

Reading spatial inequality in Gaza through UNRWA reports: Displacement and urban fragmentation

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Abstract

The escalation of conflict in Gaza in October 2023 has intensified a humanitarian crisis marked by mass displacement and the disruption of essential services, producing new forms of spatial inequality and heightened human vulnerability. To understand and analyze this crisis, this study draws on UNRWA situation reports from October 2023 to December 2025. It uses these reports as a lens to examine spatial conditions and how space is organized and transformed during the crisis. In this context, the study develops a spatial reading by identifying and interpreting how space is articulated within these reports. This includes the development of analytical visual representations derived from the data, translating textual and numerical information into spatial patterns across time and regions, and enabling a clearer understanding of displacement dynamics and spatial inequality. In doing so, it not only treats these reports as data but also critically examines how such textual, numerical, and visual outputs construct, represent, or fail to capture spatial inequalities. Through the analysis of these reports, the study identifies five temporal phases. Within each phase, a qualitative approach is adopted to analyze patterns of population movement, shelter overcrowding, and variations in service availability, allowing for a comparison of how crises intensify or recede over time and how specific challenges become more dominant in particular phases. The analysis is structured around three main aspects: access to services, the condition of infrastructure, and the uneven impact of humanitarian aid across different areas. The findings show that repeated displacement, damaged services, and limited aid intensify spatial inequalities over time, with certain vulnerabilities becoming more pronounced in specific phases.

Keywords: Gaza, spatial inequality, displacement, access to services, UNRWA reports

1. Introduction

The escalation of the Israeli–Palestinian conflict in October 2023 caused a severe humanitarian crisis in Gaza (Figure 1). It led to widespread destruction, large-scale displacement, and the disruption of essential services, such as food systems, health services, and basic infrastructure. However, it is important to note that this crisis did not begin in 2023. Instead, the war intensified long-standing structural vulnerabilities shaped by a 17-year blockade and repeated military escalation (Hassoun et al., 2024).

As the war that began on October 7 continued, the healthcare system in Gaza experienced near-total collapse. Most hospitals and primary healthcare facilities were either destroyed or forced to cease operations. By April 2024, approximately 84% of health facilities were damaged or destroyed, while hospital system functionality declined to nearly 14% and never exceeded one-third of its pre-war capacity after December 2023 (Mills et al., 2026). At the same time, internal displacement reached unprecedented levels, and food insecurity worsened dramatically across the Gaza Strip. Several areas, particularly northern Gaza, approached famine conditions, with many families resorting to animal feed and wild plants for survival. Recent studies describe the situation as one of

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the world's most severe hunger crises and warn that the population was on the verge of famine¹, if not already experiencing it (Hassoun et al., 2024; Mills et al., 2026).

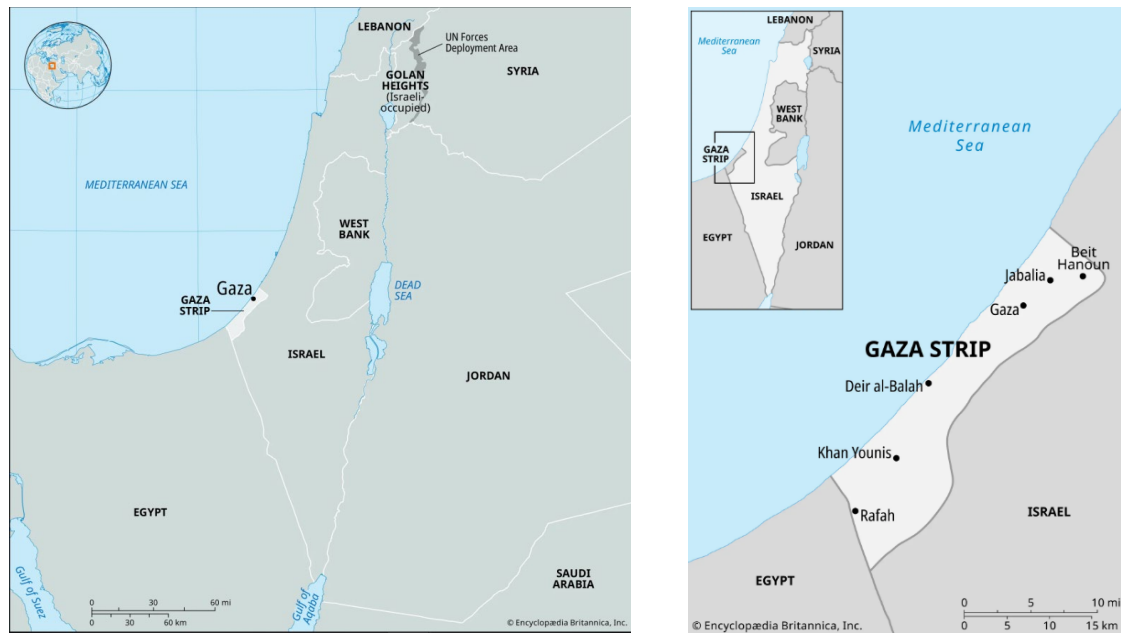


Figure 1 Geographical location of the Gaza Strip (Encyclopædia Britannica, n.d.)

Before the escalation of the conflict in October 2023, the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) played an important role in providing basic services for Palestine refugees in Gaza. As the main humanitarian organization, UNRWA operated 22 primary health-care centers that served approximately 1.3 million registered refugees and provided large numbers of daily medical consultations (UNRWA, 2023a). The agency also ran a wide education system with 278 schools, making it one of the largest school networks in the region (UNRWA, 2023b). In addition, UNRWA provided regular food assistance to approximately 1.7 million people every three months, helping to reduce food insecurity among refugee families (UNRWA, 2023c). However, even before 2023, the system was already under pressure due to high population density, limited resources, and growing demand for services, showing existing structural weaknesses before the escalation of the conflict.

After October 2023, UNRWA expanded its role to respond to the widespread destruction of health facilities and the collapse of essential service systems in Gaza. The agency opened new medical points inside shelters and coordinated with international organizations, such as the World Health Organization (WHO) and UNICEF, to restore critical health services under emergency conditions (Aljadba et al., 2025). At the same time, UNRWA scaled up its emergency nutrition response, distributing food parcels and screening tens of thousands of children for malnutrition (Alkhamash et al., 2025). UNRWA's situation reports and operational data quickly became crucial sources of information on deaths, displacement, service disruptions, and disease trends, establishing the agency not only as a central service provider but also as an institutional witness documenting the crisis through systematic reports, data collection, and public advocacy (Al-Jadba et al., 2024; Bakri et al., 2025).

¹ Several scholars describe this situation as a deliberate or manufactured humanitarian catastrophe and emphasize its devastating impact on public health and global development goals, particularly Sustainable Development Goal 2 (SDG 2)¹ on ending hunger (Bakri et al., 2025).

