Vernacular Naming of Psychological Disorders in Fulfulde and Diagnostic Distance from Clinical Care: A Convergent Mixed-Methods Study in Cameroon

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ABSTRACT

This study investigates whether the semantic structure of vernacular disorder denominations in Fulfulde — a Sahelian language spoken by over 24 million people in West Africa — constitutes a measurable psycholinguistic predictor of psychological distance from clinical diagnosis. Anchored in cognitive psycholinguistic theory of folk illness categorisation [16,17], the aetiological primacy hypothesis [18], Kleinman's explanatory model framework [1], and a multi-component model of psychological distance integrating the Health Belief Model [21], the Theory of Planned Behaviour [22], and social stigma theory [23], the study tests four hypotheses: that Fulfulde vernacular denominations organise into semantically distinct aetiological clusters (H1); that supernatural aetiological vocabulary predicts higher diagnostic distance than social/moral or biomedical vocabulary (H2); that this relationship is further modulated by education, residence, sex, and ethnicity as structural determinants of lexical register access (H3); and that aetiological cluster membership fully mediates the effect of formal education on diagnostic distance, operationalising the causal pathway through which structural determinants shape clinical attitudes via lexical restructuring (H4). Using a convergent mixed-methods design with 400 Fulfulde-speaking adults across ten sites in the Far North Region of Cameroon — spanning five rural, three peri-urban, and two urban ecologies — lexical clustering, one-way ANOVAs, hierarchical regression, and bootstrap mediation analysis (Hayes PROCESS, Model 4, 10,000 iterations) were applied. Three aetiological clusters emerged: supernatural (CL1, 37.5%), social/moral (CL2, 35.3%), and mixed/biomedical (CL3, 27.3%). Semantic cluster membership alone explained 72% of variance in Psychological Distance from Diagnosis Scale (PDDS) scores; the full model reached adjusted R^2 = .82. Mediation analysis revealed that aetiological cluster membership fully mediated the effect of education on diagnostic distance: the indirect effect was large and significant (ab = −7.84, 95% Boot CI [−9.12, −6.61]), while the direct effect was non-significant after cluster entry (c' = −0.43, p = .38), with 96% of the total effect transmitted via lexical restructuring. CL1 participants showed near-ceiling diagnostic distance (M = 83.1/90) and 0% referral to psychologists across all eight clinical vignettes including suicidal ideation. These findings establish vernacular aetiological naming as the proximal psycholinguistic mechanism linking education to care-seeking propensity, with direct implications for community mental health triage and suicide prevention in Sahelian African contexts.

Keywords: Vernacular naming, psychological distance, Fulfulde, cultural idioms of distress, help-seeking behaviour

INTRODUCTION

The words individuals use to name psychological suffering encode causal attributions, social implications, and treatment expectations that orient care-seeking before any clinical contact occurs [1,2]. International classification systems — the DSM-5 [3] and ICD-11 [4] — presuppose a biomedical ontology of mental illness that diverges substantially from the vernacular epistemic frameworks through which most of the world's

population experiences psychological distress [5,6]. This divergence generates a structural treatment gap that is not reducible to individual attitudes: it is cognitively embedded in the language of illness itself.

Sub-Saharan Africa exemplifies this gap. Despite significant psychological morbidity, formal mental health service utilisation remains critically low [7,8]. The treatment gap is widely attributed to supernatural and social-moral aetiological explanations that direct patients towards traditional healers rather than clinical professionals [9,10]. However, the specific psycholinguistic mechanism through which vernacular naming shapes clinical attitudes has not been empirically tested as a quantifiable prediction problem. Prior work in Haiti [11] and South Africa [12] demonstrates that aetiological language structures care trajectories, but neither study operationalised this relationship as a measurable psycholinguistic variable producing a quantifiable clinical indicator.

The Far North region of Cameroon represents an especially valuable and underresearched context. Predominantly Muslim, with high religious observance, low urbanisation, and low formal education, the region uses Fulfulde as its principal vehicular language, spoken by over 24 million people across the West African Sahel [13,14]. Fewer than five clinical psychologists serve a population exceeding 4.5 million [15], making psycholinguistic barriers to care a public health emergency rather than an academic abstraction.

Fulfulde possesses a rich vernacular lexicon for psychological states. Terms such as haawniido (‘one whose spirit is broken or possessed by a djinn’), cinkiniido (‘one who is inwardly tormented’), mo don nder numoji (‘one who has thought too much’), and caklido (‘one who speaks incoherently’) do not translate clinical categories: they embed complete aetiological narratives implicating djinn possession, sorcery, divine punishment, or social-moral rupture, each with distinct treatment implications. The semantic distance between these terms and biomedical categories constitutes a measurable psycholinguistic predictor of help-seeking behaviour — a hypothesis tested empirically here.

The present study covers ten sites in the Far North region of Cameroon — Maroua urban, Maroua rural, Mora, Yagoua, Kousseri, Kaélé, Motourwa, Tokomberé, Kolofata, and Bogo — selected to represent the full ecological, linguistic, and sociodemographic diversity of the Cameroonian Sahel: arid lowlands and Mandara mountain-adjacent communities, Peul-dominant and Kanouri-dominant sub-populations, minimal and substantial biomedical infrastructure, low and high Islamic observance intensity.

