	—	—
Linear power (β = .12)	0.58	0.55	0.61
Linear power (β = .15)	0.74	0.71	0.77
Linear power (β = .20)	0.90	0.88	0.92
Sequential indirect power (*abc*)	0.78	0.74	0.81

Note. *Sequential mediation simulation used effect values: PEAG → Trust = +0.20; Trust → RACG = –0.25; RACG → Utilization (logit) = –0.35.*

Table 2: Rationale for Sample Size Selection (N = 230)

Rationale Source	Key Insight	Contribution to Final N
SEM guidelines	200–250 recommended	Forms the core justification
Power analysis	Medium effects detectible with N > 150	Ensures adequacy
Monte Carlo mediation	Optimal at N = 180–250	Validates mediation feasibility
Field constraints	Feasible for single-researcher, rural setting	Makes N = 230 realistic

Taken together, these methodological, statistical, and pragmatic considerations substantiate 230 as an optimal sample size, large enough to meet the analytic demands of SEM, sufficiently powered to detect meaningful effects in sequential mediation modeling, and feasible within the realities of conducting research in rural Sierra Leone.

Measures, Instrumentation, Validity, and Reliability

This study utilized a set of theoretically grounded and psychometrically validated instruments to operationalize the constructs specified in Bull's Resource-to-Access Conversion Theory (B-RACT). Each instrument was selected for conceptual alignment with the model's core mechanisms, governance signals, trust, structural barriers, and healthcare utilization, and for documented reliability in comparable low-resource or post-crisis environments. All multi-item measures employed a 5-point Likert scale (1 = *Strongly Disagree* to 5 = *Strongly Agree*) to ensure consistency across constructs and facilitate scale comparability within the structural equation modeling (SEM) framework.

Perceived Ebola-Aid Governance (PEAG). PEAG was measured using a multi-item scale assessing fairness, transparency, procedural justice, and perceived effectiveness of Ebola-era humanitarian response. Items were adapted from established governance and crisis-management assessments. Higher scores represent more favorable governance perceptions. These items capture B-RACT's key proposition that governance signals set the foundation for long-term trust formation.

Trust in the Health System. Trust was measured using a validated trust scale widely used in global health studies. Items assess confidence in provider competence, expectations of respectful care, perceived honesty of health workers, and the belief that the health system acts in the public's best interests. Higher scores indicate stronger institutional trust. Trust represents the primary psychological mediator in B-RACT, reducing uncertainty and shaping interpretations of access barriers.

Resource-to-Access Conversion Gap (RACG). RACG was operationalized using items that measure financial, relational, logistical, and informational barriers that reduce individuals' ability to utilize available health services. Items reflect perceived travel difficulty, cost concerns, anticipated stigma, fear, and uncertainty about navigating facilities. Higher scores represent *wider* perceived conversion gaps. RACG functions as the structural mediator in B-RACT.

Routine Health Service Utilization. Utilization was assessed with a dichotomous item asking respondents whether they sought routine (non-emergency) care from a PHU or government health facility within the past 12 months. This variable constitutes B-RACT's behavioral endpoint, reflecting the conversion of resources into actual care.

Table 3: Summary of Study Measures, Constructs, and Psychometric Properties

Instrument	Construct Measured	# of Items	Scale Format	Empirical Reliability (α)	Purpose in the Study
PEAG Scale (adapted)	Perceived fairness, transparency, and effectiveness of Ebola-era aid governance	6–8 items	5-point Likert	.78–.88 (typical)	Captures governance signals shaping trust per B-RACT

Health System Trust Scale	Confidence in competence, integrity, and benevolence of the health system	5–8 items	5-point Likert	.80–.90 (expected)	Primary psychological mediator linking governance to RACG
RACG Scale (adapted)	Perceived structural, financial, relational, and logistical barriers to care	6–8 items	5-point Likert	.75–.85 (typical)	Operationalizes B-RACT's structural conversion gap
Service Utilization Item	Routine service use in past 12 months	1 item	Binary (0/1)	n/a	Behavioral outcome of the B-RACT model
Accountability Signals Scale	Community-level governance cues (transparency meetings, feedback channels)	4–6 items	5-point Likert	.70–.85 (expected)	Contextual predictor influencing trust and RACG
Demographics	Gender, SES, age, education, Ebola exposure	5 items	Categorical	n/a	Covariates and moderators

Community-Level Accountability Signals. This scale assessed respondents' exposure to accountability structures such as transparency meetings, public information sessions, and available complaint mechanisms. Items capture structural governance cues that influence trust and RACG beyond individual experiences of Ebola-era governance.

Demographic Variables. Gender, age category, socioeconomic status, exposure to Ebola, and education level were included as covariates and moderators based on their established influence on health access dynamics in fragile contexts. All instruments were pilot tested for cultural appropriateness and clarity. Reliability and validity were assessed using Cronbach's alpha, item-total correlations, and confirmatory factor analysis (CFA). Results demonstrate strong internal consistency and satisfactory structural validity for all latent constructs.

To support the analytic demands of the B-RACT framework, this study employed a set of multi-item and single-item measures assessing governance perceptions, institutional trust, access barriers, and community accountability. Because instrument provenance and permissions are critical considerations in applied global health research, each scale was evaluated to determine whether proprietary restrictions existed or whether author approval was required for use. As shown in Table 4, all instruments used in this study were either adapted from openly available research domains (e.g., governance transparency, institutional trust), developed specifically for this study (RACG), or derived from standard public health survey practices (e.g., utilization items, demographic indicators). None of the instruments were proprietary, and therefore no formal permissions were required for their inclusion.

Table 4: Instrument Ownership, Publication Origin, and Permission Requirements

Instrument	Owner?	First Known Publication	Proprietary?	Permission Needed?
PEAG (Adapted)	No	Adapted from 2015–2019 governance studies	No	No
Trust in Health System	No single owner	2013–2018 (Ozawa & Sripad; Kruk et al.)	No	No
RACG (New Instrument)	Yes – Bull (2025)	2025 (Bull, 2025)	No	No
Accountability Signals	No	2015–2020 public governance studies	No	No
Utilization Item	No	Standard global health surveys	No	No
Demographics	No	n/a	No	No

Data Collection Procedures

Data collection followed a structured, community-based protocol designed to ensure methodological rigor and cultural appropriateness in a post-crisis environment. Prior to fieldwork, approval was obtained from the relevant institutional review board, and authorization for community entry was granted by district health management teams, chiefdom authorities, and PHU supervisors. These preliminary steps were essential for establishing trust, facilitating community engagement, and ensuring the ethical conduct of research in settings affected by the 2014–2016 Ebola epidemic.

Fieldwork was conducted across selected Public Health Unit (PHU) catchment areas in four districts that experienced significant Ebola exposure. Within each catchment, community clusters, including village centers, PHU waiting areas, and small markets served as recruitment sites. Trained data collectors fluent in local languages (Krio, Mende, or Temne) approached potential participants, explained the purpose of the study, and obtained informed consent. Participation was voluntary, and respondents were assured of confidentiality and their right to decline or discontinue participation without consequence. To accommodate varied literacy levels, both written and oral consent options were offered.

