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Drought Related Displacement and Urban Mobility Patterns in Somalia

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Abstract

This study contributes to sustainable development research by examining the relationship between drought-related displacement and urban mobility patterns in Somalia. The findings can inform evidence-based policies on climate resilience, displacement management, and sustainable urban planning. The study is relevant to Sustainable Development Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action), highlighting the importance of integrating climate-related displacement into development planning and policies that support vulnerable communities.

Background: Drought-related displacement is a major humanitarian concern in Somalia, but observed settlement patterns may differ by displacement cause, movement characteristics, and geographic location.

Objective: To describe drought-related displacement patterns in Somalia and examine the association between reported drought-related displacement and the urban or rural classification of assessed locations.

Methods: This cross-sectional observational study used 5,939 assessment records from the International Organization for Migration's Displacement Tracking Matrix Emergency Trend Tracking system, covering 14 June to 26 August 2026. The outcome was location type (urban versus rural). Descriptive statistics and cross-tabulations were used to summarize displacement patterns. Logistic regression models examined the association between drought status and urban classification. For regional regression models, Banadir was excluded because all records in that region were classified as urban. Standard errors were clustered by settlement to account for repeated assessments.

Results: Overall, 83.36% of assessment records were associated with urban locations. Urban classification was observed in 79.38% of drought-related records, compared with 95.66% of non-drought records. In the model adjusted for region, movement type, and total new arrivals, drought-related records had lower odds of urban classification than non-drought records (adjusted odds ratio [AOR] = 0.129, 95% confidence interval [CI]: 0.081–0.208; $p < 0.001$).

Spontaneous movement was associated with higher odds of urban classification (AOR = 8.584, 95% CI: 5.217–14.123; $p < 0.001$), while total new arrivals showed a smaller positive association (AOR = 1.020, 95% CI: 1.005–1.036; $p = 0.009$).

Conclusion: Drought-related and non-drought displacement records showed different urban–rural distributions in the monitored locations. The findings support geographically sensitive humanitarian planning but should be interpreted in light of the non-representative monitoring coverage, repeated assessments, and the observational nature of the data.

1. Introduction

1.1 Global context

Human mobility is one of the most consequential social responses to environmental stress, and drought occupies a distinctive position within that response. Unlike sudden-onset hazards, droughts unfold gradually, eroding livelihoods over months and seasons, and the mobility they generate is correspondingly heterogeneous — ranging from short, income-diversifying movements that allow households to smooth consumption, to longer-term migration in which households relocate permanently [1]. The empirical literature has linked droughts to both forms of movement, yet the specific nexus between drought and forced displacement has remained comparatively underexplored relative to flood- and storm-related displacement[1].

A central lesson from the global literature is that drought and displacement are connected through multiple mediating processes rather than through a single pathway. Climate-related stressors are, at best, associated with mobility outcomes, and poverty, conflict, and other social processes frequently play a determining role in whether, when, and how people move[1]. Cross-national analyses illustrate the empirical ambiguity: for low-income locations in Africa, drought conditions are statistically related to increased internal migration from affected areas, while the evidence on international migration is weaker and mixed, and no clear consensus exists on the direction or magnitude of the climate–migration association(Brottrager et al., 2023). Climatic shocks may, under different conditions, either induce migration or constrain mobility, with resource-poor households sometimes unable to move at all and becoming effectively trapped(Brottrager et al., 2023; Ceola et al., 2023). Longitudinal event-history evidence from the Ethiopian highlands reinforces this nuanced picture: men's labour migration increases with drought, land-poor households appear most vulnerable, and other types of movement — such as marriage-related moves by women — may decline during drought periods[3].

Displacement triggered or aggravated by environmental stressors is not merely a statistical phenomenon but a protection concern. The durable solutions framework, elaborated by the Inter-Agency Standing Committee and monitored by the Internal Displacement Monitoring Centre, defines when internally displaced persons are no longer considered displaced, requiring durable resolution of safety, livelihood, documentation, and participation deficits (World Report on the Health of Refugees and Migrants, 2022.). Understanding where displaced populations settle, and how often they move again, is therefore directly relevant to humanitarian protection and to the design of durable solutions(World Report on the Health of Refugees and Migrants, 2022.).

1.2 African context

The African evidence suggests that environment-related mobility is predominantly internal and short-distance rather than international. A review of mobility studies across the continent concludes that environmental change is more often related to short-distance mobility than to long-distance cross-border migration[1]. Within Sub-Saharan Africa, empirical findings nevertheless vary widely. In southern Africa, prolonged drought conditions in Zambia and Zimbabwe in the late 1990s and early 2000s displaced

more than three million people internally and, in part, externally to South Africa, while extended drought in Mozambique markedly reduced agricultural production and contributed to food insecurity and population movement[5].

household and migration research in sub-Saharan Africa shows that drought and rainfall variability can produce different mobility responses depending on household resources and local conditions. Some households use migration as a way to strengthen livelihoods, while others move as a distress or last-resort coping strategy; households with fewer resources may also have limited ability to move at all. Evidence reviewed by [6] further indicates that people living in drier areas may be more likely to engage in temporary or permanent migration, while rainfall deficits can influence the timing and destination of migration. These findings suggest that environmental stress does not produce a uniform mobility response, but interacts with household resources, livelihoods, and local socioeconomic conditions.

1.3 Somalia context

From a sustainable development perspective, drought-related displacement in Somalia presents challenges for climate resilience, livelihood security, and the planning and management of urban areas. The movement of displaced populations into urban settlements may increase demand for housing, water, sanitation, healthcare, and other essential services, while also creating challenges for local authorities and host communities. Understanding the relationship between drought-related displacement and settlement patterns is therefore important for developing evidence-based responses to climate-related mobility. This study contributes to the sustainable development agenda by providing quantitative evidence on urban and rural settlement patterns in Somalia. Its relevance is particularly linked to Sustainable Development Goal 11 (Sustainable Cities and Communities) and Sustainable Development Goal 13 (Climate Action), with implications for displacement-sensitive urban planning and climate adaptation policies.

Somalia is among the countries most affected by drought-associated displacement in Africa. Of the at least 1.6 million new displacements linked to drought recorded on the continent between 2009 and 2018, Somalia is repeatedly identified, alongside Ethiopia, Angola, Botswana, Burkina Faso, Chad, Namibia, and Niger, as a principal locus of drought-related movement[1]. During the 2016–2017 drought, some 926,000 newly displaced people were recorded as accommodated in Mogadishu and other cities, contributing to population growth and overcrowding in urban areas[1].

The urban character of drought displacement in Somalia has been documented through qualitative and mixed-method work. Research conducted by the Internal Displacement Monitoring Centre, based on more than 210 interviews in Burco, Galkayo, and Qardho in late 2019, explicitly framed drought displacement as a driver of urbanisation, describing the mechanisms through which people without land, water, or pasture move to towns (IDMC)2020. The scale of urban displacement today is considerable: displaced populations predominantly reside in more than 3,340 highly congested informal settlements and IDP sites, located mainly on the outskirts of Mogadishu, Baidoa, Gaalkacyo, Beletweyne, Bossaso,

Kismaayo, and Burao[8]. Across all states of Somalia and Somaliland, more than 2,700 IDP sites have been enumerated, and a generalizable feature of displacement locations is their urbanization — war and drought, which devastate agricultural and livestock assets, are associated with rural-to-urban migration, with cities attracting people through the prospects of safety, employment, education, and healthcare [9].

Recent displacement dynamics show pronounced spatial complexity. In 2022, drought was reported as the primary driver of displacement in central regions such as Bakool and Hiraan, whereas conflict alone triggered substantial displacement in areas such as Bay, and compound displacement associated with both conflict and drought was detected in Lower Juba and Lower Shabelle[10]. Earlier evidence from the 2016–2019 period documents within-rural displacement trends in southern Somalia — for example within the Bay region — alongside urban-to-suburban displacement trends [11]. This heterogeneity underscores the need for systematic, settlement-level quantitative analysis of drought-related displacement patterns — precisely the kind of analysis that routine monitoring data, such as the DTM Emergency Trend Tracking records, can support.

1.4 Problem statement

Somalia's recurring droughts generate large, rapidly evolving displacement flows that place acute pressure on urban settlements, IDP sites, and host communities. Humanitarian actors require timely, spatially disaggregated evidence on who is moving, from where, to where, under which reported causes, and with what mobility characteristics — including whether displacement is repeated. The IOM DTM ETT system produces assessment records at settlement level across prioritized districts(Carranza et al., 2025; Ouchtar et al., 2025), capturing variables such as new arrivals, cause of displacement, origin and destination, movement type, journey duration, and number of times displaced. However, these rich routine records are frequently used for situational reporting rather than for systematic quantitative analysis of the association between cause of displacement and settlement outcomes. The problem this article addresses is twofold: first, the observed association between drought-related displacement and urban versus rural settlement remains inadequately quantified; and second, the movement characteristics and origin–destination structures of drought-related displacement relative to other causes have not been systematically described using ETT data. Without such analysis, anticipatory assistance, urban planning, and durable solutions programming in drought-affected areas operate with an incomplete evidence base ((Internal Displacement Monitoring Centre [IDMC], 2020), World Health Organization [WHO], 2022

1.5 Research gap

Four gaps in the existing literature motivate this study. First, most quantitative work on displacement in Somalia relies on the UNHCR Protection and Return Monitoring Network data, which track new displacement events at monthly frequency across the country's subregions[15], or on modelled or attribution-based approaches[16]; comparatively few peer-reviewed applications exploit settlement-level ETT arrival records. Second, the nexus between drought and displacement remains underexplored relative to conflict-related displacement, and the empirical relationship between drought and settlement

patterns has been characterized mainly at regional or national scale rather than at settlement level[1]. Third, quantitative evidence on repeated displacement — the number of times displaced — is scarce, despite qualitative and network evidence indicating that previous displacement experience plays a critical role in subsequent movement decisions[17]. Fourth, origin–destination structures of drought-related displacement, including intended final destinations, have been described for conflict-dominated flows (Carranza et al., 2025; Schon et al., 2018) but less systematically for drought-related flows in the ETT record. This article addresses these gaps by analysing drought-related displacement and urban mobility patterns within a single, internally consistent monitoring dataset.