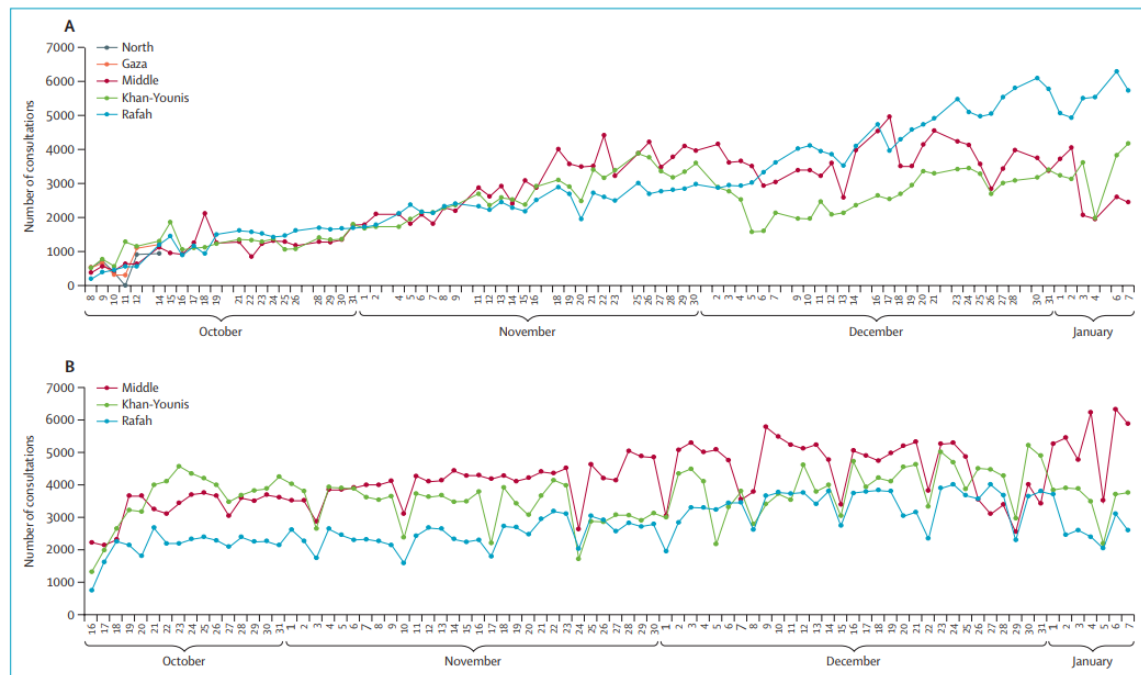


Figure 2 Spatial concentration of UNRWA health services in southern Gaza following the October 2023 war (Al-Jadba et al., 2024)

For example, Figure 2 illustrates the spatial concentration of healthcare services in southern Gaza after October 2023. As northern areas became inaccessible due to bombardment and movement restrictions, the UNRWA continued to operate health services mainly in the three southern governorates. This uneven geographical distribution of medical services demonstrates how displacement and conflict intensified spatial inequality in access to life-saving care (Al-Jadba et al., 2024).

Early in the war, drawing on UNRWA reports and field observations, Seita and Al-Jadba (2023) warned that Gaza was rapidly approaching a humanitarian catastrophe. They argued that the declaration of a “complete siege” exacerbated the already fragile situation, creating an immediate life-threatening emergency. Their commentary highlighted the collapse of basic services, including water, sanitation, and healthcare, as well as rising mental health needs, functioning as an urgent call for humanitarian access and international intervention (Seita & Al-Jadba, 2023).

The war has reshaped urban space in Gaza, turning everyday environments into spaces of destruction and survival, where urban warfare involves the active “modeling” and modification of the city through intervention and destruction of its social infrastructure (Mendonça, 2024). Damage to civilian infrastructure has been widespread and highly concentrated, particularly along designated evacuation routes, forcing civilians into overcrowded and unsafe areas with severely limited services (Asi et al., 2024). In this context, the destruction of educational and residential spaces has altered the social function of the urban environment, where schools are no longer centers of learning but have become shelters for the displaced populations. Consequently, large parts of Gaza now operate as “spaces of elimination,” where urban space is reorganized around survival rather than normal civic life (Dader et al., 2024).

At the level of everyday spatial conditions, armed conflict further reorganizes space through forced displacement, overcrowded sheltering, restricted access to services, and intensified spatial control, all of which deepen inequality and vulnerability (Asi et al., 2024). These processes have been further conceptualized in the literature as forms of colonial spatial violence that disproportionately affect women, children, and refugees, undermining access to dignified and secure living conditions (Ajour, 2025). Severe housing inadequacies, together with limited access to electricity and clean water among displaced populations, further demonstrate how spatial control

mechanisms contribute to the persistence of long-term humanitarian crises and structural social inequalities (Sabah, 2025).

Beyond these immediate humanitarian and spatial consequences, the ongoing destruction raises questions about the long-term historical and spatial transformation of Gaza. From a broader historical perspective, Veracini (2025) situates the ongoing transformation of Gaza within the trajectory of settler colonialism, questioning whether current developments represent a turning point in, rather than simply a continuation of, this historical process. More specifically, Piletić (2026) describes Gaza's urban destruction as a process of spatial restructuring in which containment, destruction, and speculative redevelopment are interconnected. Through the concept of "(un)creative destruction," Piletić further argues that redevelopment may be advanced through devastation rather than only emerging in its aftermath, drawing attention to the simultaneity of destruction and anticipation of future spatial transformation. This relationship is particularly visible in proposals for Gaza's postwar reconstruction. In this context, Bshara (2025) interprets Trump's proposal to "own Gaza" and transform it into a "Riviera" not simply as a redevelopment vision, but as a real-estate project in which postwar reconstruction becomes a means of reimagining and reorganizing Palestinian space.

Building on these spatial interpretations of the crisis, this study adopts an architectural perspective, placing it in dialogue with spatial justice theory and humanitarian document analysis to argue that spatial injustice in Gaza extends far beyond the physical destruction of buildings, and is produced through patterns of displacement, uneven access to services, and the uneven distribution of humanitarian aid.

Spatial justice builds on Lefebvre's "right to the city" (Lefebvre, 1996) and Soja's work on spatial inequalities (Soja, 2010), focusing on how power relations produce unequal access to resources, decision-making, and the ability to shape space (Moroni & De Franco, 2024). Lefebvre argued that urban space is not neutral but socially produced through everyday life, economic processes, planning, and state power. In this sense, the "right to the city" refers to the right of all urban inhabitants to access and participate in shaping urban space (Purcell, 2003). Soja extends this argument by showing that space both reflects and produces inequality, making spatial injustice visible in patterns such as unequal service distribution and socio-spatial segregation (Soja, 2010). Together, these perspectives highlight the deep relationship between space, power, and inequality.

Within this framework, displacement is approached in this study as a multi-layered concept that is understood differently across humanitarian and academic literature rather than as a single fixed condition (Echevarria-Coco & Gardeazabal, 2020). On the one hand, humanitarian organizations such as UNRWA and UNHCR define displacement primarily as the forced movement of people from their homes due to conflict, violence, or crisis. It is commonly measured through the number of internally displaced persons (IDPs) and their presence in shelters (Al-Jadba et al., 2024; Echevarria-Coco & Gardeazabal, 2020). This definition is essential for humanitarian response, as it helps identify immediate needs such as shelter, food, water, and health services.

On the other hand, critical urban and migration studies conceptualize displacement in a broader and more prolonged sense, viewing it not only as a singular event of movement but as an ongoing condition that reshapes everyday life over time (Feldman, 2012). From this perspective, displacement includes the loss of home, stability, and routine urban life, even after relocation to "safer" areas, extending beyond physical movement to encompass sustained insecurity, instability, and disruption of everyday existence (Murcia, 2020). Building on these complementary perspectives, this study adopts a combined understanding of displacement, referring both to the number of people recorded as displaced in humanitarian reports and to the wider spatial condition characterized by repeated movement, instability, and unequal access to services over time.

The spatial conditions examined in this study, loss of home, overcrowding, and sheltering, are understood as interconnected dimensions of urban disruption that collectively produce spatial inequality rather than isolated categories. The loss of home refers to ruptures in belonging and

everyday spatial continuity, while overcrowding and sheltering reflect the concentration of displaced populations within limited and often inadequate infrastructures, where space and resources are unevenly distributed. At the urban scale, these interconnected conditions are part of a broader spatial and demographic restructuring, as forced displacement and the destruction of the built environment reshape population distribution, access to services, and the organization of urban space (Maghrabieh, 2026). This broader restructuring is also manifested in everyday urban life through constrained mobility, altered routines, and differentiated exposure to risk and resources, through which spatial inequality becomes embedded in daily spatial experience (Trovato & Ariss, 2025; Maghrabieh, 2026). Thus, the combined understanding of displacement allows UNRWA reports to be read not only as numerical records, but also as spatial narratives that show how the crisis develops and affects urban life.