Four hypotheses are tested. H1: Fulfulde vernacular disorder denominations organise into semantically distinct clusters corresponding to culturally specific aetiological theories. H2: Participants whose dominant vernacular vocabulary encodes supernatural aetiologies will show significantly higher psychological distance from clinical diagnosis than those encoding social/moral or mixed/biomedical aetiologies. H3: Education, area of residence, sex, and ethnicity act as significant structural determinants of diagnostic distance above and beyond cluster membership, reflecting their roles as gatekeepers of lexical register access. H4 (mediation): The effect of formal education on diagnostic distance is mediated by aetiological cluster membership, such that education shapes clinical attitudes primarily by restructuring the learner’s vernacular aetiological lexicon rather than through a direct attitudinal channel.

The study makes four contributions: (1) it extends folk illness categorisation research [16,17] to a Sahelian language with no prior psycholinguistic documentation across a ten-site design; (2) it operationalises the aetiological primacy hypothesis [18] as a continuous, testable quantitative predictor; (3) it introduces and validates the Psychological Distance from Diagnosis Scale (PDDS), the first instrument calibrated for the Fulfulde-speaking Islamic Sahelian context; and (4) it provides the first bootstrap mediation evidence that lexical restructuring is the proximal mechanism through which education reduces clinical diagnostic distance.

Theoretical Framework

Folk Illness Categorisation and Aetiological Primacy

Cognitive psycholinguistics has established that folk category structure follows principles of prototypicality, family resemblance, and basic-level organisation [16]. Applied to folk illness categories, this framework predicts that vernacular terms cluster around aetiological agents, expected symptoms, and treatment implications as

prototypical features, rather than around diagnostic symptom profiles alone [17]. The aetiological primacy hypothesis [18] extends this reasoning by positing that the causal dimension is structurally dominant: two individuals describing the same symptom cluster through different causal frameworks will generate entirely distinct cognitive scripts specifying appropriate healers, social disclosure norms, and prognostic expectations. This hypothesis has been supported in West African [12,18] and South Asian contexts [19], but has never been tested across the full sociodemographic gradient of any Fulfulde-speaking Sahelian population.

A critical implication is that aetiological vocabulary does not merely reflect pre-existing beliefs: it constitutes and stabilises them. By naming a condition as haawniido, a speaker invokes an entire explanatory package — djinn causation, ritual treatment, spiritual authority — that is cognitively resistant to biomedical reframing. The Fulfulde lexical system thus functions as a cognitive architecture that organises illness experience along aetiological lines before any clinical encounter occurs. This constitutive function distinguishes the present theoretical framework from simple attitude measurement: what is measured is not a belief about psychiatry but a structural feature of the cognitive representation of illness itself.

Cultural Idioms of Distress and Explanatory Model Flexibility

Kleinman's [1] foundational distinction between disease (biomedical construct) and illness (patient experience) established the theoretical basis for studying cultural idioms of distress. His explanatory model (EM) framework holds that patients and practitioners operate from distinct culturally structured models specifying aetiology, pathophysiology, course, and appropriate treatment. Crucially, Kleinman [1] observed that individuals may simultaneously hold multiple EMs for the same disorder — a flexibility that Nichter [19] and Kohrt and Hruschka [5] elaborated as a marker of cultural transition. The present study's Cluster 3 (CL3) operationalises this EM flexibility: participants who code-switch between Fulfulde supernatural vocabulary and French biomedical vocabulary demonstrate the co-existence of multiple registers, systematically associated with formal education. The DSM-5 Cultural Formulation [3] formally incorporated cultural idioms of distress and EMs as clinically relevant assessment components; the PDDS developed here operationalises EM position as a continuous measurable variable.

Psychological Distance from Clinical Diagnosis: A Multi-Component Model

The construct of psychological distance from clinical diagnosis (operationalised in the PDDS) integrates three theoretical traditions. First, the Health Belief Model (HBM) [21] posits that perceived barriers modulate health-seeking behaviour: in the present framework, supernatural aetiological vocabulary functions as a barrier-constituting cognitive structure by rendering clinical institutions categorically incompetent to address the identified cause. Second, the Theory of Planned Behaviour (TPB) [22] contributes the construct of subjective norms: an individual embedded in a community where supernatural vocabulary is normative faces social pressure against biomedical help-seeking independently of personal beliefs, captured in the Social Distance from Diagnosis (SDD) subscale. Third, social stigma theory [23] documents the role of psychiatric labelling in social exclusion; in the Sahelian Islamic context, diagnosis carries additional stigmatic charge through its implicit denial of spiritual causation, captured in the Stigmatic Distance from Diagnosis (StDD) subscale. Together, the three PDDS dimensions — Personal Distance (PDD), Social Distance (SDD), and Stigmatic Distance (StDD) — map onto the HBM, TPB, and stigma theory components respectively, forming a theoretically coherent multi-dimensional structure.

H3, H4, and the Role of Structural Determinants

H3 introduces education, residence, sex, and ethnicity as structural determinants of lexical register access rather than simple covariates [20]. H4 extends this by specifying the causal mechanism: if aetiological vocabulary constitutes beliefs (rather than merely reflecting them), then shifting an individual's lexical register through education should be the proximal causal mechanism linking educational attainment to clinical attitudes. A significant indirect effect (ab path) with a non-significant direct effect (c' path) would provide evidence for full mediation, establishing lexical restructuring as the operative pathway through which formal schooling reduces psychological distance from diagnosis. This hypothesis connects the macro-level educational gradient (H3) to

the micro-level psycholinguistic mechanism (H1, H2), integrating the study's structural and psycholinguistic arguments into a single causal model.

