Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Mortality Estimation in Conflict-Affected Settings: A Scoping Review of the Methodological Landscape

Lauren D'Mello-Guyett

lauren.dmello-guyett@lshtm.ac.uk

London School of Hygiene and Tropical Medicine https://orcid.org/0000-0002-8174-1737

Samantha Olson

London School of Hygiene & Tropical Medicine https://orcid.org/0009-0003-9192-2923

Maysoon Dahab

London School of Hygiene & Tropical Medicine https://orcid.org/0000-0002-4271-9705

Systematic Review

Keywords: mortality estimation, humanitarian crises, conflict

Posted Date: November 11th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11689330/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: The authors declare no competing interests.

Mortality Estimation in Conflict-Affected Settings: A Scoping Review of the Methodological Landscape

Lauren D'Mello-Guyett[1], Samantha Olson[1] and Maysoon Dahab[1]

[1] Health in Humanitarian Crises Centre, London School of Hygiene and Tropical Medicine, UK

Abstract

Background

Mortality is the primary signal of crisis severity, yet systematic mortality estimation in conflict-affected settings remains largely unachieved. Methodological constraints, inadequate data infrastructure, and political barriers collectively limit the reach and reliability of available methods. No comprehensive mapping of the full landscape of direct and indirect approaches has previously been conducted.

Objectives

This scoping review aimed to map direct mortality estimation methods and indirect, composite, and mortality-adjacent approaches used in conflict-affected settings; to characterise their methodology, level of application, and geographic scope; and to identify evidence and methodological gaps, with particular attention to feasibility at subnational level.

Methods

We searched six academic databases and ten grey literature repositories, restricted to 1990-2026 with no language restriction. Screening and data extraction used a pre-specified eligibility framework based on Population, Concept, Context criteria. The unit of analysis was the methodology rather than the individual study.

Results

Searches retrieved 14,869 records; 103 academic papers and 12 grey literature methods were included following removal of duplicates and screening. Twenty-six distinct methods were identified: 13 direct estimation methods, which measure mortality through field-based data collection, community reporting, or physical documentation of deaths, and 13 indirect, composite, and mortality-adjacent approaches, which infer mortality from secondary data, composite severity indicators, or mortality-adjacent signals. The evidence gap map reveals

that no indirect or composite method has documented application at community or locality level.

Conclusions

The methodological landscape is more diverse than previously documented but structurally constrained by data infrastructure gaps, geographic concentration in accessible settings, and political barriers to measurement. Innovations address specific access constraints but remain disconnected from existing severity assessment frameworks. A practical framework for local mortality monitoring will require contextually calibrated combinations of approaches, sustained investment in secondary data systems, and governance solutions to the structural pathway failures identified.

Key messages

What is already known on this topic

- Mortality is the primary signal of crisis severity, but systematic estimation in conflict-affected settings has been characterised as failing across methodological, political, and institutional dimensions, with direct survey-based methods requiring conditions of access and infrastructure that are routinely unavailable where mortality is highest.
- No comprehensive mapping of the full landscape of direct and indirect mortality estimation approaches in conflict-affected settings had previously been conducted, and the conditions under which indirect or composite methods could support subnational mortality monitoring remained uncharacterised.

What this study adds

- This review identifies 26 distinct methods spanning 13 direct estimation methods and 13 indirect, composite, and mortality-adjacent approaches; the post-2020 literature has produced a rapid diversification including network survival analysis, satellite imagery-based cemetery analysis, Bayesian demographic mortality modelling, and forward-projecting infectious disease models that extend estimation into access-restricted settings.
- No indirect or composite method has documented application at community or locality level, and two structural pathway failures compound this gap in that local mortality signals have no standardised route into national severity classifications, and global composite methods are not designed for disaggregation to local level.

How this study might affect research, practice, or policy

- Methodological innovations remain structurally disconnected from the institutional frameworks through which mortality evidence drives humanitarian decisions; integrating them into existing processes represents a governance priority.
- Sustained investment in secondary data systems including health facility reporting, civil documentation, and displacement tracking is itself investment in mortality monitoring capacity and should be treated as such by humanitarian and development financing frameworks.

