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# Exploring socio-ecological context and mental health of Ukrainian refugees in Italy through eco-map: a mixed-methods study

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ABSTRACT

*Background:* Following the humanitarian crisis in Ukraine, an estimated 8,174,189 refugees have fled (April 2023). Refugee status leads to a higher prevalence of mental illness, which may also arise or be worsened by post-migration stressors. Although a growing literature on the social determinants of mental health, little is known on the Ukrainian refugee population. Thus, this study aims to analyse the association between mental health and the socio-ecological context of Ukrainian refugees.

*Methods:* A mixed-methods study was conducted involving Ukrainian refugees hosted in the province of Verona (Italy) from November 2022 to April 2023. Mental health (MH) was assessed through the International Trauma Questionnaire (ITQ) and the General Health Questionnaire-12 (GHQ-12). The socio-ecological context was explored through a semi-structured ecomap distributing individuals into ecomap clusters. Logistic regression was used to explore association between mental health outcomes and ecomap clusters adjusting for sex, age, and chronic diseases.

*Results:* A total of 224 refugees were recruited ($F = 80.8$ %; median age=35.5 years, IQR 24.7–44.0). At the GHQ-12, 119/214 (55.6 %) individuals were found to be at risk for psychological distress; at the ITQ, 86/211 (40.8 %) tested positive for post-traumatic stress disorder (PTSD) and 28/211 (13.3 %) for complex PTSD.

Five clusters of stressful edges were identified: none (53.4 %), family (15.5 %), social network (12.1 %), public services (9.7 %), school/work (9.2 %). Refugees from the stressful clusters social network, public services and school/work had an odds ratio of PTSD 1.24 [0.95CI 1.01–1.53, $p = 0.049$], 1.41 [0.95CI 1.12–1.78, $p = 0.031$] and 1.46 [0.95CI 1.15–1.85, $p = 0.002$] times higher than none. The risk of a positive GHQ-12 was 1.29 [0.95CI 1.02–1.62, $p = 0.031$] and 1.46 [0.95CI 1.14–1.87, $p = 0.003$] times higher in the public services and school/work clusters compared to none.

*Conclusions:* MH distress was high in our sample and was associated with having stressful edges with public services and school or work in the resettlement country. Ecomap proved to be a useful tool to explore the social network of refugees. Reducing the stressors of refugees' social context could contribute to improving their MH.

## 1. Background

The number of displaced people worldwide has steadily increased in recent decades, reaching 110 million in 2023. Among them, one-third (36.4 million) are refugees, i.e. people forced to flee their country due to conflict or persecution (United Nations High Commissioner for Refugees UNHCR, 2023). The invasion of Ukraine by the Russian Federation in February 2022 led to a new wave of forcibly displaced people and

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refugees in Europe. By mid-2023, 11.6 million Ukrainians were displaced, of which 5.9 million were refugees, surpassing Afghanistan and becoming the second-largest refugee population after Syria (United Nations High Commissioner for Refugees UNHCR, 2023).

Displaced persons are a group particularly vulnerable to psychological distress due to the numerous stressors that occur during the migration process. A distinction can be made between pre-migratory, migratory, and post-migratory factors. The former includes exposure to conflict and human rights violations; the second refers to the migration itself, which bears the potential to be a stressful time due to infectious diseases, extortion, and human trafficking; the latter is linked to the resettlement process that migrants go through in the country of arrival and include detention, uncertainty about applying for asylum and reduced social integration (Public Health Aspects of Mental Health Among Migrants and Refugees, 2016).

All these elements contribute to an increased prevalence of mental disorders among migrants than in the general population: post-traumatic stress disorder (PTSD) reaches a prevalence of 31 % (95 % CI 25–38), while that of major depressive disorder (MDD) 32 % (95 %CI 26–39) (Blackmore et al., 2020; Patanè et al., 2022). In contrast, the lifetime prevalence of PTSD in global mental health surveys has been estimated at between 3.9 % and 5.6 %, and the worldwide prevalence rate of MDD at 4.4 % (Koenen et al., 2017; World Health Organization WHO, 2017). Among the Ukrainian population, previous studies found an elevated risk of PTSD in 30.8 % of internally displaced people in Ukraine and abroad, and 41 % screened positive for depression among a representative of Ukrainian War Refugees in Czechia (Lushchak et al., 2023; Guerrero et al., 2023).

In recent years, more attention has been paid to factors influencing health outcomes in the post-migration phase including the social context and relational ties of migrants and refugees in the post-resettlement environment. Separation from the family of origin, fear for their safety and social isolation are known risk factors for migrants' mental health. In contrast, social support from the community is a protective factor against mental health difficulties (Morgan et al., 2017). Moreover, in the post-resettlement phase of adjustment and integration, emotional distress contributes to negative health outcomes for refugees. Finally, being exposed to violence, displacement, and resettling contributes to the undermining of interpersonal bonds and the dismantling of communities (James et al., 2019).

The emerging role of the post-resettlement phase in shaping health and social outcomes indicates that refugees' psychological distress acknowledgement in the country of arrival and adequate psychological care is a priority. Moreover, it is important to rebuild and strengthen the social network enabling it to act as a shock absorber and harmonizer of the change and adaptation process to the new context (Gleeson et al., 2020). The ecomap is one of the tools to explore one's socio-ecological network, through the subjective drawing of one's connections in a specific time and space. In qualitative research, this tool has been used to relate socio-ecological context and health outcomes (Saragosa et al., 2024).

Miller and Rasmussen first applied this ecological approach to the migrant population in the resettlement country by linking it with mental health (Miller and Rasmussen, 2017). Shifting from a war exposure-based model of interpreting migrants' mental health to one based on post-migration stressors has been shown to improve understanding of mental health in this population.

Although there is a growing body of literature on the social determinants of mental health relatively few have focused on the migrant population and none on the Ukrainian refugees (Purgato et al., 2017). Indeed, it is important to study context-specific situations and different populations as the relationship between socio-ecological context and mental health may differ depending on the specific country of resettlement and population considered (Li et al., 2016). To the best of our knowledge, this is the first study to explore this association with the proposed methodology in Italy, despite being among the main arrival countries of migrant people. Therefore, the primary study objective was to describe the socio-ecological context of the refugees in the resettlement country and to assess their mental health status. Secondary objective was to explore the possible association between the socio-ecological context and mental well-being (in terms of psychological distress and PTSD) of Ukrainian refugees in Verona (Italy). The primary hypothesis was that a less strong socio-ecological context (i.e. with fewer supportive and more stressful edges) had a negative relationship with the mental health of the refugee person.

## 2. Methods

### 2.1. Ethical approval

The research was performed following the ethical standards of the 1964 Declaration of Helsinki and was approved by the Ethical Committee of the University Hospital of Verona on 24/10/2022 (protocol number 63939).

### 2.2. Study design

This is a cross-sectional study with a mixed method design encompassing a qualitative part (socio-ecological assessment) and a quantitative one (mental health assessment). Both parts were administered to the entire sample.