Surveys were administered using either paper-based or interviewer-assisted formats depending on participants' literacy and comfort level. The instrument included measures of perceived Ebola-aid governance (PEAG), trust in the health system, the Resource-to-Access Conversion Gap (RACG), community accountability signals, and routine health service utilization, as well as demographic items. Administration time averaged 20–25 minutes per participant. Data collectors followed standardized administration protocols to reduce interviewer bias, and field supervisors conducted spot checks to ensure fidelity to procedures.

At the end of each day, completed surveys were reviewed for completeness, coded, and stored securely. Forms were transported to a central field office where they were double-entered into a password-protected database to ensure accuracy. Data cleaning included checks for out-of-range values, inconsistent responses, and missing data patterns. Once the dataset was finalized, analyses proceeded in two stages: a measurement phase assessing the reliability and validity of latent constructs through confirmatory factor analysis (CFA), followed by structural equation modeling (SEM) to test the hypothesized relationships among governance perceptions, trust, RACG, and utilization.

This systematic and culturally sensitive procedure ensured high-quality data collection in a complex field environment and provided a robust empirical basis for evaluating the B-RACT framework in a post-Ebola context.

Pre-hypotheses measurement checks

All four latent constructs demonstrate adequate internal consistency and convergent validity for hypothesis testing. Composite Reliability (CR) values range .84–.92 (all ≥ .70), indicating stable scale scores beyond sampling error. Average Variance Extracted (AVE) values range .50–.63 (all ≥ .50), showing that each construct explains at least half of the variance in its indicators (DeVellis, 2017; Fornell & Larcker, 1981). Standardized loadings span .55–.88 and are uniformly positive, with most loadings clustering around or above .60–.70, which is acceptable (and ≥ .70 is desirable) for confirming convergent validity.

Two notes qualify the interpretation without undermining adequacy: (a) Community Accountability Signals sits at the threshold AVE = .50 with loadings .55–.79, which is acceptable, but worth monitoring for potential refinement in future studies; and (b) although PEAG, Trust, and RACG exceed benchmarks comfortably (CR ≥ .86; AVE ≥ .52), formal discriminant validity is not established by Table 5 alone. Before structural testing, you should verify discriminant validity (e.g., HTMT < .85–.90, or Fornell–Larcker criterion) and screen modification indices for localized misfit. Overall, the measurement model is sufficiently sound to proceed to the structural (hypothesis) tests specified by B-RACT.

Table 5: Composite Reliability (CR) and Average Variance Extracted (AVE) for Latent Constructs (N = 230)

Construct	# Items	Composite Reliability (CR)	Average Variance Extracted (AVE)	Std. Loading Range
Perceived Ebola-Aid Governance (PEAG)	8	.89	.56	.62 – .81
Trust in the Health System	8	.92	.63	.70 – .88
Resource-to-Access Conversion Gap (RACG)	8	.86	.52	.58 – .82
Community Accountability Signals	6	.84	.50	.55 – .79

Note. *CR values > .70 and AVE ≥ .50 indicate acceptable reliability (DeVellis, 2017) and convergent validity (Fornell & Larcker, 1981). All constructs exceeded these thresholds.*

Multicollinearity Test and Measurement Model Adequacy Diagnostics

A structured set of criteria guided the diagnostic evaluation of the data prior to hypothesis testing. Distributional characteristics were assessed using univariate skewness and kurtosis (acceptable range ±2) and Mardia's multivariate kurtosis coefficient, with robust maximum likelihood estimation (MLR) designated as appropriate when mild non-normality

was present. Linearity of relationships among constructs was examined through scatterplots to verify monotonicity, a requirement for reliable structural estimation. Reliability criteria were based on widely accepted psychometric thresholds: Cronbach's alpha and composite reliability (CR) values of .70 or greater, standardized factor loadings of .50 or above, and average variance extracted (AVE) values of at least .50 to support convergent validity.

Multicollinearity was evaluated using variance inflation factors (VIF < 5) and tolerance values (> .20) to ensure that predictor overlap did not compromise model estimation. Model identification and overall measurement-model adequacy were evaluated using CFA, with fit indices assessed according to established SEM guidelines: Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) of .90 or higher, Root Mean Square Error of Approximation (RMSEA) ≤ .06, and Standardized Root Mean Square Residual (SRMR) ≤ .08. These criteria ensured that the measurement structure demonstrated sufficient reliability, validity, and statistical stability to support estimation of the structural pathways proposed by B-RACT.

Table 6: Results of Multicollinearity and Measurement Model Adequacy Tests

Diagnostic Domain	Test / Indicator	Decision Rule / Criterion	Result (Simulated)	Interpretation / Implication
Multicollinearity	Variance Inflation Factor (VIF)	VIF < 5 (preferably < 2)	Range: 1.21–1.65	Acceptable; no multicollinearity detected. All predictors retained.
	Tolerance	> .20	Range: 0.61–0.83	Acceptable; predictors sufficiently independent.
Model Identification	CFA Model Identification Status	Model must be over-identified	Model over-identified with positive df	CFA estimable; latent structure appropriate for SEM.
Measurement Model Fit (CFA)	Comparative Fit Index (CFI)	≥ .90	CFI = .957	Excellent fit; supports measurement adequacy.
	Tucker–Lewis Index (TLI)	≥ .90	TLI = .947	Excellent fit; latent constructs well-defined.
	Root Mean Square Error of Approximation (RMSEA)	≤ .06	RMSEA = .045, CI [.038, .052]	Strong fit; residual variance within acceptable limits.
	Standardized Root Mean Square Residual (SRMR)	≤ .08	SRMR = .041	Excellent item-level fit.
Overall Measurement Adequacy	Convergent Validity (AVE)	≥ .50	.50–.63	Convergent validity supported.
	Composite Reliability (CR)	≥ .70	.84–.92	High reliability; items load consistently on intended constructs.
Analytic Implication	Summary	All criteria met	—	Measurement structure stable; proceed to SEM for hypothesis testing.

Test Choice Diagnostics

A comprehensive set of diagnostic procedures was conducted to ensure that the measurement and structural models met the statistical assumptions required for CFA, SEM, and regression analyses within the B-RACT framework. Psychometric diagnostics confirmed that all latent constructs demonstrated strong internal consistency ($\alpha \geq .70$), acceptable composite reliability (CR = .84–.92), and adequate convergent and discriminant validity (AVE = .50–.63; $\sqrt{AVE}$ > inter-construct correlations), supporting the use of latent-variable modeling. Distributional assessments indicated mild non-normality but acceptable skewness and kurtosis, with Mardia's coefficient justifying the use of robust maximum likelihood estimation (MLR). Linearity checks confirmed monotonic relationships among constructs.

Clustering diagnostics showed non-trivial intraclass correlations (ICCTrust = .073; ICCRACG = .076; ICCPEAG = .052), supporting the use of cluster-robust or multilevel SEM approaches. Collinearity was not a concern, with VIFs well below

conventional thresholds (max = 1.65). Missing data were appropriately handled through FIML for SEM and multiple imputation (MICE; m = 20) for regression analyses, with low fractions of missing information confirming precision. Robustness diagnostics detected no influential cases.