Introduction

Mortality is the primary signal of crisis severity, an outcome that other indicators predict, the threshold that triggers famine declarations, and the metric that underpins accountability for violations of international humanitarian law (1-4). Yet systematic mortality estimation in conflict settings remains largely unachieved. Checchi and Roberts (2008) documented this failure comprehensively, identifying methodological weaknesses in available methods, the political barriers to their use, and the institutional fragmentation that leaves populations unmonitored (5). Many years later, these problems remain unresolved in most conflict-affected settings including inadequate surveillance infrastructure, politically contested data, and insufficient sustained investment in mortality measurement capacity.

Mortality can be estimated through direct methods, which measure mortality through field-based data collection, community reporting, or physical documentation of deaths, or through indirect and composite approaches, which infer mortality from secondary data or composite methods that either include mortality as one indicator among several or monitor mortality-adjacent indicators functioning as early warning signals. The Sphere Handbook minimum standards, a crude mortality rate above 1 per 10,000 per day as the emergency threshold, set by expert consensus in 1997 and not independently validated since, provides the reference point against which these methods are implicitly calibrated (6). The methodological limitations of direct mortality estimation are well established. Many approaches involve fundamental trade-offs between simplicity and accuracy, cost and rigour, and speed and reliability (7). For instance, household cluster surveys, the standard approach for all-cause crude mortality estimation, require representative sampling frames, population access, and trained field teams that are routinely unavailable in active conflict.

The political barriers compound the methodological ones (8), including overt suppression of survey reports and retraction demands following findings implicating government-aligned forces; bureaucratic obstruction through ignored ethics applications and withheld approvals; data hoarding within the United Nations system; and financial discontinuity in which measurement capacity built during acute emergencies collapses as crises become protracted (9). Dynamics which have been documented in Sudan, South Sudan, Ethiopia, Myanmar, and Gaza, where governments and armed actors have systematically restricted or contested mortality data to limit accountability (10-13).

This scoping review maps the landscape of direct mortality estimation methods and indirect, composite, and mortality-adjacent approaches used in conflict-affected settings, and to characterise each approach's methodology, level of application, geographic scope, and feasibility for use at local level. Answering it is directly relevant to local humanitarian actors across settings, as risk profiling and response coordination at local level requires some estimate of mortality or mortality risk, and any approach that could provide that estimate without the full cost and access requirements of a direct survey would materially improve the basis for local response prioritisation. With this, we hope to identify evidence and methodological gaps, with particular attention to the feasibility of indirect and composite approaches at subnational level in conflict-affected settings.

Methods

Search Terms

Search terms and eligibility was defined using the Population, Concept, Context (PCC) framework recommended for scoping reviews (14). The search strategy used three concepts: direct mortality estimation, indirect mortality estimation with conflict and humanitarian settings. All searches were restricted to title and abstract fields. Searches were conducted between June and August 2026, limited to publications from 1990 onwards with no language restriction. The search strategy was developed in accordance with Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidance (15) and search strings for each database can be found in Annex 1. The protocol is registered at: **10.17605/OSF.IO/KRFYD**.

Eligibility Criteria

Sources were included where they described the development, application, validation, or evaluation of a direct or indirect mortality estimation method or mortality-adjacent approach used in a conflict-affected or humanitarian crisis setting. Papers applying existing methodologies without methodological innovation were used as supporting evidence for existing method entries rather than generating new entries. Sources reporting barriers or facilitators to the use of mortality estimation or indirect severity monitoring approaches were included, as were sources documenting the governance, funding, or institutional context of such methods. Publications from 1990 onwards in any language were eligible.

Sources were excluded where they described methods applied exclusively in non-crisis or peacetime contexts with no conflict-affected application; where they discussed mortality estimation conceptually without describing a specific method or structured approach; where they were published before 1990; or, where they were conference abstracts without associated full-text publications. Purely opinion or editorial pieces not describing a specific method were also excluded.

Sources

Six electronic databases were searched: MEDLINE/PubMed, Embase (Ovid), Global Health (Ovid), Web of Science (Core Collection), Scopus, and CINAHL (EBSCO). Ten grey literature repositories and organisational libraries were searched: ACAPS Knowledge Base, ReliefWeb, WHO Institutional Repository for Information Sharing (IRIS), OCHA Humanitarian Data Exchange, Medecins Sans Frontieres (MSF) Scientific Library, International Committee of the Red Cross (ICRC) Library, Sphere Project publications, United Nations High Commissioner for Refugees (UNHCR) Data and Statistics portal, and Save the Children, Oxfam, and International Rescue Committee (IRC) publication libraries. Reference lists of all included sources were screened for additional relevant sources.