### 2.3. Population and setting

Individuals who had arrived in Italy from Ukraine after 24 February 2022, following the outbreak of the Russian-Ukrainian conflict, were considered eligible for this study. Individuals aged 15 years or older were included. Refugees unable to give informed consent or lacking a legal guardian were excluded.

Italy's Ukrainian refugee reception system operates through two distinct services, both falling under the jurisdiction of the Ministry of the Interior. The Reception and Integration System (RIS) is administered locally, while the Centers for Extraordinary Reception (CER) are overseen centrally (Dipartimento della Protezione Civile, 2022). In addition, these systems are integrated by the extended reception network consisting of nonprofit, religious, and social service organizations, co-housing with families, and accommodation provided by other private institutions. In the province of Verona, the reception network for Ukrainian refugees includes about 117 CERs and four RIS-related projects (Centro Studi Immigrazione (CESTIM); Ministero dell'interno). As of the beginning of 2024, the number of Ukrainian refugees in the province of Verona reached 2377, of whom 1346 (56.6 %) were adult females and 694 (29.2 %) were minors (Dipartimento della Protezione Civile). This was the population from which the study sample was drawn.

### 2.4. Endpoints

The primary endpoint was the number of individuals with a GHQ-12 score suggestive of psychological distress and the number of persons with a positive result at the ITQ for PTSD and C-PTSD. Secondary endpoints were the edge density by system level of Bronfenbrenner's framework and by edge type and the silhouette coefficient for the number of clusters fitted over the nodes' type and the edge density.

### 2.5. Data collection and instruments

The questionnaire was administered between November 2022 and April 2023 to all persons meeting the inclusion criteria. Ukrainian refugees were recruited in the province of Verona through the local refugee reception network (i.e., regional, and local authorities, SRC, RIS, and non-profit organizations). A written disclosure about the study was first

given, and those who agreed to participate signed an informed consent form. All documents were written in Ukrainian or Russian. For those under eighteen, informed consent was signed by their parents or legal guardian. The questionnaire consisted of three sections:

#### 2.5.1. Socio-demographic information

A closed-ended questionnaire was administered to evaluate socio-demographic and migration context characteristics (Supplementary material).

#### 2.5.2. Socio-ecological context assessment

To explore the refugees' socio-ecological network, a semi-structured ecomap was used. It was based on Bronfenbrenner's ecological system theory. This conceptual framework provides a means to interpret how people interact and develop within socially constructed environments (ecologies), families, institutions, workplaces, peers, or other formal and informal contexts. Bronfenbrenner's theory assumes that a person grows within spheres of influence. The ecomap in the present study was structured into three levels, according to the literature (Bennett and Grant, 2016). The first level (micro-system) represents the sphere of closest relationships for the individual consisting mainly of the family (restricted or extended) and friendships. The second level (exo-system) represents everyday community relations such as work, school, and church. Finally, the third level (macro-system) comprises the socio-cultural context (including connections maintained through social networks) and relations with institutions (e.g., health services, legal services) (Supplementary material).

At each level, there were circles corresponding to different environments (*nodes*) belonging to that specific level. The person was asked to fill in the circles with the people in his/her social network and indicate the type of relationship he/she has with them (*edges*). The expected relationship types were:

- Supportive: indicating those people who are important within the social network and who play a helpful and positive role for the person.
- Neutral: indicating those relationships that, although present, do not have a decisive impact on the person's life, attitudes, or state.
- Stressful: indicating those relationships that are conflictual or a source of concern for the person.

In the ecomap provided to the refugees, the three levels were shown and in each of them, the circles representing the nodes were already present to facilitate filling them in. Some circles had a pre-filled label indicating the node (e.g. family, work, school). In contrast, others were left blank to allow the person to express any nodes not identified by the research team and to improve the completeness and flexibility of the tool.

#### 2.5.3. Mental health assessment

To assess being at risk for psychological distress or post-traumatic stress disorder the General Health Questionnaire (GHQ-12) and the International Trauma Questionnaire (ITQ) were used.

The GHQ-12 consists of 12 items to be answered by the participant according to the variation, compared to his or her habitual standard, in the frequency of scenarios or behaviours described in the specific statement of the items. In the present study, the four-level responses were scored using bimodal methods (0, 0, 1, 1), having a total score ranging between 0 and 12 points. According to the literature, the cut-off chosen was 4 points (Anjara et al., 2020). The GHQ-12 was previously tested and validated in Ukrainian refugees (Benoni et al., 2024).

The ITQ is a self-report measure that allows a simple and concise assessment of key aspects of PTSD, according to the ICD-11 diagnostic criteria. The ITQ has two main sub-scales: the first (9 items), concerns PTSD and assesses three symptom domains, namely re-experiencing avoidance and sense of threat; the second (9 items), used to evaluate the complex-PTSD, investigates the symptoms of self-organization disorder, and the functional impairment caused by them. Each item is answered on a Likert scale from 0 (not at all) to 4 (very much). The cut-off for PTSD is given by a score $\geq 2$ in at least one of the two items of each of the three symptom domains (re-experiencing, items 1 and 2; avoidance, items 3 and 4; hyperarousal, items 5 and 6) plus at least one of the three indicators of functional impairment (items 7, 8 and 9). C-PTSD is defined by exceeding the PTSD cut-offs and by at least one of the two symptoms of each of the three clusters of Self-organisation Disorders: affective dysregulation (items 10–11), negative self-concept (items 12–13) and relationship disorders (items 14–15). Thus, a person can receive a diagnosis of PTSD or c-PTSD, but not both. The ITQ is available in the Ukrainian and Russian language-validated versions (Karatzias et al., 2023).

### 2.6. Pilot testing

To assess the feasibility, comprehensibility, and acceptability of the questionnaire, particularly to evaluate the likelihood of self-completion of the ecomap following the instructions in Supplementary material, a pre-test was conducted on 20 people. Participants included Ukrainian refugees and personnel of nonprofit organisations involved in the reception system to include a plurality of perspectives and to complement the identification of critical issues. After completing the questionnaire, a cognitive interview was used to assess the abovementioned characteristics and discuss possible improvements. Secondly, the research team estimated the questionnaire's results for completeness and suitability for the objectives of this study. Refugees who participated in the pre-test were excluded from the final study sample.

### 2.7. Statistical analysis

Descriptive statistics were conducted on sociodemographic and migration context data using frequencies and proportions for categorical variables and means and standard deviation (SD) or medians and interquartile ranges (IQRs) for continuous ones. Sample distribution was tested via $\chi 2$ and Fisher exact test or Mann-Whitney-U non-parametric, as appropriate.

In the ecomap analysis, the edge density was computed as the number of edges divided by the total number of edges. It was calculated by the type of edges and by the system level of Bronfenbrenner's framework.

Cluster analysis was used to identify groups of socio-relational contexts. To apply cluster analysis, the Gower distance was estimated over the following six variables: type of nodes and edge density in the micro-, exo-, and macro-system. It was computed for both types of edges, namely supportive and stressful. The Gower distance was selected because data had both continuous and categorical variables, and it allows for mixed variables to be used simultaneously. The silhouette coefficient fitted on Gower distance was used to estimate the optimal number of clusters to be imputed in the algorithm. The individuals were assigned to the different clusters through the partitioning around medoids technique with the k-medoids algorithm fitted on the previously computed optimal number of clusters and Gower distance (Schubert and Rousseeuw, 2019).