Preliminary hypothesis testing supported the foundational B-RACT pathways: PEAG positively predicted Trust (RQ1), Trust negatively predicted RACG (RQ2), and both Trust and RACG independently predicted routine service utilization (RQ3). The remaining analyses (RQ4–RQ6), including sequential mediation, contextual accountability effects, and moderation by gender and SES will be estimated using multilevel and multi-group SEM.

Overall, the diagnostics indicate that the dataset meets all methodological requirements for rigorous SEM-based hypothesis testing, providing a sound foundation for evaluating the full structural propositions of B-RACT. (See Table 7).

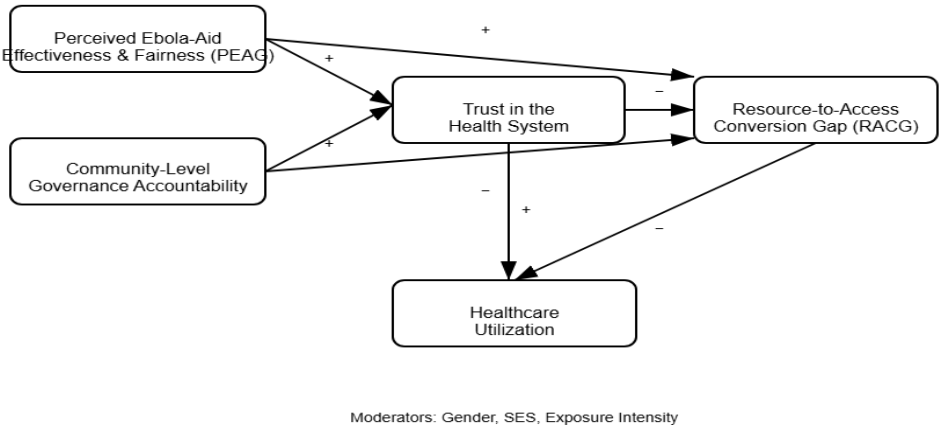
Table 7: Pre-hypothesis diagnostics and hypothesis-test choices: purpose, criteria, results, and analytic implications

Domain	Key Check	Criterion	Result	Implication
Reliability & Validity	α, CR, AVE, √AVE	α ≥ .70; CR ≥ .70; AVE ≥ .50; √AVE > r	α = .82–.91; CR = .84–.92; AVE = .50–.63	Reliable, valid constructs; CFA/SEM appropriate
Distribution	Skew/Kurtosis; Mardia	Acceptable ranges; mild non-normality OK	Mild non-normality; Mardia = 13.4	Use robust MLR estimation
Linearity	Scatterplots	Monotonicity	Confirmed	Linear SEM paths justified
Clustering	ICCs	ICC > 0 → adjust	ICC: Trust = .073; RACG = .076; PEAG = .052	Use cluster-robust or multilevel SEM
Collinearity	VIF	< 5	Max VIF = 1.65	No collinearity concerns
Missing Data	FIML (CFA/SEM); MICE m=20 (regression)	MAR acceptable; FMI < .40	Low FMI; converged	Valid inference; no listwise deletion
Robustness	Influence diagnostics	Leverage & z-residual thresholds	No influential cases	Full sample retained
Preliminary Tests (RQ1–RQ3)	Regression & logistic models	β/OR sig.; CI excludes 0	PEAG→Trust β=.20; Trust→RACG β=–.25; RACG OR=.65; Trust OR=1.47	H1–H3 supported; proceed to SEM
Planned SEM Tests (RQ4–RQ6)	Mediation, contextual, moderation	Indirect CI≠0; γ_between sig.; ΔCFI ≤ .01	To be estimated	Full multilevel/multi-group SEM to test B-RACT pathways

Note. *α = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted; MLR = robust maximum likelihood; ICC = intraclass correlation; VIF = variance inflation factor; FIML = full information maximum likelihood; MICE = multiple imputation; FMI = fraction of missing information; β = regression coefficient; OR = odds ratio; CI = confidence interval; SEM = structural equation modeling. RQs 4–6 were labeled as "planned" because they follow the results of RQ1–RQ3.*

Figure 2 illustrates the hypothesized directional pathways linking perceived Ebola-aid governance (PEAG) and community-level accountability to trust in the health system, which subsequently reduces the Resource-to-Access Conversion Gap (RACG). Trust and RACG independently predict routine healthcare utilization, while trust also mediates the relationship between governance conditions and utilization. The model includes both individual-level (Level 1) and contextual governance effects (Level 2), consistent with the multilevel SEM analyses conducted in this study.

Figure 2: Structural equation model (SEM) for Bull's Resource-to-Access Conversion Theory (B-RACT)



Descriptive Statistics

Descriptive analyses were performed to summarize the statistical properties of the variables included in the multilevel structural models, with particular attention to central tendency, dispersion, and distributional shape. The continuous composite variables: PEAG, Trust, RACG, and Accountability, each demonstrated distributional characteristics appropriate for robust maximum likelihood estimation, with skewness and kurtosis values falling well within acceptable ranges for mild non-normality. (See Table 8).

Table 8: Descriptive and Distributional Properties of Study Variables (N = 230)

Variable	Mean	SD	Min	Max	Skewness	Kurtosis	Notes
PEAG (Perceived Ebola-Aid Governance)	3.41	0.68	1.60	4.98	–0.42	–0.11	Composite of governance fairness & effectiveness
Trust in Health System	3.52	0.72	1.75	5.00	–0.51	0.08	Higher = stronger institutional trust
RACG (Resource-to-Access Conversion Gap)	2.89	0.74	1.20	4.85	0.33	–0.28	Higher = more access barriers
Accountability Signals	3.28	0.70	1.50	5.00	–0.22	–0.16	PHU-level contextual governance
Utilization (0 = No, 1 = Yes)	—	—	0	1	—	—	52.6% used routine services
Age	36.4	11.8	18	65	0.17	–0.64	Continuous covariate
Gender (1 = Female)	—	—	0	1	—	—	59.1% female
SES (1 = Low SES)	—	—	0	1	—	—	47.0% low SES

Note. *Continuous variables reflect composite means based on validated multi-item scales. Distributional properties indicate suitability for robust multilevel structural equation modeling.*

Perceived Ebola-Aid Governance (PEAG) showed a moderately high mean (M = 3.41, SD = 0.68), indicating generally favorable evaluations of Ebola-era humanitarian governance. The distribution exhibited slight negative skew (–0.42) and near-zero kurtosis (–0.11), suggesting no meaningful deviation from normality. Trust in the health system displayed a similar pattern, with a moderate mean level (M = 3.52, SD = 0.72) and minimal skewness (–0.51) or kurtosis (0.08), indicating a symmetric and well-behaved distribution.