Screening

Title and abstract screening was conducted by two reviewers against the inclusion and exclusion criteria using Rayyan systematic review software (rayyan.ai). Records were excluded where the title and abstract provided sufficient information to determine ineligibility. Records where eligibility was uncertain were retained for full-text review.

Data Extraction

The unit of analysis was the method, not the individual study or report. This review assembled its method list iteratively rather than deductively from prior knowledge, an approach consistent with scoping review methodology and appropriate given the broader scope of the review question (14). Each method was classified by developer; year; method type; method; temporality (retrospective, prospective, and/or real-time); level of application (national to local); and mortality measure (direct, indirect, or mortality-adjacent). A narrative synthesis of methods is provided.

Results

Search Results and Study Selection

Searches across six academic databases retrieved 14,867 records in total (**Error! Reference source not found.**). Following removal of 6,456 duplicates, 8,416 unique records were screened at title and abstract stage; and 8,241 records were excluded. 175 records were reviewed at full text, seven additional papers were identified through citation searching and reviewed, leaving 103 academic papers included. Grey literature searching identified 23 candidate methods across ten repositories, we excluded 11 methods, and 12 methods were retained. Full lists of included and excluded papers are included in Annexes 2 and 3.

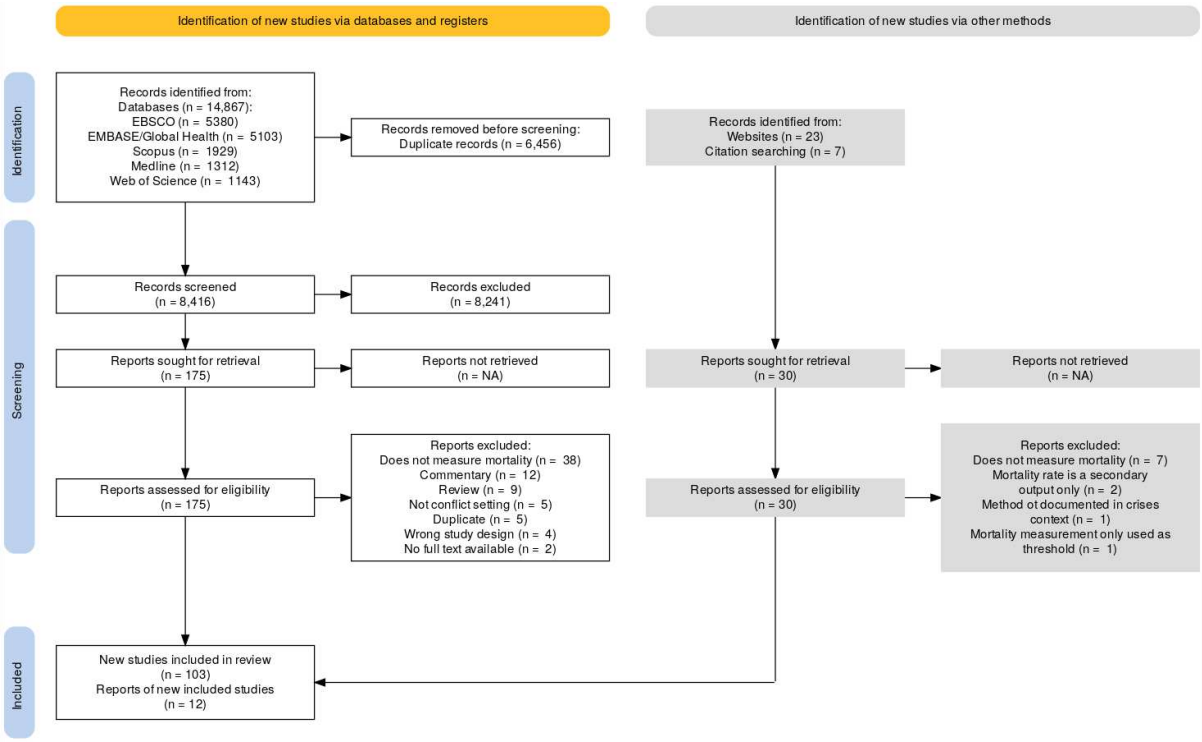


Figure 1. PRISMA-ScR flow diagram of searches and included sources.