The univariate association between sociodemographic characteristics, migratory context, and previously identified edge clusters, as independent variables, and results (positive/negative) at the GHQ-12 and ITQ was explored using the $\chi 2$ or the Fisher exact test. Three multivariable binomial logistic regressions were used to explore the association between the three MH outcomes: presence of psychological distress (i.e., GHQ-12 results), PTSD and complex PTSD (i.e., ITQ results) and ecomap clusters adjusted for sex, age and presence of chronic diseases. . Results were presented as odds ratio (OR) with a 0.95 confidence interval (CI).

A p-value $< 0.05$ was considered significant. All analyses were performed using the R software (version 4.3.0) using package "cluster",

"ggplot2" and "Rtsne" to perform the cluster analysis and data visualization.

## 3. Results

### 3.1. Sample characteristics

During the study period, 224 refugees participated. The majority were females ($n = 181$, 80.8 %) and the median age was 35.5 years (IQR 24.7–44.0). University ($n = 109$, 48.7 %) was the most listed educational level followed by secondary ($n = 46$, 20.5 %) and high ($n = 45$, 20.1 %) schools.

Almost all of the sample spoke Ukrainian ($n = 205$, 91.5 %) and arrived from regions directly affected by the war ($n = 170$, 75.9 %), with 135 (60.3 %) and 100 (44.6 %) reporting having family members who either stayed in Ukraine or actively served in the army, respectively. Respondents who described their migration journey as either *not at all difficult* or *not very difficult* accounted for 46 (20.5 %) and 73 (32.6 %), respectively. Only 14 (6.3 %) stated it was *extremely difficult*. The median time from their arrival in Italy was 8.7 months (IQR 6.7–11.6). There were no significant differences in migration difficulty scores based on age ($p = 0.179$) or sex ($p = 0.464$).

Regarding health status, 86 (38.4 %) and 94 (42.0 %) rated it as good or on average, and 43 (19.2 %) reported having at least one chronic disease. Females reported their health status as *on average* more often than *good (51.6 % vs 39.5 %)* compared to males (31.0 % vs 57.1 %, $p = 0.030$). There were no significant differences regarding chronic diseases ($p = 0.395$).

### 3.2. Socio-ecological context assessment

Of the overall sample, 18 (8.0 %) did not complete the semi-structured ecomap and were excluded (Fig. 1). Characteristics of the included refugees are shown in Table 1.

The mean number of edges was 10.4 (SD=5.4). The most represented system was the micro-system encompassing median edges density of 0.537 (SD=0.243), followed by exo- (0.254, SD=0.151) and macro-systems (0.210, SD=0.157). There was a significant positive gradient in supportive edges density, being more represented in micro-system (0.857, SD=0.385), followed by exo- (0.614, SD=0.367) and macro-systems (0.391, SD=0.385, $p < 0.001$, Fig. 2). On the contrary, stressful edges density was higher in the macro-system (0.218, SD=0.329) compared to both micro- (0.053, SD=0.119, $p < 0.001$) and exo-system (0.088, SD=0.199, $p < 0.001$, Fig. 2).

Table 2 shows the distribution of edges by nodes and type. The most frequent nodes for supportive edges were in the micro-system and specifically were family members (*children*: 8.9 %, *siblings*: 8.1 %, *mother*: 8.9 %, *father*: 5.0 %), *partner* (7.2 %), and *friends* (9.8 %). Other frequently listed nodes for supporting edges were *hobbies* (5.3 %) and *hosting community* (8.9 %), in the exo-system. Regarding stressful edges, nodes were more likely to be retrieved in the macro-system with 24.9 % for *social network*, 12.7 %, and 10.8 % for *legal services* and *health services*, respectively. In the exo- and micro-system, the most frequent nodes related to stressful edges were *school* (7.0 %), *job* (6.1 %), and *partner* (6.6 %).

In the cluster analysis, the silhouette coefficient fitted on the supportive edges was not satisfactory, ranging between 0.32 for a cluster number $K = 2$ and 0.37 with $K = 10$. The silhouette coefficient fitted on the stressful edges was satisfactory (0.64) with $k = 5$. The five cluster characteristics are shown in Table 1.

Five stressful clusters were identified based on the density of stressful edges in the levels of the Bronfenbrenner's framework. The most frequent cluster was 'None', having a mean density of stressful edges of 0.000 (SD=0.024). Following that, 'Micro' ($n = 32$, 15.5 %) and 'Macro/SN' ($n = 25$,12.1 %) were observed, with the micro-system (0.147, SD=0.092) and the macro-system at social network nodes (0.154,

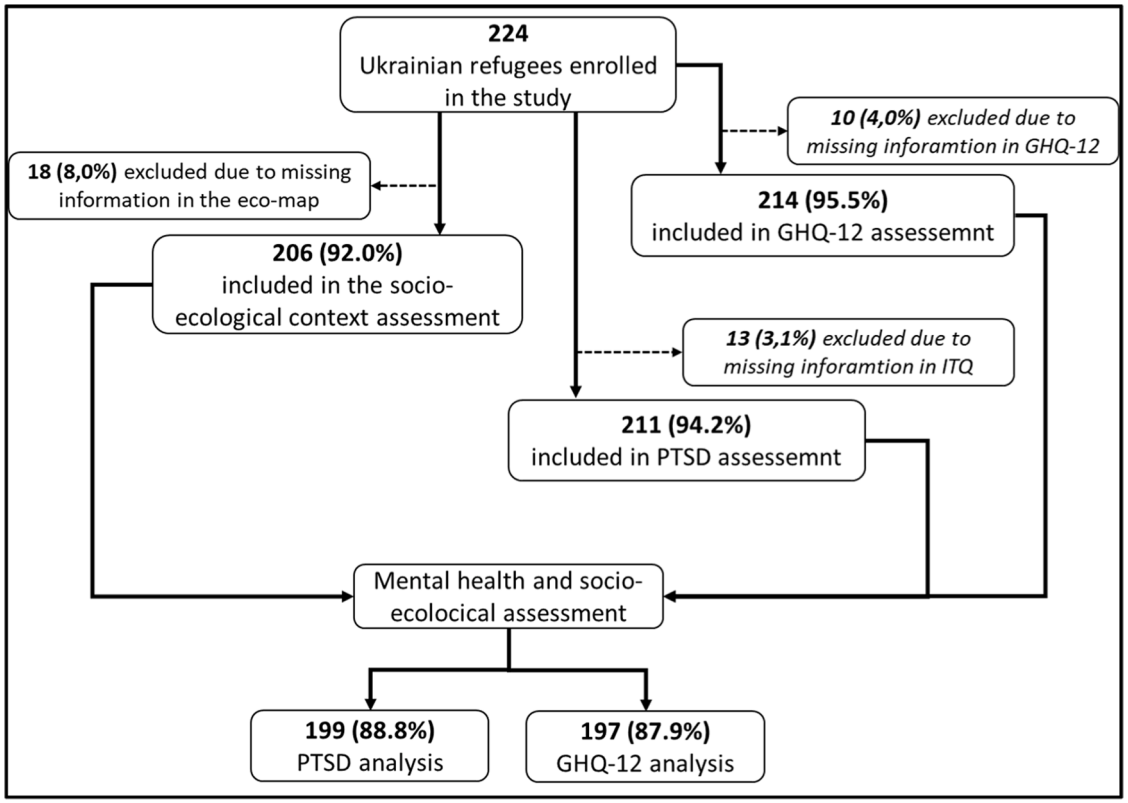


**Fig. 1.** Flowchart of the Ukrainian refugee sample included in the study. GHQ-12=general health questionnaire-12; ITQ=international trauma questionnaire; PTSD=post-traumatic stress disorder.