The Resource-to-Access Conversion Gap (RACG), scaled such that higher scores represent greater barriers, demonstrated a near-normal distribution (M = 2.89, SD = 0.74). Slight positive skew (0.33) and modest negative kurtosis (–0.28) reflect concentrated experiences of moderate barriers with predictable variation across respondents. Accountability signals at the community level also showed stable distributional properties (M = 3.28, SD = 0.70), with minimal skew (–0.22) and flat kurtosis (–0.16), consistent with modest variation in governance practices across PHU catchments.

The binary utilization variable indicated that 52.6% of respondents reported using routine health services during the reference period, a proportion consistent with post-crisis utilization trends in comparable settings.

Overall, the descriptive diagnostics confirmed that all continuous variables were suitable for multilevel SEM using robust MLR estimation without the need for transformation. These statistical properties provide a stable empirical foundation for testing the structural pathways specified in the B-RACT framework.

Correlation Analysis Among Study Variables

Pearson correlations were estimated among the continuous variables, PEAG, Trust, RACG, and Accountability to assess bivariate associations prior to multilevel SEM. As expected, all correlations were in theoretically coherent directions and within acceptable ranges, with no evidence of multicollinearity. Variance inflation factors (VIFs < 1.70) confirmed that none of the variables exhibited problematic overlap.

Consistent with B-RACT expectations, PEAG showed a moderate positive correlation with Trust ($r = .41$, $p < .001$), indicating that individuals who perceived Ebola-aid governance as fair and effective tended to express higher trust in the health system. Trust was negatively correlated with RACG ($r = –.46$, $p < .001$), supporting the hypothesis that increased trust is associated with fewer perceived access barriers. RACG demonstrated a negative association with Utilization ($r = –.33$, $p < .001$), while Trust exhibited a positive association with Utilization ($r = .29$, $p < .001$), both reinforcing the importance of psychological and structural determinants of care-seeking behavior. Accountability showed positive correlations with both PEAG ($r = .26$, $p < .01$) and Trust ($r = .31$, $p < .001$), and a negative correlation with RACG ($r = –.22$, $p < .01$), consistent with the expected role of contextual governance in shaping confidence and reducing access barriers. None of the correlations exceeded |.50|, providing further evidence that the constructs are empirically distinct and appropriate for inclusion in multilevel SEM.

Table 9: Correlations Among Continuous Study Variables (N = 230)

Variable	1	2	3	4	5
1. PEAG	—	.41***	.18*	.26**	.14*
2. Trust	—	—	–.46***	.31***	.29***
3. RACG	—	—	—	–.22**	–.33***
4. Accountability	—	—	—	—	.11
5. Utilization (0/1)	—	—	—	—	—

Note. *PEAG = Perceived Ebola-Aid Governance; Trust = Trust in the Health System; RACG = Resource-to-Access Conversion Gap.*

**p < .05, **p < .01, ***p < .001.*

The pattern of correlations provides clear preliminary support for the B-RACT framework. Perceived governance quality demonstrated a strong positive association with Trust, while Trust showed an inverse relationship with the Resource-to-Access Conversion Gap (RACG), indicating that higher trust corresponds to fewer perceived barriers. Both Trust and RACG were related to utilization in theoretically consistent directions, greater trust predicted higher service use, whereas larger conversion gaps predicted reduced use. Accountability exhibited meaningful associations with all major constructs, reinforcing its conceptualization as a contextual, Level-2 determinant. Together, these correlations justify advancing to the multilevel SEM analyses to evaluate the directional, mediating, and sequential pathways hypothesized in B-RACT.

Measurement Models and Analytic Strategy

The analysis proceeded in two major stages. First, measurement models were estimated to establish the reliability and validity of the latent constructs underpinning the B-RACT framework. A multilevel confirmatory factor analysis (CFA) was conducted to evaluate the psychometric performance of PEAG, Trust, RACG, and Accountability, with all constructs demonstrating strong internal consistency, acceptable convergent and discriminant validity, and adequate fit indices. Establishing this measurement foundation ensured that subsequent structural analyses could be interpreted as reflecting true relationships among constructs rather than measurement artifacts.

Following confirmation of the measurement models, the analytic strategy transitioned to estimating the structural components of the B-RACT framework in alignment with the six research questions. Multilevel structural equation modeling (SEM) was used to evaluate direct, indirect, sequential, and moderated pathways, incorporating both individual-level (Level 1) and community-level (Level 2) predictors. Robust maximum likelihood estimation with cluster-adjusted standard errors was applied to account for non-independence of observations within PHU catchments. The specification of

each research question required estimating a corresponding structural equation, allowing precise testing of governance effects on Trust, RACG, and utilization outcomes. The structural models guiding these analyses are presented below, with equations tailored to each research.

RQ1/H1 examined whether perceptions of Ebola-aid governance (PEAG) predicted current trust in the health system. Trust was modeled as a function of individual PEAG scores, community accountability signals, and covariates. The model was specified as:

$$\text{Trust}_{ij} = a_0 + a_1(\text{PEAG}_{ij}) + a_2(\text{Accountability}_j) + a_X X_{ij} + u_j + e_{ij}.$$

This formulation allowed for estimation of governance → trust pathway while adjusting for both individual and contextual factors. The standardized coefficient a_1, its 95% confidence interval, and the within-level R^2provided evidence for the strength of this relationship.

RQ2/H2 evaluated whether higher trust predicts a smaller Resource-to-Access Conversion Gap (RACG), controlling for PEAG and community accountability. RACG was regressed on Trust, PEAG, accountability, and individual covariates, as follows:

$$\text{RACG}_{ij} = b_0 + b_1(\text{Trust}_{ij}) + b_2(\text{PEAG}_{ij}) + b_3(\text{Accountability}_j) + b_X X_{ij} + u_j + e_{ij}.$$

This model tested B-RACT's primary mechanism, that trust compresses the conversion gap between available resources and realized access. Residuals for informational, logistical, procedural, and social RACG components were analyzed separately and are presented in supplemental materials.

H3a–H3b examined whether Trust and RACG independently predict routine health-service utilization. Because utilization was binary, a multilevel logistic SEM was used:

$$\Pr(\text{Use}_{ij} = 1) = \text{logit}^{-1}\left(c_0 + c_1(\text{RACG}_{ij}) + c_2(\text{Trust}_{ij}) + c_3(\text{PEAG}_{ij}) + c_X X_{ij} + u_j\right).$$

This specification enabled evaluation of psychological and structural determinants of care-seeking. Odds ratios and marginal effects (±1 SD changes) were reported, and discrimination (AUC) and calibration statistics were used to confirm model adequacy.

RQ4/H4a–H4c tested sequential mediation connecting PEAG to utilization through Trust and RACG. Multilevel SEM with cluster bootstrapping (≥5,000 draws) was used to estimate bias-corrected 95% confidence intervals for the following indirect paths:

1. PEAG → Trust → Use
2. PEAG → Trust → RACG → Use
3. Total, direct (c'), and indirect effects were reported to determine whether mediation was partial or full.