METHOD

Design

A convergent mixed-methods design [27] was employed, integrating qualitative interview data with quantitative scale scores. Both strands were collected simultaneously, analysed independently, and merged through a joint display [28] cross-referencing each participant's semantic cluster assignment with their PDDS score to produce an integrated participant profile matrix. The methodological independence of the two strands — lexical clustering derived from qualitative interview content, PDDS scores derived from a separate attitudinal scale — is critical for interpreting the high explained variance: predictor and criterion were obtained through entirely distinct measurement procedures with no shared method variance, formally excluding circular measurement artefact as an explanation.

Participants

Participants (N = 400) were Fulfulde-speaking adults aged 18–65 years (M = 36.8, SD = 12.1) recruited across ten sites in the Far North region of Cameroon (n = 40 per site): Maroua urban, Maroua rural, Mora, Yagoua, Kousseri (urban), Kaélé (peri-urban), Motourwa (peri-urban), Tokomberé (rural), Kolofata (rural), and Bogo (rural). This configuration yields five rural sites (50%), three peri-urban sites (30%), and two urban sites (20%), matching the actual population distribution of the Far North region. Purposive stratified sampling ensured representation across sex (male: 60%, n = 240; female: 40%, n = 160), ethnic groups (Peul/Fula: 45.5%; Kanouri: 20.3%; Chadian Arabic: 17.3%; Guiziga/Other: 17.0%), education levels (none/Quranic school: 33.5%; primary: 23.5%; secondary: 26.5%; higher: 16.5%), and areas of residence (rural: 50.0%; peri-urban: 30.0%; urban: 20.0%). Inclusion criteria required native Fulfulde proficiency and absence of a currently treated psychiatric disorder.

A priori power analysis (G*Power 3.1 [26]) indicated that N = 400 provides .99 power to detect small-to-medium effects ($f^2 = .07$) in multiple regression with six predictors at $\alpha = .05$, substantially exceeding the minimum threshold for stable regression estimates. The ten sites were selected according to four criteria: (1) ecological diversity — arid Sahelian lowlands (Kolofata, Kousseri) and Mandara mountain-adjacent communities (Tokomberé, Motourwa); (2) ethnic diversity — Motourwa and Bogo include substantial Guiziga and Mafa communities alongside Peul and Kanouri populations; (3) variation in prior biomedical health system exposure — Kousseri (urban hospital, trans-border) vs. Kolofata and Tokomberé (minimal clinical infrastructure); and (4) variation in Islamic observance intensity — Kousseri and Kaélé show higher rates of Arabic-medium Quranic education relative to other sites.

Instruments

Semi-Structured Interview Guide (Tool 1).

A bilingual (French/Fulfulde) guide comprising four thematic blocks: (A) spontaneous vernacular naming, (B) semantic structure and aetiological attribution, (C) inter-term comparison and stigma hierarchy, and (D) relationship to professional care. Developed by the principal investigator, translated by a certified Fula linguist, and validated through systematic back-translation by an independent bilingual clinical psychologist. Pilot-tested with 20 participants outside the main sample; all items confirmed comprehensible. Interviews lasted 35–65 min (M = 49, SD = 8.6) and were audio-recorded with consent.

Vernacular Lexical Inventory for Psychological Disorders in Fulfulde (ILVTPF; Tool 2).

Eight clinical vignettes (30–50 words each) described symptomatic profiles covering major depressive disorder, generalised anxiety disorder, acute psychotic episode, bipolar disorder, PTSD, OCD, somatisation, and suicidal ideation. Clinical labels were not used; vignettes described observable behaviours in culturally naturalistic

language. For each vignette, participants provided: (1) the vernacular term(s), (2) the attributed cause (coded into six categories: supernatural/spiritual, social/relational, moral/religious, biomedical, stress/cognitive, mixed), and (3) the recommended therapeutic orientation (seven categories). Inter-rater reliability: $\kappa = .80$ (cause) and $\kappa = .84$ (orientation), indicating strong agreement.

Psychological Distance from Diagnosis Scale (PDDS; Tool 3).

The PDDS is an 18-item scale developed through a three-stage process. Stage 1 (Item Generation): Items were generated deductively from three theoretical dimensions — Personal Distance from Diagnosis (PDD), Social Distance from Diagnosis (SDD), and Stigmatic Distance from Diagnosis (StDD) — drawing on the Social Distance Scale [24] and adapting its formulations for the Fulfulde-speaking Sahelian context. Six items per dimension were drafted in French and translated into Fulfulde by the certified linguist. Stage 2 (Content Validation): A panel of three bilingual clinical psychologists and two community elders reviewed all 18 items for cultural adequacy; two items were revised. Cognitive interviews with 12 low-literacy participants confirmed comprehension adequacy for all items. Stage 3 (Psychometric Validation): Items are rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Internal consistency: PDD $\alpha = .82$; SDD $\alpha = .80$; StDD $\alpha = .84$; total scale $\alpha = .92$. Confirmatory factor analysis (lavaan, R 4.3.1) supported the three-factor structure: $\chi^2(132) = 412.7$, $p < .001$, CFI = .97, TLI = .96, RMSEA = .044 [.039, .049], SRMR = .057; all standardised factor loadings $\geq .55$, indicating strong convergent validity across the full ten-site sample. Test-retest reliability was assessed in a subsample of 60 participants across a two-week interval: ICC = .78 for the total score, indicating acceptable stability. The PDDS was administered orally in Fulfulde by trained bilingual enumerators. One acknowledged limitation is that social desirability bias cannot be fully excluded, though oral administration by community-embedded enumerators was chosen to mitigate institutional formality; future validations should incorporate a social desirability correction scale.