1.6 Objectives

General objective

Research Aim

This study aims to quantitatively examine the relationship between drought-related displacement and urban–rural settlement patterns in Somalia, with particular attention to the implications for climate resilience, sustainable urban planning, and displacement management. By analysing settlement assessment data, the study seeks to provide evidence that can inform policies supporting climate adaptation and sustainable development in displacement-affected communities.

Specific objectives

Specific Objectives

1. To describe the patterns of displacement and the distribution of assessed settlements across urban and rural locations in Somalia.
2. To examine the association between drought-related displacement and the urban–rural location of assessed settlements.
3. To discuss the implications of the findings for climate adaptation, sustainable urban planning, and displacement-responsive development policies.
4. To estimate the association between drought status and urban location classification after adjustment for region, movement type, and recorded new arrivals, accounting for repeated settlement assessments.

1.7 Research questions

- **RQ1**: How do drought-related displacement records compare with other cause categories in volume, timing, and geographic distribution?
- **RQ2**: Is there an observed association between the main cause of displacement and settlement classification (urban versus rural)?
- **RQ3**: Which origin regions and districts are most strongly represented among drought-related displacements, and which destination regions and districts receive them?

- **RQ4**: How do movement type, journey duration, and the number of times displaced differ across causes of displacement?
- **RQ5**: What patterns of intended final destination are observed among drought-related displaced populations?

1.8 Hypotheses

H1

Reported drought status is associated with the urban–rural classification of assessment locations.

H2

The association between drought status and urban–rural classification differs across geographic regions.

H3

Movement type and recorded arrival volume are associated with urban–rural classification.

1.9 Significance

This study contributes to three constituencies. For humanitarian practice, a quantitative characterization of drought-related mobility supports anticipatory action, the siting of assistance, and the targeting of IDP site interventions, particularly in the urban peripheries where displaced populations cluster[8,9]. For urban governance, evidence on the association between drought displacement and urban settlement informs planning for services, shelter, and labour markets in secondary cities and district capitals. For scholarship, the study extends the still-limited quantitative literature on the drought–displacement nexus [1,16] by exploiting a routinely collected monitoring dataset whose settlement-level granularity permits analysis of origin–destination flows and repeated displacement at a scale rarely available in displacement research. Finally, by explicitly avoiding causal claims and treating the data as records of observed displacement, the article models a cautious, reproducible template for secondary analysis of humanitarian monitoring data.

2. Literature Review

2.1 Drought and human mobility

The relationship between drought and human mobility is long established but conceptually contested. Early frameworks emphasized migration as a coping response to crop and livestock loss, with drought pushing households to seek opportunities elsewhere[20]. More recent syntheses distinguish between short-term mobility — for example, seasonal or temporary moves to diversify income — and long-term

migration, noting that both have been linked to drought[1]. A recurring finding is that environmental change is more often associated with short-distance, internal movement than with international migration[1]. The direction of the association, however, is not uniform: cross-national analyses report increased internal migration from low-income drought-affected areas, but also reduced international migration, and the broader evidence base shows no consistent consensus on the relationship between climatic shocks and migration outcomes[21]. Droughts, through their effects on livelihoods and agricultural viability, can influence both temporary and permanent migration, but they operate alongside political, economic, and demographic factors that jointly shape observed mobility[1]. The mobility response itself is stratified: households with resources may migrate successfully, poorer households migrate as an erosive coping strategy, and the most vulnerable may be trapped in place[1,9].

2.2 Drought and displacement in Somalia

Somalia's experience illustrates the intensity and spatial complexity of drought-related displacement. During the 2016–2017 drought, 926,000 newly displaced persons were accommodated in Mogadishu and other cities, with urban overcrowding a documented consequence[1]. At the continental scale, at least 1.6 million new displacements linked to drought were recorded in Africa between 2009 and 2018, with Somalia among the most drought-affected countries[1]. Drought-related movement in Somalia coexists with conflict-driven displacement in complex, compounding configurations: people are internally displaced from drought-affected areas, sometimes toward areas where conflict dynamics dominate, and drought and conflict frequently interact within the same regions and periods[10,11]. In 2022, drought was the primary driver of displacement in central regions including Bakool and Hiraan, while Bay experienced primarily conflict-related displacement and Lower Juba and Lower Shabelle recorded compound displacement associated with both conflict and drought[10]. Spatially, displacement patterns range from within-rural movement in southern regions to urban-to-suburban movement, indicating that drought-related mobility does not follow a single rural-to-urban trajectory[15]. Displacement monitoring itself draws on multiple systems, including the DTM, which carries out cross-sectional assessments of IDP and returnee settlements through field visits and remote contact with local informants (Ouchtar et al., 2025).

2.3 Livelihood disruption

Livelihood disruption is the principal mechanism through which drought translates into displacement in agrarian and pastoral economies. Drought reduces crop yields, undermines livestock keepers' production and reproduction, and erodes the asset base on which rural households depend[3,6]. In the Somali context, the erosion of agricultural and livestock assets is a clear displacement factor, with rural-to-urban migration driven by the loss of viable livelihoods in the countryside[9]. Evidence from comparable settings documents the same pattern: cumulative drought events that sharply reduce agricultural yields erode rural households' margins of subsistence and compel movement toward cities[23]. The distinction between movement as livelihood diversification and movement as distress displacement is analytically important; in the ETT data, displacement records capture movement associated with acute livelihood failure as reported by respondents, and this study therefore treats cause of displacement as a reported

attribute of observed displacement rather than as a measure of agricultural production(Carranza et al., 2025).

2.4 Urban mobility

A growing body of evidence associates drought with movement toward urban areas. During drought periods, cities attract people seeking to diversify income, since agricultural activity is no longer feasible in dry rural areas [1]. Continental-scale analysis across Africa shows that drought occurrences are frequently associated with settlement shifts toward rivers and cities, with such patterns observed in 70–81 percent of African countries (Ceola et al., 2023).Global panel evidence suggests that drought is associated with faster urban growth — a hypothetical twelve-month drought is associated with a 27 percent increase in the average annual increment of built-up area — implying that slow-onset drought conditions have likely become a driver of urbanization across much of the developing world [25]. At the city level, mixed-methods research in India found a significant relationship between drought at origin and mobility to the destination city, with recent arrivals and migrants of rural origin most affected[26]. In Somalia, the urbanization of displacement is well documented: displaced populations are concentrated in informal settlements on the outskirts of the country's major cities [8], and cities attract displaced people through the prospects of safety, employment, and access to education and healthcare[9]. IDMC research has explicitly identified drought displacement as a driver of urbanization in northern Somali cities[7]. This literature supports the expectation, formalized in H1, that drought-related displacement is associated with a higher likelihood of urban settlement.

2.5 Repeated displacement

Displacement in Somalia is frequently not a single event. The interaction of recurring droughts, floods, and conflict forces individuals and families to move multiple times in search of safety and basic necessities(Carranza et al., 2025). Recent displacement scholarship conceptualizes such dynamics as cycles of repeated uprooting in which each displacement erodes livelihoods and resources, increasing vulnerability to further displacement[17]. Quantitative evidence from Somalia indicates that previous displacement experience plays a critical role in subsequent movement decisions, and that the intensity and successiveness of droughts together shape displacement outcomes [27]. Globally, protracted displacement is the norm rather than the exception: of those displaced over the past two decades, only an estimated 25 percent have been able to return home [28], and durable solutions outcomes — requiring safety, livelihoods, housing, documentation, and participation — remain unachieved for large populations[29]. Common features of protracted displacement include multiple waves of displacement, changing needs over time, and the invisibility of displaced populations in urban areas[30]. The ETT variable recording the number of times displaced provides an opportunity to quantify repeated displacement among drought-related and other displaced populations — a dimension rarely examined in the empirical literature.

2.6 Origin–destination mobility

Spatial analysis of displacement flows in Somalia reveals persistent and asymmetric origin–destination structures. Displacement flows are concentrated among settlements in the southern and central regions, with particularly high volumes observed between settlements in Bay, Banadir, Bakool, Lower Shabelle, and Gedo; settlements in Banadir and Lower Shabelle act as principal receivers, while settlements in Bay and Bakool serve as major origins or transit hubs (Carranza et al., 2025). This asymmetric structure indicates persistent push and pull factors shaping movement across the country(Carranza et al., 2025). Destination selection research suggests that displaced persons do not choose destinations based on absolute attractiveness alone, but relative to alternative destinations — a gravity logic in which distance and the attributes of competing destinations jointly shape movement [31], and population flows generally favour larger population centres [32]. In conflict settings, destination decisions are guided by social cascades — following community networks, co-ethnics, or the crowd — as documented in Somalia(Schon et al., 2018). The ETT's recording of origin region, origin district, and final destination enables the construction of origin–destination flow matrices that extend this literature to drought-related displacement.

2.7 Empirical studies

Empirical studies of displacement in Somalia and comparable contexts offer methodological and substantive anchors for this article. Modelling work using PRMN data found that IDPs consider both the intensity and the successiveness of droughts, and that prior displacement experience significantly predicts movement [27]. Timing analyses of Somali internal migration show that whether migration events follow independent or interdependent dynamics depends on their coincidence with conflicts and extreme weather events[34]. Causal-discovery approaches applied to drought-induced displacement in Somalia between 2016 and 2023 emphasize that the relationships between drought, food and water security, and displacement vary across districts, and that attributing movements to specific drivers is challenging[16]. Multi-dataset analyses of the 2022 and 2023 hazard years demonstrate that the identification of displacement drivers depends heavily on the temporal and spatial aggregation chosen, and that disaggregated, settlement-level data are better suited to capturing localized displacement dynamics [10]. In the broader African literature, the strongest empirical designs combine household panels with drought indicators, as in the Ethiopian highlands study, which found drought associated with increased male labour migration and heightened vulnerability among land-poor households [3]. Taken together, these studies support an analytical approach that is descriptive and associational, exploits settlement-level granularity, and attends carefully to spatial and temporal disaggregation — the approach adopted here.