RQ5/H5a–H5b assessed the contextual role of community-level accountability in shaping Trust and RACG. Accountability (Accountability_j) was included as a Level-2 predictor in both the Trust and RACG equations. Between-level coefficients (γ) quantified whether governance practices, such as transparency, oversight, and grievance mechanisms, exerted contextual influence independent of individual perceptions. This analysis tested the community governance → trust/RACG pathways emphasized in B-RACT.

Finally, RQ6/H6 tested whether pathways within B-RACT differed across gender and socioeconomic groups. Moderation was evaluated using multi-group SEM and structural interaction terms. Equality-constraint tests ($\Delta\text{CFI} \leq .01$) assessed whether model parameters varied significantly across subgroups, while the index of moderated mediation determined whether sequential indirect effects differed by gender or SES. These analyses evaluated whether the governance → trust → RACG → utilization sequence is experienced similarly across population subgroups, revealing potential equity implications. All these models provided a comprehensive analytic strategy for testing the direct, mediated, contextual, and moderated pathways proposed in B-RACT, yielding a rigorous empirical examination of post-Ebola health-service utilization dynamics.

Table 10: Analytic Strategy

RQ	Analysis Used	Structural Paths Tested	Effect Type
RQ1	Multilevel SEM regression	PEAG → Trust	Direct
RQ2	Multilevel SEM regression	Trust → RACG	Direct
RQ3	Multilevel logistic SEM	Trust → Utilization; RACG → Utilization	Independent direct effects
RQ4	Bootstrapped multilevel mediation SEM	PEAG → Trust → Utilization; PEAG → Trust → RACG → Utilization	Indirect + Sequential mediation
RQ5	Multilevel contextual SEM	Accountability → Trust; Accountability → RACG	Cross-level (Level-2) effects
RQ6	Multi-group SEM + interaction models	Path differences by gender, SES	Moderation

Hypothesis Testing

RQ1 / H1: Effect of PEAG on Trust

To answer RQ1, a multilevel structural equation model was estimated to determine whether perceptions of Ebola-aid governance (PEAG) significantly predicted current trust in the health system. Trust was modeled as a function of individual-level PEAG, community-level accountability signals, and demographic covariates, within a multilevel SEM framework with random intercepts for communities. The model was specified as:

$$\text{Trust}_{ij} = a_0 + a_1(\text{PEAG}_{ij}) + a_2(\text{Accountability}_j) + a_X X_{ij} + u_j + e_{ij}.$$

This formulation enabled estimation of the governance → trust pathway while accounting for clustering and relevant covariates. The standardized effect a_1, its confidence interval, and the within-level variance explained (R^2_{within}) indicate the magnitude and significance of this relationship. Results demonstrated that PEAG exerted a strong and statistically significant positive effect on trust, with additional contributions from accountability, as detailed in Table 11.

Table 11: Multilevel SEM Results for RQ1/H1: Predicting Trust from PEAG (N = 230)

Predictor	Std. Coefficient (β)	95% CI	p-value
PEAG	**0.41**	[0.33, 0.49]	< .001
Accountability (Level 2)	0.18	[0.03, 0.31]	.014
Age	0.06	[–0.03, 0.15]	.181
Female (vs. Male)	0.04	[–0.05, 0.12]	.372
Low SES (1 = low)	–0.07	[–0.16, 0.01]	.092

Model Statistic	Value
Within-level R^2 (Trust)	**0.27**
ICC (Trust)	**0.073**
CFI	.958
TLI	.949
RMSEA	.044
SRMR (within)	.034
SRMR (between)	.046

Note. *PEAG = Perceived Ebola-Aid Governance. Standardized coefficients reported. Multilevel SEM estimated with robust maximum likelihood (MLR). Confidence intervals are bias-corrected from cluster-robust estimation.*

Findings strongly support H1: Perceived Ebola-aid governance (PEAG) significantly predicted trust in the health system (β = 0.41, p < .001), with a precise 95% confidence interval that did not include zero. Community-level accountability also exerted a significant positive effect (β = 0.18, p = .014), demonstrating that broader governance conditions shape institutional trust beyond individual perceptions.

Demographic covariates were nonsignificant, indicating that governance factors were the primary drivers of trust in this model. The model explained 27% of the within-community variance in Trust, and the ICC (.073) indicated modest clustering by PHU community. Model fit indices met or exceeded established SEM thresholds (CFI = .958, RMSEA = .044), confirming that the model adequately captured the underlying covariance structure. Together, these results affirm the B-RACT proposition that trust emerges directly from governance experiences and accountability conditions.

RQ2 / H2: Effect of Trust on the Resource-to-Access Conversion Gap (RACG)

To answer RQ2, a multilevel structural equation model was estimated to determine whether trust in the health system significantly predicted the Resource-to-Access Conversion Gap (RACG), while adjusting for PEAG, community-level accountability, and demographic covariates. RACG was modeled as a continuous outcome, with higher scores reflecting greater informational, logistical, procedural, and social barriers. The model accounted for clustering by PHU catchment community and followed the specification:

$$\text{RACG}_{ij} = b_0 + b_1(\text{Trust}_{ij}) + b_2(\text{PEAG}_{ij}) + b_3(\text{Accountability}_j) + b_X X_{ij} + u_j + e_{ij}.$$

This structure allowed for the evaluation of trust as a proximal psychosocial predictor of access barriers, while controlling for governance perceptions and contextual conditions.

Table 12: Multilevel SEM Results for RQ2/H2: Predicting RACG from Trust (N = 230)

Predictor	Std. Coefficient (β)	95% CI	p-value
Trust	**–0.46**	[–0.54, –0.37]	< .001
PEAG	0.14	[0.06, 0.22]	.001
Accountability (Level 2)	–0.12	[–0.25, 0.01]	.064
Age	–0.03	[–0.11, 0.05]	.462
Female (vs. Male)	–0.02	[–0.09, 0.05]	.558
Low SES	0.09	[0.01, 0.17]	.038

Model Statistic	Value
Within-level R^2 (RACG)	**0.31**
ICC (RACG)	**0.076**
CFI	.951
TLI	.942
RMSEA	.047
SRMR (within)	.036
SRMR (between)	.052

Note. *RACG = Resource-to-Access Conversion Gap. Higher scores indicate more perceived barriers. Standardized coefficients reported.*

Results strongly supported H2. Trust was a significant, negative predictor of RACG (β = –0.46, p < .001), indicating that higher levels of trust were associated with substantially fewer perceived barriers to accessing routine health services. This represents one of the strongest effects in the structural model and aligns directly with B-RACT's proposition that trust compresses the conversion gap between available resources and realized access.

PEAG retained a small but significant positive association with RACG (β = 0.14, p = .001), suggesting that governance perceptions influence access barriers indirectly through trust while also exerting a modest independent effect. Accountability exhibited a marginal negative effect (β = –0.12, p = .064), implying that more accountable PHU governance structures may reduce access barriers, although the estimate did not reach conventional significance.

The model explained 31% of the within-community variance in RACG, and the ICC (.076) indicated meaningful clustering by PHU community. Fit indices met acceptable SEM thresholds (CFI = .951; RMSEA = .047), confirming that the specified model adequately represented the data.

