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CLINICAL RESEARCH ARTICLE



Intersectional insights into refugee mental health: exploring the impact of identity and systemic barriers

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ABSTRACT

Background: The global refugee crisis has reached unprecedented levels, placing millions of forcibly displaced individuals at heightened risk for psychological distress. While the effects of pre-migration trauma on mental health are well established, less is known about how intersecting identity factors and post-migration systemic barriers jointly shape posttraumatic stress severity.

Objective: Guided by Intersectionality Theory and Ecological Systems Theory, this study examined how pre-migration trauma exposure, identity-related characteristics, and post-migration stressors interact to predict post-traumatic stress symptom severity among refugees and asylum seekers.

Method: Participants included 610 refugees and asylum seekers who completed standardized assessments at the Boston Center for Refugee Health and Human Rights. PTSD symptom severity was assessed using the Harvard Trauma Questionnaire. Predictors included pre-migration trauma exposure, identity factors (e.g., education level, region of origin, English proficiency), and post-migration stressors (e.g., legal status, employment, housing, community involvement). Classification and Regression Tree (CART) analysis was used to identify hierarchical and nonlinear interactions among predictors.

Results: The pruned CART model identified education level, English language proficiency, and region of origin as the strongest predictors of PTSD symptom severity. Individuals with some formal education, higher English proficiency, and origins outside Uganda and Europe reported higher symptom scores. Pre-migration trauma variables were not retained in the final model, highlighting the influence of post-migration structural conditions.

Conclusions: Findings underscore the importance of moving beyond trauma-focused models to address how legal insecurity, social exclusion, and linguistic integration shape refugee mental health and recovery.

Perspectivas interseccionales sobre la salud mental de personas refugiadas: explorando el impacto de la identidad y las barreras sistémicas

Antecedentes: La crisis mundial de personas refugiadas ha alcanzado niveles sin precedentes, situando a millones de individuos desplazados forzosamente en un elevado riesgo de malestar psicológico. Si bien los efectos del trauma previo a la migración sobre la salud mental están ampliamente documentados, se conoce menos cómo los factores identitarios interseccionales y las barreras sistémicas posteriores a la migración interactúan para configurar la severidad del estrés postraumático.

Objetivo: Guiado por la Teoría de la Interseccionalidad y la Teoría de los Sistemas Ecológicos, este estudio examinó cómo la exposición a traumas pre-migratorios, las características relacionadas con la identidad y los estresores post-migratorios interactúan para predecir la severidad de los síntomas de TEPT en personas refugiadas y solicitantes de asilo.

Método: La muestra incluyó a 610 personas refugiadas y solicitantes de asilo que fueron evaluadas mediante instrumentos estandarizados en el Boston Center for Refugee Health and Human Rights. La severidad de los síntomas de TEPT se evaluó mediante el Cuestionario para Trauma de Harvard (HTQ por sus siglas en inglés). Las variables predictoras incluyeron la exposición a traumas pre-migratorios (físicos, psicológicos y sexuales), factores identitarios (género, religión, pertenencia a minorías sexuales, nivel educacional, región de origen y dominio del idioma inglés) y estresores post-migratorios (estatus legal, empleo, autorización de trabajo, situación habitacional y participación comunitaria). Se utilizó el método de Árbol de Clasificación y Regresión (CART) para identificar interacciones jerárquicas y no lineales entre los predictores.

Resultados: El modelo CART podado identificó el nivel educacional, el dominio del idioma inglés y la región de origen como los predictores más robustos de la severidad de los síntomas de TEPT. Las personas con algún nivel de educación formal, mayor dominio del inglés y procedencia fuera de Uganda y Europa informaron puntajes más elevados de sintomatología. Las variables de trauma pre-migratorio mostraron una importancia

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Salud mental de personas refugiadas; estresores post-migratorios; interseccionalidad; determinantes estructurales; análisis CART

HIGHLIGHTS

- Refugee mental health is shaped by the intersection of identity factors and structural barriers, not trauma exposure alone.
- Education, language proficiency, and region of origin emerged as the strongest predictors of PTSD symptom severity in the CART model.
- Findings highlight the importance of intersectional and systemic approaches that address legal insecurity, discrimination, and social exclusion to support the psychological well-being of forcibly displaced populations.

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moderada, pero no fueron retenidas en el modelo final, lo que subraya la mayor influencia de las condiciones estructurales posteriores a la migración.

Conclusiones: Los hallazgos destacan la necesidad de trascender los modelos centrados exclusivamente en el trauma, incorporando el análisis de cómo la precariedad legal, la exclusión social y la integración lingüística configuran conjuntamente la salud mental y los procesos de recuperación de las personas refugiadas.

The global refugee crisis has reached record levels by the end of 2024, with an estimated 123.2 million people displaced worldwide (United Nations High Commissioner for Refugees [UNHCR], 2025). The 1951 Refugee Convention defines refugees as individuals fleeing their country due to a well-founded fear of persecution based on race, religion, nationality, membership in a particular social group, or political opinion (UN General Assembly, 1951), and outlines minimum protections, including access to courts, employment, and public relief. Despite this, modern asylum policies have become increasingly restrictive, limiting access to work and housing, worsening long-term mental health outcomes (Linton et al., 2017; Silove et al., 2000). In the United States, for example, refugees receive legal protections, such as work authorisation, while asylum seekers remain in a legal and social limbo as they await case resolutions (Kerwin, 2018).