Drought Related Displacement and Sustainable Development

Drought-related displacement is an important sustainable development concern because it connects climate vulnerability with population mobility, livelihood insecurity, and pressure on urban services. Understanding how displacement relates to urban and rural settlement patterns can help policymakers identify the challenges facing displacement-affected communities and plan more inclusive and resilient settlements. This perspective is consistent with Sustainable Development Goal 11, which emphasizes

inclusive, safe, resilient, and sustainable cities and human settlements, and Sustainable Development Goal 13, which calls for action to address climate change and strengthen adaptive capacity. In the Somali context, quantitative evidence on displacement and settlement patterns can help inform climate adaptation strategies, urban planning, and displacement-responsive policies. However, the relationship between displacement and settlement location should be interpreted in light of the available data and study design, without assuming that drought alone explains urban mobility.

2.8 Research gap

Synthesizing the review, the key gap is the absence of systematic, settlement-level quantitative analysis of drought-related displacement and urban mobility patterns in Somalia based on ETT monitoring data. Existing studies rely on PRMN event data, modelled displacement, or qualitative interviews[7,15,16], while the ETT's granular arrival records have seen limited peer-reviewed exploitation(Carranza et al., 2025). Furthermore, the specific combination of variables available in the ETT dataset — cause of displacement, settlement classification, origin and destination, movement type, number of times displaced, and journey duration — permits an integrated description of drought-related mobility that prior studies have addressed only in fragments. This article responds to that gap.

3. Conceptual Framework

Dependent variable. The dependent variable was the location type recorded in the IOM ETT assessment data. It was coded as 1 for urban locations and 0 for rural locations for binary logistic regression. This variable is distinct from settlement classification, which describes categories such as IDP sites and host communities. The outcome represents the classification of an assessment location rather than an individual household's migration decision.

Main independent variable. Drought status was the main independent variable in the binary logistic regression analysis. It was derived from the reported displacement reason and coded as 1 for drought-related displacement and 0 for non-drought-related displacement. The analysis examined the association between drought status and the urban–rural classification of assessment locations, adjusting for the geographic and movement-related characteristics included in the final model.

Other covariates in the revised regression. The revised models included geographic region, movement type, and total new arrivals since the previous week. The analysis accounted for repeated assessment records by clustering standard errors at the settlement level.

4.1 Research design

This study employs a cross-sectional, observational quantitative design based on secondary analysis of routinely collected displacement monitoring data. The analysis describes observed displacement patterns and examines the association between reported drought status and the urban–rural classification of assessment locations. Binary logistic regression is used to estimate this association

while adjusting for selected geographic and movement-related characteristics. Because the data are observational and contain repeated assessments of settlements, the findings are interpreted as statistical associations rather than causal effects.

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4. Methodology

4.2 Data source

The data are drawn from the International Organization for Migration's Displacement Tracking Matrix Emergency Trend Tracking system in Somalia. The DTM is a well-established mechanism that carries out cross-sectional assessments of IDP and returnee settlements through field visits and remote contact with local informants[13]. The ETT is the crisis-focused component of DTM, designed to monitor and analyse sudden displacement movements within Somalia at rapid intervals, with data collected by DTM teams across prioritized districts and recorded at a granular geographic level — including region, district, and settlement — and with fields for cause of displacement and places of origin and destination [12]. The present analysis uses the author-selected subset of ETT variables, comprising the fifteen variables listed in the variables section below. The present analysis uses an author-selected subset of 15 ETT variables, as listed in the Variables section below. The dataset is secondary and was not collected by the author.

Repeated assessment records and clustering. The dataset comprised 5,939 assessment records from 1,962 unique settlements. Each settlement contributed an average of 3.03 assessment records (median = 2; range = 1–11). Because some settlements were assessed more than once, the records may not be statistically independent. Accordingly, the regression models used standard errors clustered at the settlement level to account for within-settlement dependence.

Study period and geographic coverage. The dataset covered assessment dates from 14 June 2026 to 26 August 2026. The records represent locations and assessment rounds included in the IOM DTM Emergency Trend Tracking dataset supplied for this analysis. The coverage reflects monitoring priorities and should not be interpreted as a nationally representative sample of all displacement in Somalia.

4.3 Unit of analysis

Unit of analysis and repeated assessments. The unit of analysis was the ETT assessment record rather than the individual displaced person. Because some settlements were assessed repeatedly, the logistic regression models used settlement-clustered standard errors to account for within-settlement dependence. Banadir was excluded from the regional regression models because all records in that region were classified as urban, leaving no variation in the rural outcome. The resulting models included 4,863 assessment records from 1,095 settlement clusters. Therefore, the findings are interpreted as associations among assessment records rather than individual-level migration effects.

4.4 Study period and geographic coverage

The study period is defined by the range of assessment dates recorded in the dataset, reflecting the ETT monitoring rounds included in the author's dataset. Geographic coverage comprises the regions and districts represented in the dataset, as recorded in the Region, District, and Location Type variables. Consistent with the ETT's crisis-focused mandate, the dataset covers priority monitoring areas rather than constituting a nationally representative sample.[12] This limitation is acknowledged in the Discussion section.

For the regression analysis, Banadir was excluded because all records in that region were classified as urban, leaving no variation in the rural outcome. The final regional regression models included 4,863 assessment records from 1,095 settlement clusters.

4.5 Data preparation

Data preparation proceeds in five steps. First, variable screening: each of the fifteen selected variables is inspected for completeness, value ranges, and internal consistency; impossible values (for example, negative counts) are flagged for review. Second, cleaning and recoding: categorical variables are standardized, and cause-of-displacement categories are consolidated into a coherent scheme — drought, conflict/insecurity, flood, other — with any combined-cause categories retained as recorded where they occur. Third, outcome coding: The dependent variable was defined using the Location Type variable, distinguishing urban locations from rural locations. Urban locations were coded as 1 and rural locations as 0, consistent with the outcome used in the logistic regression models. Fourth, derivation: where relevant, a repeated-displacement indicator is derived from the Number of Times Displaced variable (first displacement versus repeated displacement), and arrival-volume variables (New Arrivals; Total New Arrivals) are inspected for consistency and used as Third, outcome coding: The dependent variable was defined using the Location Type variable, distinguishing urban locations from rural locations. Urban locations were coded as 1 and rural locations as 0, consistent with the outcome used in the logistic regression models. measures. **Fifth, missing-data handling**: The analysis used the available records for the descriptive and regression analyses, subject to the variables required for each analysis and the exclusion of Banadir from the regional regression models. Formal missing-data pattern assessments and sensitivity comparisons between included and excluded records were not conducted. Therefore, the potential influence of missing data on the findings cannot be fully assessed.

4.6 Variables and operational definitions

The variables are operationalized as follows.

Dependent variable. The dependent variable was location type, recorded in the IOM displacement assessment dataset as urban or rural. For binary logistic regression, the outcome was coded as 1 for urban locations and 0 for rural locations. Settlement classification, which distinguishes IDP sites from host communities, was treated as a separate variable and was not used as a substitute for the urban–rural outcome. The analysis examines associations at the assessment-record level and does not establish individual settlement decisions or causal effects.

Main independent variable. Main Cause of Displacement — the principal cause of displacement recorded for the assessed arrivals, treated as the main independent variable.

Secondary outcome and descriptive variables. New Arrivals — the number of newly arrived persons recorded at the assessment location; Total New Arrivals — cumulative or total recorded arrivals as defined in the dataset; Reason for Arrival — the stated reason for settling at the destination; Final Destination — the intended final destination of the assessed arrivals; Movement Type — the recorded characterization of the movement; Number of Times Displaced — the recorded count of prior displacements; Journey Duration — the recorded duration of the journey to the assessment location.

Geographic variables. Region, District, Location Type, Origin Region, Origin District — administrative and locational attributes of the assessment location (destination) and of the origin, used for spatial description, stratification, and adjustment.

Temporal variable. Date of Assessment — the date of the assessment round, used for temporal description and for defining the study period.

The roles assigned to variables in the analysis are summarized in Table 1.

Table 1
Variable roles in the analysis

Variable	Role in the analysis
Location Type (urban/rural)	Dependent variable; urban = 1, rural = 0
Drought status	Main independent variable; drought = 1, non-drought = 0
Region	Geographic adjustment variable; Banadir excluded from the regional regression, with Bay as the reference category
Movement type	Movement characteristic and adjustment variable
Total new arrivals	Numeric adjustment variable, as defined in the final regression model
Assessment date	Defines the study period; used for temporal description
Final destination	Descriptive variable; not a regression covariate unless included in the reported model
Number of times displaced	Descriptive variable unless included in the reported model
Journey duration	Descriptive variable unless included in the reported model
Origin region and origin district	Geographic description, where supported by available data and reported analyses
Settlement Classification	Separate variable distinguishing IDP sites from host communities; not the urban–rural outcome

Consistent with the stated scope of the study, the variables are treated strictly as records of observed displacement. In particular, Main Cause of Displacement is a reported attribute, and the analysis does not claim that the data measure climate change, agricultural production, or causal effects of drought.

4.7 Statistical analysis

The statistical analysis proceeds in five stages.

Stage 1 — Descriptive analysis. Frequency distributions and percentages describe the distribution of records and arrivals by main cause of displacement, settlement classification, region, district, location type, movement type, and reason for arrival. Medians, interquartile ranges, and means describe New Arrivals, Total New Arrivals, Number of Times Displaced, and Journey Duration, with cause-stratified summaries.

Stage 2 — Bivariate analysis. Cross-tabulations and descriptive comparisons were used to examine patterns in the observed displacement records across relevant categorical and continuous variables, where applicable. These analyses were intended to describe differences across groups rather than establish causal relationships. Inferential tests and measures of association are reported only where the corresponding analyses were performed and their results verified.

Stage 3 — Multivariable analysis. Binary logistic regression was used to examine the association between drought status and urban location classification. Three models were estimated. Model 1 included drought status and geographic region; Model 2 additionally included movement type; and Model 3 additionally included total new arrivals since the previous week. Banadir was excluded from these regional models because all records in that region were classified as urban. Bay was the reference region, and non-drought records were the reference category for drought status. Standard errors were clustered by settlement to account for repeated assessments. Results are reported as adjusted odds ratios with 95% confidence intervals and p-values. The analyses estimate associations and do not establish causal effects.

Stage 4 — Geographic and temporal description. Geographic patterns were described using the available origin and assessment-location variables, where information was available. Descriptive analyses were also used to summarize displacement characteristics and reported arrival patterns. These analyses describe the observed assessment records and do not establish complete population movement flows.