Humanitarian action operates within fragmented environments, where access to affected populations and the delivery of essential services depend on changing political and military conditions. Kool et al. (2021) describe this through the concept of shifting “micro-spaces,” in which humanitarian actors must continuously adapt to unstable and restricted areas of operation. These conditions complicate aid delivery, as movement restrictions and security constraints create unstable zones of access that hinder consistent service provision across affected populations. Overall, these dynamics demonstrate how humanitarian response, everyday survival, and the organization of space become closely intertwined during conflict.

Studies on housing, health, and WASH (water and sanitation) further show that infrastructure damage and service disruption are unevenly distributed and concentrated in specific areas, thereby intensifying inequalities among displaced populations (Sabah, 2025; Sabah & Abuzerr, 2025). Satellite and infrastructure studies further document widespread damage to homes, schools, hospitals, and water systems, leaving severely limited functional urban spaces (Holail et al., 2024; Asi et al., 2024). Viewed within a broader historical context, these spatial conditions can be understood as part of a longer trajectory shaped by decades of siege, repeated military attacks, and externally controlled infrastructures. These processes have produced overlapping spaces of crisis characterized by restricted movement and limited access to essential services (Hynek & Ter-Ghazaryan, 2025; Agha et al., 2024).

UNRWA reports provide detailed datasets on these conditions, including variations in housing, access to water and electricity, and damage to essential services (Sabah, 2025; Asi et al., 2024; Hamamra et al., 2025). Rather than treating these reports as descriptive accounts, this study uses them as raw empirical material to reconstruct spatial inequalities through systematic analysis, allowing the uneven geographies of vulnerability and hardship across Gaza to be examined over time.

Discussions in architecture, urban studies, and spatial justice have increasingly treated inequality as something produced and organized through space. Research has extensively examined how spatial arrangements shape unequal access to public facilities, services, and opportunities, and how urban environments reproduce broader social and economic inequalities (Wu & Liu, 2022; Sarkar et al., 2024). In contrast, a smaller body of humanitarian and conflict-related scholarship has explored how humanitarian interventions contribute to the production of spatial orders, exclusions, and inequalities. Studies have shown that humanitarian practices often rely on specific spatial forms and governance mechanisms that structure access, mobility, and assistance in conflict settings (Prinz & Schetter, 2020; Kool et al., 2021). Other research argues that the spatial implications of displacement and humanitarian action have frequently been overlooked, with place treated mainly as background rather than as a central object of analysis (Fawaz et al., 2022).

In response to these gaps, this study examines how spatial inequality in Gaza is constructed and represented in UNRWA reports published after October 2023, treating these reports as primary material through which recurring spatial conditions can be analytically interpreted within the humanitarian discourse and institutional responsibility. From this perspective, the analysis is

structured around three interconnected questions that guide the inquiry into how UNRWA reports describe spatial conditions in Gaza after October 2023, what forms of spatial inequality emerge in relation to displacement, shelter, and access to services, and how these reports operate as forms of institutional witnessing during the war.

To address these questions, this article analyzes UNRWA situation reports issued after October 2023, along with related supporting documents, as key institutional texts through which the humanitarian crisis in Gaza is narrated and spatialized. While UNRWA reports do not represent all lived experiences in Gaza, they provide insight into one of the Strip’s most influential humanitarian knowledge systems and illustrate how it articulates spatial injustice. Rather than evaluating humanitarian performance, the analysis focuses on how space is described and made visible within humanitarian discourse. This approach contributes to broader debates on spatial justice, humanitarian governance, and the role of architecture in contexts of prolonged conflict.

2. Methodolgy

This study draws on UNRWA Situation Reports from Gaza, published between October 2023 and December 2025, for a mixed-methods (qualitative and quantitative) analysis of how urban space changes and is reshaped during the conflict. While such reports continue to be published beyond this period, including after ceasefire announcements, this timeframe is selected to capture the period from the initial escalation of the conflict and its most acute phases of spatial and humanitarian change. To examine spatial inequality in Gaza, this study focuses on how displacement, sheltering, restricted access to services, and the transformation of everyday urban environments reshape urban life during conflict. By examining reports over time, the study aims to identify broader transformations in spatial conditions.

More than 200 UNRWA reports were published during the study period (UNRWA, n.d.). From these, 45 reports were purposefully selected. The selection of the 45 reports was based on the fact that UNRWA issues situation reports on a regular weekly basis, with each report covering approximately one week of humanitarian developments. Accordingly, the selected reports were distributed across the study period at relatively regular temporal intervals to ensure balanced coverage of the 2023–2025 period. This approach allowed for the inclusion of key moments of intensified humanitarian change while maintaining a structured temporal representation of the overall dataset. Reports providing clear descriptions of spatial conditions, such as shelter status, infrastructure damage, access restrictions, and population movement, were prioritized to capture major shifts in displacement patterns, service disruption, and humanitarian conditions across the broader temporal development of the conflict.

During the preliminary review of the reports, five major phases of the humanitarian crisis were identified based on changes in displacement patterns, humanitarian access, military escalation, and the condition of essential services (Table 1). This temporal classification was developed to support a comparative analysis across different stages of the conflict and examine how spatial conditions evolved over time.

Table 1 Phases and Associated Reports

Phase	Time Period	Selected Reports
Phase 1	Oct–Nov 2023	#1, #4, #10, #16, #20, #26, #32, #38, #40
Phase 2	Dec 2023–Feb 2024	#50, #57, #60, #63, #68, #71, #74, #78, #82
Phase 3	Mar–Jun 2024	#83, #86, #90, #94, #98, #102, #107, #111, #115
Phase 4	Jul–Dec 2024	#118, #123, #126, #132, #136, #141, #145, #149, #153
Phase 5	2025	#156, #161, #166, #171, #176, #183, #187, #192, #202

To interpret changes across reports and phases systematically, a semi-quantitative scoring system based on three analytical indicators was developed. Each report was evaluated using an ordinal scale from 0 to 3 to reflect the level of spatial impact, where 0 indicates no impact, 1 indicates minor impact, 2 indicates moderate impact, and 3 indicates severe impact. For each report, the highest observed level of impact was recorded to preserve critical conditions and avoid masking severe spatial disruptions through averaging.

Thus, the methodology links humanitarian reporting with urban and spatial theory by treating UNRWA reports not only as descriptive humanitarian documents, but also as spatial narratives that reveal how urban space is reorganized, restricted, and experienced during conflict. This approach allows for a systematic examination of how war reshapes urban environments, affects population movement, and produces uneven access to infrastructure and essential services across the Gaza Strip.

3. From Data to Spatial Interpretation

UNRWA reports are analyzed as spatial documents that reflect the reorganization of urban life during conflict. The analysis focuses on recurring references to movement, sheltering, infrastructure damage, access restrictions, and everyday survival, interpreting them as indicators of broader spatial conditions rather than isolated humanitarian descriptions. Numerical data and qualitative observations are therefore used to identify patterns of spatial change across the conflict period.

Accordingly, the analysis is organized into three stages: data compilation from UNRWA reports, involving the systematic extraction of key observations related to spatial conditions; spatial patterns across temporal phases, focusing on the comparison of severity levels and changes in displacement, access, and infrastructure across the identified crisis phases; and reframing temporal phases through spatial injustice, where recurring conditions are interpreted as expressions of unequal spatial access and differentiated vulnerability across Gaza.