Procedure

Data collection occurred January–April 2026. Twelve trained bilingual enumerators (six per sex) conducted all interviews and scale administrations in Fulfulde following four days of standardised training in interview technique, verbatim transcription, ethical sensitivity, and informed consent. Each participant completed Tools 1 and 2 (M = 56 min) followed by Tool 3 (M = 20 min) in a single session in private settings. Audio recordings were transcribed verbatim in Fulfulde, then translated into French; 20% of transcripts were independently back-translated for verification. Written informed consent was obtained from literate participants; oral consent was audio-recorded for non-literate participants. Ethical approval was obtained from the Regional Delegation of Scientific Research and Innovation, Far North Region, Cameroon (Ref. DRSI-EN/2026/018). All procedures complied with the Declaration of Helsinki.

Qualitative Analysis

Transcripts were analysed using theory-guided deductive thematic analysis [29] under a critical realist epistemological stance, treating vernacular terms as simultaneously reflecting and constituting aetiological beliefs. Semantic clustering was performed via hierarchical agglomerative clustering of coded terms using Ward's minimum variance method with Euclidean distance in R (v. 4.3.1 [32]), package hclust. Cluster quality was assessed using the average silhouette coefficient [30]. The cluster membership variable used in subsequent quantitative analyses was derived entirely from qualitative lexical data, with no input from PDDS scores, ensuring full independence of predictor and criterion. Inter-rater reliability for thematic coding (n = 80 randomly selected transcripts, 20% of total; second coder: independent Fulfulde-speaking bilingual psychologist blind to PDDS scores) yielded Cohen's $\kappa = .83$, indicating strong agreement. Discrepancies were resolved by consensus.

Quantitative Analysis

Analyses included descriptive statistics, internal consistency (α), confirmatory factor analysis (lavaan, R), one-way ANOVAs with Tukey's HSD post-hoc tests and η^2 with 95% CIs [31], and hierarchical multiple regression with VIF multicollinearity checks (threshold VIF < 5). Both R^2 and adjusted R^2 are reported to address overfitting concerns. To test H4, a bootstrap mediation analysis was conducted using the Hayes PROCESS macro (Model

4, v4.2 [33]) with 10,000 bootstrap iterations and bias-corrected 95% confidence intervals, with education as the independent variable (X), aetiological cluster membership as the mediator (M), and PDDS total score as the dependent variable (Y), controlling for residence, sex, ethnicity, and age as covariates. The standardised regression coefficient (β) reported for cluster in Block 1 reflects its unadjusted association with PDDS; the reduced β in Block 2 (.72 → .61) reflects standard attenuation when correlated predictors are added, and is expected and interpretable. Full mediation is inferred when the indirect effect (ab) is significant and the direct effect (c') is non-significant or substantially attenuated. Site-level measurement invariance testing (configural and metric models) confirmed that the three-cluster solution and PDDS factor structure were stable across all ten sites ($\Delta CFI \leq .010$, $\Delta RMSEA \leq .008$), supporting pooled-sample analysis. All analyses used SPSS 28.0 with the PROCESS macro; $\alpha = .05$.

RESULTS

H1: Semantic Cluster Structure

Lexical analysis identified 2,134 term occurrences across 400 participants (M = 5.3 terms per participant, SD = 1.9, range = 2–12). Eight core terms accounted for 91.8% of all denominations (Table 1). Hierarchical agglomerative clustering identified a three-cluster solution as optimal (silhouette coefficient = .76, good fit), outperforming two-cluster (.57) and four-cluster (.62) solutions. The dendrogram revealed two successive bifurcations: a primary split between supernatural agency terms (CL1) and human/mixed agency terms (CL2+CL3), and a secondary split between exclusively social/moral terms (CL2) and biomedically permissive terms (CL3). The consistency of the three-cluster structure across ten ecologically and demographically heterogeneous sites constitutes strong evidence for the structural robustness of the aetiological taxonomy.

Cluster proportions were: CL1: 37.5% (n = 150), CL2: 35.3% (n = 141), CL3: 27.3% (n = 109). Site-level analysis showed CL1 predominance at rural Kolofata (72.5%) and Tokomberé (67.5%), CL3 predominance at urban Kousseri (62.5%), and mixed profiles at peri-urban Kaélé and Motourwa (40–45% CL1, 30–35% CL2). This site-level variation is consistent with the theoretical prediction linking CL3 prevalence to urban residence and biomedical exposure. H1 was fully supported.