Stage 5 — Interpretation and analytical limitations. The findings are interpreted as associations rather than causal effects. The analysis acknowledges the limitations of repeated settlement assessments, incomplete geographic information, and the restricted coverage of the monitoring data. Additional robustness checks were not reported unless they were explicitly conducted and their results verified.

All statistical analyses were conducted using Stata. The reported results and statistical models reflect the analyses performed for this study.

4.8 Ethical considerations

This study is a secondary analysis of de-identified, aggregated displacement monitoring data. The ETT data do not contain individual names, household identifiers, or personally identifiable information, and records are reported at the level of locations and settlements. The IOM DTM operates under established data-collection protocols involving informed consent of informants and adherence to data-use principles. In line with standard practice for secondary analysis of such data, no additional ethics approval is required; nevertheless, the analysis adheres to the ethical obligations of responsible use of humanitarian data: results are reported in aggregate, findings are communicated with cautious language to avoid misrepresentation of displaced populations, and the interpretative limits of the data — particularly the absence of causal inference — are stated explicitly. Special care is taken to avoid any presentation that could stigmatize displaced communities or misattribute the drivers of movement.

4.9 Limitations

Several limitations qualify the findings. First, the ETT is a crisis-focused monitoring system covering prioritized districts, and its records are not a nationally representative probability sample of displacement; the study period and geographic coverage reflect monitoring priorities rather than exhaustive coverage[12]. Second, cause of displacement and other attributes are informant- or respondent-reported and subject to recall and reporting error; in multi-causal settings, the recorded main cause may not capture the full configuration of drivers[10,11]. Third, the dataset measures displacement as recorded arrivals at assessment locations and does not provide a full accounting of the population of potential movers; immobility and being trapped — recognized features of drought-exposed populations — cannot be observed in these data[1]. Fourth, the data do not include household-level covariates such as assets, income, or social networks, so unobserved confounding cannot be excluded; associations may reflect selection processes rather than the recorded cause alone[2]. Fifth, Somalia's highly mobile nomadic population poses known measurement challenges, and such groups may be underrepresented in settlement-based assessments[35]. Sixth, repeated displacement is captured as a reported count rather than through longitudinal tracking of individuals, which may under- or over-estimate recurrence. Finally, the study does not, and cannot, establish causal effects: the data are not treated as measures of climate change, agricultural production, or the causal impacts of drought, and no such claims are made. Within these limits, the analysis provides a rigorous, transparent, and reproducible characterization of drought-related displacement and urban mobility patterns as recorded in the ETT data.

5. Result

5.1 Characteristics of Assessed Displacement Records

Table 5.1
Characteristics of assessed displacement records

Characteristic	Category	Frequency (n)	Percentage (%)
Location type	Rural (Tulo/Village)	988	16.64
	Urban (Waah/Neighborhood)	4,951	83.36
Drought status	Non-drought	1,453	24.47
	Drought	4,486	75.53
Main cause of displacement	Conflict	1,145	19.28
	Eviction	268	4.51
	Natural hazards	4,503	75.82
	Other	23	0.39
Movement type of the majority of new arrivals	Organized	647	10.89
	Spontaneous	5,292	89.11

Interpretation:

Urban locations accounted for 83.36% of the assessment records, while rural locations accounted for 16.64%. Drought was recorded in 75.53% of assessments. Natural hazards were the most frequently recorded main cause of displacement (75.82%), followed by conflict (19.28%). Spontaneous movement was recorded in 89.11% of assessments, compared with 10.89% for organized movement.

The distribution of observations by urban and rural location by drought 1.

Interpretation:

Figure 1. Urban and rural locations by drought status

The distribution of assessment records differed between drought and non-drought categories. Among non-drought records, 95.66% were classified as urban and 4.34% as rural. In comparison, among drought-related records, 79.38% were urban and 20.62% were rural. Thus, the proportion of rural records was higher among drought-related assessments than among non-drought assessments.

The distribution of observations by location type is presented in Fig. 2.

The distribution of observations by regions in Fig. 2.

Interpretation:

The multivariable logistic regression analysis identified several factors associated with the odds that an assessment record was classified as urban rather than rural. After adjustment for the other variables included in Model 3, drought status was associated with substantially lower odds of an urban classification (adjusted odds ratio [AOR] = 0.129, 95% CI: 0.081–0.208, p < 0.001).

Compared with Bay Region, the reference category, the odds of an urban classification were also lower in Awdal (AOR = 0.031, 95% CI: 0.012–0.082), Bari (AOR = 0.050, 95% CI: 0.028–0.089), Gedo (AOR = 0.056, 95% CI: 0.023–0.138), and Togdheer (AOR = 0.129, 95% CI: 0.051–0.325). These associations were statistically significant at p < 0.001. No statistically significant difference was observed for Woqooyi Galbeed compared with Bay (AOR = 0.925, 95% CI: 0.284–3.014, p = 0.898).

Spontaneous movement, compared with organized movement, was associated with higher odds of an urban classification (AOR = 8.584, 95% CI: 5.217–14.123, p < 0.001). The total number of new arrivals was also positively associated with urban classification: each one-unit increase was associated with approximately 2.0% higher odds (AOR = 1.020, 95% CI: 1.005–1.036, p = 0.009).

5.2 Main Cause of Displacement by location type

Table 5.2
Association between main cause of displacement and location

Main cause	Rural, n (%)	Urban, n (%)	Total, n
Conflict	32 (2.79)	1,113 (97.21)	1,145
Eviction	25 (9.33)	243 (90.67)	268
Natural hazards	928 (20.61)	3,575 (79.39)	4,503
Other	3 (13.04)	20 (86.96)	23
Total	988 (16.64)	4,951 (83.36)	5,939
Statistical test: Pearson $\chi^2(3) = 219.95,\ p < 0.001$.			

interpretation

Location type differed significantly across the recorded main causes of displacement ($p < 0.001$). The proportion of urban records was highest for conflict (97.21%) and lowest for natural hazards (79.39%). These are descriptive associations; the chi-square test does not account for repeated assessments of the same settlement, so it should not be presented as a cluster-adjusted inferential result.

5.3 Table 3. **Drought status by location type**

Table 3
Location type by drought status

Drought status	Rural, n (%)	Urban, n (%)	Total, n
Non-drought	63 (4.34)	1,390 (95.66)	1,453
Drought	925 (20.62)	3,561 (79.38)	4,486
Total	988 (16.64)	4,951 (83.36)	5,939
Statistical test: Pearson $\chi^2(1) = 209.85,\ p < 0.001$.			

interpretation

Urban classification was recorded in 79.38% of drought-related assessments, compared with 95.66% of non-drought assessments. This difference was statistically significant in the unadjusted chi-square test ($p < 0.001$). The direction of this finding is important: drought-related records were less likely to be classified as urban than non-drought records. This does not establish that drought reduces urban migration; the result concerns the locations and assessment records represented in this dataset.

5.4 Table 4. Weekly arrivals and departures

Table 4
Descriptive statistics for new arrivals and departures since the previous week

Statistic	Total new arrivals	Total departures
Number of assessment records	5,939	5,939
Mean	9.71	2.27
Standard deviation	10.59	19.7
Median	6	0
25th percentile (Q1)	4	0
75th percentile (Q3)	12	0
Minimum	1	0
Maximum	120	1,200
Skewness	3.67	44.12

Interpretation:

The mean number of new arrivals since the previous week was 9.71, with a median of 6 and a range of 1–120. Departures were substantially lower: the mean was 2.27, while the median and 75th percentile

were both zero. The maximum recorded number of departures was 1,200. The extreme positive skewness of the departure variable indicates that a small number of assessment records reported very large departure counts. Therefore, the median and interquartile range are particularly useful when describing these data.

The distribution of observations by journey duration is presented in Fig. 3

Interpretation:

Journeys lasting between one and two days were the most common, representing **1647** of assessed records. Journeys of less than one day accounted for **1304** between 2 days while **399** berween 5 _6 days ,Longer journeys were less common, with only **127** lasting one week or more.

5.5 Displacement history and journey duration

Table 5.5
Displacement history and journey duration

Displacement history	**Frequency (n)**	**Percentage (%)**
First displacement	4,557	76.73
Second displacement	838	14.11
Third displacement	475	8
Unknown	69	1.16
Total	**5,939**	**100**
Panel B. Journey duration		
Journey duration	**Frequency (n)**	**Percentage (%)**
Less than 1 day	1,647	27.73
Between 1–2 days	2,462	41.45
Between 3–4 days	1,304	21.96
Between 5–6 days	399	6.72
1 week (7 days) or more	127	2.14
Total	**5,939**	**100**

Interpretation:

Table 5 presents the displacement history and journey duration reported in the 5,939 displacement assessment records. Regarding displacement history, the majority of records (76.73%) concerned first displacement, while 14.11% concerned second displacement and 8.00% concerned third displacement. A small proportion (1.16%) had an unknown displacement history. These findings indicate that most

recorded cases were classified as first displacement, although a considerable proportion involved repeated displacement.

Regarding journey duration, the largest proportion of records (41.45%) reported journeys lasting between one and two days, followed by journeys lasting less than one day (27.73%). Journeys lasting between three and four days accounted for 21.96%, while 6.72% lasted between five and six days. Only 2.14% of records reported journeys lasting one week or longer. Overall, most recorded journeys were completed within two days. However, these findings describe the assessment records and do not establish the reasons for differences in displacement frequency or journey duration.

The distribution of observations by origin region is presented in Fig. 4

Interpretation:

The figure shows a strong geographic concentration of reported origins, with Bay accounting for the largest number of records (3,619). Lower Shabelle (551) and Bakool (537) had the next-highest frequencies, while the remaining regions contributed substantially fewer records. These results describe the distribution of recorded origins in the dataset and should not be interpreted as population-wide estimates of displacement flows.

The distribution of observations by how many time displaced is presented in Fig. 5

Interpretation:

Most assessed records represented a first displacement **4557** (76.73%). A second displacement was reported in **838 (**14.11%)of records, while **475** 8.00% represented a third displacement. Thus, although first-time displacement dominated the dataset, a notable proportion of records involved repeated displacement.