3.1. Data Compilation from UNRWA Reports

Table 2 Raw Data

Phase / Period (Reports)	Timeframe	Displaced People (IDPs)	UNRWA Shelters / Capacity	Health Services	WASH (Water & Sanitation)	Casualties / Deaths	Notes / Key Observations
Phase 1 – (Reports #1–#43)	07/10/2023 – 30/11/2023	Rapid increase from 20,000 to 1.8 million (80% of Gaza population displaced)	3,400 to 1.1M in 156 shelters; average 9,500 per shelter (4–20x capacity)	0 to 600,000+ patients treated; daily consultations 10,700; post-natal/high-risk pregnancy cases 1,100+; 11,622 children vaccinated	8 water wells + water trucking; solid waste collection ongoing; partial reliance on solar due to fuel shortage; some desalination plants limited	Gaza fatalities ~100 to >15,000 (6,150 children & 4,000 women); UNRWA staff 0 to 111	Extreme overcrowding occurred in shelters in Gaza City and North Gaza became largely inaccessible, leading to displacement toward Deir al-Balah and Khan Younis. This increased disease spread, worsened hygiene, and deepened mental health strain. Humanitarian aid remained limited due to conflict, fuel shortages, and damaged infrastructure, though psychosocial support reached 81,102 people, and 375,000 children received recreational activities. Temporary humanitarian pauses (November 24–29) allowed limited aid access, while northern shelters remained highly restricted.
Phase 2 – (Reports #50–#82)	7 Dec 2023 – 24 Feb 2024	~1.7M IDPs (over 75% population); multiple displacements common	150–155 shelters operational; severely congested; capacity exceeded	7 health centres operational; 539–708 staff; >2.4M consultations cumulatively; vaccinations ongoing; psychosocial support for 148,000+ IDPs	WASH services limited due to conflict; infrastructure damaged; water/sanitation access restricted	Gaza Strip: 29,514 killed (70% women & children), 69,616 injured; UNRWA shelters: 403 IDPs killed, 1,385 injured; UNRWA staff fatalities: 158	Heavy fighting occurred in Khan Younis, Deir al-Balah (Middle Area), and Northern Gaza, while mass displacement caused extreme overcrowding in Rafah, where the population exceeded 1.5 million. Repeated displacement became common as schools, shelters, distribution centres, and IDP sites were repeatedly affected. Hospitals, including Nasser Hospital in Khan Younis, were under siege. Humanitarian aid was severely restricted to about 98 trucks per day (vs. 500 pre-war), limiting access to Northern Gaza and worsening the crisis.

Phase 3 – (Reports #83– #115)	1 Mar 2024 – 24 Jun 2024	~1.63M IDPs (over 75–80% population; multiple displacement s continue)	186–188 shelters impacted; severely congested ; >1,600 IDPs per shelter on average; some shelters destroyed or rendered inaccessibl e	66 medical points/centres operational; ~953 staff; 15,000– 15,600 weekly consultations; vaccinations ongoing; MHPSS reached 680,000 IDPs including 430,000 children; post-natal & high- risk pregnancy care ongoing	WASH updates limited due to security and internet disruptions; critical fuel shortages affecting water pumping and sanitation; infrastructure damaged	UNRWA staff killed: 193; IDPs killed in shelters: 508; IDPs injured in shelters: 1,559; Gaza total fatalities: 36,479– 37,396; injuries: 82,777– 85,523	Severe disruption of aid through the Kerem Shalom Crossing and Rafah limited humanitarian access and increased the risk of famine. Continued displacement occurred between Rafah, Deir al-Balah, and Khan Younis due to changing security conditions. Hospitals were overwhelmed, while airstrikes on health and education facilities further weakened services. Fuel shortages critically affected WASH and health systems, and psychosocial support became essential. Over 446 incidents impacted UNRWA premises, reflecting a highly unstable humanitarian environment.
Phase 4 – (Reports #118– #153)	Jul 2024 – 31 Dec 2024	~1.5–1.6M IDPs (~80– 90% of Gaza population; repeated displacement s common)	200+ shelters impacted; overcrowd ing severe; some destroyed or inaccessibl e	3 of 22 UNRWA health centres operational; 97 mobile medical teams; 1,189 health staff; 14,952 consultations/day (Dec 29); post- natal & high-risk pregnancy care; 7M+ consultations cumulatively since start; vaccinations: 560,000 children <10; MHPSS: 278,981 sessions for 730,000 displaced	Emergency WASH: water wells maintained, desalination systems, water trucking; hygiene kits distributed; 38,000 m ³ water distributed (early Dec); 1,972 tons solid waste collected (first 2 weeks Dec); winterization ongoing	Gaza fatalities ~33,000– 35,000 (est.); UNRWA shelters: 745+ IDPs killed, 2,202 injured; UNRWA staff killed since Oct 7: 263	Israeli evacuation orders affected over 80% of Gaza, causing repeated displacement across the Strip. Attacks on shelters and hospitals, including Kamal Adwan Hospital, continued, while hospitals remained overwhelmed. Harsh winter conditions in Rafah increased risks, such as neonatal hypothermia, with approximately 7,700 newborns lacking care. Aid was severely restricted (approximately 76 trucks/day vs. 500 pre-war), and WASH and energy systems further deteriorated. Despite this, psychosocial support reached over 730,000 displaced people (520,000 children), and food aid reached approximately 1.46 million people.
Phase 5 – (Reports #156– #202)	1 July 2025 – 23 December 2025	~1.33 million IDPs, including ~79,000 in UNRWA collective shelters and the rest in damaged or informal sites	150–160 shelters, most severely congested ; some destroyed or within militarized areas	8–10 health centres + 103 mobile medical teams; ~56,000 consultations per week; ~1,100– 1,200 health staff; high-risk pregnancy care and vaccination ongoing	35,000–40,000 m ³ of water distributed to 300,000–1.4 million people; ~3,500 tons of solid waste collected; 400– 500 cleaning campaigns; maintenance of water wells and desalination systems ongoing	~30,000– 40,000 killed, ~50,000– 60,000 injured; 50– 60 UNRWA staff killed	A prolonged crisis continues with widespread displacement and movement across Rafah, Khan Younis, and central Gaza. Severe shortages of food, water, and health services persist, along with outbreaks of skin and communicable diseases, reflecting worsening conditions. Schools and hospitals remain heavily damaged, infrastructure is largely degraded, and humanitarian access is limited. UNRWA facilities face ongoing risks, while psychosocial support continues to reach tens of thousands of affected people.

Across the five phases, the data reveal a clear and consistent transformation in Gaza's humanitarian geography. Displacement progressively shifts from northern Gaza toward central and southern regions, particularly Deir al-Balah, Khan Younis, and eventually Rafah, reflecting repeated forced movement under deteriorating security and loss of habitable areas. At the same time, essential services, including shelters, health systems, and WASH infrastructure, remain under continuous strain, with capacity increasingly misaligned with the growing concentration of displaced populations. Although humanitarian assistance expands over time, it remains unable to compensate for the scale and repetition of displacement and infrastructure collapse. Overall, the data indicate a widening spatial imbalance between concentrated humanitarian needs and fragmented service delivery, producing an increasingly unequal geography of survival across the Strip.

Building on these observations, [Figure 3](#) visually synthesizes the evolving relationship between displacement pressure, shelter overcrowding, insecurity, and access to essential services across the five phases of the conflict, while also highlighting regional differences in humanitarian conditions throughout Gaza.