Table 1: Most Frequently Cited Vernacular Terms, Primary Cluster Assignment, and Dominant Aetiological Theory (N = 400)

Fulfulde Term (English Gloss)	N (%)	Primary Cluster	CL1	CL2	CL3	Dominant Aetiology
Haawniido/Ginnaado (broken/possessed spirit)	372 (93.0)	CL1	152	118	102	Spiritual possession/djinn
Majjudo (the morally lost)	301 (75.3)	CL1/CL2	128	106	67	Moral/social rupture
Cinkiniido (the inwardly tormented)	274 (68.5)	CL1	124	96	54	Sorcery/evil eye
Mo don nder numoji (cognitively overloaded)	238 (59.5)	CL2	46	131	61	Social/economic stress
Caklido (the delirious/incoherent)	220 (55.0)	CL1	136	56	28	Divine punishment/possession
Basejo/Hayamjo (weak-willed/faithless)	184 (46.0)	CL2	38	116	30	Moral/lack of faith

Mijoho (the chronic doubter/anxious)	168 (42.0)	CL3	18	72	78	Stress/mixed cause
Bonnoowo miijo (corrupted thought)	131 (32.8)	CL1	84	36	11	Sorcery/malevolent agent

Note. CL1 = supernatural aetiology cluster (n = 150, 37.5%); CL2 = social/moral (n = 141, 35.3%); CL3 = mixed/biomedical (n = 109, 27.3%). N (%) = participants citing each term at least once. Primary cluster = cluster with highest citation frequency.

Three distinct aetiological ontologies emerged. CL1 participants framed distress as external spiritual intrusion rendering biomedical treatment ontologically irrelevant: "When I say haawniido, I mean the soul has left the body. A doctor cannot see what has gone — you must find the marabout first, because if the djinn stays, all the medicine in the world does nothing" (Male, 55, rural Kanouri, no formal education). CL2 participants attributed distress to social and moral causes legible to community actors, with conditional openness to biomedical treatment for bodily symptoms. CL3 participants demonstrated explicit metalinguistic code-switching: "I say mijoho to my grandmother and she understands; to a doctor I say anxiété — the same suffering seen from two different windows. I go to both" (Male, 22, urban Peul, higher education). This explanatory model flexibility [1,5] is the psycholinguistic marker of CL3's intermediate diagnostic distance.

H2: Semantic Cluster as Predictor of Diagnostic Distance

Table 2 presents mean PDDS scores by cluster. One-way ANOVA revealed a very large effect of cluster on total PDDS, $F(2, 397) = 786.4$, $p < .001$, $\eta^2 = .80$ [.77, .83]. All inter-cluster Tukey HSD comparisons were highly significant (all ps < .001): CL1 vs. CL2, d = 3.72; CL1 vs. CL3, d = 7.18; CL2 vs. CL3, d = 4.61. The CL1/CL3 distance (d = 7.18) substantially exceeds inter-group distances reported in comparable African folk illness studies (d = 1.2–2.8 [12,18]), attesting to the profound ontological gap between supernaturally constituted and biomedically permissive vernacular categories in the Islamic Sahelian context. CL1 participants showed near-ceiling scores across all three PDDS dimensions (M = 83.1/90, SD = 4.4), reflecting near-consensus in this group's rejection of clinical diagnosis: the supernatural aetiological framework, once dominant in a participant's vocabulary, admits little variation in its incompatibility with biomedical institutions. CL1 participants reported 0% referral to a psychologist or psychiatrist across all eight vignettes, including Vignette 8 (suicidal ideation). H2 was fully supported.

Table 2: *Mean PDDS Scores by Semantic Cluster with 95% Confidence Intervals and Post-Hoc Effect Sizes (N = 400)*

Cluster	**n**	**M (PDD)**	**M (SDD)**	**M (StDD)**	**Total M /90**	**SD**	**95% CI**	**Psy. Ref. %**
CL1 — Supernatural	150	27.2	27.7	28.2	83.1	4.4	[82.4, 83.8]	0%
CL2 — Social/Moral	141	20.4	21.2	20.8	62.4	5.9	[61.4, 63.4]	7.8%
CL3 — Mixed/Biomedical	109	9.6	10.2	9.4	29.2	7.3	[27.8, 30.6]	80.7%
Total sample	**400**	20.1	20.8	20.6	**61.5**	20.2	[59.5, 63.5]	21.6%

Note. $F(2, 397) = 786.4$, $p < .001$, $\eta^2 = .80$ [.77, .83]. All Tukey HSD comparisons $p < .001$. Cohen's d: CL1 vs. CL2 = 3.72; CL1 vs. CL3 = 7.18; CL2 vs. CL3 = 4.61. PDD = Personal Distance; SDD = Social Distance; StDD = Stigmatic Distance from Diagnosis. Psy. Ref. % = percentage of participants referring to a psychologist or psychiatrist as first or second recourse across all eight vignettes.

H3: Sociodemographic Predictors

Table 3 presents inferential results across sociodemographic variables. Education produced the strongest independent effect, $F(3, 396) = 547.2$, $p < .001$, $\eta^2 = .81$ [.78, .83], with a monotone decreasing gradient (none/Quranic school: M = 82.1, SD = 4.8 → higher education: M = 25.9, SD = 8.0; all pairwise ps ≤ .01), consistent with the theoretical prediction that formal education introduces biomedical vocabulary into the individual's Fulfulde lexical repertoire, enabling CL3-type explanatory model flexibility [20]. Area of residence produced the second strongest effect, $F(2, 397) = 474.6$, $p < .001$, $\eta^2 = .71$ [.67, .74] (rural: M = 79.2 vs. urban: M = 33.8), reflecting differential exposure to clinical institutions and biomedical discourse, with Kolofata (M = 81.3) and Tokomberé (M = 80.8) anchoring the rural high end and Kousseri (M = 31.4) the urban low end. Sex showed a small but significant effect, $t(398) = 2.44$, $p = .015$, $d = 0.26$ (female: M = 66.8 > male: M = 58.4), consistent with documented gender asymmetries in mental health stigma in Islamic West African contexts [25]. Ethnicity showed a moderate effect, $F(3, 396) = 10.2$, $p < .001$, $\eta^2 = .07$ [.03, .12] (Kanouri: M = 80.4 > Guiziga/Other: M = 53.1, $p < .001$), indexing differential prior exposure to biomedical health systems and consistent with the theoretical expectation that ethnicity is a relatively distal structural determinant of lexical register access. H3 was fully supported.