Identified Methods and Approaches

The 12 retained grey literature methods were developed between 1985 and 2024. Three direct methods appear exclusively in the grey literature with no corresponding academic paper evidence base in this review: Standardized Monitoring and Assessment of Relief and Transitions (SMART) (2002), Multi-Sector Needs Assessment (MSNA) mortality module (2024), and Maternal Death from Informants / Maternal Death Follow-on Review (MADE-IN/MADE-FOR) (2010). Four indirect or composite frameworks are similarly grey literature

only: Integrated Food Security Phase Classification (IPC) (2004), Famine Early Warning Systems Network (FEWS NET) (1985), World Health Organization (WHO) Health Cluster People in Need (PiN) (2018), and Cadre Harmonise (1999). The remaining grey literature methods were supported by examples also published in the academic literature. Among direct methods these included verbal autopsy (1960s), body count and event-based documentation (1990s), Community Based Surveillance (CBS) direct (2000s), Maternal and Perinatal Death Surveillance and Response (MPDSR) (2013), key informant method (KIM) (2009), and two-stage cluster survey (1990s) each have an academic evidence base; among indirect methods, CBS indirect (2000s) and Index for Risk Management (INFORM) (2018) do likewise.

The 103 academic papers span 1990 and 2026 (median publication year of 2012), with publication volume increasing over time: 11 papers in the 1990s, 27 in the 2000s, 30 in the 2010s, and 35 from 2020 onwards, with 2025 producing the largest single-year yield of 11 papers. The majority of papers (81 of 103) applied at least one direct mortality estimation method; 26 applied at least one indirect or modelling approach, and four applied methods from both categories. Methods with the most academic papers included: the two-stage cluster retrospective mortality surveys (36 papers and rapid or non-representative retrospective mortality surveys (26 papers). Modelling and statistical methods emerged exclusively in the most recent decade, with all small-area estimation (SAE), multiple systems estimation (MSE), network survival analysis, Bayesian demographic mortality models, satellite imagery cemetery analysis, and forward-projecting modelling papers published from 2020 onwards, indicating a rapid recent diversification concentrated in approaches without existing operational infrastructure. Five methods, including rapid or non-representative retrospective mortality surveys, sentinel site surveillance, indirect demographic estimation (Brass Method and Preceding Birth Technique), capture-recapture, and pooled retrospective mortality survey analysis, were represented exclusively in the academic literature with no corresponding operational grey literature tool, all emerging from 2020 onwards.

Across the combined landscape of 26 distinct methods, 13 are direct estimation methods (Table 1) and 13 are indirect, composite, or mortality-adjacent approaches (Table 2).