5. 6 Displacement History by Location Type

Table 5.6
Association Between Displacement History and Location Type

Displacement history	Rural, n (%)	Urban, n (%)	Total (n)
First displacement	463 (10.16)	4,094 (89.84)	4,557
Second displacement	161 (19.21)	677 (80.79)	838
Third displacement	326 (68.63)	149 (31.37)	475
Unknown	38 (55.07)	31 (44.93)	69
Total	**988 (16.64)**	**4,951 (83.36)**	**5,939**
Pearson chi-square test: $\chi^2(3) \approx 1{,}100$, $p < 0.001$.			

Interpretation

The results indicate a statistically significant association between displacement history and location type ($\chi^2(3) \approx 1{,}100,\ p < 0.001$). Among records classified as first displacement, 89.84% were associated with urban locations, compared with 80.79% of second-displacement records. In contrast, 68.63% of third-displacement records were associated with rural locations, while 31.37% were associated with urban locations. Among records with unknown displacement history, 55.07% were rural and 44.93% were urban.

Overall, urban locations predominated among first- and second-displacement records, whereas rural locations predominated among third-displacement records. These findings demonstrate differences in location type across displacement-history categories, but they do not establish a causal relationship. Furthermore, because some settlements were assessed repeatedly, the ordinary chi-square test does not account for the dependence between repeated assessments.

5.7 Multivariable Logistic Regression of Factors Associated with Urban Location

Variable	Adjusted odds ratio (AOR)	95% confidence interval	p-value
Drought status			
Non-drought (Reference)	1	Reference	—
Drought	0.129	0.081–0.208	< 0.001
Region			
Bay (Reference)	1	Reference	—
Awdal	0.031	0.012–0.082	< 0.001
Bari	0.05	0.028–0.089	< 0.001
Gedo	0.056	0.023–0.138	< 0.001
Togdheer	0.129	0.051–0.325	< 0.001
Woqooyi Galbeed	0.925	0.284–3.014	0.898
Movement type			
Organized (Reference)	1	Reference	—
Spontaneous	8.584	5.217–14.123	< 0.001
Total new arrivals since last week	1.02	1.005–1.036	0.009
Model statistics			
Observations	4,863	—	—
Settlement clusters	1,095	—	—
Wald chi-square	184.92	—	< 0.001
Pseudo-R^2	0.2146	—	—
Log pseudolikelihood	−1,928.001	—	—

Interpretation of model

The multivariable logistic regression examined the association between drought status and urban location while adjusting for region, movement type, and the number of new arrivals since the previous week. The model included 4,863 assessment records from 1,095 settlement clusters and was statistically significant overall (Wald $\chi^2(8) = 184.92,\ p < 0.001$).

Drought status was significantly associated with the urban–rural classification of assessment locations. After adjustment for region, movement type, and total new arrivals, drought-related assessment records

had approximately 87.1% lower odds of being classified as urban than non-drought records (AOR = 0.129, 95% CI: 0.081–0.208, p < 0.001). This finding represents an association in the observed assessment records and should not be interpreted as evidence that drought reduces urban migration.

Compared with Bay, the odds of urban classification were significantly lower in Awdal (AOR = 0.031), Bari (AOR = 0.050), Gedo (AOR = 0.056), and Togdheer (AOR = 0.129), with all $p < 0.001$. The difference between Woqooyi Galbeed and Bay was not statistically significant (AOR = 0.925, 95% CI: 0.284–3.014, $p = 0.898$).

Movement type was also significantly associated with location classification. Records reporting spontaneous movement had approximately 8.58 times the odds of urban classification compared with records reporting organized movement (AOR = 8.584, 95% CI: 5.217–14.123, $p < 0.001$). Each additional recorded arrival was associated with approximately 2.0% higher odds of urban classification (AOR = 1.020, 95% CI: 1.005–1.036, $p = 0.009$).

5.8 Summary of Key Findings

Overall, the assessed displacement records were predominantly associated with urban locations and drought-related displacement. Drought accounted for 75.53% of all records, while 83.36% were associated with urban locations. A statistically significant association was observed between displacement reason and location type, although the magnitude of the association was relatively modest. Journey duration, reasons for arrival, and final-destination reporting were also significantly associated with location type. The geographic distribution of reported origins was highly concentrated, particularly in Bay Region, which accounted for 61.84% of records with available origin information. Most movements were spontaneous and represented first-time displacement. In the multivariable model, drought-related displacement, movement type, displacement history, and some journey-duration categories were significantly associated with the likelihood that a record was classified as urban.

6. DISCUSSION

This study examined drought-related displacement and urban–rural location patterns in Somalia using 5,939 assessment records from the International Organization for Migration (IOM) Displacement Tracking Matrix (DTM) Emergency Trend Tracking (ETT) system. The findings demonstrate that drought was the most prominent displacement-related category in the dataset and that most assessment records were associated with urban locations. However, the relationship between drought status and urban classification was more complex than the descriptive distribution alone suggests. In the multivariable analysis, drought-related records had significantly lower odds of urban classification than non-drought records after adjustment for region, movement type, and total new arrivals. The findings also revealed substantial differences across regions and displacement-history categories, highlighting the importance of interpreting displacement patterns in their geographic and operational context.

6.1 Drought-related displacement and urban–rural location patterns

Drought accounted for 75.53% of the assessment records, while 83.36% were associated with urban locations. At first glance, these findings suggest that drought-related displacement was strongly represented in urban settings. Nevertheless, the comparison by drought status revealed that 79.38% of drought-related records were classified as urban, compared with 95.66% of non-drought records. The unadjusted association between drought status and location type was statistically significant, indicating that the distribution of urban and rural classifications differed between drought and non-drought records.

The multivariable results reinforced this distinction. After adjustment for region, movement type, and total new arrivals, drought-related records had approximately 87.1% lower odds of urban classification than non-drought records (adjusted odds ratio [AOR] = 0.129, 95% confidence interval [CI]: 0.081–0.208, $p < 0.001$). This finding should not be interpreted as evidence that drought reduces migration to urban areas. Rather, it indicates that drought status was associated with a lower likelihood of an assessment record being classified as urban within the observed dataset, conditional on the variables included in the model.

Several explanations may be relevant, although they cannot be established directly from the available data. Drought-related displacement may be recorded in a variety of settlement contexts, including rural and peri-urban locations, while non-drought displacement in the assessed sample may be disproportionately represented in urban locations. Differences in geographic coverage, humanitarian monitoring priorities, the composition of displacement events, and the characteristics of assessed settlements may also contribute to the observed pattern. The dataset does not establish which of these mechanisms explains the association.

These results demonstrate why the absolute number of drought-related urban records should be distinguished from the relative likelihood of urban classification. A large number of drought-related records may be associated with urban locations even when the proportion classified as urban is lower than that among non-drought records. This distinction is important for interpreting routine displacement-monitoring data and for avoiding unsupported conclusions about the effects of drought on urban mobility.

6.2 Displacement history and journey duration

Displacement history provided additional descriptive evidence of the complexity of displacement patterns. First displacement accounted for 76.73% of records, while second and third displacement accounted for 14.11% and 8.00%, respectively. Thus, although first displacement predominated, repeated displacement represented a meaningful proportion of the assessed records.

Location type differed markedly across displacement-history categories. Urban locations accounted for 89.84% of first-displacement records and 80.79% of second-displacement records. In contrast, 68.63%

of third-displacement records were classified as rural. The ordinary Pearson chi-square test indicated a statistically significant association between displacement history and location type ($p < 0.001$). This pattern suggests that the distribution of assessed rural and urban locations differed across reported displacement-history categories.

Journey-duration findings showed that most recorded journeys were relatively short. Journeys lasting between one and two days accounted for 41.45% of records, while 27.73% lasted less than one day. A further 21.96% lasted between three and four days. Urban classification was particularly common among records reporting journeys of less than one day, whereas the proportion of rural records was highest among those reporting journeys of five to six days.

These findings provide useful descriptive information about reported displacement histories and journey durations. However, they should not be interpreted as evidence that repeated displacement or longer journeys cause people to settle in rural locations. The journey and displacement-history comparisons are unadjusted, and repeated assessments of the same settlements may influence the observed distributions. These variables were not included in the final multivariable model reported in this revised analysis; consequently, their independent associations with urban classification have not been established by that model.

6.3 Regional differences in urban classification

The multivariable analysis identified substantial differences in urban classification across the six regions included in the regional model. Using Bay as the reference region, the adjusted odds of urban classification were significantly lower in Awdal (AOR = 0.031, 95% CI: 0.012–0.082), Bari (AOR = 0.050, 95% CI: 0.028–0.089), Gedo (AOR = 0.056, 95% CI: 0.023–0.138), and Togdheer (AOR = 0.129, 95% CI: 0.051–0.325). The difference between Woqooyi Galbeed and Bay was not statistically significant (AOR = 0.925, 95% CI: 0.284–3.014, $p = 0.898$).

These differences indicate that the distribution of urban and rural assessment records varied considerably across the included regions, even after adjustment for drought status, movement type, and arrival volume. Geographic context is therefore an important consideration when interpreting the association between drought and location classification.

The regional comparisons require an important qualification. Banadir was excluded from the regional regression because all 1,076 records in that region were classified as urban, leaving no variation in the outcome for estimating its regional odds ratio. Accordingly, Bay served as the reference region, and the regional estimates apply only to the analytical sample excluding Banadir. They should not be interpreted as comparisons with Banadir or as nationally representative estimates of regional differences.

6.4 Movement type and arrival volume

Movement type was strongly associated with urban classification in the final multivariable model. Records classified as spontaneous movement had approximately 8.58 times the odds of urban

classification compared with records classified as organized movement (AOR = 8.584, 95% CI: 5.217–14.123, p < 0.001). This association suggests that the distribution of urban and rural assessment locations differed substantially according to the recorded movement type.

One possible interpretation is that spontaneous arrivals may be more frequently recorded in established urban receiving locations or in settlement contexts where displacement monitoring is more intensive. However, the available analysis cannot determine whether these mechanisms explain the observed association. The result should therefore be understood as an adjusted statistical relationship rather than evidence that spontaneous movement itself causes urban settlement.