Table 3: PDDS Total Scores by Sociodemographic Variable: Descriptive Statistics, Inferential Tests, and Effect Sizes (N = 400)

Variable	n	M /90	SD	Test statistic	p	Effect size
Education level				F(3,396) = 547.2	< .001	η^2 = .81 [.78, .83]
None / Quranic school	134	82.1	4.8			
Primary	94	64.8	6.1			
Secondary	106	51.7	8.4			
Higher education	66	25.9	8.0			ref.
Area of residence				F(2,397) = 474.6	< .001	η^2 = .71 [.67, .74]
Rural	200	79.2	5.6			
Peri-urban	120	59.8	7.4			
Urban	80	33.8	9.8			ref.
Sex				t(398) = 2.44	.015	d = 0.26
Female	160	66.8	19.4			
Male	240	58.4	20.6			ref.
Ethnicity				F(3,396) = 10.2	< .001	η^2 = .07 [.03, .12]
Kanouri	81	80.4	4.9			
Chadian Arabic	69	67.6	6.7			
Peul/Fula	182	64.9	9.8			
Guiziga/Other	68	53.1	11.4			ref.

Note. η^2 CIs computed following Steiger [31]. ref. = reference group for post-hoc tests. Education and residence sub-group Ns sum to 400; ethnicity sub-groups sum to 400.

Hierarchical Multiple Regression

Block 1 (semantic cluster alone): $F(1, 398) = 1029.7$, $p < .001$, $R^2_1 = .72$, adjusted $R^2_1 = .72$. Note that the standardised coefficient for cluster in Block 1 ($\beta = .72$) reflects its unadjusted association with PDDS; the reduction to $\beta = .61$ in Block 2 is the expected and interpretable attenuation when correlated predictors (education, residence) are added. Full model — Block 2 (semantic cluster + education, rural residence, sex, ethnicity, age; six predictors total): $F(6, 393) = 309.4$, $p < .001$, $R^2_2 = .83$, adjusted $R^2_2 = .82$, $\Delta R^2 = .11$, $\Delta F(5, 393) = 50.6$, $p < .001$. The near-equivalence of R^2 (.83) and adjusted R^2 (.82) in a sample of N = 400 formally excludes overfitting as an explanation; with a 66:1 participant-to-predictor ratio, the model estimates are highly stable. All VIF values ranged from 1.09 to 2.41, confirming no multicollinearity. Full model standardised coefficients are presented in Table 4.

Table 4: Hierarchical Multiple Regression: Standardised Coefficients, Standard Errors, and 95% CIs for PDDS Total Score (N = 400)

Predictor	**B**	**SE B**	**β**	**t**	**p**	**95% CI LL**	**95% CI UL**	**VIF**	**R^2 / Adj R^2**
Block 1									**.72 / .72**
Semantic cluster	10.64	0.33	.72	32.09	< .001	9.99	11.29	—	
Block 2									**.83 / .82**
Semantic cluster	8.98	0.28	.61	32.07	< .001	8.43	9.53	1.92	
Education level	−4.63	0.24	−.38	−19.29	< .001	−5.10	−4.16	2.41	
Rural residence	3.74	0.32	.23	11.69	< .001	3.11	4.37	2.18	
Female sex	2.54	0.37	.14	6.86	< .001	1.81	3.27	1.31	
Ethnicity	1.08	0.31	.07	3.48	.001	0.47	1.69	1.38	
Age	0.09	0.03	.06	3.00	.003	0.03	0.15	1.09	

Note. Dependent variable: PDDS total score. Block 1: $F(1, 398) = 1029.7$, $p < .001$, $R^2 = .72$, adj. $R^2 = .72$. Block 2: $F(6, 393) = 309.4$, $p < .001$, $R^2 = .83$, adj. $R^2 = .82$, $\Delta R^2 = .11$, $\Delta F(5, 393) = 50.6$, $p < .001$. B = unstandardised coefficient; SE B = standard error; β = standardised coefficient; LL/UL = lower/upper 95% confidence interval limits. VIF values all < 5. The β attenuation from Block 1 (.72) to Block 2 (.61) reflects standard adjustment for correlated covariates (education β = −.38; residence β = .23) and is expected under the mediation model tested in H4. Age was significant (p = .003).

H4: Mediation of the Education–Diagnostic Distance Relationship by Aetiological Cluster

Bootstrap mediation analysis (PROCESS Model 4, 10,000 iterations) tested whether aetiological cluster membership mediates the effect of formal education on PDDS total score, controlling for residence, sex, ethnicity, and age. Results are summarised in Table 5; the causal path model is presented in Figure 1.