Refugees and asylum seekers (RAS) often endure severe pre-migration trauma, including war, political persecution, forced displacement, and economic instability. These adversities are often compounded by trauma during migration, including family separation, human trafficking, sexual violence, and other life-threatening experiences (Miles et al., 2019; Steel et al., 2009). These experiences have lasting psychological consequences, with meta-analyses estimating that up to one-third of refugees meet criteria for post-traumatic stress disorder (PTSD), anxiety, and depression (Bogic et al., 2015; Fazel et al., 2005). Trauma involving physical or psychological torture contributes to depressive symptoms, hypervigilance, and emotional dysregulation (Rizkalla et al., 2024; Schippert et al., 2025; Specker et al., 2024). Sexual violence, affecting about one in five women (Vu et al., 2014), intensifies PTSD and stigma-related distress (Vallejo-Martín et al., 2021).

While the impact of pre-migration trauma is well-established, growing research highlights the equally critical role of post-migration stressors on RAS mental health outcomes. Adversities such as housing instability, unemployment, discrimination, and legal precarity can compound prior trauma and impede psychological recovery (Hynie, 2018; Porter & Haslam, 2005). A systematic review found that post-migration stressors were as significant as trauma severity in

predicting PTSD among refugees (Li et al., 2016). Particularly, restrictive asylum policies, such as prolonged detention, limited work authorisation, and temporary protection visas, heighten psychological distress by contributing to chronic uncertainty and financial insecurity (Laban et al., 2004; Momartin et al., 2006).

1. Sociopolitical discrimination and marginalisation

RAS hold multiple, intersecting identities that influence their access to resources, exposure to discrimination, and ability to integrate into host societies (Alessi et al., 2016; Ziersch et al., 2020). These identities interact with sociopolitical conditions in host countries, where systemic hostility towards certain groups can intensify pre-existing psychological distress. Although refugee mental health has been widely studied, most research examines pre-migration trauma, post-migration stressors, and identity-related factors in isolation, limiting our understanding of how these domains intersect to shape mental health outcomes. While the psychological impacts of war, persecution, and violence are well-documented (Miles et al., 2019; Steel et al., 2009), and the effects of economic hardship and sociopolitical discrimination are increasingly recognised (Hynie, 2018; Miller & Rasmussen, 2017), few studies have systematically explored how these factors interact.

To address these gaps, this study applies Intersectionality Theory (Crenshaw, 1991) and Ecological Systems Theory (Bronfenbrenner, 2005) to examine the mental health of RAS. Intersectionality highlights how overlapping systems of oppression and privilege – such as race, gender, legal status, and socioeconomic position – jointly shape outcomes (Alessi et al., 2020; Samari et al., 2018). Research on asylum-seeking women in Europe shows how gender and legal status interact to exacerbate distress, particularly among those facing gender-based violence and uncertain asylum outcomes (Freedman, 2016). LGBTQ refugees often experience compounded discrimination from both their communities and host societies, limiting access to care and support (Alessi et al., 2016). Legal precarity has been linked to increased anxiety and depression due to fear of deportation, financial instability, and restricted access to services (Nickerson

et al., 2019). Language barriers further intensify distress by impeding access to healthcare, employment, and integration. Limited proficiency is associated with increased symptoms due to isolation, reduced self-efficacy, and miscommunication, which can sometimes result in misdiagnosis or inadequate care (Ostrand, 2015; Shannon et al., 2015).

Ecological Systems Theory complements this perspective by situating refugee mental health within overlapping individual, community, and structural contexts (Bronfenbrenner, 2005; Miller & Rasmussen, 2017). RAS in high-crime or socially isolated neighbourhoods report heightened distress due to unsafe conditions and limited support (Hynie, 2018). In contrast, ethnic enclaves and faith-based organisations can buffer trauma and support integration (Goodkind et al., 2014). Religious participation often provides coping and identity resources, though it may also expose refugees, particularly Muslims, to discrimination in host societies (Samari et al., 2018). Broader structural barriers, such as labour market exclusion and restrictive immigration policies, further undermine stability and mental health (Steel et al., 2009). Together, Intersectionality and Ecological Systems Theory provide a comprehensive framework for examining how overlapping identities and systemic barriers contribute to distress.

2. Study

This study investigates how pre-migration trauma, post-migration stressors, and identity-related characteristics interact to shape PTSD symptom severity among RAS. While prior research has often examined these domains separately (Nickerson et al., 2019; Porter & Haslam, 2005), we adopt a more holistic intersectional and ecological perspective (Bronfenbrenner, 2005; Crenshaw, 1991). To operationalise this, we employ Classification and Regression Tree (CART) analysis, a nonparametric machine learning method that identifies subgroups at elevated risk by detecting nonlinear and hierarchical interactions among predictors (Breiman et al., 2017). Unlike traditional linear regression models, CART automatically captures complex interactions (e.g. Gass et al., 2014; Venkatasubramaniam et al., 2017), making it especially useful for studying multifactorial processes in health disparities (Gass et al., 2014; Hastie et al., 2008). CART has been successfully applied to uncover risk profiles in racially minoritised, trauma-affected, and economically marginalised populations (Bauer et al., 2021; Mena et al., 2019).