Total new arrivals since the previous week were also positively associated with urban classification. Each additional recorded arrival was associated with approximately 2.0% higher odds of urban classification (AOR = 1.020, 95% CI: 1.005–1.036, p = 0.009), assuming the specified linear relationship between arrival count and log odds is appropriate. This association may be relevant to humanitarian planning because locations recording larger arrival volumes may face greater demands for shelter, water, sanitation, health care, and other essential services.

Nevertheless, the arrival-volume association should be interpreted cautiously. Arrival counts may reflect settlement characteristics, the intensity of monitoring, or the composition of assessed displacement events. The analysis does not establish that higher arrival volumes cause urbanization, and the adequacy of the assumed functional form should be evaluated during model checking.

6.5 Implications for humanitarian planning

Taken together, the findings support a geographically differentiated and mobility-sensitive approach to displacement planning in Somalia. The high proportion of urban assessment records underscores the importance of preparing receiving locations for displacement-related service demands. At the same time, the lower adjusted odds of urban classification among drought-related records indicate that preparedness should not focus exclusively on major urban centres.

The substantial proportion of repeated-displacement records also highlights the importance of identifying populations that experience multiple displacement episodes. Such populations may have distinct assistance and protection needs, but the current analysis does not directly measure household vulnerability, service access, livelihood recovery, or long-term settlement outcomes. Programmes should therefore combine settlement-level monitoring with more detailed assessments of the needs and preferences of displaced households.

The regional differences further support the value of locally informed planning rather than assuming that drought-related displacement follows a uniform national pattern. More complete geographic coverage, consistent monitoring across assessment rounds, and improved origin–destination information would help humanitarian agencies identify emerging displacement patterns and allocate resources more appropriately.

6.6 Study limitations

Several limitations should be considered when interpreting these findings. First, the ETT system is a crisis-focused monitoring mechanism rather than a nationally representative probability survey. The records cover the locations and assessment rounds included in the dataset and cannot be assumed to represent all displacement in Somalia.

Second, the analysis is based on assessment records rather than independent observations of individual people or households. The 5,939 records correspond to 1,962 unique settlements, with some settlements assessed repeatedly. Although the regression models used standard errors clustered at the settlement level, this adjustment does not eliminate selection bias or other potential sources of measurement error.

Third, drought status and other displacement characteristics were recorded within the monitoring system and may be affected by reporting or classification error. The dataset also lacks important household-level information, such as assets, income, livelihood conditions, and social networks, which may influence displacement and settlement patterns. Residual confounding therefore remains possible.

Fourth, the outcome represents the urban or rural classification of the assessment location. It should not automatically be interpreted as a directly observed individual decision to migrate to an urban or rural destination. The data describe the characteristics of assessed locations and recorded displacement patterns rather than complete individual migration trajectories.

Fifth, Banadir could not be included in the regional regression because all observations in that region were urban. Regional comparisons consequently exclude Banadir and use Bay as the reference category. The resulting estimates cannot be generalized to comparisons involving Banadir.

Finally, the final multivariable model included drought status, region, movement type, and total new arrivals. The descriptive analyses of displacement history and journey duration were not incorporated into this final model, so their independent associations with location type remain unassessed in the revised regression. The available data are observational and do not establish causal effects. The study also does not directly measure climate change, agricultural production, or the causal impact of drought on migration.

Despite these limitations, the study provides a systematic description of drought-related displacement records and urban–rural location patterns during the period covered by the dataset. Its findings can inform humanitarian monitoring and planning while identifying areas where more representative and longitudinal evidence is needed.

6.7 Implications for Sustainable Development

The findings of this study have implications for sustainable development planning in Somalia, particularly in relation to climate resilience, displacement management, and urban development.

Understanding the relationship between drought-related displacement and the urban–rural location of assessed settlements can help policymakers identify settlement patterns and consider the needs of displacement-affected communities when allocating resources and planning essential services.

The findings are relevant to Sustainable Development Goal 11 (Sustainable Cities and Communities), particularly the need for inclusive and resilient human settlements. Where displacement is concentrated in urban areas, local authorities and humanitarian organizations may need to consider the implications for housing, water, sanitation, healthcare, and other essential services. The study is also relevant to Sustainable Development Goal 13 (Climate Action), as its findings can inform discussions about climate adaptation and the planning of responses to drought-related displacement.

These implications should be interpreted in light of the study's design and data. The analysis examines settlement assessment records rather than individual migration decisions, and associations between displacement-related factors and settlement location do not establish causation. Nevertheless, the evidence can contribute to discussions about integrating displacement data into climate adaptation, urban planning, and sustainable development policies in Somalia.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

This study examined drought-related displacement and urban–rural location patterns in Somalia using 5,939 assessment records from the IOM DTM Emergency Trend Tracking system covering 14 June to 26 August 2026. Drought accounted for 75.53% of the records, and 83.36% were associated with urban assessment locations. However, the proportion classified as urban was lower among drought-related records (79.38%) than among non-drought records (95.66%).

The multivariable logistic regression, based on 4,863 records from 1,095 settlement clusters and excluding Banadir, found that drought-related records had significantly lower adjusted odds of urban classification than non-drought records (AOR = 0.129, 95% CI: 0.081–0.208, $p < 0.001$). Spontaneous movement was associated with higher odds of urban classification than organized movement (AOR = 8.584, 95% CI: 5.217–14.123, $p < 0.001$), while each additional recorded arrival was associated with a small increase in the odds of urban classification (AOR = 1.020, 95% CI: 1.005–1.036, $p = 0.009$). Significant regional differences were also observed, although these comparisons were restricted to regions included in the model and used Bay as the reference category.

The descriptive findings further showed that most records concerned first displacement and journeys lasting no more than two days. However, the distribution of urban and rural classifications differed substantially across displacement-history categories, particularly for third displacement. These descriptive patterns highlight the heterogeneity of recorded displacement experiences but do not establish independent or causal effects.

Overall, the study demonstrates that drought-related displacement and urban–rural location classification are associated in complex ways within the assessed population. The findings should not be interpreted as evidence that drought reduces urban migration, because the analysis is based on assessment records rather than representative individual-level migration histories. Instead, the results highlight the importance of considering geographic context, movement characteristics, arrival volumes, repeated displacement, and monitoring coverage when interpreting displacement patterns.

The study contributes quantitative evidence for humanitarian monitoring and planning in Somalia. However, broader conclusions about national displacement trends and the mechanisms underlying settlement decisions require more representative data, stronger longitudinal tracking, and information on household livelihoods and environmental conditions.

7.2 Recommendations

1. Strengthen anticipatory humanitarian planning

Humanitarian agencies should strengthen early-warning and preparedness systems in areas experiencing recurrent drought-related displacement. Monitoring should identify emerging displacement pressures and help agencies prepare assistance before arrival volumes increase. Planning should cover both urban receiving locations and rural or peri-urban areas represented in displacement assessments.

2. Improve assistance for repeatedly displaced populations

Humanitarian agencies should systematically assess the needs of people experiencing second and subsequent displacement episodes. Programmes should consider access to shelter, food, water, health services, protection, livelihoods, and durable solutions. Because the current findings are descriptive, future assessments should investigate the specific vulnerabilities and service-access barriers faced by repeatedly displaced households rather than assuming that displacement history alone determines their needs.

3. Integrate displacement into urban and rural service planning

Municipal and district authorities should incorporate displacement trends into planning for housing, water, sanitation, health care, education, and other essential services. The positive association between arrival volume and urban classification supports monitoring locations reporting larger arrivals. However, preparedness should not focus exclusively on urban areas, because a substantial proportion of drought-related records were associated with rural locations.

4. Improve geographic coverage and representativeness

IOM DTM and relevant humanitarian partners should, where operationally feasible, strengthen consistent monitoring across regions and districts. More balanced geographic coverage would improve the ability to compare displacement patterns and determine whether findings from monitored locations reflect wider trends. Future regional analyses should also address areas such as Banadir where the outcome distribution prevents standard estimation of regional odds ratios.

5. Strengthen settlement-level and longitudinal monitoring

Future monitoring should consistently identify assessment dates and settlements so that repeated observations can be distinguished from new displacement events. Where appropriate and ethically feasible, protected longitudinal or linked data would improve understanding of displacement trajectories, repeated movement, and changes in settlement classification over time. Data linkage should follow strict privacy and protection safeguards.

6. Improve origin–destination and displacement-characteristic data

Future assessments should continue to collect consistent information on displacement origins, destination locations, movement type, journey duration, displacement history, and reported causes. Linking these variables systematically would help identify recurring displacement corridors and assess how movement patterns vary across locations. Clear variable definitions and data-quality checks should be maintained to reduce classification errors.

7. Integrate climate, livelihood, and household-level information

Future studies should combine displacement-monitoring data with relevant drought indicators, rainfall information, agricultural and livestock livelihood measures, conflict information, and household socioeconomic characteristics. These complementary data would help distinguish the relationships between drought, livelihood stress, displacement, and settlement patterns more effectively than assessment records alone.

8. Strengthen analytical quality and reporting

Researchers using routine displacement-monitoring data should account for repeated assessments, report the analytical sample and reference categories clearly, and conduct appropriate model-specification and robustness checks. Findings should be reported as associations unless the study design supports causal inference. Regional estimates should be interpreted cautiously where outcome categories are sparse or absent, and conclusions should reflect the actual variables included in the final models.

7.3 Policy and Humanitarian Implications

The findings support a more geographically differentiated and evidence-informed approach to displacement planning in Somalia. Humanitarian responses should consider not only the number of recorded arrivals but also the location of assessments, movement characteristics, displacement history, and the distribution of rural and urban locations. The results suggest that both urban receiving locations and rural settlements should be considered in preparedness and service planning.

The association between arrival volume and urban classification highlights the potential value of monitoring locations reporting larger numbers of arrivals, while the lower adjusted odds of urban classification among drought-related records caution against treating drought-related displacement as a uniform process of movement toward cities. Repeated displacement also warrants continued attention in humanitarian assessments and durable-solutions programming.

These implications should be applied with appropriate caution. The dataset is not nationally representative, and the findings do not establish causal effects or directly measure the decisions of individual households. Humanitarian agencies and policymakers should therefore use the results alongside local assessments, longitudinal monitoring, and other environmental and socioeconomic evidence when designing interventions.

Declarations

Clinical Trial Number

Clinical trial number: not applicable.