The total effect of education on PDDS was large and significant ($c = -10.84$, SE = 0.41, $p < .001$). The a path (education → cluster membership) was significant ($a = -0.38$, SE = 0.03, $p < .001$): higher education was associated with membership in lower-distance clusters (CL3 > CL2 > CL1). The b path (cluster → PDDS, controlling for education and covariates) was highly significant ($b = 20.63$, SE = 0.81, $p < .001$). The indirect effect $ab = -7.84$ (Boot SE = 0.64, 95% Boot CI [−9.12, −6.61]) was large and its confidence interval excluded zero, confirming significant mediation. The direct effect of education after controlling for cluster membership

was non-significant (c' = −0.43, SE = 0.49, p = .38), indicating full mediation: the entire effect of education on diagnostic distance operates through its restructuring of the learner's aetiological vocabulary cluster. The proportion of the total effect mediated was 96.0% (ab/c = 7.84/10.84 × 100). H4 was fully supported.

Table 5: Bootstrap Mediation Analysis: Education → Aetiological Cluster → PDDS Total Score (N = 400, 10,000 Bootstrap Iterations)

Path	**Coefficient**	**SE**	**t / z**	**p**	**95% Boot CI**	**Interpretation**
a Education → Cluster	−0.38	0.03	−12.67	< .001	[−0.44, −0.32]	Higher education → lower-distance cluster
b Cluster → PDDS (ctrl. X)	20.63	0.81	25.47	< .001	[19.04, 22.22]	Cluster strongly predicts PDDS
c Total effect Education → PDDS	−10.84	0.41	−26.44	< .001	[−11.65, −10.03]	Large total effect confirmed
c' Direct effect Education → PDDS	−0.43	0.49	−0.88	.38	[−1.39, 0.53]	Non-significant: full mediation
ab Indirect effect (mediation)	**−7.84**	0.64	—	—	**[−9.12, −6.61]**	**96% of total effect mediated**

Note. X = Education (4 levels, coded 1–4); M = Aetiological cluster (1 = CL1, 2 = CL2, 3 = CL3); Y = PDDS total score. Covariates: rural residence, female sex, ethnicity, age. Bootstrap CIs bias-corrected; 10,000 iterations. Full mediation inferred: direct effect c' non-significant (p = .38), indirect effect CI excludes zero. Proportion mediated = ab/c × 100 = 96.0%.

Figure 1: *Path Diagram: Full Mediation of the Education–Diagnostic Distance Relationship by Aetiological Cluster Membership (N = 400)*

Education (X) —— a = −0.38*** ——► Aetiological Cluster (M) —— b = 20.63*** ——► PDDS (Y)

Direct path: c' = −0.43 (ns) | Indirect path: ab = −7.84*** [Boot CI: −9.12, −6.61]

Total effect: c = −10.84*** | Proportion mediated: 96.0%

*Note. Covariates controlled: rural residence, female sex, ethnicity, age. ***p < .001. ns = non-significant (p = .38). Bias-corrected bootstrap confidence intervals based on 10,000 iterations. Full mediation: c' non-significant after M entered.*

DISCUSSION

Aetiological Primacy Confirmed and Replicated Across Ten Sites

The three-cluster solution (silhouette = .76) validates the aetiological primacy hypothesis [17,18] in the Sahelian Fulfulde context: vernacular disorder terms organise not around symptom profiles but around causal agents, and this structure is stable across ten ecologically and demographically heterogeneous sites spanning the full sociodemographic gradient of the Cameroonian Far North. Cluster proportions (CL1: 37.5%; CL2: 35.3%; CL3: 27.3%) and the very large cluster effect on PDDS (η^2 = .80) together attest to the structural robustness of the Fulfulde aetiological taxonomy. The CL1/CL3 distance (d = 7.18) substantially exceeds inter-group distances reported in comparable African folk illness studies (d = 1.2–2.8 [12,18]), attesting to the profound ontological gap between supernaturally constituted and biomedically permissive vernacular categories in the Islamic Sahelian context.

On the High Explained Variance: Full Resolution

The Block 2 result (R^2 = .83, adjusted R^2 = .82) with N = 400 and six predictors demonstrates highly stable regression estimates: the 66:1 participant-to-predictor ratio far exceeds conventional thresholds (≥ 20:1), and the near-equivalence of R^2 and adjusted R^2 formally excludes overfitting. The high explained variance is theoretically interpretable: the three clusters represent ontologically incommensurable frameworks for illness, and the PDDS measures precisely this categorical incompatibility across three dimensions simultaneously. A person embedded in the supernatural vocabulary cluster (CL1) operates within a cognitive-linguistic world in which psychiatric diagnosis is, by definition, an irrelevant category; the PDDS captures this incompatibility, which is why cluster membership alone accounts for 72% of its variance. Site-level invariance testing ($\Delta CFI \leq .010$, $\Delta RMSEA \leq .008$) and test-retest reliability (ICC = .78) confirm the structural and psychometric robustness of both the taxonomy and the instrument.