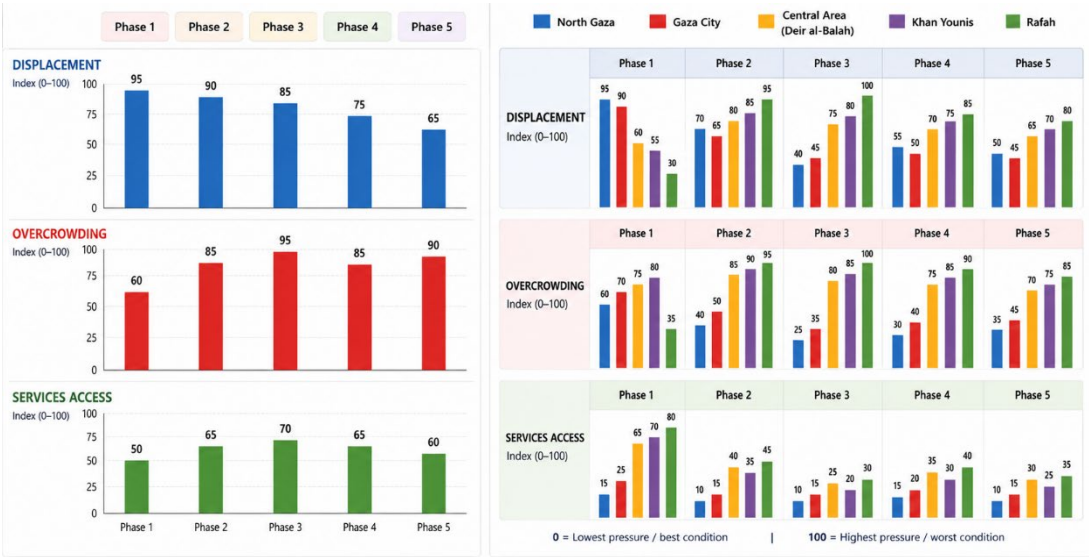


Figure 3 Evolution of humanitarian conditions across Gaza (2023–2025)

Figure 3 presents a combined temporal and regional analysis of the humanitarian conditions in Gaza. It illustrates persistent displacement and shelter overcrowding, alongside declining access to essential services across the five phases of the conflict. Regionally, it shows a gradual shift in humanitarian pressure from northern Gaza toward the central areas and Rafah in the south. Together, these patterns highlight how humanitarian conditions have evolved across both time and space, forming a foundation for subsequent spatial analysis. By translating UNRWA reports into comparable visual patterns, the figure marks an important step from descriptive humanitarian reporting to a spatial interpretation of the crisis.

Following the temporal patterns illustrated in Figure 3, Figure 4 provides a structured comparison of humanitarian pressure across northern, central, and southern Gaza over five phases.

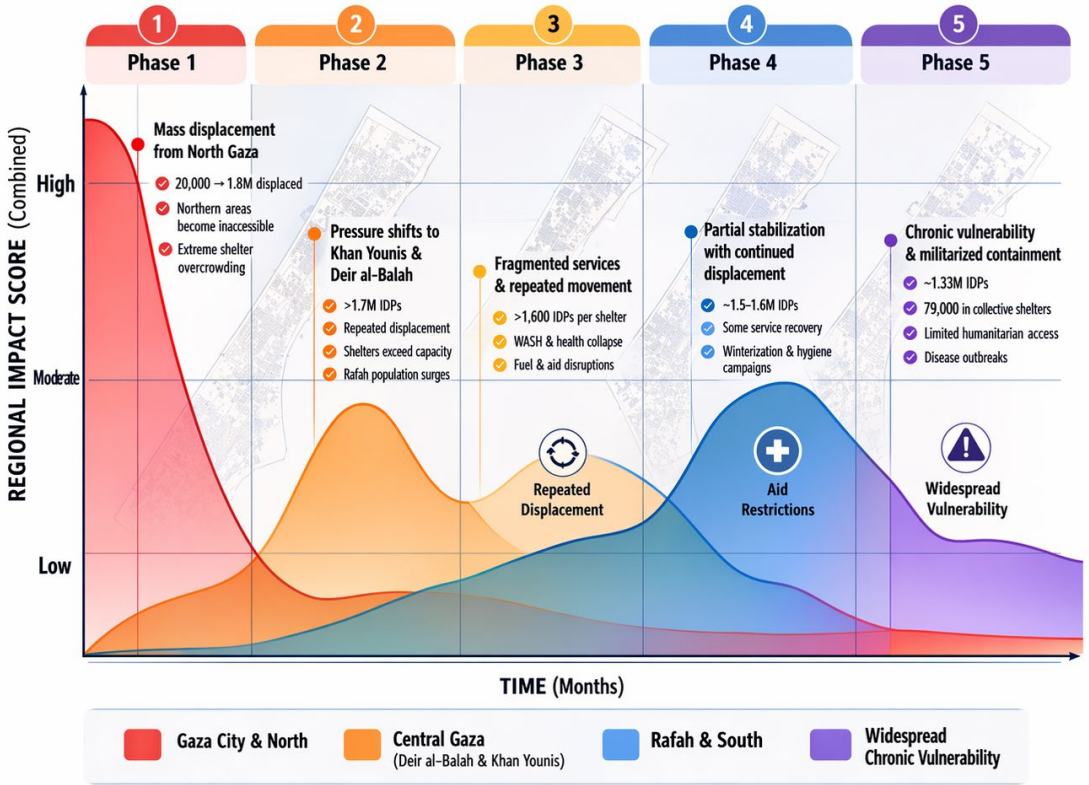


Figure 4 Spatial inequality and humanitarian pressure in Gaza: A five-phase regional trend analysis (2023–2025)

Figure 4 translates the temporal findings of this study into a comparative spatial framework across the five phases of the conflict. This enables a relational reading of humanitarian conditions by situating northern, central, and southern Gaza within a single spatial system rather than treating them as isolated units. The visualization reveals a progressive spatial reconfiguration of vulnerability: northern Gaza transitions from a displacement origin to a largely inaccessible zone, central Gaza functions as a transitional buffer under increasing pressure, while southern Gaza, particularly Rafah, emerges as the main concentration area for displaced populations and humanitarian stress. Overall, the figure demonstrates that spatial inequality is produced through continuous redistribution of population and resources within a shrinking and increasingly constrained spatial system. These patterns inform the subsequent analytical framework, which organizes the findings into a structured scoring system.

3.2. Spatial Patterns Across Temporal Phases

The scoring system in Table 3 is based on a structured qualitative reading of UNRWA Situation Reports, identifying recurring textual evidence related to severity, frequency, and spatial intensity across four key indicators: Average Displacement Score, Average Health Services Score, Average WASH Score, and Average Humanitarian Access Score. Building on the findings presented earlier in Table 2, Figure 3, and Figure 4, Table 3 was developed to synthesize these dimensions into a comparative analytical framework across the five phases.

In this way, Table 3 translates narrative humanitarian descriptions into comparable indicators, allowing a systematic comparison of changes in displacement pressure, service conditions, and humanitarian access over time.

Table 3 Data Analysis Using a Scoring System

Phase	Avg Displacement Score	Avg Health Services Score	Avg WASH Score	Avg Humanitarian Access Score	Key Trends / Spatial Patterns
Phase 1	3.0	2.5	2.8	2.2	Rapid mass displacement across Gaza, extreme shelter overcrowding, northern areas often inaccessible, early outbreaks of disease, and sporadic emergency aid deliveries.
Phase 2	2.8	2.8	3.0	3.0	Overcrowding remains critical; multiple displacements; health services strained; WASH limited due to conflict; aid deliveries blocked; fighting concentrated in Khan Younis, the Middle Area, Northern Gaza, and Deir al Balah.
Phase 3	2.5	3.0	3.0	3.0	Severe congestion in shelters, multiple displacements, continued disruption of water, sanitation, and health infrastructure, fuel shortages, high risk of famine, and incidents affecting UNRWA facilities are widespread.
Phase 4	2.3	2.7	2.6	2.7	Slight stabilization in IDPs, but repeated displacements continue; some health and WASH services partially restored; winterization and hygiene campaigns implemented; northern and central Gaza heavily affected; psychosocial support scaled up.
Phase 5	2.0	2.5	2.5	2.5	Chronic crisis with persistent displacement; 79,000 in collective shelters; continued strain on health services; WASH coverage improves but is still limited; humanitarian access blocked in militarized zones; outbreaks of communicable diseases; damage to schools and hospitals widespread; psychosocial support for tens of thousands ongoing.

Drawing on a structured qualitative reading of UNRWA Situation Reports, Table 3 presents a scoring system based on recurring textual evidence related to severity, frequency, and spatial intensity across four key indicators: Average Displacement Score, Average Health Services Score, Average WASH Score, and Average Humanitarian Access Score.

To further spatialize the displacement dynamics identified in the scoring analysis, Figure 5 map visualizes the directional movement and concentration of displaced populations across Gaza throughout the five phases of the conflict.