Ethics, Consent to Participate, and Consent to Publish

Ethics, Consent to Participate, and Consent to Publish declarations: not applicable.

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Author Contribution

The author was responsible for the conceptualization of the study, data curation, formal analysis, methodology, interpretation of the findings, and writing of the original manuscript. The author also

reviewed and revised the manuscript and approved the final version for submission.This is my first try i wish that you will encourage me thanks to you

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Data Availability

Data AvailabilityThe data used in this study were obtained from the International Organization for Migration (IOM) Displacement Tracking Matrix (DTM) for Somalia. The relevant datasets and associated data outputs are available through the IOM DTM Somalia data portal at https://dtm.iom.int/datasets/somalia-emergency-trend-tracking-dataset-june-2026 The specific dataset used in this study is [insert the exact dataset title, assessment round, and direct dataset URL]. Access to the original dataset is subject to the applicable IOM data-sharing policies and permissions.

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Figures

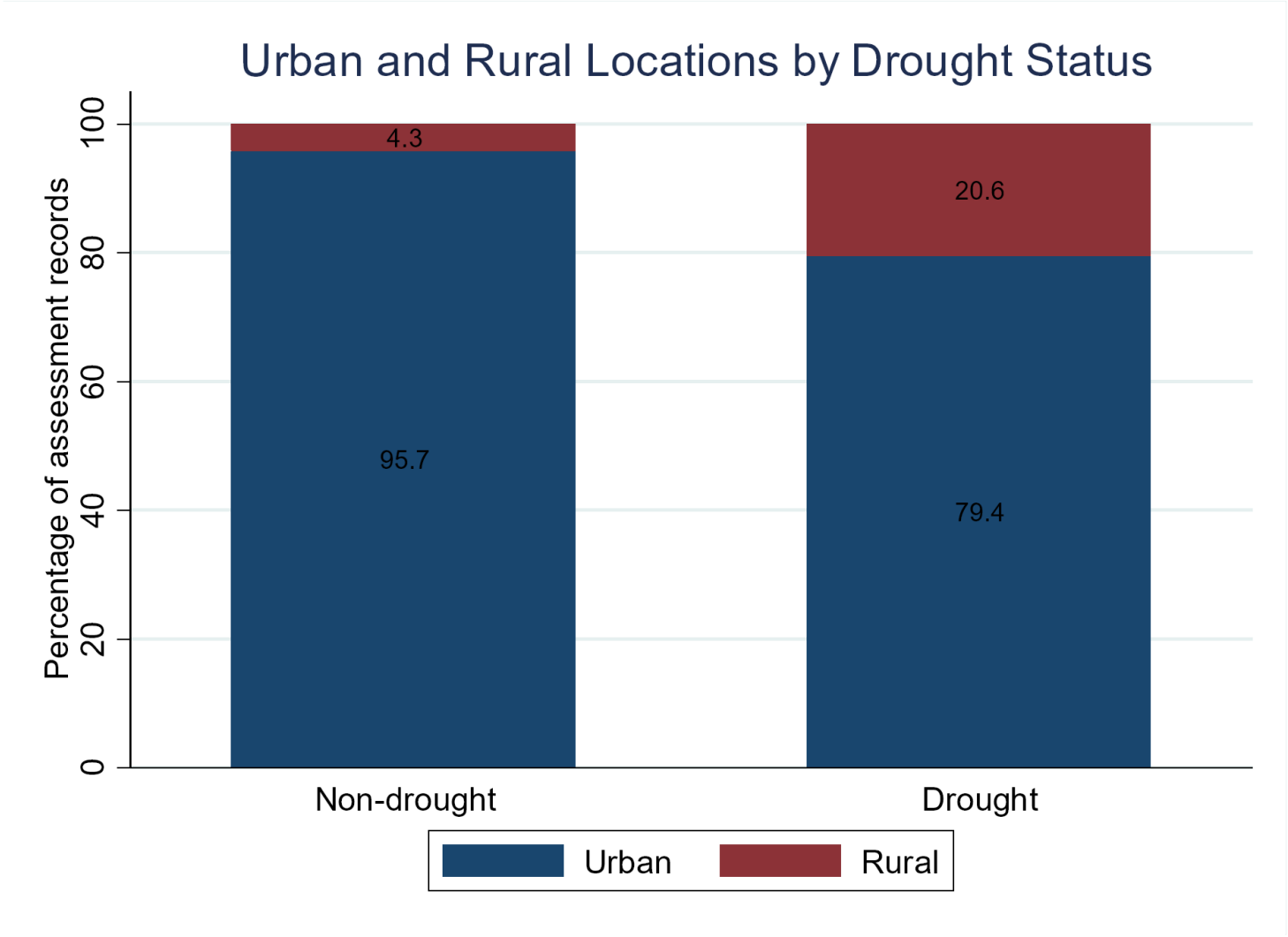

Figure 1

Urban and rural locations by drought status

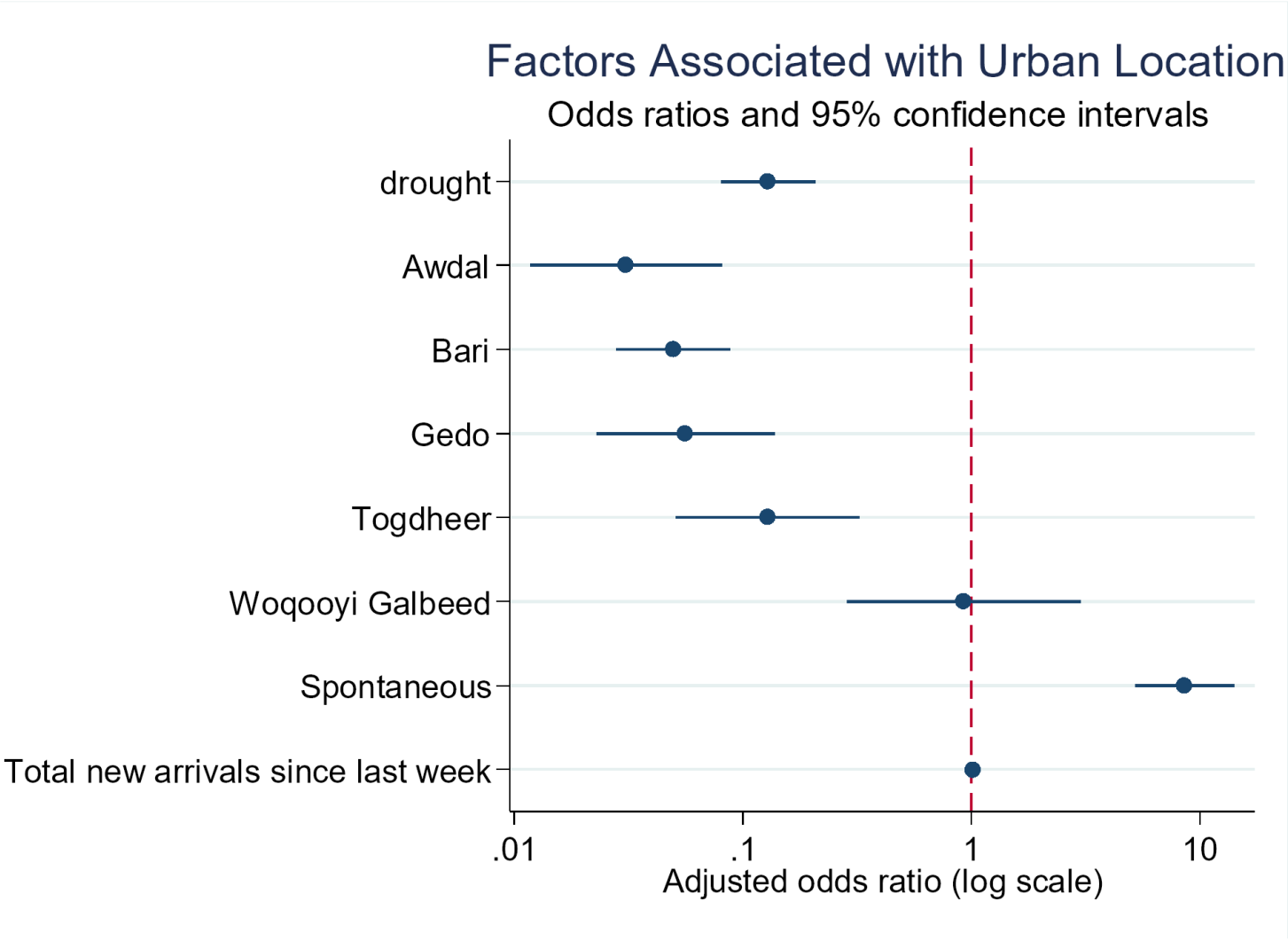

Figure 2

The distribution of observations by regions in Figure 2.