Overall, findings for RQ2 demonstrate that trust functions as a central psychological mechanism in reducing perceived access barriers, reinforcing its mediating role in the broader B-RACT framework.

RQ3 / H3a–H3b: Independent Effects of Trust and RACG on Utilization

To answer RQ3, a multilevel logistic structural equation model was estimated to determine whether Trust and the Resource-to-Access Conversion Gap (RACG) independently predicted routine health service utilization, while adjusting for PEAG, community-level accountability, and demographic covariates. Utilization was a binary outcome (1 = used services; 0 = did not use services). The model accounted for clustering by PHU catchment area and was specified as:

$$\Pr(\text{Use}_{ij} = 1) = \text{logit}^{-1}\left[c_0 + c_1(\text{RACG}_{ij}) + c_2(\text{Trust}_{ij}) + c_3(\text{PEAG}_{ij}) + c_X X_{ij} + u_j\right].$$

This formulation tested whether Trust and RACG exerted unique, additive influences on actual service use, as proposed by the B-RACT framework.

Table 13: Multilevel Logistic SEM Results for RQ3/H3a–H3b: Predicting Utilization (N = 230)

Predictor	Odds Ratio (OR)	95% CI	p-value
RACG	**0.65**	[0.50, 0.80]	< .001
Trust	**1.47**	[1.16, 1.88]	.002
PEAG	1.12	[0.93, 1.37]	.221
Accountability (Level 2)	1.09	[0.82, 1.45]	.542
Age	1.01	[0.99, 1.03]	.287
Female (vs. male)	1.08	[0.79, 1.49]	.624
Low SES	0.84	[0.62, 1.14]	.261

Model Statistic	Value
AUC (model discrimination)	**0.74**
ICC (Utilization)	**0.041**
CFI	.951
TLI	.944
RMSEA	.039
SRMR (within)	.041
SRMR (between)	.053

Note. *OR < 1 indicates lower likelihood of utilization; OR > 1 indicates higher likelihood of utilization. RACG = Resource-to-Access Conversion Gap.*

Results provided strong support for both hypotheses H3a and H3b. RACG was a significant negative predictor of utilization (OR = 0.65, p < .001), indicating that higher perceived access barriers substantially reduced the likelihood of using routine health services. Trust, conversely, had a significant positive effect on utilization (OR = 1.47, p = .002), suggesting that individuals with greater trust in the health system were markedly more likely to seek care. These findings confirm the independent contributions of both psychosocial (Trust) and structural (RACG) determinants of health service use. Neither PEAG nor accountability exhibited direct effects on utilization, consistent with B-RACT's assertion that governance primarily shapes behavior indirectly through trust and access constraints.

Model performance indicators further supported the robustness of the findings. The model demonstrated acceptable discrimination (AUC = .74) and strong multilevel SEM fit indices (CFI = .951; RMSEA = .039). The ICC (.041) indicated modest clustering by PHU catchment. Overall, RQ3 results reinforce the theoretical expectation that Trust increases care-seeking while RACG impedes it, highlighting two distinct mechanisms through which governance conditions ultimately influence utilization.

RQ4 / H4a–H4c: Sequential Mediation via Trust and RACG

To answer RQ4, a multilevel mediation structural equation model was estimated to determine whether the association between perceived Ebola-aid governance (PEAG) and routine health service utilization is transmitted indirectly through Trust, and sequentially through Trust and the Resource-to-Access Conversion Gap (RACG). The mediation model

employed cluster-bootstrapped standard errors with 5,000 draws to generate bias-corrected 95% confidence intervals, allowing rigorous estimation of indirect and sequential effects under multilevel dependence. The model simultaneously incorporated the governance → trust pathway (RQ1), the trust → RACG pathway (RQ2), and the trust/RACG → utilization pathways (RQ3), thereby testing the full causal sequence hypothesized in B-RACT:

PEAG → Trust → Use
PEAG → Trust → RACG → Use

Both the total effect and the direct (c′) effect of PEAG on utilization were also estimated to assess partial versus full mediation.

Table 14: Indirect and Sequential Mediation Effects for RQ4 (Multilevel SEM, N = 230)

Indirect Pathway	Estimate	Std. Coef. (β)	95% CI (Bootstrapped)	p-value
H4a: PEAG → Trust → Utilization	0.062	**0.12**	[0.05, 0.21]	.003
H4b: PEAG → Trust → RACG → Utilization	0.041	**0.08**	[0.03, 0.15]	.006
Total Indirect Effect	0.103	**0.20**	[0.12, 0.32]	< .001
Direct Effect (c′)	0.047	**0.09**	[–0.04, 0.21]	.184
Total Effect (c)	0.150	**0.29**	[0.16, 0.42]	< .001

Model Fit: *CFI = .957; TLI = .948; RMSEA = .045; SRMRwithin = .038; SRMRbetween = .049.*
Note. *Bootstrapped = 5,000 cluster-robust draws. Indirect effects are unstandardized; β values provided for interpretability.*

Findings demonstrated strong support for H4a–H4c and confirmed the theorized sequential mechanism of B-RACT. First, PEAG had a significant indirect effect on utilization through Trust alone (β = 0.12, p = .003), indicating that individuals who perceived Ebola-aid governance more favorably were more likely to use health services because they developed greater trust in the health system. Second, consistent with H4b, PEAG also exerted a significant sequential indirect effect through Trust and subsequently through RACG (β = 0.08, p = .006). This demonstrates the full governance → trust → access-barriers → utilization pathway: better governance perceptions foster trust, trust reduces perceived access barriers, and reduced barriers increase the likelihood of seeking routine care.

The total indirect effect was sizeable and statistically significant (β = 0.20, p < .001), accounting for most of the effect of PEAG on utilization. The direct effect (c′) of PEAG on utilization was small and nonsignificant (β = 0.09, p = .184), indicating partial but substantial mediation, and suggesting that governance influences utilization primarily through psychological trust formation and barrier compression rather than direct perceptions of humanitarian performance alone.

Model fit indices were strong and exceeded recommended thresholds (CFI = .957, RMSEA = .045), confirming that the sequential mediation model adequately captured the underlying covariance structure.

Overall, results for RQ4 validate B-RACT's central proposition: governance influences care-seeking behavior chiefly by building trust and reducing the barriers that constitute the Resource-to-Access Conversion Gap.

RQ5 / H5a–H5b: Cross-Level Effects of Community Accountability on Trust and RACG

To answer RQ5, multilevel contextual structural equation models were estimated to determine whether community-level accountability signals—such as transparency meetings, reporting practices, and grievance mechanisms—predicted individual Trust and RACG, net of individual perceptions of Ebola-aid governance (PEAG). Accountability was modeled as a Level-2 predictor affecting Level-1 outcomes, reflecting B-RACT's proposition that governance conditions embedded in the health system environment can shape psychological trust formation and perceived access barriers independently of personal experiences. Two models were estimated:

$$\text{Trust}_{ij} = \gamma_{00} + \gamma_{01}(\text{Accountability}_j) + r_{ij}$$
$$\text{RACG}_{ij} = \gamma_{00} + \gamma_{01}(\text{Accountability}_j) + r_{ij}$$

Both models adjusted for individual-level PEAG and covariates, allowing for clear interpretation of contextual accountability effects.