**Table 1**
Sociodemographic, epidemiological, and clinical characteristics of Ukrainian refugees included (i.e., completed the ecomap), distinguished by the cluster type of stressful edges. Groups were built through cluster analysis based on the density of stressful edges in the levels of the Bronfenbrenner's framework.

| | Overall ($n$ = 206) | None ($n$ = 110) | Micro ($n$ = 32) | Macro/SN ($n$ = 25) | Macro/PS ($n$ = 20) | Exo/Macro ($n$ = 19) |
|---|---|---|---|---|---|---|
| **Sex** | | | | | | |
| Female | 167 (81.1 %) | 86 (78.2 %) | 27 (84.4 %) | 19 (76.0 %) | 18 (90.0 %) | 17 (89.5 %) |
| Male | 39 (18.9 %) | 24 (21.8 %) | 5 (15.6 %) | 6 (24.0 %) | 2 (10.0 %) | 2 (10.5 %) |
| **Age (years)** | | | | | | |
| Median (IQR) | 36.0 (23.3–44.0) | 35.0 (23.3–44.0) | 36.0 (23.0–43.6) | 36.4 (23.0–33.9) | 34.0 (29.7–42.0) | 37.0 (25.5–43.0) |
| **Family status (N/A = 24)** | | | | | | |
| De facto union or married | 96 (52.7 %) | 51 (49.5 %) | 15 (48.4 %) | 11 (55.0 %) | 12 (75.0 %) | 7 (58.3 %) |
| Single | 54 (29.7 %) | 36 (35.0 %) | 7 (22.6 %) | 5 (25.0 %) | 3 (18.8 %) | 3 (25.0 %) |
| Divorced | 21 (11.5 %) | 8 (7.8 %) | 8 (25.8 %) | 3 (15.0 %) | 1 (6.3 %) | 1 (8.3 %) |
| Widower | 11 (6.0 %) | 8 (7.8 %) | 1 (3.2 %) | 1 (5.0 %) | 0 (0.0 %) | 1 (8.3 %) |
| **Education (N/A = 3)** | | | | | | |
| University or higher | 111 (54.7 %) | 56 (51.9 %) | 14 (43.8 %) | 19 (76.0 %) | 12 (63.2 %) | 10 (52.6 %) |
| High school | 41 (20.2 %) | 24 (22.2 %) | 7 (21.9 %) | 3 (12.0 %) | 3 (15.8 %) | 4 (21.1 %) |
| Middle School | 43 (21.2 %) | 23 (21.3 %) | 9 (28.1 %) | 3 (12.0 %) | 4 (21.1 %) | 4 (21.1 %) |
| Elementary school | 8 (3.9 %) | 5 (4.6 %) | 2 (6.3 %) | 0 (0.0 %) | 0 (0.0 %) | 1 (5.3 %) |
| **Chronic disease** | | | | | | |
| No | 166 (80.6 %) | 92 (83.6 %) | 27 (84.4 %) | 18 (72.0 %) | 15 (75.0 %) | 14 (73.7 %) |
| Yes | 40 (19.4 %) | 18 (16.4 %) | 5 (15.6 %) | 7 (28.0 %) | 5 (25.0 %) | 5 (26.3 %) |
| **Health status 5-likert score (N/A = 22)** | | | | | | |
| Mean (SD) | 2.6 (0.7) | 2.6 (0.6) | 2.6 (0.7) | 2.6 (0.7) | 2.5 (0.8) | 2.1 (0.9) |
| **Migration difficulties 5-likert score (N/A = 23)** | | | | | | |
| Median (IQR) | 1.5 (1.2) | 1.4 (1.3) | 1.5 (1.2) | 1.2 (1.0) | 1.9 (1.2) | 1.8 (1.4) |
| **Time from Italy's arrivalin months (N/A = 1)** | | | | | | |
| Median (IQR) | 8.7 (6.8–11.6) | 9.4 (7.3–11.8) | 9.1 (7.8–9.2) | 8.7 (5.4–11.2) | 7.6 (6.5–7.8) | 6.5 (6.2–11.2) |
| **GHQ-12 (N/A = 7)** | | | | | | |
| Negative | 90 (45.2 %) | 58 (54.2 %) | 14 (45.2 %) | 11 (45.8 %) | 5 (25.0 %) | 2 (11.8 %) |
| Positive | 109 (54.8 %) | 49 (45.8 %) | 17 (54.8 %) | 13 (54.2 %) | 15 (75.0 %) | 15 (88.2 %) |
| **ITQ (PTSD, N/A = 9)** | | | | | | |
| Negative | 119 (60.4 %) | 75 (72.8 %) | 18 (56.3 %) | 13 (52.0 %) | 7 (36.8 %) | 6 (33.3 %) |
| Positive | 78 (39.6 %) | 28 (27.2 %) | 14 (43.8 %) | 12 (48.0 %) | 12 (63.2 %) | 12 (66.7 %) |
| **ITQ (C-PTSD, N/A = 10)** | | | | | | |
| Negative | 169 (86.2 %) | 91 (89.2 %) | 25 (80.6 %) | 23 (92.0 %) | 18 (94.7 %) | 12 (63.2 %) |
| Positive | 27 (13.8 %) | 11 (10.8 %) | 6 (19.4 %) | 2 (8.0 %) | 1 (5.3 %) | 7 (36.8 %) |
| **Micro-system** | | | | | | |
| Mean (SD) supportive density | 0.473 (0.265) | 0.592 (0.291) | 0.331 (0.173) | 0.33 (0.102) | 0.356 (0.097) | 0.334 (0.164) |
| Mean (SD) neutral density | 0.042 (0.060) | 0.046 (0.081) | 0.033 (0.059) | 0.054 (0.128) | 0.096 (0.232) | 0.071 (0.18) |
| Mean (SD) stressful density | 0.027 (0.066) | 0.000 (0.005) | 0.147 (0.092) | 0.005 (0.017) | 0.007 (0.023) | 0.027 (0.048) |
| **Exo-system** | | | | | | |
| Mean (SD) supportive density | 0.159 (0.145) | 0.138 (0.16) | 0.193 (0.131) | 0.206 (0.128) | 0.189 (0.119) | 0.124 (0.088) |
| Mean (SD) neutral density | 0.084 (0.097) | 0.070 (0.104) | 0.076 (0.141) | 0.086 (0.103) | 0.146 (0.280) | 0.115 (0.221) |
| Mean (SD) stressful density | 0.022 (0.052) | 0.010 (0.040) | 0.009 (0.027) | 0.027 (0.052) | 0.005 (0.020) | 0.127 (0.045) |
| **Macro-system** | | | | | | |
| Mean (SD) supportive density | 0.084 (0.116) | 0.093 (0.135) | 0.087 (0.093) | 0.072 (0.089) | 0.081 (0.100) | 0.041 (0.079) |
| Mean (SD) neutral density | 0.132 (0.170) | 0.051 (0.082) | 0.144 (0.255) | 0.133 (0.191) | 0.159 (0.276) | 0.139 (0.241) |
| Mean (SD) stressful density | 0.043 (0.079) | 0.000 (0.000) | 0.012 (0.038) | 0.154 (0.100) | 0.100 (0.033) | 0.135 (0.111) |