We hypothesised that the CART analysis would uncover distinct subgroups of RAS at heightened risk for PTSD symptoms based on combinations of pre-migration trauma exposure, post-migration structural stressors, and identity-related characteristics. We

expected that variables such as English language proficiency, education level, continent of origin, religion, sex, exposure to physical, psychological, or sexual torture, and level of protection from deportation would interact in complex ways to shape mental health risk. For example, while individuals with temporary protected status or pending asylum applications may face greater instability and threat of deportation, we anticipated that their risk for elevated PTSD symptoms would be further magnified when combined with other identity-based vulnerabilities, such as being female and Muslim (Crenshaw, 1991; Hynie, 2018), as well as with pre-migration experiences of severe trauma. Rather than predicting the effects of single variables, this study aimed to utilise CART's capacity for modelling non-linear, intersectional interactions to identify high-risk profiles based on the interplay between social location and structural vulnerability.

3. Methods

This study utilised data collected from the Boston Center for Refugee Health and Human Rights (BCRHHR), a clinic located in Boston, Massachusetts, that offers comprehensive healthcare services to RAS and their families. The dataset consists of information from standard intake interviews conducted by clinicians with new patients who sought care between January 2013 and March 2019. During this timeframe, individuals were eligible for services at BCRHHR if they had undergone torture, which was a factor in the asylum determination process. Torture was defined following 18 U.S.C. §§ 2340–2340A, which specifies that it involves intentional actions designed to cause severe physical or psychological pain. The intake process included a section where clients briefly described their persecution experiences to establish service eligibility and completed brief mental health questionnaires. The intake forms collected included sociodemographic details and self-reported PTSD symptoms.

3.1. Measures

3.1.1. Identity factors

Clients reported sex, education, and religious preference. Educational responses (e.g. college, vocational training) were recoded into three groups: No Formal Education, Basic (primary/secondary education), and Higher (college or beyond). Religion was categorised as Muslim, Christian, or Other/Unaffiliated. Religious preference was categorised as Muslim, Christian, or Other/Unaffiliated to balance conceptual relevance with sample size constraints and to reflect the religious groupings most examined in refugee mental health research, particularly regarding experiences of

discrimination, community support, and sociopolitical marginalisation.

3.1.2. Sexual minority status

Although clients were not explicitly asked about their sexual orientation, their narrative interviews included descriptions of persecution experiences, some of which involved persecution related to same-sex behaviours. To identify potential sexual minority status, this study used a coding scheme developed in a prior study examining the demographic characteristics of Lesbian, Gay, and Bisexual asylum seekers (Bird et al., 2022). Specifically, short narrative summaries generated by clinicians in response to the prompt 'Can you tell me what happened?' were reviewed for client-reported instances of persecution involving same-sex behaviours. Following established procedures (e.g. Rodrigues et al., 2017), clients were coded as being persecuted for holding a sexual minority identity (pLGB) if their narratives referenced same-sex romantic or sexual behaviours or explicitly identified an LGB orientation. Persecution related to same-sex behaviour thus served as a proxy for identifying clients with sexual minority status. Narratives were coded using content analysis by trained research assistants under supervision, and a binary indicator was created (0 = non-PLGB, 1 = PLGB).

3.2. Region of origin

During intake, clients self-reported their country of origin. For the purposes of analysis, countries were grouped into broader regional categories to reflect geographical patterns while accounting for sample size limitations. Most clients in this sample, seen at the BCRHHR, were from Uganda; therefore, it was categorised separately. The remaining African countries were grouped under Other African Nations. Individuals from Asian and Middle Eastern countries were combined into a single category due to regional proximity and the limited number of clients from each country. The remaining countries were classified into two groups: Europe and the Americas. This resulted in five regional categories: Uganda, Other African Nations, Asia and the Middle East, Europe, and the Americas.

3.3. Pre-migration trauma experiences

Pre-migration trauma variables were derived from a previously coded dataset developed by Bird et al. (2022). In that study, clinicians elicited short narrative statements using the prompt, 'Can you tell me what happened?' regarding persecution experiences, which were summarised in 2–5-sentence narrative reports. Bird and colleagues applied a structured content analysis procedure to code each narrative dichotomously for

the presence or absence of three trauma types: physical torture (e.g. beatings, forced labour), psychological torture (e.g. threats of harm, forced witnessing of violence), and sexual violence (e.g. rape or coerced sexual acts). This coding approach demonstrated high interrater reliability ($\kappa = .87$). In the current study, these dichotomous trauma indicators were retained without modification and entered as separate predictors in the CART analysis to examine their associations with PTSD symptom severity.