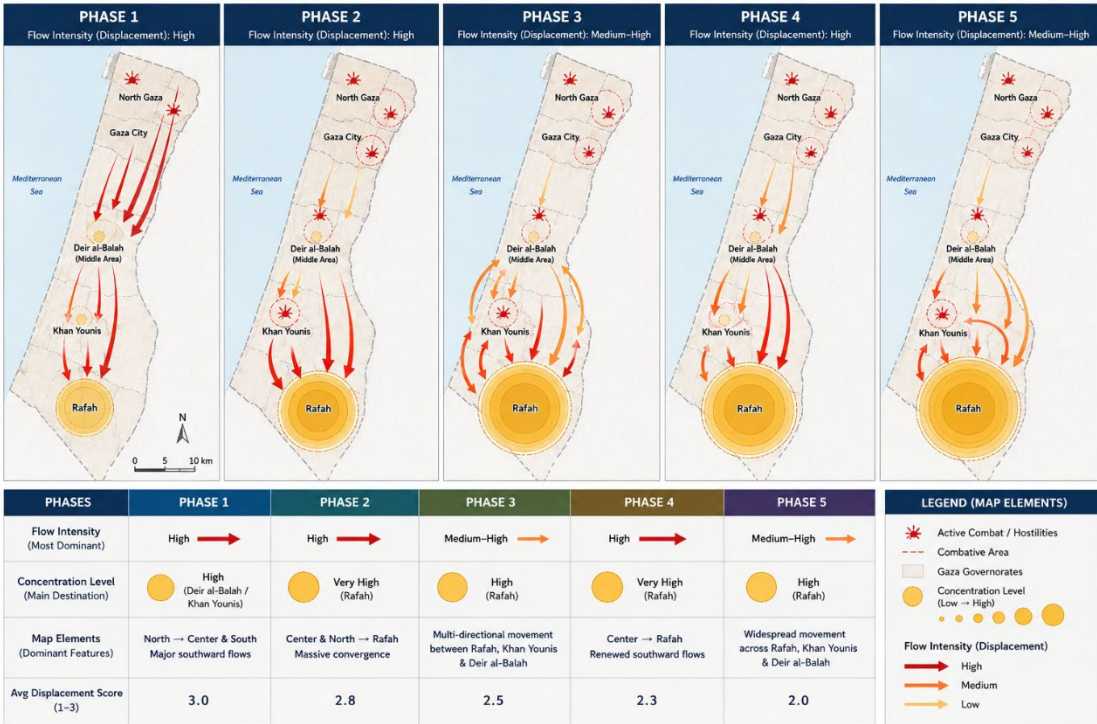


Figure 5 Displacement flow map

Figure 5 illustrates how repeated displacement flows gradually shifted the population pressure from northern Gaza toward central and southern regions, particularly Deir al-Balah, Khan Younis, and Rafah. Rather than depicting a single directional movement, the visualization reveals recurring cycles of evacuation, temporary concentration, and secondary displacement driven by insecurity, restricted mobility, and the continuous loss of habitable areas. This process demonstrates how mobility itself became a key mechanism through which humanitarian pressure and spatial inequality were redistributed across the Gaza Strip. In relation to these displacement dynamics, Figure 6 examines how the repeated accumulation of displaced populations generated severe and uneven patterns of shelter overcrowding across different regions over time.

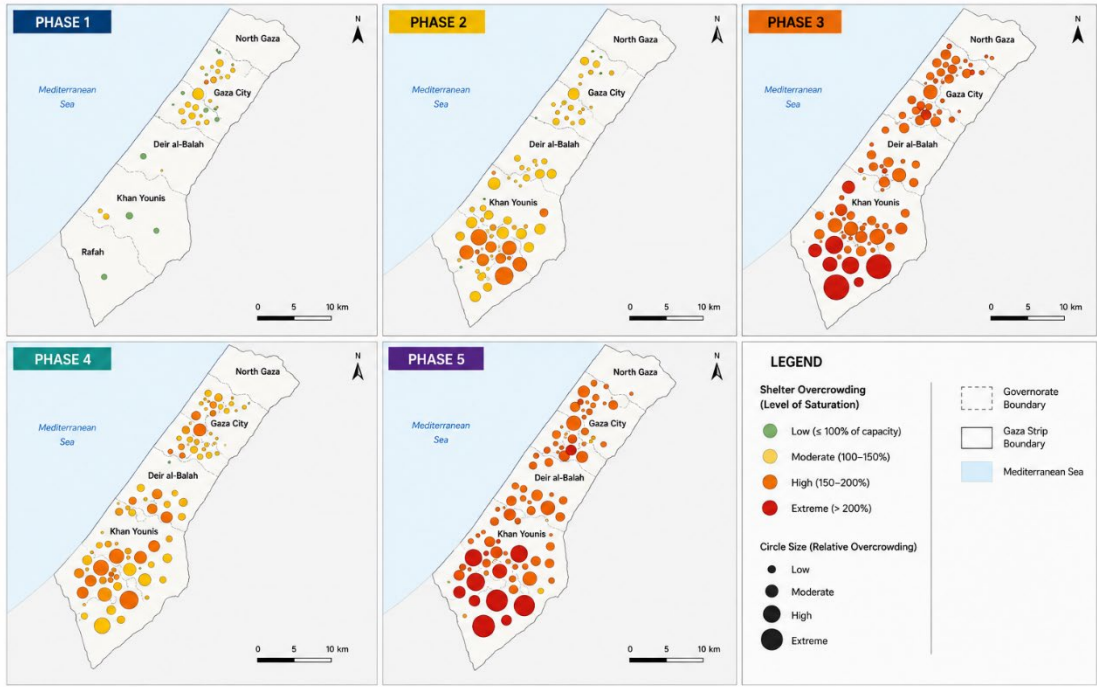


Figure 6 Spatial distribution of shelter overcrowding

This figure illustrates spatial variations in shelter overcrowding across Gaza, revealing a progressive shift in population concentration from central areas toward southern locations, particularly Rafah. Phase 1 shows relatively localized overcrowding within central Gaza, while Phase 2 reflects increasing pressure in southern areas as displacement flows intensify and available shelter capacity becomes more constrained. Phase 3 and 4 demonstrate a further escalation of overcrowding in southern zones, accompanied by widening pressure across multiple urban centers, indicating a transition from concentrated to more spatially diffused high-density conditions. Overall, the comparison highlights how displacement pressure accumulates unevenly across space, producing concentrated humanitarian stress in specific areas rather than a uniform distribution. This pattern demonstrates that shelter overcrowding is driven by continuous population compression into increasingly limited viable locations, reinforcing emerging forms of spatial inequality.

The northern areas experienced severe service disruption due to infrastructure damage, restricted mobility, and limited humanitarian access, while central and southern regions faced growing pressure from the concentration of displaced populations. The maps reveal that essential services remained spatially fragmented and unable to match the scale and distribution of humanitarian needs, reinforcing broader patterns of displacement pressure, overcrowding, and spatial inequality across the territory. Taken together, [Figures 3, 4, 5, and 6](#) provide a spatial interpretation of how displacement, shelter overcrowding, and uneven service accessibility collectively reorganized the conditions of vulnerability across Gaza.

4. Discussion: Reframing Temporal Phases Through Spatial Injustice

Building on the raw data, scoring analysis, and spatial mapping, this final section reframes the five phases through a spatial justice perspective by examining recurring patterns of displacement, service disruption, overcrowding, and restricted access across Gaza. Rather than treating the phases as only chronological stages, the analysis identifies dominant spatial conditions within each phase to show how humanitarian inequality progressively evolved into a prolonged and structurally uneven geography of vulnerability ([Table 4](#)).