SN=Social Network, PS=Public Services; GHQ-12=General Health Questionnaire-12; ITQ=International Trauma Questionnaire. PTSD=post-traumatic stress disorder, c-PTSD=complex post-traumatic stress disorder.

SD=0.101) showing the highest density of stressful edges, respectively.

The two least common clusters were 'Macro/PS' ($n$ = 20, 9.7 %) with a higher density of stressful edges in macro-system *public services* nodes (0.100, SD=0.033) and 'Exo/Macro' ($n$ = 19, 9.2 %) with stressful edges in both exo- and macro-systems (exo=0.127, SD=0.045, macro=0.135, SD=0.111).

### 3.3. Mental health assessment

In the whole sample, 119 (55.6 %) refugees proved positive for psychological distress at the GHQ-12, with a mean score of 5.1 (SD=3.4, Cronbach's alpha= 0.85 [0.95CI 0.82–0.88). At the ITQ, 86 (40.8 %) and 28 (13.3 %) people scored positive for PTSD (Cronbach's alpha= 0.88 [0.95CI 0.85–0.90) and c-PTSD (Cronbach's alpha= 0.88 [0.95CI 0.86–0.91), respectively, with a mean score equal to 10.1 (SD=5.5) and 16.7 (SD=9.2).

Fig. 3 shows the distribution of supportive and stressful edges based on the result at the GHQ-12 and ITQ.

The probability of testing positive at GHQ-12 was 28.7 % (OR: 1.29, 0.95CI 1.02–1.62) and 46.2 % (OR: 1.46, 0.95CI: 1.14–1.87) higher in clusters 'Macro/PS' ($p$ = 0.031) and 'Exo/Macro' ($p$ = 0.003) compared to the cluster 'None'. It was also higher for those with chronic diseases (OR: 1.20, 0.95CI: 1.01–1.44], $p$ = 0.046, Table 3).

Similarly, the probability of testing positive for PTSD was 41.4 % (OR: 1.41, 0.95CI: 1.12–1.78) and 45.6 % (OR: 1.46 0.95CI: 1.15–1.85) higher for refugees in cluster 'Macro/PS' ($p$ = 0.004) and 'Exo/Macro' ($p$ = 0.002) compared to the cluster 'None'. Moreover, it was higher also for those in cluster 'Macro/SN' (OR: 1.24, 0.95CI: 1.01–1.53, $p$ = 0.049). There were no differences based on sex ($p$ = 0.662), age ($p$ = 0.263), or chronic diseases ($p$ = 0.071, Table 4).

The odds of testing positive for c-PTSD were 26.3 % (OR: 1.26,0.95CI: 1.07–1.49) higher for cluster 'Exo/Macro' ($p$ = 0.007) compared to 'None' and 13.1 % (OR: 0.87, 0.95CI: 0.77–0.98) lower for male refugees compared to females ($p$ = 0.030, Table 5). No other

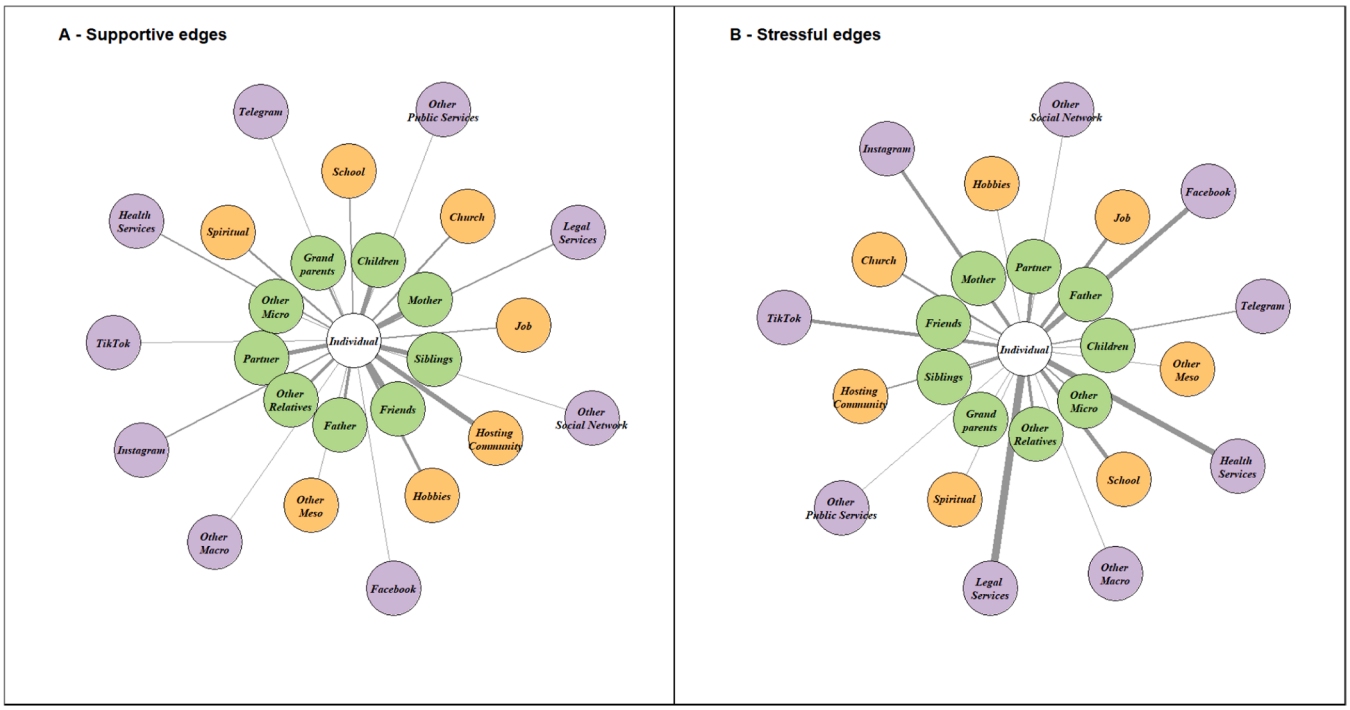


**Fig. 2.** Network diagram of the overall sample who completed the ecomap ($n = 206$), with nodes stratified by levels of Bronfenbrenner's ecological systems theory and edges distinguished by type (panel $A$ = supportive edges, panel $B$ = stressful edges).

differences were found.