3.4. PTSD risk

The Harvard Trauma Questionnaire (HTQ; Mollica et al., 1992) served as the primary outcome measure to assess posttraumatic stress disorder (PTSD) risk among trauma-exposed individuals. The HTQ is a widely used self-report screening instrument that evaluates trauma-related symptom severity across diverse populations, including refugees and asylum seekers (Mollica et al., 1992; Shoeb et al., 2007). It has been extensively validated in cross-cultural contexts, including Southeast Asian, Middle Eastern, and African refugee populations, and has demonstrated robust psychometric properties across these groups (Berthold et al., 2019; Mollica et al., 1992).

The English version of the Harvard Trauma Questionnaire (HTQ) was administered to all participants as part of routine clinical assessment at the BCRHHR. Data were obtained retrospectively from clinical records and were not collected specifically for research. In accordance with hospital guidelines, all clients received the same English-language HTQ, and telephone-based interpretation services were used as needed to support comprehension. The same HTQ symptom items were administered to all participants, regardless of region of origin.

In this study, participants completed Part IV of the HTQ, which comprises 30 items assessing PTSD-related symptoms. The first 16 items correspond to the DSM-IV (APA, 1994) diagnostic criteria for PTSD, including symptoms from the re-experiencing, avoidance/numbing, and hyperarousal clusters. The remaining 14 items were developed by the Harvard Program in Refugee Trauma to capture culturally specific expressions of distress that may not be reflected in standard diagnostic criteria, such as guilt, loss of trust, and feelings of shame or isolation (Mollica et al., 1992). These culturally grounded additions aim to enhance the scale's relevance and sensitivity to the experiences of displaced individuals. Clients rated how much each symptom bothered them in the past week on a 4-point Likert scale from 1 (*not at all*) to 4 (*extremely*). Total symptom scores were calculated by summing responses across all completed items (possible range: 30–120), with higher scores

indicating greater severity of PTSD symptoms. In the present study, the total HTQ score was retained as a continuous variable to allow nuanced analysis of PTSD symptom patterns. The 30-item HTQ's internal consistency in this sample was moderate, with Cronbach's $\alpha = .66$. Although this value falls below the conventional cut-off of .70, it is consistent with prior research suggesting that alpha coefficients may vary across culturally diverse samples and may reflect the multidimensional and culturally nuanced nature of trauma-related symptoms among refugee populations (Shoeb et al., 2007; Sigvardsson et al., 2016).

3.5. Post-migration factors

During the intake process, clients self-reported their housing status, employment, work authorisation, current immigration status, and community involvement. Housing status included Shelter/Homeless, With Family and Relatives, With People Unrelated to Me, and Alone/Other (a combined category for individuals living alone or in other arrangements). These categories were retained to capture nuanced differences in living conditions that may uniquely influence mental health outcomes.

Immigration status was collapsed into three categories based on the degree of legal protection and vulnerability to deportation: High Protection (e.g. U.S. citizens and permanent residents), Moderate Protection (e.g. refugees, asylees, or individuals with Temporary Protected Status), and Low Protection (e.g. asylum seekers and undocumented individuals). This tiered classification reflects varying levels of access to legal, economic, and social resources, with lower protection levels linked to greater uncertainty and higher risk of adverse mental health outcomes (Chu et al., 2013; Steel et al., 2009).

Work authorisation was coded as a binary variable (authorised vs. unauthorised). Employment status was categorised as Unemployed, Employed (including formal and informal work), or Inconsistent/Seasonal Employment to reflect varying degrees of labour market stability. Participants self-rated their English language fluency in four domains: speaking, reading, writing, and understanding. Each domain was assessed on a 4-point Likert scale from 1 (*not at all*) to 4 (*fluent*), reflecting perceived ability to communicate in English. A composite score was computed by averaging the four domain scores. Based on this average, participants were categorised into three proficiency levels: Low (1.00–1.50), Moderate (1.51–2.50), and High (2.51–4.00).

This multidimensional self-assessment approach aligns with the Language Experience and Proficiency Questionnaire (LEAP-Q), a validated tool that measures perceived fluency across multiple language domains. It has been shown to be reliable in

multilingual and refugee populations (Marian et al., 2007; Narasimhan et al., 2023). Furthermore, the conceptual framework for categorising proficiency draws on the Interagency Language Roundtable (ILR) scale, which provides standardised descriptors of functional language ability across core communication skills (Interagency Language Roundtable, 2011).

At intake, clients were asked, 'Are you currently involved in any social, cultural, or community activities?' The first author (GA) reviewed and coded responses using a five-domain framework: faith or spiritual community, family or friends in the U.S., cultural or ethnic group, sports/recreation, and other organised activities (e.g. volunteering, clubs). Each domain was coded dichotomously (0 = not involved, 1 = involved), and total scores were computed by summing endorsed categories. For example, 'I attend church and sometimes help with food drives' was coded as both faith/spiritual and other social activities. Scores were grouped into three levels of community involvement: Low (1–2), Medium (3–4), and High (5 or more), reflecting increasing embeddedness. This operationalisation draws on ecological models and social capital frameworks that emphasise the role of social integration in buffering psychological distress among displaced populations (Bronfenbrenner, 2005; Goodkind et al., 2014; Kreitzer et al., n.d.; Miller & Rasmussen, 2017).