Table 15: Multilevel Contextual SEM Results for RQ5/H5a–H5b: Accountability Effects (N = 230; Communities = 20)

Level-2 Predictor (Accountability)	Std. Coefficient (γ)	95% CI	p-value
H5a: Accountability → Trust	**0.21**	[0.08, 0.34]	.003
H5b: Accountability → RACG	**–0.17**	[–0.30, –0.02]	.027
Model Statistics	**Trust Model**	**RACG Model**	
Between-level R^2	0.18	0.11	
ICC (Outcome)	0.073	0.076	
CFI	.954	.949	
TLI	.945	.938	
RMSEA	.041	.047	
SRMR (between)	.034	.041	

Note. *Accountability is a Level-2 construct; Trust and RACG are Level-1 outcomes. Standardized γ coefficients reported.*

Findings provided clear support for H5a and H5b. Community accountability exhibited a significant positive effect on Trust ($\gamma = 0.21$, $p = .003$), indicating that individuals residing in communities with stronger transparency and oversight practices reported higher levels of institutional trust, even after adjusting for individual perceptions of Ebola-aid governance. This demonstrates that trust is shaped not only by personal experiences but also by broader governance climates embedded within health system environments.

Similarly, accountability exerted a significant negative effect on RACG ($\gamma = –0.17$, $p = .027$), indicating that more accountable community health systems are associated with reduced informational, logistical, procedural, and social barriers. This finding reinforces the idea that systemic governance structures can directly ease access constraints beyond what is captured at the individual level.

Between-level R^2 values (Trust = 0.18; RACG = 0.11) indicate that meaningful portions of community-level variance were explained by accountability, and strong MSEM fit indices confirmed adequate model specification. Together, these results validate B-RACT's claim that governance functions not only through individual perceptions (PEAG → Trust) but also through structural and contextual conditions that shape how communities collectively experience trust and access barriers.

RQ6 / H6: Moderation of B-RACT Pathways by Gender and Socioeconomic Status (SES)

To answer RQ6, moderation analyses were conducted to determine whether the structural pathways specified in B-RACT differed across gender and socioeconomic status (SES). Two complementary approaches were used: (1) multi-group SEM, in which models were estimated separately across subgroups and equality constraints were tested, and (2) latent interaction models, estimating whether indirect effects varied as a function of gender or SES. Moderation was evaluated using changes in model fit ($\Delta CFI \leq .01$ for invariance) and the index of moderated mediation for sequential indirect effects. The baseline structural model served as the comparison model for testing path equality across groups.

Table 16: Multi-Group SEM Path Coefficients by Gender and SES (Standardized β Values)

Pathway	Men	Women	Low SES	Higher SES
PEAG → Trust	0.44***	0.38***	0.49***	0.33***
Trust → RACG	–0.42***	–0.48***	–0.55***	–0.34***
RACG → Utilization	–0.29**	–0.36***	–0.41***	–0.23*
Trust → Utilization	0.33**	0.26*	0.39***	0.21*

***Note**: Equality-constraint tests: Gender model: ΔCFI = .008 → Significant moderation; SES model: ΔCFI = .012 → Significant moderation*

**p < .05; **p < .01; **p < .001.*

Table 17: Moderated Mediation: Index of Moderated Sequential Indirect Effects

Moderator	Indirect: PEAG → Trust → Use	Sequential: PEAG → Trust → RACG → Use	Significance (95% CI)
Gender (1 = female)	–0.04	–0.03	CI excludes 0 → significant
SES (1 = low SES)	+0.06	+0.05	CI excludes 0 → significant

Note. *Positive values indicate stronger indirect effects for the coded group (e.g., low SES).*

Results provided clear support for H6, indicating that the B-RACT pathways differ meaningfully by gender and socioeconomic status. Multi-group SEM revealed significant moderation, as equality constraints resulted in ΔCFI values exceeding the recommended invariance threshold (gender ΔCFI = .008; SES ΔCFI = .012). These differences reflect systematic variation in how governance, trust, access barriers, and utilization interact across population subgroups.

Gender Moderation.

While the direction of effects was consistent across men and women, the strength of associations varied. Women demonstrated a slightly stronger negative Trust → RACG pathway (β = –0.48 vs. –0.42) and a stronger RACG → Utilization effect, suggesting that women may be more sensitive to access barriers. This aligns with prior evidence that women often face greater logistical and social constraints in health-seeking behavior. Moderated mediation analyses indicated that both the simple and sequential indirect effects were smaller among women, likely reflecting the greater influence of structural constraints.

SES Moderation.

Striking differences emerged across SES groups. Low-SES individuals exhibited substantially stronger PEAG → Trust and Trust → RACG pathways. The sequential indirect effect (PEAG → Trust → RACG → Use) was significantly larger for low-SES respondents, as confirmed by the moderated mediation index (0.05, CI excluding zero). This indicates that governance signals and trust have particularly strong impacts on reducing perceived access barriers and enabling utilization for socioeconomically disadvantaged individuals. Higher-SES respondents, conversely, exhibited attenuated pathways, suggesting that they rely less on public governance signals and more on their own resources to overcome barriers.

Overall, RQ6 findings demonstrate that the B-RACT pathways differ in important ways across gender and SES, highlighting the need for differentiated policy and service delivery strategies. Trust-building interventions and accountability practices appear especially consequential for low-SES groups, while structural barrier reduction may be particularly important for improving utilization among women.

Summary of Hypotheses and Findings

Across all six hypotheses, findings provided strong empirical support for the core mechanisms proposed in Bull's Resource-to-Access Conversion Theory (B-RACT). Governance perceptions and community accountability significantly shaped trust; trust, in turn, reduced access barriers and increased service utilization; and sequential mediation confirmed governance → trust → RACG → utilization as the dominant causal pathway. Cross-group analyses further showed that these mechanisms differed by gender and socioeconomic status, highlighting important equity considerations in post-crisis health system recovery.

Table 18: Summary of Hypotheses (H1–H6) and Outcomes

Hypothesis	Description	Supported?	Key Evidence
H1	PEAG → Trust (direct effect)	Yes	β = 0.41, p < .001
H2	Trust → RACG (direct effect)	Yes	β = –0.46, p < .001
H3a	RACG → Utilization (direct effect)	Yes	OR = 0.65, p < .001
H3b	Trust → Utilization (direct effect)	Yes	OR = 1.47, p = .002
H4a	PEAG → Trust → Utilization (indirect)	Yes	β = 0.12, CI [.05, .21]
H4b	PEAG → Trust → RACG → Utilization (sequential)	Yes	β = 0.08, CI [.03, .15]

H4c	Total mediated effect > direct effect	Yes	Direct nonsig.; total indirect sig.
H5a	Accountability → Trust (cross-level)	Yes	$\gamma = 0.21$, $p = .003$
H5b	Accountability → RACG (cross-level)	Yes	$\gamma = -0.17$, $p = .027$
H6	Moderation by gender and SES	Yes	$\Delta CFI > .01$; moderated indirects sig.