Table 4 Spatial Injustice Across Phases

Phase	Phase Title	Spatial Justice Theme	Observations / Examples	Implications
Phase 1	Initial Escalation	Initial loss of safe space	Rapid IDP movement from 20,000 to 1.8M; 156 shelters overcrowded (4–20× capacity); northern shelters often inaccessible; limited WASH and health services; psychosocial support reached 81,102 people	Rapid spatial rupture from distributed urban living to an extreme concentration of population in limited shelter nodes. Early infrastructure collapse produces a severe mismatch between spatial demand and service capacity, establishing the foundational condition of spatial vulnerability.
Phase 2	Mass Displacement	Spatial concentration and contested space	Over 1.7M IDPs; shelters exceeded capacity; repeated displacements; fighting in Khan Younis, Middle Area, Northern Gaza, Deir al Balah; aid deliveries blocked; hospitals under siege	Increased spatial inequality as access to shelters, health, and water becomes uneven; high-risk zones emerge near conflict lines; contested urban spaces limit humanitarian movement
Phase 3	Service Collapse	Fragmentation of service space	1.63M IDPs; 186–188 shelters severely congested; >1,600 IDPs per shelter; fuel shortages disrupt WASH and health; over 446 UNRWA facilities impacted; hospitals overwhelmed	Fragmented access to essential services; shelter density creates health hazards; spatial segregation intensifies between safe vs high-risk zones; humanitarian access heavily restricted
Phase 4	Ongoing Crisis	Partial reclamation of space	~1.5–1.6M IDPs; 200+ shelters impacted; some WASH and health services restored; winterization campaigns; northern and central Gaza heavily affected; psychosocial support scaled up	Partial and uneven recovery of services produces differentiated spatial conditions. Repeated displacement cycles maintain instability, preventing the consolidation of spatial recovery and sustaining long-term spatial inequality.
Phase 5	Chronic Crisis	Militarized containment and protracted displacement	~1.33M IDPs; 79,000 in collective shelters; many shelters in militarized zones; limited humanitarian access; outbreaks of communicable diseases; schools and hospitals damaged; UNRWA facilities exposed	Transition from acute crisis to structural spatial injustice. Populations become spatially contained within high-risk, overcrowded environments, indicating the long-term normalization of infrastructural collapse and chronic marginalization.

Taken together, [Table 4](#) demonstrates that the humanitarian crisis in Gaza cannot be understood as a linear sequence of events, but rather as a continuous process of spatial restructuring under conflict conditions. Across all five phases, three interrelated dynamics persist: the concentration of displaced populations in increasingly limited areas, the fragmentation and overloading of essential services, and the progressive restriction of access to safe and functional urban spaces.

These dynamics indicate that spatial inequality is structurally reproduced throughout the conflict through repeated cycles of displacement and service disruption. While the intensity and geographic focus of violence shift over time, the underlying pattern remains stable: the compression of the population into shrinking safe zones alongside the erosion of service capacity.

From a spatial justice perspective, the findings reveal a persistent mismatch between population needs and the spatial distribution of infrastructure and humanitarian access, producing chronic spatial inequality. This inequality evolves from acute disruption in the early phases to long-term spatial containment and vulnerability, becoming embedded in the everyday production of urban space through unequal access to safety, services, and mobility.

As shown in [Table 4](#), the phase names were derived from the analysis and interpretation of the data presented in [Tables 2](#) and [3](#), rather than being adopted from an existing classification. They reflect the dominant spatial conditions observed during each period, including displacement levels, service disruption, infrastructure damage, and access to humanitarian support.

The findings of this study demonstrate that the humanitarian crisis in Gaza should not be understood as a linear sequence of humanitarian phases, but rather as a progressively intensifying process of spatial reconfiguration in which displacement, infrastructure breakdown, and restricted access to services continuously reshape the urban system. What emerges across the five phases is not simply a change in scale or severity but a fundamental transformation in how space itself functions: from a relatively distributed urban system during Phase 1 to a highly compressed, fragmented, and ultimately militarized geography of survival by Phase 5. In this sense, spatial inequality is not a background condition of the crisis, but its central mechanism, continuously produced through the interaction between forced displacement patterns and the uneven collapse of urban infrastructure. As [Soja \(2010\)](#) argues, spatial injustice becomes most visible not in static conditions, but in the way spatial systems are actively reorganized through uneven development and crisis dynamics.

The comparison across Phases 1 to 3 reveals a gradual but critical shift in the spatial logic of displacement and vulnerability. During Phase 1, displacement was massive but was still partially distributed across central Gaza, allowing areas such as Deir al-Balah and Khan Younis to function as temporary absorption zones; however, by Phase 2, this buffering capacity had largely collapsed as repeated waves of displacement intensified pressure on the same limited areas, producing highly concentrated spatial stress and transforming central and southern Gaza into primary zones of survival. By Phase 3, this concentration evolved into extreme overcrowding combined with repeated exposure to infrastructural collapse and conflict, particularly in southern Gaza and Rafah, where vulnerability became spatially accumulated rather than evenly distributed. Importantly, this stage demonstrates that proximity to humanitarian aid and services does not necessarily reduce vulnerability, but may instead coincide with higher exposure due to density, repeated displacement, and systemic breakdown, thereby challenging conventional humanitarian assumptions about the protective role of spatial proximity.

A further transformation becomes evident in Phases 3 and 4, where the crisis shifts from concentrated spatial clustering to systemic fragmentation of the urban and humanitarian system. Instead of a single dominant overcrowded zone, Gaza begins to exhibit multiple disconnected and partially functioning humanitarian spaces in which healthcare, water, shelter, and mobility systems operate intermittently and unevenly. This fragmentation indicates that spatial inequality is no longer produced primarily through concentration, but through the breakdown of connections between places, infrastructures, and services. As [Lefebvre \(1996\)](#) suggests, urban space is produced

through both material structures and the continuity of social and functional relations; when these relations collapse, urban space itself becomes fragmented. Accordingly, vulnerability in this phase depends not only on location, but also on the degree to which spatial and infrastructural linkages remain operational or severed.

The transition to Phase 5 reflects a further shift toward chronic spatial containment, where displacement appears relatively stabilized but does not indicate recovery, rather, it indicates long-term entrapment within damaged, fragmented, and heavily constrained urban environments. At this stage, mobility is severely restricted and access to services remains uneven, meaning that spatial inequality becomes structurally embedded in everyday urban life rather than being produced through continuous mass movement. What characterizes this phase is a shift from movement-driven inequality to containment-driven inequality, where deprivation becomes fixed within deteriorated urban spaces. Taken together, the comparison across all five phases reveals a consistent but evolving spatial logic in which Gaza's urban system becomes progressively compressed, fragmented, and immobilized over time, demonstrating that spatial inequality is not simply a by-product of humanitarian crises but a constitutive process through which urban space itself is continuously reorganized.

From a spatial justice perspective, these dynamics reveal a persistent contradiction between humanitarian response mechanisms and the actual production of space under crisis conditions. Although humanitarian interventions expand in scale and technical capacity over time, they remain spatially concentrated within already overburdened zones, which inadvertently reinforce existing inequalities rather than alleviating them. Access to healthcare, shelter, water, and aid increasingly depends on spatial position within a fragmented urban system, meaning that location itself becomes a determinant of survival. Ultimately, the trajectory from distributed urbanity in Phase 1, to concentrated survival zones in Phases 2 and 3, to fragmented humanitarian spaces in Phase 4, and finally to chronic containment in Phase 5, demonstrates that the crisis cannot be reduced to a progression of severity levels, but instead reflects a deeper restructuring of urban spatial order under prolonged conflict, where inequality becomes embedded in the very production and organization of space itself.

5. Conclusion

This study demonstrates that the humanitarian situation in Gaza should be understood as a continuous dynamic spatial process rather than a series of isolated humanitarian events. The analysis is organized around five analytically derived phases identified through a systematic examination of UNRWA Situation Reports and named according to observed changes in displacement patterns and other forms of spatial inequality, including shelter overcrowding, service disruption, and infrastructure collapse. Across these phases, displacement remained consistently high, with populations increasingly concentrated in limited geographic areas under the sustained humanitarian pressure. In this context, spatial inequality emerges not as a temporary condition, but as a continuously reproduced process shaped by the interaction between population movement, infrastructural breakdown, and unequal access to essential services. Over time, this process has produced interconnected spatial conditions characterized by concentration, fragmentation, and long-term containment, resulting in persistent and evolving geographies of vulnerability across Gaza.