3.6. Data analysis

Data analyses were conducted using SPSS Statistics (v29.0). Descriptive statistics were computed for all demographic, identity-related, and post-migration variables, as well as PTSD symptom scores. CART (Classification and Regression Tree) analysis was used to examine how intersecting identity and post-migration factors collectively contributed to PTSD symptom severity. This approach aligns with intersectionality frameworks, which emphasise the role of overlapping identities and systemic stressors in shaping mental health outcomes (Bowleg, 2008; Crenshaw, 1991). CART models were generated using SPSS's decision tree procedure, applying the Gini impurity criterion to determine optimal splits. Variable importance scores were computed to assess each predictor's relative contribution. Pruning techniques were applied to improve model interpretability and avoid overfitting, yielding a parsimonious final tree. CART's flexibility in handling missing data was particularly beneficial for this study. Rather than removing incomplete cases, the algorithm uses surrogate splitters, alternative variables that approximate the primary split when data are missing.

Additionally, SPSS allows missing values to be treated as a separate category, enabling the model to retain cases and account for missingness as a potentially meaningful feature of subgroup membership. To

further examine differences in PTSD symptom severity across the subgroups identified by CART, one-way analyses of variance (ANOVAs) were conducted. These follow-up analyses compared group means to assess whether the decision tree splits reflected statistically significant variation in PTSD outcomes.

4. Results

The study sample consisted of $N = 610$ participants, with the majority identifying as female (see Table 1). Some intake responses were incomplete, and all descriptive statistics are based on valid responses only. In the CART analysis, missing values were treated as a separate category to retain cases and account for potential effects of missingness. As shown in Table 1, most participants identified as Christian and reported at least some formal education, with nearly 60% having attended college or higher. The gender distribution was relatively balanced. Table 2 details post-migration stressors, including high rates of unemployment (65%) and lack of work authorisation (70%). Most participants also reported living with unrelated individuals and having only moderate English proficiency. The mean PTSD symptom score was 76.03 ($SD = 10.5$), indicating moderate to severe trauma-related distress.

4.1. CART model

4.1.1. Variable importance

As part of the CART analysis, variable importance scores were calculated to assess the contribution of

each predictor to the classification model. These scores reflect how effectively a variable reduced classification error across all possible splits in the tree and are normalised such that the most important variable receives a score of 100%. Education level was considered the most important, followed by English proficiency and community involvement. Other variables with moderate importance included immigration status, religious preference, physical and psychological torture, gender, continent of origin, work authorisation, and employment status (all ranging from 55.1% to 66.7%). These variables were selected by the model as primary or surrogate splitters in the final tree. Housing status had a low importance score (3.8%) and was not used in any splits. Although all predictors were included in the initial model, only those that improved classification accuracy contributed to the development of the tree structure (See Table 3 for importance scores).

4.1.2. Pruned regression tree

The final pruned regression tree from the CART analysis had four terminal nodes. The model produced a risk estimate of 103.742 (standard error = 6.977), representing the mean squared error between predicted and observed HTQ scores. To aid interpretability, we also examined the root mean squared error (RMSE), which was approximately 10.18. This value represents the standard deviation of prediction errors and is expressed in the same units as the outcome variable, allowing comparison with observed variability (Harwell, 2019). Given that the sample's standard deviation on the HTQ was 10.31 ($M = 76.17$, $SD = 10.31$), the RMSE suggests that the model's predictions deviated from observed scores by approximately the same amount as the natural variation in the data. This level of error supports the utility of the CART model for exploratory purposes, particularly for identifying subgroups in psychological research contexts,

Table 1. Participant descriptives of the sample.

Variable	Categories	<i>n</i>	%
Gender	Male	258	42.3
	Female	273	44.8
Religious Preference	Christian	381	62.5
	Muslim	111	18.2
	Non-Christian/Other	39	6.4
	Missing	79	12.9
	No Formal Education	19	3.1
Education	Basic Education	160	26.2
	Higher Education	350	57.4
	Missing	79	12.9
	Uganda	310	50.8
Continent of Origin	Other African Countries	148	24.3
	Asia & Middle East	49	8.0
	Americas	24	3.3
	Europe	4	.7
	Missing	75	12.3
	Non-LGBT	445	73.0
	LGBT Persecuted	86	14.1
Sexual Minority Status	Missing	79	12.9
	No	374	61.3
Sexual Violence	Yes	157	25.7
	Missing	79	12.9
	No	122	20.0
Physical Assault	Yes	409	67.0
	Missing	79	12.9
	No	159	26.1
Psychological Torture	Yes	372	61.0
	Missing	79	12.9
	No	159	26.1

Note. Missingness was treated as a separate category. Percentages are based on the full sample ($N = 610$).

Table 2. Post migration factors of the sample.