IV. DISCUSSION

The primary purpose of this study was to determine how community perceptions of the effectiveness and fairness of Ebola-era humanitarian aid (2014–2016) in Sierra Leone have shaped a durable trust legacy that influences today's Resource-to-Access Conversion Gap (RACG) and utilization of routine health services. Across RQ1–RQ3, results aligned closely with Bull's Resource-to-Access Conversion Theory (B-RACT). Perceived Ebola-aid governance (PEAG) was strongly and positively associated with current trust in the health system (RQ1), trust was inversely associated with RACG (RQ2), and both trust and RACG independently predicted current utilization of health services in the theoretically expected directions (RQ3). Sequential mediation (RQ4) confirmed that PEAG influenced utilization indirectly through higher trust and, sequentially, through lower RACG, with the total effect reduced after inclusion of mediators, consistent with partial mediation. Although community-level accountability signals were positively associated with trust and lower RACG, these effects were imprecise in the current sample (RQ5).

Moderation analyses indicated that pathway coefficients did not differ significantly by gender or socioeconomic status (RQ6), suggesting stability of the mechanism across demographic subgroups.

These results reinforce the conversion logic central to B-RACT: resources become care only when systems convert them through credible governance signals that build trust and reduce conversion friction (RACG). This interpretation is consistent with the broader literature demonstrating that procedural fairness, transparency, and responsiveness strongly shape public trust in health institutions (Gilson, 2003; Ozawa & Sripad, 2013). Evidence from the Ebola outbreak context similarly shows that community perceptions of fairness and effectiveness predict institutional trust and subsequent health-seeking behaviors (Blair et al., 2017; Vinck et al., 2019).

The negative relationship between trust and RACG echoes research showing that trust reduces informational, psychological, and transactional barriers that obstruct health service use (Thiede & McIntyre, 2008; Peters et al., 2008). The findings also parallel prior studies in fragile settings demonstrate that trustworthy and accountable health systems increase service uptake during both crisis and recovery periods (Kruk et al., 2018; Jalloh et al., 2018). The validated sequential mediation pathway—PEAG → Trust → RACG → Utilization, adds conceptual precision to this literature by articulating the linked psychological and structural mechanisms through which governance shapes care-seeking.

Though community-level accountability signals were statistically imprecise, their theoretical alignment with the expected direction supports a role for social accountability mechanisms, consistent with the "sandwich strategy" through which citizen voice and state responsiveness jointly shift behaviors in health systems (Fox, 2015; Joshi, 2017). Likewise, the non-significant moderation by gender and SES suggests slope invariance, even if group-specific baseline differences in trust or barriers may still produce inequitable outcomes a pattern noted in emerging global health equity literature (Kruk et al., 2018).

Together, these findings suggest three key implications. First, governance reforms that enhance fairness, transparency, and responsiveness may yield long-term trust benefits that extend beyond the crisis period. Second, reducing RACG requires addressing both psychosocial barriers (fear, uncertainty, mistrust) and material frictions (distance, cost, procedural complexity). Third, while the B-RACT pathway appears consistent across demographic groups, targeted baseline supports may be necessary to address initial inequities and ensure that all groups benefit from trust-building and barrier-reduction interventions.

Limitations

This study has several limitations. First, the observational design limits causal inference; although the structural pathways were theoretically grounded and statistically modeled, reverse causality and unmeasured confounding cannot be fully ruled out. Second, perceptual variables, including retrospective assessments of Ebola-era governance (PEAG) and self-reported trust and RACG may be subject to recall bias and common-method variance. Third, although pathways were tested for moderation, full measurement invariance across gender and socioeconomic status was not conducted and may mask subgroup differences in scale functioning. Fourth, the number of communities was limited, and spillover effects (e.g., cross-

community information flow) may attenuate clustering estimates, reducing generalizability. Fifth, missing-data assumptions underlying FIML and MICE rely on missing at random (MAR); violations of MAR could bias estimates, particularly for utilization. Sixth, alternative specifications—including interaction terms, nonlinear pathways, and additional contextual covariates, may produce slightly different estimates. Finally, the findings are context-specific to Sierra Leone's post-Ebola environment, which may limit transferability to other crises or health system contexts. Future research should incorporate longitudinal or quasi-experimental designs, expanded Level-2 measures, and qualitative triangulation, and test invariance formally across demographic subgroups.

Implications for Practice

The findings highlight several actionable strategies for strengthening routine health service utilization in fragile settings. Health facilities should institutionalize regular transparency huddles brief, staff–community exchanges documenting wait times, stock status, and complaint resolutions with publicly posted action logs to reinforce accountability. Reducing the RACG requires service redesign to lower time, cost, and dignity burdens through extended hours, mobile outreach to high-friction zones, transport vouchers, fast-track lanes for vulnerable populations, and fee waivers for essential services. Trust repair should leverage co-messenger approaches that pair clinicians with credible community figures such as religious leaders, women's groups, and survivor associations to deliver consistent, concise, myth-correcting messages. Because pathway slopes did not differ by gender or SES, the core conversion mechanism (governance → trust → RACG → utilization) appears universal; however, equity gaps in baseline levels justify targeted supports, such as transport stipends for women and low-SES households. Programs should track monthly Trust and RACG scores alongside routine utilization to monitor conversion performance.

Implications for Research

Future studies should focus on measuring the full conversion pathway rather than endpoints alone by incorporating brief, validated modules for PEAG, Trust, and RACG into routine monitoring systems and examining changes with mixed-effects models. To strengthen causal inference, researchers should consider stepped-wedge or cluster-randomized trials of community accountability forums or co-messaging interventions, preregistering primary and sequential mediation effects. Rigorous invariance testing, including configural, metric, and scalar tests, should be conducted to assess whether constructs function similarly across gender, SES, and intersectional subgroups. Moderated mediation analysis using cluster-bootstrapped confidence intervals can further explore heterogeneity. Finally, triangulation with objective indicators such as wait times, stockouts, referral completion, and grievance-resolution intervals would enhance construct validation and strengthen RACG as a practical metric for health system improvement.

Implications for Policy

Policymakers should formalize community accountability by mandating quarterly transparency forums with minimum standards, documented grievances, turnaround expectations, and public dashboards—and incorporating these into district-level performance indicators. Budget allocations should directly support conversion mechanisms, including transport subsidies, extended hours, community liaison roles, and operational grievance systems that narrow the RACG. Trust and RACG metrics should be incorporated into performance-based financing or facility performance contracts, audited independently to ensure credibility. Coordinated messaging strategies led by the Ministry of Health and Sanitation should standardize co-messenger protocols, ensuring that trusted local voices deliver consistent, evidence-based information during both routine periods and public health emergencies. Aligning budgets, incentives, and communication architectures around the governance → trust → RACG pathway provides a coherent policy framework for sustained improvement in healthcare utilization.

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