227 *Table 1. Direct Mortality Estimation Methods*

ID	Method Type	Method	Year	Temporality	Mortality measure	Academic citation	Grey literature citation
1	**Survey based**	**Two-Stage Cluster Retrospective Mortality Survey**	~1990s	Retrospective	*Direct - all-cause CMR and U5MR*	(16-51)	(52)
2		**Rapid or Non-Representative Retrospective Mortality Survey**	~1990s	Retrospective	*Direct - all-cause CMR, variable precision*	(50, 53-77)	
3		**Standardized Monitoring and Assessment of Relief and Transitions (SMART) Survey - Mortality Module**	2002 (v1); 2017 (v2)	Retrospective	*Direct - CMR and U5MR measured through household recall; not modelled*		(78)
4		**Multi-Sector Needs Assessment (MSNA) - Mortality Module**	Mortality module from 2024	Retrospective	*Direct - CMR where mortality module included; not yet standardised*		(79)
5	**Informant based**	**Key Informant Method (KIM)**	2009	Retrospective	*Direct - all-cause CMR without household access*	(80-82)	(83)
6		**Maternal Death from Informants / Maternal Death Follow-on Review (MADE-IN/MADE-FOR)**	2010	Retrospective / Prospective	*Hybrid - maternal mortality; community informant listing with VA cause ascertainment*		(84)
7		**Network Survival Analysis**	2010 (conflict application)	Retrospective	*Direct - all-cause mortality estimated from personal network reports*	(85-87)	
8	**Surveillance based**	**Maternal and Perinatal Death Surveillance and Response (MPDSR)**	2013 (WHO framework); 2021 (operational guidance)	Prospective	*Direct - individual maternal and perinatal deaths; cause-specific*	(88-90)	(91)
9		**Community-Based Surveillance - Direct**	~2000s (humanitarian adaptation)	Prospective / Real-time	*Direct - community death signal detection through first-hand reporting; not rate estimation*	(44, 50, 92, 93)	(94)
10		**Sentinel Site Surveillance**	~2000s	Prospective / Real-time	*Direct - all-cause mortality through continuous or repeated demographic monitoring within defined sites*	(95-97)	
11	**Document-based**	**Body Count and Event-Based Death Documentation**	~1990s onwards	Retrospective / Real-time	*Direct - violent deaths from physical evidence or reported events; indirect mortality not captured*	(98-101)	(102)
12	**Demographic and statistical**	**Verbal Autopsy (VA)**	1960s origin; WHO 2022 standard	Retrospective	*Direct - cause-of-death ascertainment*	(95, 103)	(104)
13		**Indirect Demographic Estimation (Brass Method and Preceding Birth Technique)**	1964 (Brass); adapted for conflict settings	Retrospective	*Indirect - U5MR estimated from aggregate birth and survival data; no individual death recall required*	(105)	

228

229 *Table 2. Indirect, Composite, and Mortality-Adjacent Approaches*

ID	Method type	Method	Year	Temporality	Mortality measure	Academic citation	Grey literature citation
14	**Composite-severity frameworks**	**Integrated Food Security Phase Classification (IPC)**	2004 (Somalia); globally expanded	Retrospective / Prospective	*Mortality included - CMR and U5MR as key evidence inputs for phase determination*		*(106)*
15		**Famine Early Warning Systems Network (FEWS NET)**	1985 (FEWS); 2000 (FEWS NET)	Retrospective / Prospective	*Mortality-adjacent - mortality risk projected from food security and nutrition indicators*		*(107)*
16		**Index for Risk Management (INFORM) Severity Index**	2018 (beta); 2020 (operational)	Retrospective	*Mortality-adjacent - U5MR included as one of approximately 80 composite indicators*	(108)	(109)
17		**WHO Health Cluster PiN and Severity Tool**	~2018 (current version)	Retrospective	*Mortality included where data permits - not standardised*		*(110)*
18		**Cadre Harmonise (CH)**	1999 (Sahel); 2012 (Gulf of Guinea)	Retrospective / Prospective	*Mortality included - CMR and U5MR used as inputs where available*		*(111)*
19	**Surveillance-based**	**Community-Based Surveillance - Indirect**	~2000s	Real-time	*Mortality-adjacent - death signal detection from secondary and administrative data sources*	(112-115)	(116)
20	**Statistical modelling**	**Small-Area Estimation (SAE)**	~2013 (methodology); 2022 (peer-reviewed)	Retrospective	*Indirect - modelled mortality estimates for areas and time periods without direct survey coverage*	(117-121)	
21		**Multiple Systems Estimation (MSE)**	~2000s (conflict applications)	Retrospective	*Indirect - total deaths estimated from overlapping independent documentation sources*	(12, 122)	
22		**Capture-Recapture**	~1990s (conflict applications)	Retrospective	*Indirect - total deaths estimated from two independent death lists*	(82, 123, 124)	
23		**Pooled Retrospective Mortality Survey Analysis**	~2000s	Retrospective	*Indirect - pooled CMR and U5MR from multiple surveys generating synthesised mortality findings*	(125-129)	
24		**Bayesian Demographic Mortality Model with Reporting Completeness Adjustment**	2025	Retrospective	*Indirect - age- and sex-specific mortality and life expectancy losses modelled from reported deaths with Bayesian correction for reporting incompleteness*	(100, 130)	
25	**Remote sensing**	**Satellite Imagery-Based Cemetery Analysis**	2023 (preprint)	Retrospective	*Indirect - excess burial rate as proxy for excess mortality; does not generate CMR directly*	(131)	
26	**Prospective modelling**	**Forward-Projecting Infectious Disease Mortality Model with Expert Elicitation**	2025 (preprint)	Prospective	*Indirect - forward-projected infection-attributable mortality under alternative crisis scenarios*	(132)	

230

Direct Mortality Estimation Methods

Thirteen direct mortality estimation methods were identified and are predominantly retrospective and survey-based, though two prospective approaches were identified.