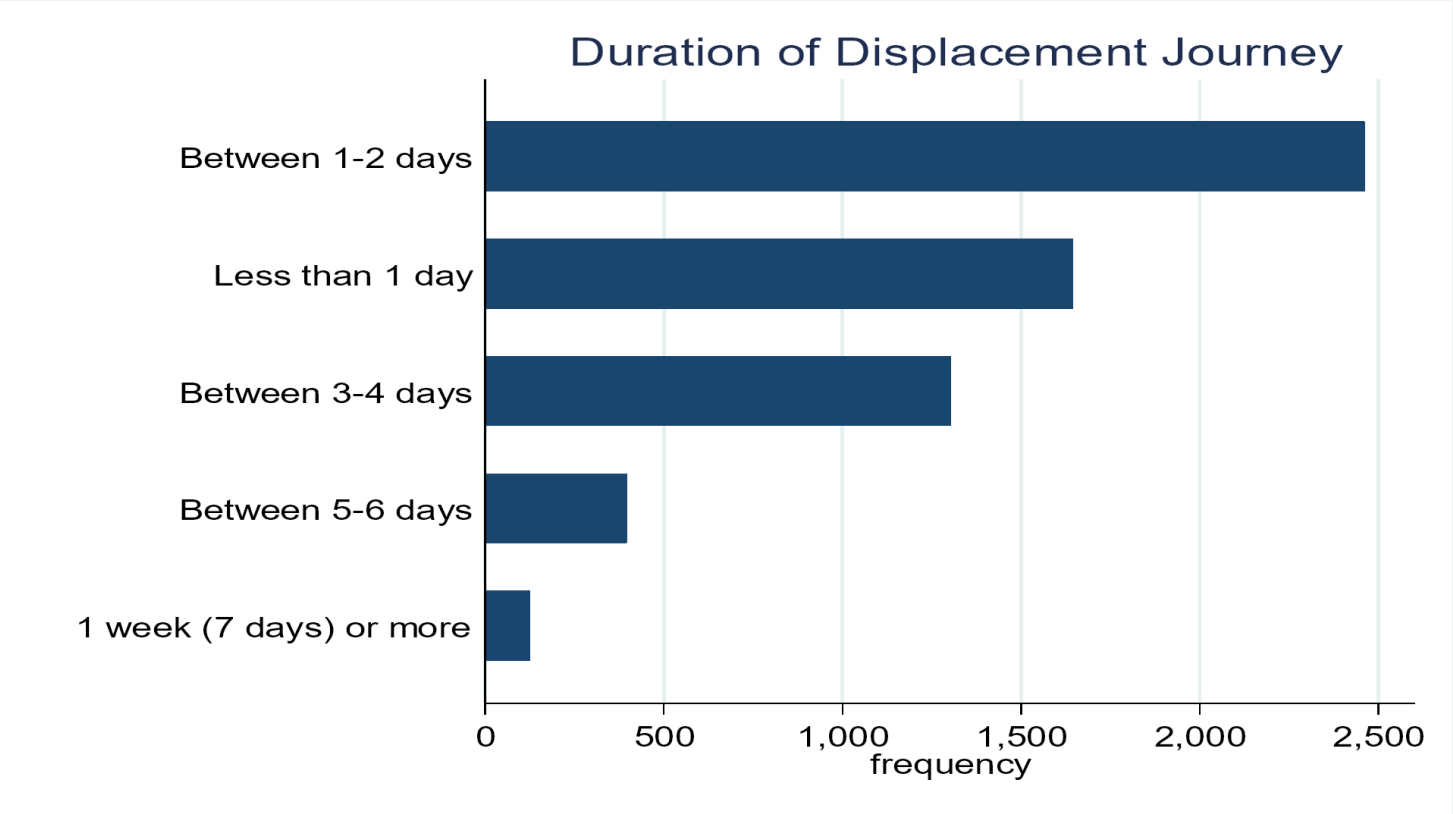

Figure 3

The distribution of observations by journey duration is presented in Figure 3

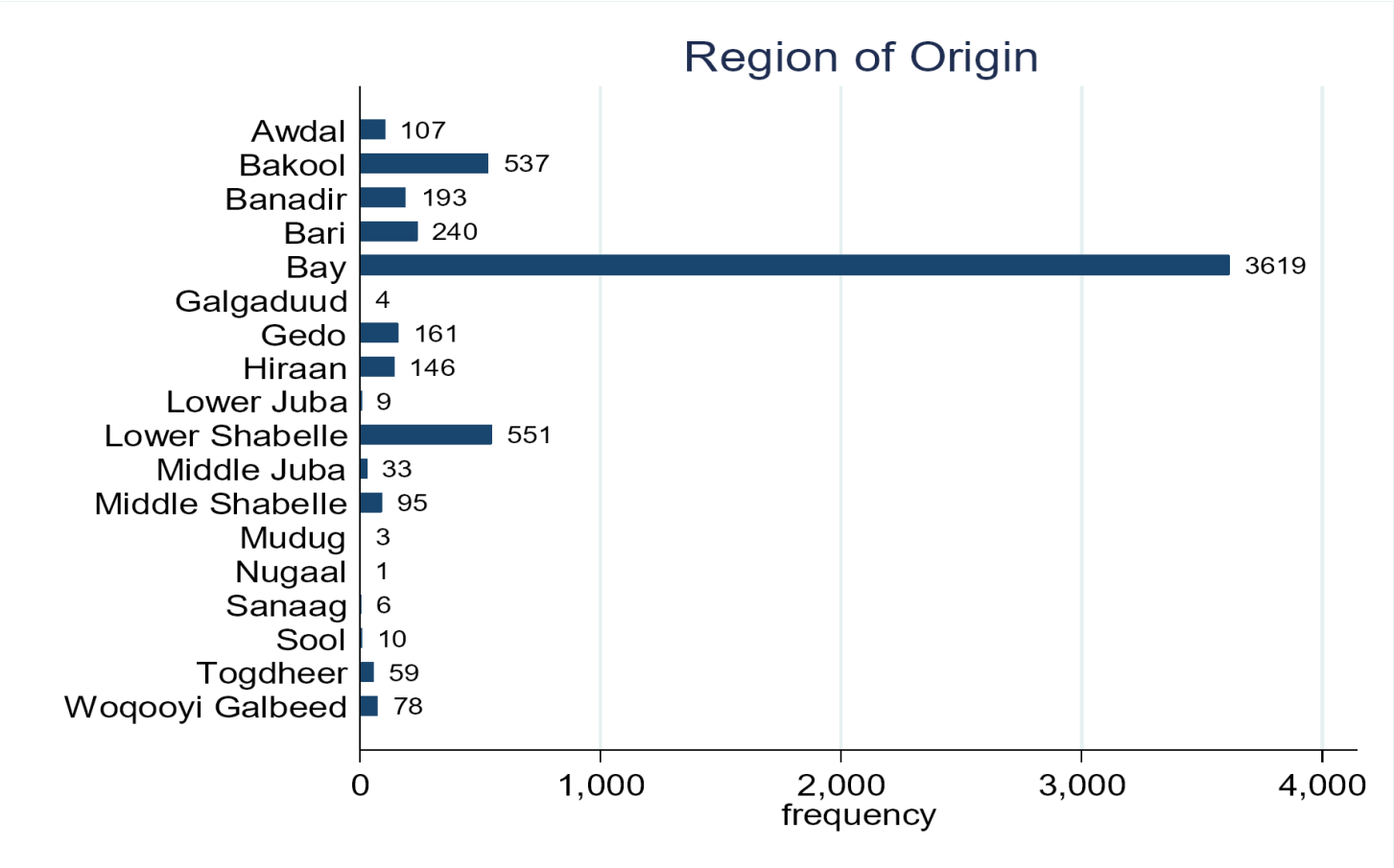

Figure 4

The distribution of observations by origin region is presented in figure 4

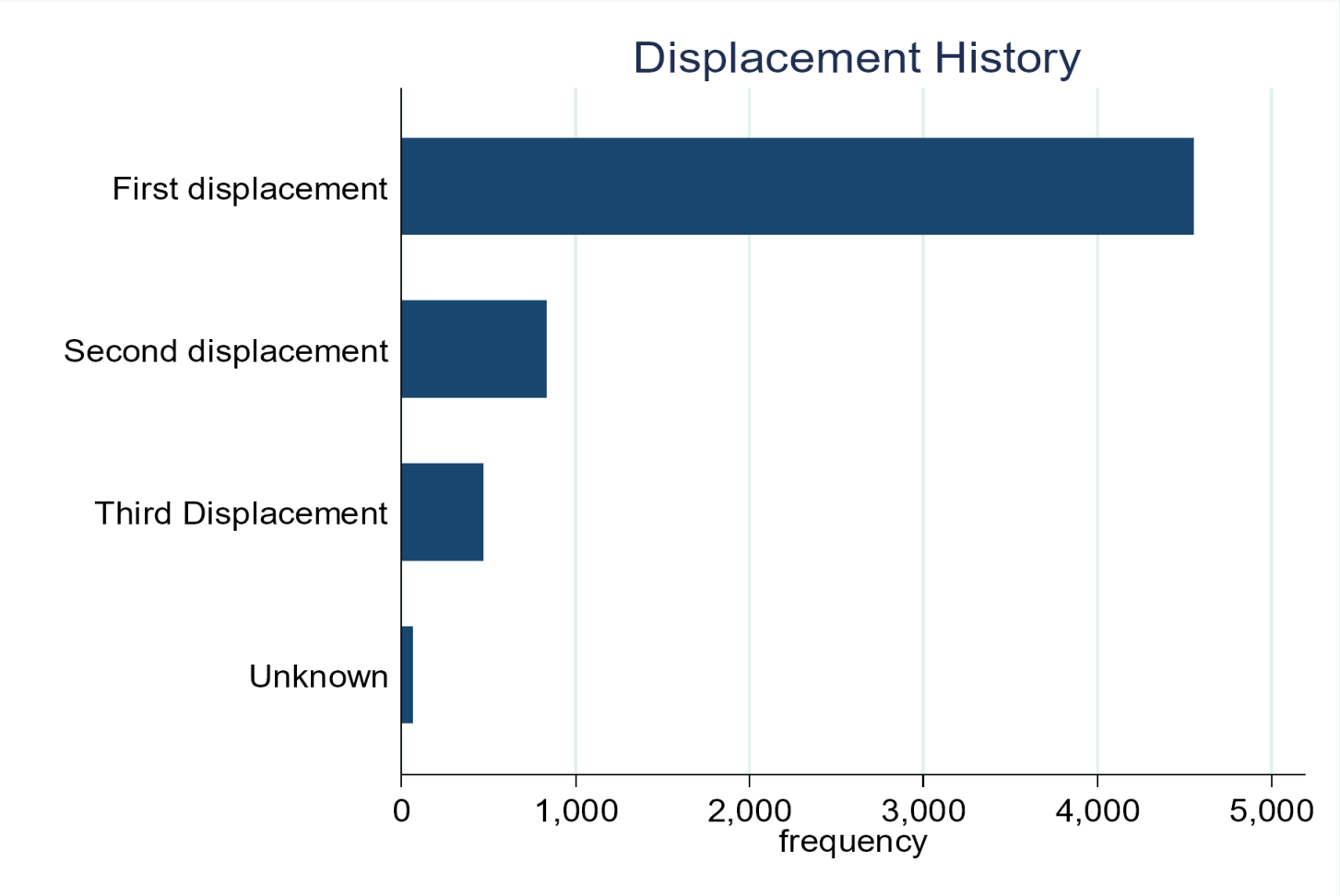

Figure 5

The distribution of observations by how many time displaced is presented in Figure 5