## 4. Discussion

This study explored the ecomap as a tool to investigate the social ties and relationships of Ukrainian refugees in Italy and its association with mental health outcomes. Five clusters of stressful edges were identified. Individuals in the clusters with stressful edges in the Bronfenbrenner's macro-system (specifically with the node *public services*) and in both exo- and macro-systems had a higher probability of scoring positive for PTSD and having psychological distress (i.e. a positive score at GHQ-12), compared to the cluster without stressful edges. The edges displayed through the tool of the ecomap were more represented in the micro-system (i.e. family, friends, close ties) than in the exo- (i.e. occupation, host community, hobbies) and macro- (i.e. social network, public services) systems. A higher density of stressful edges was observed at the macro-system level, where edges most frequently identified were those related to social networks and legal or health services.

A recent literature review proposed adapting Bronfenner's ecological model to the refugee context (resettlement ecological model) (Wachter et al., 2021). The micro-system corresponds to individual factors such as age, gender, language ability, access to technology, and health status, which interact as mediators of social needs for which the closest people act as sources of support. The exo-system is included in the support system and represents the inter-related network of potential supports deriving from work, school, and faith-based organizations. Finally, the macro-system can be described in the resettlement context (i.e. urban/rural, housing conditions) and structural factors (i.e. immigration policies, xenophobia, and interaction with public institutions) (Wachter et al., 2021). In the present study, most supportive ties were found in the micro-system, particularly in friends and family, followed by the host community. This result aligns with the scoping review on social support by Watcher and colleagues, which found that out of 41 studies included, 57 % and 46 % indicated that family and friends were the main source of social support for migrants, followed by the co-ethnic community (Wachter et al., 2021).

In the post-resettlement context, family support contributes to health management, both on an individual level and in terms of emotional and psychological support. Nevertheless, family isolation and anxiety related to stigma may act as barriers to accessing healthcare (Tan et al., 2021). Moreover, social support may not be sufficient to improve health outcomes without adequate translation into practical resources such as education and engagement. This gap is exacerbated if there are differences between healthcare providers' cultural norms and behaviours and the immigrant culture and their families' experiences. Therefore, building a culturally competent and cross-cultural environment and social network is essential (Kleinman and Benson, 2006).

Migrant populations suffer worse psychological health than natives in the host country (Hasan et al., 2021). In this study, 55.6 % of the respondents reported psychological distress at GHQ-12, furthermore, 40.8 % scored positive for PTSD and 13.3 % for c-PTSD, showing a high prevalence of mental health disorders. A recent review found a similar prevalence of PTSD (31 %, 95 %CI 23–40) in refugees previously exposed to armed conflict (Mesa-Vieira et al., 2022). Previous studies of Ukrainian refugees in Germany found psychological distress at GHQ-12 in 74.3 % of the sample, and clinically significant levels of PTSD at the Refugee Health Screener (RHS) in 45 % of Ukrainian adolescent refugees (Buchcik et al., 2023; Catani et al., 2023). In a survey on Ukrainian refugees in the Czech Republic, 41.5 % of respondents screened positive for moderate or more severe depression and 23.1 % for moderate or severe anxiety. Women and younger individuals were more likely to be screened positive for mental health problems. Moreover, A significant proportion of refugees who experience symptoms of moderate or severe anxiety or depression do not recognize their mental health issues as problems and are therefore less likely to seek help (Guerrero et al., 2023)

Several factors contribute to the higher risk of PTSD among refugees. The most studied are poor language skills, female gender, advanced age, trauma, childlessness, a disrupted social network, and having arrived in the host country recently (Ahmad et al., 2020; Benoni et al., 2024). Worries for those left behind can add stress to refugees as they may feel guilty towards those left behind or fear for their safety. In our sample, 60.3 % stated that they still have relatives in Ukraine and 44.6 %

**Table 2**
Edge distribution distinguished by node and edge type in the three levels of Bronfenbrenner's ecological system theory.

| | Overall (*n* = 2143) | Strong (*n* = 1412) | Neutral (*n* = 518) | Stressful (*n* = 213) |
|---|---|---|---|---|
| **MICRO-system** | | | | |
| **Family** | **582 (27.2 %)** | **497 (35.2 %)** | **53 (10.2 %)** | **32 (15.0 %)** |
| *Mother* | 139 (6.5 %) | 126 (8.9 %) | 8 (1.5 %) | 5 (2.3 %) |
| *Siblings* | 138 (6.4 %) | 115 (8.1 %) | 12 (2.3 %) | 11 (5.2 %) |
| *Children* | 134 (6.3 %) | 125 (8.9 %) | 6 (1.2 %) | 3 (1.4 %) |
| *Father* | 97 (4.5 %) | 71 (5.0 %) | 17 (3.3 %) | 9 (4.2 %) |
| *Grandparents* | 74 (3.5 %) | 60 (4.2 %) | 10 (1.9 %) | 4 (1.9 %) |
| **Extended family** | **223 (10.4 %)** | **166 (11.8 %)** | **33 (6.4 %)** | **24 (11.3 %)** |
| *Partner* | 121 (5.6 %) | 101 (7.2 %) | 6 (1.2 %) | 14 (6.6 %) |
| *Other family members* | 102 (4.8 %) | 65 (4.6 %) | 27 (5.2 %) | 10 (4.7 %) |
| **Friends** | **157 (7.3 %)** | **139 (9.8 %)** | **15 (2.9 %)** | **3 (1.4 %)** |
| **Other Micro** | **30 (1.4 %)** | **23 (1.6 %)** | **2 (0.4 %)** | **5 (2.3 %)** |
| **EXO-system** | | | | |
| **Hosting community** | **184 (8.6 %)** | **125 (8.9 %)** | **52 (10.0 %)** | **7 (3.3 %)** |
| **Faith** | **158 (7.4 %)** | **102 (7.2 %)** | **47 (9.1 %)** | **9 (4.2 %)** |
| *Church* | 88 (4.1 %) | 50 (3.5 %) | 29 (5.6 %) | 9 (4.2 %) |
| *Spiritual life* | 70 (3.3 %) | 52 (3.7 %) | 18 (3.5 %) | 0 (0.0 %) |
| **Occupation** | **153 (7.1 %)** | **76 (5.4 %)** | **49 (9.5 %)** | **28 (13.1 %)** |
| *Job* | 85 (4.0 %) | 40 (2.8 %) | 32 (6.2 %) | 13 (6.1 %) |
| *School* | 68 (3.2 %) | 36 (2.5 %) | 17 (3.3 %) | 15 (7.0 %) |
| **Hobby** | **103 (4.8 %)** | **75 (5.3 %)** | **27 (5.2 %)** | **1 (0.5 %)** |
| **Other Meso** | **4 (0.2 %)** | **2 (0.1 %)** | **1 (0.2 %)** | **1 (0.5 %)** |
| **MACRO-system** | | | | |
| **Social network** | **341 (15.9 %)** | **119 (8.4 %)** | **169 (32.6 %)** | **53 (24.9 %)** |
| *Instagram* | 96 (4.5 %) | 34 (2.4 %) | 48 (9.3 %) | 14 (6.6 %) |
| *Facebook* | 92 (4.3 %) | 27 (1.9 %) | 48 (9.3 %) | 17 (8.0 %) |
| *Telegram* | 64 (3.0 %) | 29 (2.1 %) | 28 (5.4 %) | 7 (3.3 %) |
| *TikTok* | 63 (2.9 %) | 21 (1.5 %) | 30 (5.8 %) | 12 (5.6 %) |
| *Other social network* | 26 (1.2 %) | 8 (0.6 %) | 15 (2.9 %) | 3(1.4 %) |
| **Public services** | **201 (9.4 %)** | **83 (5.9 %)** | **68 (13.1 %)** | **50 (23.5 %)** |
| *Legal services* | 93 (4.3 %) | 32 (2.3 %) | 34 (6.6 %) | 27 (12.7 %) |
| *Health services* | 92 (4.3 %) | 43 (3.0 %) | 26 (5.0 %) | 23 (10.8 %) |
| *Other public services* | 16 (0.7 %) | 8 (0.6 %) | 8 (1.5 %) | 0 (0.0 %) |
| **Other Macro** | **7 (0.3 %)** | **5 (0.4 %)** | **2 (0.4 %)** | **0 (0.0 %)** |