Variable	Categories	<i>n</i>	%
Housing Status	Shelter/Homeless	17	2.8
	Alone/Other	36	5.9
	With Family and Relatives	129	21.1
	With People Unrelated to me	347	56.9
Employment	Unemployed	399	65.4
	Employed	126	20.7
Work Authorisation	Not Authorised	429	70.3
	Authorised	87	14.3
Protection from Deportation	Low	419	68.7
	Moderate	71	11.6
	High	28	4.6
English Proficiency	Low	39	6.4
	Moderate	345	56.6
	High	113	18.5
Community Involvement	None	125	20.5
	Low	208	34.1
	Moderate	255	41.8
	High	22	3.6

Note. Percentages are based on valid responses only and exclude missing values, which were treated as a separate category in the CART analysis. All variables retained a 'Missing' category in the analyses.

Table 3. Variable importance scores of variables.

Variable	Importance	Normalised Importance
Education level	0.895	100.0%
English proficiency (high/fluent)	0.867	97.0%
Community involvement	0.690	77.1%
Immigration status	0.597	66.7%
Religious preference	0.548	61.2%
Physical torture	0.546	61.1%
Psychological torture	0.546	61.1%
Gender	0.546	61.1%
Region of origin	0.528	59.0%
Work authorisation	0.524	58.6%
Employment status	0.493	55.1%
Housing status	0.034	3.8%

where RMSE values comparable to standard deviations are considered acceptable (Harwell, 2019). Although CART models are not evaluated using traditional variance-explained metrics, this predictive performance indicates that the model captures meaningful structure in the data.

4.1.3. Final tree

Figure 1 shows the tree splitting for the CART model, which included pre-migration torture experiences, identity, and post-migration variables from the study. The initial split in the CART model was based on education level, separating individuals with no formal education from those with some formal education. Among individuals with no formal education (HTQ Mean = 78.2; 16.4%), there was no further split, indicating that no additional variable contributed to their heterogeneity. Among the subset with some education, the next split was based on continent of origin, with individuals from Uganda (N = 309; 98.7%) and Europe (N = 4; 1.3%) forming one subgroup (HTQ Mean = 75.21, $n = 313$), while those from other African countries, Asia, the Middle East,

Table 4. Terminal group characteristics.

Group Label	N	% of Sample	Mean HTQ Score
No Education (Group 1)	100	16.4%	78.24
Some Education – Uganda/Europe (Group 2)	313	51.3%	75.21
Some Education – Other Regions – Low English Proficiency (Group 3)	142	23.3%	75.64
Some Education – Other Regions – High English Proficiency (Group 4)	55	9.0%	79.27

and the Americas formed another. Within the group with some education, participants from regions other than Uganda and Europe were further split by English language proficiency. Individuals with low English proficiency within that subset had a lower PTSD risk score (HTQ Mean = 75.64, 23.3%) than those with higher English language proficiency (HTQ Mean = 79.27, 9.0%). Table 4 presents the mean HTQ scores for each terminal group. The group with some education, from Africa/Asia/Middle East/Americas, and high English fluency had the highest PTSD risk score ($M = 79.27$).

4.2. ANOVA results

A one-way analysis of variance (ANOVA) was conducted to compare PTSD symptom severity across the four terminal groups identified in the CART model. Results showed a statistically significant difference in HTQ scores between groups, $F(3, 417) = 2.95$, $p = .032$, indicating that PTSD symptom severity varied by subgroup. Tukey HSD post hoc comparisons indicated that the mean HTQ score for Group 2 ($M = 75.21$, $n = 313$) was significantly lower than that for Group 4 ($M = 79.27$, $n = 55$), $p = .038$. No other pairwise comparisons were statistically significant.

5. Discussion

This study used a Classification and Regression Tree (CART) analysis to examine how pre-migration trauma, identity-related characteristics, and post-migration systemic barriers predict PTSD symptom severity among refugees and asylum seekers. We hypothesised that PTSD risk scores would be shaped by intersecting identity-based and structural vulnerabilities, including English proficiency, education level, region of origin, religion, sex, and legal protection from deportation. Consistent with this expectation, the CART model identified distinct subgroups at elevated PTSD risk, primarily differentiated by education level, region of origin, and English proficiency, each of which was retained in the final decision tree.

Notably, education level emerged as the most important predictor in the model, closely followed by English proficiency and region of origin. Although

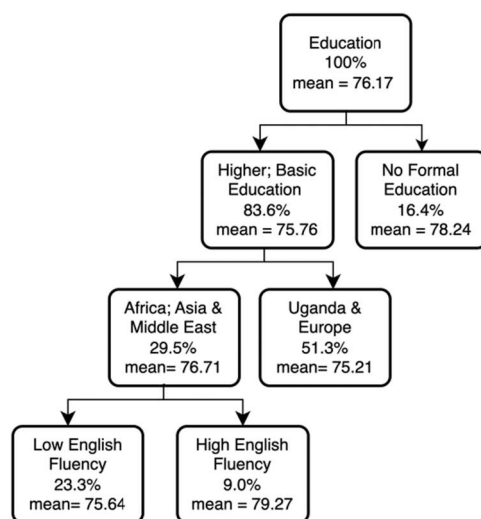


Figure 1. Classification and Regression Tree (CART) Model Predicting PTSD Symptom Severity. Note. The tree illustrates the hierarchical splits that classify participants into subgroups. Each terminal node presents the percentage of the study sample and the mean PTSD score (HTQ Total).

traditional models of PTSD in forcibly displaced populations emphasise pre-migration trauma, such as physical and psychological torture, these factors, despite moderate variable importance, were not among the strongest predictors and were ultimately not retained in the final pruned tree. This suggests that, within this sample, post-migration structural conditions may play a more critical role in shaping PTSD risk than trauma exposure alone. These findings highlight broader critiques of trauma-focused refugee mental health models, which often underemphasise the enduring impact of post-migration stressors, including legal, linguistic, and socioeconomic marginalisation in resettlement contexts (Miller & Rasmussen, 2017; Silove et al., 2007).