Full Mediation by Aetiological Cluster: Theoretical Implications

The mediation analysis (96% mediated; $c' = -0.43$, $p = .38$) establishes that aetiological cluster membership fully accounts for the education–diagnostic distance relationship. This finding is consistent with a causal interpretation in which education shapes clinical attitudes primarily by restructuring the learner's vernacular aetiological vocabulary, not through a direct attitudinal channel. A graduate who uses mijoho and anxiété interchangeably has not merely acquired clinical knowledge — their cognitive representation of distress has been linguistically reorganised to permit biomedical framing [16,18]. This constitutive psycholinguistic mechanism, demonstrated here for the first time as an empirically testable mediation pathway, transforms the intervention logic: targeted vocabulary expansion programmes in Fulfulde, deliverable by community health workers, are theoretically positioned as the proximal lever for reducing diagnostic distance without requiring population-wide educational reform. An important caveat: bootstrap mediation on cross-sectional data establishes the statistical coherence and plausibility of the causal pathway, but does not prove temporal precedence. Longitudinal validation tracking vocabulary change following educational exposure, and subsequent PDDS change, remains the required next step.

The 0% Suicidal Ideation Referral: Replicated Public Health Emergency

CL1 participants reported 0% referral to psychologists for suicidal ideation across all ten sites, with the finding most pronounced at the five rural sites where CL1 proportions are highest. Within the theoretical model, this follows directly from aetiological incompatibility: suicidal ideation named as haawniido grave or caklido is categorised as a manifestation of divine punishment or djinn possession, for which a psychologist has no acknowledged competence [1,3]. Community health workers identifying supernatural vocabulary in a patient's self-description of acute distress should be trained to initiate a culturally adapted risk escalation pathway that neither dismisses the spiritual framework nor withholds emergency clinical assessment. Suicide prevention programmes must develop psychoeducational bridges between spiritual and clinical ontologies that can be endorsed by Islamic religious authorities.

Site-Level Variation as Quasi-Experimental Evidence

The site-level variation in cluster proportions provides theoretically interpretable evidence for the structural determinants framework without experimental manipulation. The two sites showing highest CL1 prevalence (Kolofata, 72.5%; Tokomberé, 67.5%) are both characterised by minimal biomedical infrastructure, high religious observance, and low formal education — the exact profile theorised to produce supernatural vocabulary dominance. Kousseri, the only large urban trans-border centre in the sample, shows the highest CL3 prevalence (62.5%) of any site, reflecting substantial biomedical service exposure. This ecological convergence between site profile and cluster distribution constitutes quasi-experimental evidence for the structural determinants hypothesis: the vocabulary–distance association scales with the theoretically predicted ecological and institutional conditions across heterogeneous communities.

Limitations and Future Research Directions

Four limitations warrant acknowledgement, each with associated future research implications. First, while the mediation analysis establishes the statistical coherence and plausibility of the causal pathway (education → cluster → PDDS), cross-sectional data cannot demonstrate temporal precedence. Longitudinal confirmation remains necessary: a prospective cohort design tracking vernacular vocabulary at baseline (T0) and actual care-seeking behaviour at 6-month (T1) and 12-month (T2) follow-up intervals would simultaneously establish causal directionality and validate PDDS scores against observed behaviour.

Second, the PDDS relies on declared intentions rather than observed behaviours. The intention–behaviour gap [22] means actual care-seeking may diverge from declared propensity under crisis conditions. Future research should validate PDDS scores against prospectively observed care-seeking trajectories in a clinical referral population.

Third, while the present study covers the Cameroonian Far North comprehensively, it does not represent other major Fulfulde-speaking populations (Nigerian Fulani, Nigerien Peul, Malian Peul). The stability of the three-cluster structure across ten heterogeneous Cameroonian sites strengthens the case for replication in these populations.

Fourth, a randomised intervention study — community health education sessions introducing biomedical Fulfulde vocabulary, with pre/post PDDS measurement — would provide causal experimental evidence for the lexical expansion hypothesis and directly test the intervention implication derived from the mediation findings.

CONCLUSION

This study establishes vernacular aetiological naming in Fulfulde as both the dominant psycholinguistic predictor of diagnostic distance and the proximal causal mechanism through which formal education shapes care-seeking propensity. The ten-site, N = 400 design, spanning the full ecological and sociodemographic gradient of the Cameroonian Far North, demonstrates structural robustness: consistent cluster proportions, stable effect sizes, and invariant instrument factor structure across heterogeneous communities confirm the generalisability of the findings within the Cameroonian Sahel. The mediation analysis — showing that 96% of the education–diagnostic distance relationship is transmitted via aetiological cluster membership, with a non-significant direct effect — constitutes the study's central causal contribution: education reduces diagnostic distance not through a direct attitudinal channel, but by restructuring the learner's vernacular aetiological lexicon from supernatural to mixed or biomedical registers. This finding position targeted vocabulary expansion programmes, deliverable in Fulfulde by community health workers, as the theoretically justified and practically achievable proximal lever for reducing the psycholinguistic treatment gap. The 0% clinical referral rate for suicidal ideation in CL1 populations, consistent across all ten sites, establishes an immediate public health priority. A two-to-three-minute vernacular probe based on the present taxonomy, validated against prospective care-seeking behaviour in follow-up research, has the potential to constitute the first culturally calibrated psycholinguistic triage instrument for mental health services in sub-Saharan Africa.

Ethical Approval and Conflict of Interest

Ethical approval: Regional Delegation of Scientific Research and Innovation, Far North Region, Cameroon (Ref. DRSI-EN/2026/018). All procedures complied with the Declaration of Helsinki. The author declares no conflict of interest.

Data Availability

Anonymised dataset, PDDS items in Fulfulde and French, and analysis code (R and SPSS with PROCESS macro) are available from the corresponding author upon reasonable request and subject to ethical approval.

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