claimed to have at least one relative employed in the military. Experiences of xenophobia and racism may exacerbate a refugee's situation and result in a loss of trust in the host system. Various conflicts occur within the refugee community due to behavioural adaptation processes that cause distress. The uncertainty regarding integration, administrative tasks, and bureaucratic processes has been identified in the literature as a source of distress and concern on the macro-system (Walther et al., 2021). The protective factors identified include social network support, personal resilience, employment in the host country, a favourable perception of health services, and visa status (Yule et al., 2019). The impact of the social environment on mental health is crucial in that supportive and trusting bonds and coping skills increase self-confidence in tackling the current situation and for the future. It is also known from the literature that high psychological distress is linked to lower support from family, friends, acquaintances, and colleagues, among others (du Plooy et al., 2019).

Considering the clusters related to the types of edges represented on the ecomap, it emerged that the probability of testing positive at the GHQ-12 and PTSD was higher in clusters with more stressful edges in the macro-system, in particular concerning public services (*Macro/PS*), and in persons reporting stressful edges in both the exo- and macro-system (*Exo/Macro*). The most frequently reported stressor in the exo-system was employment (i.e. job/school, 13.1 %). According to a survey conducted by the UNHCR on Ukrainian refugees, the majority of respondents identified economic income (49 %) as their primary need, followed by the pursuit of employment (36 %) and housing (3 %). Health and education were placed fifth and sixth, respectively (United Nations High Commissioner for Refugees UNHCR, 2022). Promoting community resilience among Ukrainian migrants through participatory community interventions can effectively address their specific needs and promote empowerment, as shown in studies of refugees of other nationalities (Migliorini et al., 2023). Moreover, psychosocial interventions are effective in reducing PTSD symptoms in refugees and asylum seekers resettled in high-income countries compared with control groups and LMICs (Nosè et al., 2017; Turrini et al., 2019).

Despite this evidence, it should be noted that no firm conclusions can be drawn regarding the direction of the association between mental health and socio-ecological context. Indeed, although most authors agree that daily stressors in the country of resettlement of migrants negatively affect mental health status, it should be considered that poor mental health can also cause or exacerbate such stressors, affect social relationships and thus lead to a more fragile socioecological context (Miller and Rasmussen, 2014; Benoni et al., 2025).

The present study has several limitations. Firstly, the cross-sectional design of the study prevents drawing inferences about the causality of the association found. Moreover, dealing with a different culture in the context of social relationships and mental health could lead to interpretation difficulties. The involvement of a Ukrainian association in the design phases of the study and the tool construction contributed to bridging potential gaps related to different backgrounds and language barriers. Potential selection bias in the recruitment of participants is a second limitation, as associations were involved in the recruitment of the sample and may have led to the inclusion of people with a more structured social network. Furthermore, since the study was only conducted in the province of Verona and with Ukrainian refugees, it cannot be generalized to the entire Italian national context nor to refugees with different origins or cultural backgrounds. The number of migrants reached was limited leading to a rather small sample size which may have influenced the results of both the cluster analysis and the logistic regressions Finally, the present study used the ecomap as a qualitative-quantitative research tool to explore the individual's social-ecological context but did not assess the edges between other actors in the social network of people (e.g., between parents and friends or parents and siblings, etc.) thus preventing the estimation of typical parameters of social network analysis. Nevertheless, using the ecomap allowed to explore in a nonclinical sample the social-ecological context as one of the primary focuses of the study, considering social support as an integral and key point of research on refugee mental health (Wachter et al., 2021).

## 5. Conclusions

This study contributes to the understanding of the prevalence of mental health disorders in Ukrainian refugees and their association with socio-ecological context. Two clusters of stressful edges were found to be related to MH disorders: the one that included stressful edges in the macrosystem particularly with public services and the one that had stressful edges in both the exo and macrosystem. Even though Ukrainian refugees had easier access to Italy and services than other groups of migrants, the results show how streamlining the bureaucratic apparatus by facilitating the process of legalisation has a positive association with better MH. Moreover, acting on the exo-system to facilitate integration into the social structure at the community, school, and job levels in the resettlement country could have a positive impact on the psychological distress of the refugee person.

Promoting mental health of migrants and refugees means guaranteeing a fundamental right, also in line with the 2030 Agenda for