Although only three variables were retained in the final tree, several others showed relatively high importance within the model's internal structure. Community involvement, immigration status, and religious preference contributed meaningfully to the initial splits, while identity-related and trauma variables, such as sex, sexual minority status, and psychological torture, were also moderately influential. Their exclusion from the final tree reflects CART's parsimony: only variables that substantially improve classification accuracy are retained (Breiman et al., 2017; Mena et al., 2019). However, the elevated importance scores suggest that these variables interacted with others in shaping PTSD risk profiles, even if they did not yield unique predictive value once stronger structural markers were accounted for.

From an intersectional perspective, these patterns suggest that overlapping systems of oppression, legal precarity, social isolation, and cultural displacement cumulatively affect mental health outcomes. For example, LGBTQ+ refugees often face compounded marginalisation across gender, sexual orientation, and immigration status, resulting in elevated psychological distress (Alessi et al., 2016). Similarly, ecological systems theory emphasises the influence of multiple environmental layers, including individual identity, social networks, and institutional structures, on mental health. The elevated importance of variables such as community involvement and immigration status aligns with prior research documenting the protective role of social support and the detrimental effects of legal uncertainty and restricted access to services (Bronstein & Montgomery, 2011; Ellis et al., 2010; Yoon et al., 2013). Thus, even when not retained in the final classification model, these variables remain critical to understanding the psychosocial ecology of RAS mental health.

Participants with some formal education reported lower PTSD severity than those with none, consistent with literature indicating that education often reflects access to resources that support post-migration adjustment, including literacy, problem-solving skills,

and familiarity with institutional structures (Farahani et al., 2021; Kirmayer et al., 2011; Simich et al., 2005). For example, Steel et al. (2009) found that among trauma-exposed refugees, higher educational attainment was inversely related to PTSD severity. Similarly, Beiser and Hou (2001) reported that higher levels of education were associated with better psychological adjustment among Southeast Asian refugees resettled in Canada. Education may facilitate navigation of bureaucratic systems, access to social support, and future-oriented thinking, all of which are linked to reduced distress in displaced populations.

At the same time, the protective effects of education are not uniform. They may depend on the degree of continuity between individuals' pre-migration educational experiences and the host country's institutional, linguistic, and bureaucratic systems. For refugees whose education occurred in markedly different political, administrative, or pedagogical contexts, formal schooling may not readily translate into effective navigation of systems or institutional trust. In such cases, education may coexist with frustration, status loss, or unmet expectations, potentially attenuating its protective role. These findings underscore the importance of situating education within broader sociopolitical and institutional contexts when interpreting its relationship to mental health among forcibly displaced populations.

Interestingly, although English proficiency was among the strongest predictors in the CART model, its relationship to PTSD severity appears more complex than assumed. Fluency can facilitate access to healthcare, employment, and education, yet may heighten vulnerability during displacement. Studies suggest that higher proficiency is associated with greater awareness of inequities, unrealistic expectations for integration, and more frequent encounters with discrimination, particularly when individuals are underemployed or their credentials are unrecognised (Bustamante et al., 2017; Chu et al., 2013; Porter & Haslam, 2005). Chu et al. (2013) found that higher host-language fluency was unexpectedly linked to worse PTSD outcomes, possibly due to pressure to adapt and succeed. Similarly, Porter and Haslam (2005) reported that refugees with higher pre-migration socioeconomic status, often tied to proficiency and education, experienced sharper mental health declines due to steeper post-migration status loss. Notably, English proficiency in this study reflects self-perceived functional ability within clinical contexts, which may fluctuate under stress and should be interpreted cautiously.

This paradox has been echoed in broader literature on refugee and immigrant mental health. Ingleby (2004) and Yakushko et al. (2008) argue that strong communication skills may increase refugees' exposure to and recognition of subtle or systemic forms of

exclusion that might otherwise go unnoticed or unarticulated by those with limited language ability. Beiser and Hou (2006) similarly found that more acculturated refugees reported higher levels of distress, potentially because greater language competence fosters greater awareness of the gap between their aspirations and constrained realities. Studies of underemployment among high-proficiency immigrant populations also report elevated risk for anxiety and depression, particularly when professional identities cannot be reclaimed in the host society (Porter & Haslam, 2005).

Therefore, while English fluency is often viewed as a protective factor, these findings suggest it may heighten risk when paired with structural inequities and social exclusion. Rather than treating language proficiency as uniformly beneficial, it is essential to consider how sociopolitical context, labour market exclusion, and downward mobility interact to shape its psychological consequences for forcibly displaced individuals. Future research should further explore these dynamics by examining how language proficiency intersects with perceived discrimination, employment mismatch, and identity disruption to influence mental health outcomes across diverse refugee subgroups and resettlement contexts.