This raises a central question: How does displacement lead to spatial inequality? The findings suggest that displacement progressively reorganizes urban spaces through concentration, fragmentation, restriction, and containment, ultimately producing an uneven geography of vulnerability.

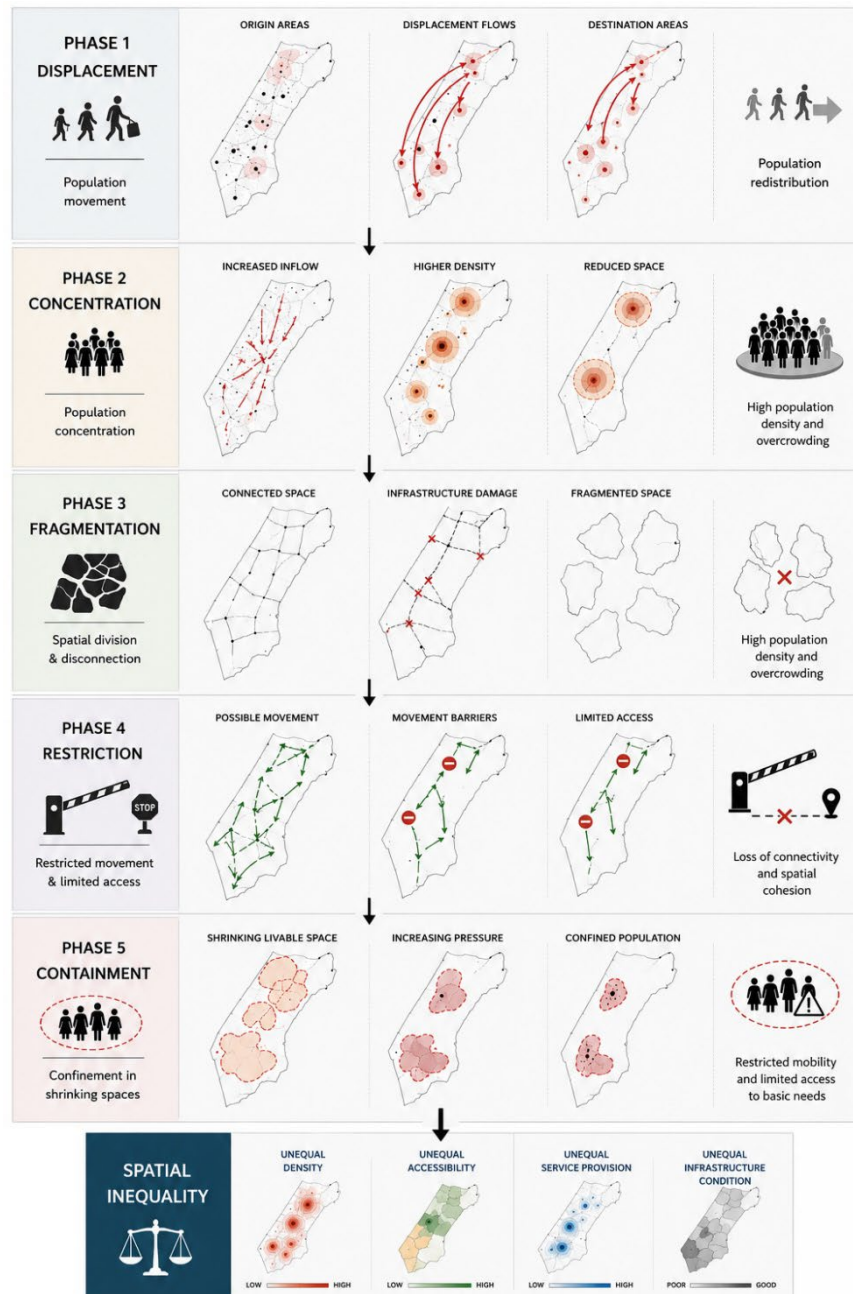


Figure 7 From displacement to spatial inequality: A conceptual spatial transformation

Taken together, these phases (Figure 7) reveal that displacement progressively transforms the spatial distribution of vulnerability. As populations become increasingly concentrated, fragmented, restricted, and contained, spatial inequalities in density, accessibility, services, infrastructure, and living conditions become more pronounced. This progression highlights an important finding of the study: spatial inequality emerges not only from the destruction of the built environment but also from the way displacement itself reorganizes where people can live, move, and access essential resources.

These findings can be further understood in relation to the broader patterns of spatial disruption documented in other conflict-affected urban contexts. In Ukraine, studies of wartime urbanization have documented how the destruction of civilian and social infrastructure contributes simultaneously to displacement, service disruption, and the reconfiguration of urban space, including the emergence of less visible geographies of internal displacement and fragmented urban environments (Haque et al., 2022; Havryliuk, 2022; Mezentsev & Mezentsev, 2022). The experience of Bosnia and Herzegovina similarly demonstrates how forced displacement and territorial

fragmentation can extend beyond the immediate period of conflict and contribute to the longer-term processes of spatial reconfiguration (Dahlman & Tuathail, 2005; Aquilué & Roca, 2016). These cases reinforce the broader relevance of examining displacement not only as a demographic outcome of conflict, but also as a spatial process associated with changing patterns of access, concentration, and urban fragmentation.

However, the Gaza case and the methodological approach adopted in this study offer a distinctive analytical perspective. While previous studies of Ukraine and Bosnia provide important evidence of the relationships between destruction, displacement, infrastructure disruption, and spatial reconfiguration, this study traces these relationships longitudinally through UNRWA Situation Reports and organizes them into five analytically derived phases. This temporal approach makes it possible to examine how humanitarian pressure is continuously redistributed across Gaza rather than treating displacement and service disruption as isolated consequences of conflict. The integration of humanitarian reporting with visual and spatial analysis further enables the study to identify changing concentrations of displaced populations, service pressures, and spatial inequalities across regions and phases. In this respect, the comparison does not position Gaza as identical to Ukraine or Bosnia, rather, it demonstrates how insights from other conflict settings can strengthen the interpretation of Gaza while underscoring the value of a systematic spatial and temporal approach to tracing the evolving geography of humanitarian vulnerability.

While UNRWA Situation Reports provide important time-based operational data for tracking displacement patterns, shelter conditions, and service provision over time, their capacity to represent the spatial complexity of these processes remains limited. In particular, the reports provide limited spatial details on local variations in vulnerability, accessibility, and service pressure. Within this context, this study identifies the limited use of detailed spatial representation as a significant gap in existing humanitarian reporting, highlighting the need for more precise spatial analytical tools to strengthen the understanding of humanitarian conditions and response strategies.

Therefore, Visualisation and visual analysis therefore play a crucial role in illustrating changes in displacement flows and the distribution of services across regions and phases. By revealing the interconnected and spatially dynamic nature of humanitarian pressures, they provide a means of tracing the continuous redistribution of vulnerability, access, and humanitarian burden across the territory.

Thus, this study emphasizes the importance of integrating spatial analysis with humanitarian data to better understand the long-term urban consequences of conflict. By combining humanitarian reporting with a spatial justice perspective, this study enables an analysis that goes beyond identifying where humanitarian needs exist, to also examine how spatial inequalities are produced and reproduced through unequal access to space, services, mobility, and safety.

CRediT Authorship Contribution Statement

Areen Soboh: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Data visualization, Writing – original draft, Writing – review & editing. Bengi Su Ertürkmen: Supervision, Conceptualization, Methodology, Writing – review & editing.

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.

Data Availability

The data used in this study are derived from publicly available UNRWA Situation Reports and related publicly accessible sources.

Ethics Committee Approval

Ethics committee permission is not required.

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Resume

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