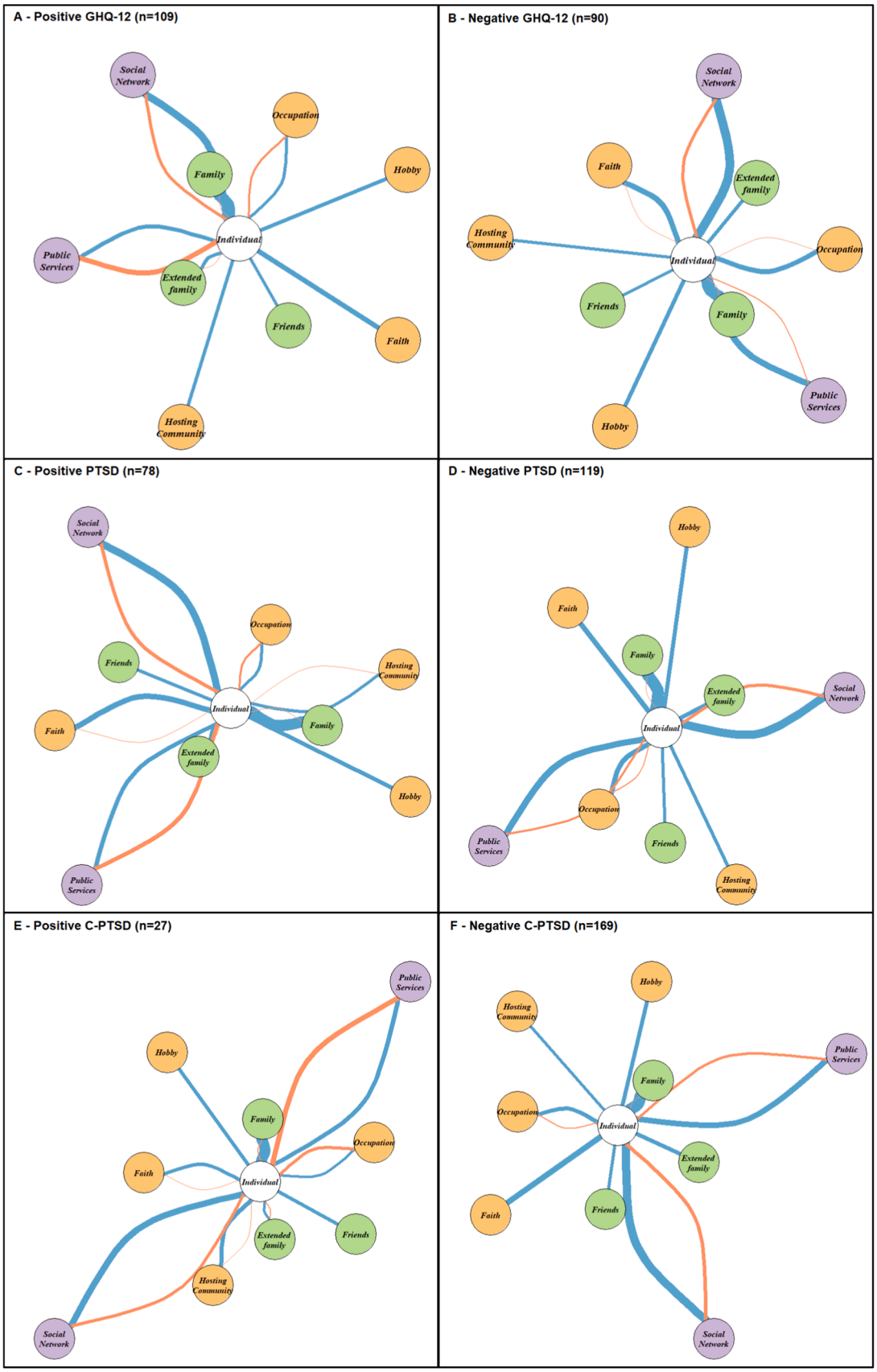


**Fig. 3.** Network diagram of the nodes stratified by the three level of the Bronfenbrenner's ecological systems theory and distinguished by type of edge (blue = supportive, red = stressful). Each row shows the comparison between those who tested positive at the GHQ-12 and at the ITQ for PTSD and C-PTSD (left side, panels A, C, E, respectively) and those who scored negative (right side, panels B, D, F). GHQ-12 =general health questionnaire-12, ITQ=international trauma questionnaire, PTSD=post-traumatic stress disorder, C-PTSD=complex post-traumatic stress disorder.

**Table 3**
Results of the logistic regression models fitted on results at general health questionnaire-12 (i.e., mental health distress: yes/no) as dependent variable and type of stressful socio-ecological cluster, age, sex and presence of chronic diseases.

| | Odds Ratio | 0.95 CI | p-Value |
|---|---|---|---|
| **Stressful socio-ecological cluster** (None) | | | |
| Eso Public Services | 1.29 | 1.02–1.62 | 0.031 |
| Eso Social Network | 1.08 | 0.87–1.34 | 0.494 |
| Micro | 1.10 | 0.91–1.33 | 0.332 |
| Meso/Eso | 1.46 | 1.14–1.87 | 0.003 |
| **Age** (years) | 1.00 | 0.99–1.01 | 0.075 |
| **Sex** (Male) | 0.94 | 0.79–1.12 | 0.459 |
| **Chronic diseases** (yes) | 1.20 | 1.01–1.44 | 0.046 |

Number of observations=199. Hosmer-Lemeshow Goodness-of-Fit Test: Chi-squared=4.939; df=8; p-value=0.764.

**Table 4**
Results of the logistic regression models fitted on results at international trauma questionnaire (i.e., post-traumatic stress disorder: yes/no) as dependent variable and type of stressful socio-ecological cluster, age, sex and presence of chronic diseases.

| | Odds Ratio | 0.95 CI | p-Value |
|---|---|---|---|
| **Stressful socio-ecological cluster** (None) | | | |
| Eso Public Services | 1.41 | 1.12–1.78 | 0.004 |
| Eso Social Network | 1.24 | 1.01–1.53 | 0.049 |
| Micro | 1.16 | 0.96–1.40 | 0.137 |
| Meso/Eso | 1.46 | 1.15–1.85 | 0.002 |
| **Age** (years) | 0.99 | 0.99–1.01 | 0.263 |
| **Sex** (Male) | 0.96 | 0.81–1.15 | 0.662 |
| **Chronic diseases** (yes) | 1.18 | 0.98–1.42 | 0.071 |

Number of observations=199. Hosmer-Lemeshow Goodness-of-Fit Test: Chi-squared=11.448; df=8; p-value=0.178.

**Table 5**
Results of the logistic regression models fitted on results at international trauma questionnaire (i.e., complex post-traumatic stress disorder: yes/no) as dependent variable and type of stressful socio-ecological cluster, age, sex and presence of chronic diseases.

| | Odds Ratio | 0.95 CI | p-Value |
|---|---|---|---|
| **Stressful socio-ecological cluster** (None) | | | |
| Eso Public Services | 0.92 | 0.78–1.09 | 0.336 |
| Eso Social Network | 0.96 | 0.83–1.12 | 0.643 |
| Micro | 1.08 | 0.94–1.24 | 0.263 |
| Meso/Eso | 1.26 | 1.07–1.49 | 0.007 |
| **Age** (years) | 0.99 | 0.99–1.01 | 0.322 |
| **Sex** (Male) | 0.87 | 0.77–0.98 | 0.030 |
| **Chronic diseases** (yes) | 1.11 | 0.98–1.27 | 0.103 |

Number of observations=197. Hosmer-Lemeshow Goodness-of-Fit Test: Chi-squared=4.741; df=8; p-value=0.785.

Sustainable Development's goal to leave no one behind and build inclusive communities.

According to our results, this goal can be pursuit by reorienting health policies in order to provide prompt psychological support when emotional distress is detected and at the same time, preventing its onset by exploring and properly handling specific socio-economic and cultural needs of migrants and refugees.

*Data availability*

The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

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None.

## CRediT authorship contribution statement

**Roberto Benoni:** Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Anna Sartorello:** Writing – original draft, Data curation, Conceptualization. **Elena Paiola:** Data curation, Conceptualization. **Loretta Berti:** Writing – review & editing, Conceptualization. **Marina Sorina:** Validation, Data curation, Conceptualization. **Giovanna Varischi:** Supervision. **Francesco Marchiori:** Writing – review & editing. **Stefano Tardivo:** Writing – review & editing, Supervision. **Michela Rimondini:** Writing – review & editing, Supervision, Conceptualization. **Francesca Moretti:** Writing – review & editing, Supervision, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmh.2025.100351.

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