Another key finding from this study was that among participants with some formal education, those from Uganda reported lower PTSD symptom severity than similarly educated participants from other regions. This pattern should be interpreted within the clinical, community, and global context in which the data were collected. During the study period (2013–2019), the Boston Center for Refugee Health and Human Rights served a large number of Ugandan refugees and asylum seekers, reflecting broader regional displacement patterns and sustained political repression in Uganda, including state-sanctioned violence, persecution of political dissidents, and intensified targeting of sexual minorities (Human Rights Watch, 2015, 2019; Amnesty International, 2018). As a result, the clinic's patient population included a disproportionately large and relatively well-established Ugandan community.

Importantly, Boston is home to the largest Ugandan immigrant and refugee population in the United States, and the clinic operates within a densely networked Ugandan community. The presence of a culturally cohesive community may have facilitated access to instrumental resources, shared language practices, collective identity, and social recognition – factors linked to improved mental health outcomes among displaced populations (Beiser & Hou, 2006; Guruge & Butt, 2015). This community context likely shaped linguistic environments and access to support in ways that intersect with education and English proficiency, potentially buffering distress relative to refugees from more dispersed, less established, or

recently arrived groups. Empirical studies support the idea that ethnic enclaves can serve as vital sources of social capital. For instance, Simich et al. (2005) found that Vietnamese and Afghan refugees living in ethnically concentrated communities in Canada experienced better mental health outcomes due to access to familiar languages, shared norms, and community-based support networks. Similarly, Goodkind et al. (2014) demonstrated that ethnic community involvement was linked to increased resilience and lower distress among refugee women in the U.S. While enclaves may sometimes hinder broader social integration, for recently resettled or marginalised individuals, they can offer a crucial buffer against cultural alienation, systemic racism, and post-migration stress. These findings suggest that region-specific dynamics, including access to supportive enclaves, must be considered when assessing the mental health risk and resilience of refugees.

This study has several limitations. First, data were drawn from retrospective medical records, which may vary in completeness and accuracy due to reliance on clinician documentation (Vassar & Matthew, 2013). Second, the cross-sectional design limits causal inference, and self-reported measures may be affected by cultural norms around symptom expression and disclosure (Choi et al., 2006). An additional limitation concerns the assessment of English language proficiency. Participants self-rated their English ability across speaking, reading, writing, and comprehension domains, reflecting perceived rather than objectively measured proficiency. Prior linguistic and health communication research suggests that both patients and providers may overestimate functional proficiency, particularly in clinical settings, and that second-language use under stress may further affect comprehension, expression, and response accuracy (Flores, 2006; Karliner et al., 2007). Language-related anxiety and cognitive load associated with communicating in a non-native language may influence how individuals interpret and endorse symptom items, even when interpreter support is available (Ingleby, 2004; Yakushko et al., 2008). As such, English proficiency in this study should be interpreted as a contextual and subjective marker of linguistic integration rather than a precise indicator of language competence (Ingleby, 2004; Marian et al., 2007).

Additionally, the sample was drawn from a single clinic in Boston, which has a large representation of Ugandan refugees, potentially limiting its generalisability. However, the study's strengths include a relatively large clinical sample and the application of CART analysis, which enabled the detection of complex interactions often overlooked in traditional models (King & Resick, 2014; Zhang & Singer, 2010). The integration of intersectionality and ecological systems frameworks further supports the study's

relevance for real-world refugee mental health contexts.

This study advances understanding of RAS mental health by identifying how structural and identity-related factors intersect to shape PTSD severity. Although education, English proficiency, and region of origin were key predictors, traditionally emphasised variables such as torture and sex were not retained in the final CART model, suggesting a more prominent role for post-migration conditions. Using a data-driven, intersectional approach, this study underscores the need to move beyond trauma-focused frameworks towards more comprehensive models that incorporate systemic influences. These insights can inform clinical practice, policy development, and future research to support the mental health of forcibly displaced populations.

From a clinical perspective, these findings underscore the need to incorporate post-migration structural and identity-related factors into refugee mental health assessment and care. Rather than relying solely on trauma exposure, clinicians should consider how education, language proficiency, legal protection, and community embeddedness intersect to shape psychological risk and resilience. Identifying subgroup-specific risk profiles may support more tailored screening, referral, and intervention strategies that are responsive to patients' social and structural contexts.

At the policy level, the results highlight opportunities to move beyond one-size-fits-all refugee services towards more targeted resource allocation and culturally responsive programming. Policies that improve access to language support, employment pathways, legal stability, and community-based resources may yield downstream mental health benefits. By showing how structural determinants cluster within specific subpopulations, this study provides empirical support for refugee health policies that address both individual-level needs and broader systemic barriers.

6. Data availability statement

The data supporting the findings of this study are available upon request from the corresponding author, LCN. The data are not publicly available because they contain information that could compromise the privacy of research participants.

Disclosure statement

No potential conflict of interest was reported by the authors.

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