The two-stage cluster retrospective mortality survey uses probability-proportional-to-size sampling followed by structured retrospective household recall to generate CMR and U5MR estimates with 95% confidence intervals (16-51). The SMART nutrition survey uses the same cluster design with an embedded mortality module, making it the most widely operationalised version of this approach globally (78). The MSNA mortality modules extends this into operational planning (79). There were also non-representative or rapid survey designs, in which purposive, convenience, or snowball sampling replaces probability sampling where access or resource constraints preclude the two-stage cluster approach (50, 53-77). However, all three approaches require representative sampling frames, stable populations, and household access.

KIM was developed specifically for settings where household access is impossible, asking community-embedded informants to report all deaths they are aware of in a defined geographic area over a recall period, adapted by Roberts et al for humanitarian settings (82). Informant sub-types include community leaders and elders, Community Health Workers (CHW), neighbours, mothers and women in group settings, religious figures, and teachers. The “Neighbourhood Method” asks people in public settings about deaths in their immediate area (81); the “Motherhood” or “Sisterhood Method” identifies deaths through women's group meetings or women respondents and is primarily sensitive to female and perinatal mortality; while CHW informants have professional knowledge of deaths within their facility catchment. This diversity of sub-types makes the key informant method a flexible family of approaches rather than a single design, adaptable to different community structures and access conditions. Across sub-types it was found to require 29-33% fewer resources than a six-month cluster survey (80). MADE-IN/MADE-FOR extends the KIM by adding a verbal autopsy follow-up to listing meetings that identify deaths, generating cause-specific as well as rate data (84), but for specific populations rather than all-population estimates. Network survival analysis asks respondents to report deaths among people in their personal social network then scaling up from network-reported deaths using an estimate of average network size (85-87). It can be conducted entirely remotely using diaspora or remote respondents reached through web survey or respondent-driven sampling, requiring no field presence in the conflict zone.

MPDSR and CBS direct are the two prospective direct methods, detecting deaths as they occur rather than through retrospective recall. MPDSR operates through community health worker notification of maternal deaths followed by facility audit (91); CBS direct through regular standardised reporting by community health workers or volunteers with first-hand community knowledge (44, 50, 92). Both provide near real-time mortality signals but neither generates statistically valid CMR estimates independently, MPDSR because its scope is cause-specific, CBS direct because it detects signals rather than producing population-level rate estimates. Both require sustained CHW infrastructure (88, 89, 93). Sentinel site surveillance has been adapted from continuous demographic surveillance (96) to exhaustive census variants suited to bounded camp populations (95) to repeated surveys (97).

Body count and event-based documentation spans a spectrum from forensic physical collection, as in the Rwanda genocide response where teams physically collected and counted bodies from streets and morgues (98), through administrative death registry analysis as applied to Palestinian Ministry of Health mortality data (100), to direct monitoring systems in which deaths are inputted in real time from field sources (99, 101). These approaches count directly documented violent or conflict-related deaths and do not capture indirect mortality from disease, malnutrition, or health system collapse. Coverage is limited to deaths in accessible and documented contexts.

Verbal autopsy (VA) ascertains cause of death through structured post-death household interviews, generating cause-specific mortality fractions rather than a CMR (95, 103). It does not stand alone as a severity monitoring method but functions as a complement to rate-generating methods. Where embedded in surveillance systems, VA outputs can feed into MPDSR response cycles and contribute evidence to IPC convergence-of-evidence processes; where published in academic literature they contribute to the global burden of disease evidence base.

The Brass Method and Preceding Birth Technique, both demographic estimation approaches, were applied to survey data from displaced populations, but differs from all other direct

methods in requiring no individual death recall, using instead aggregate data on children ever born and surviving to estimate U5MR (105). This makes it applicable in settings where reporting individual deaths is impractical, where recall is unreliable, but relies on a functioning and accurate birth registry. It appeared only once in the conflict literature identified by this review.

Several methodological adaptations over the review period have extended the reach of direct estimation into previously infeasible settings. GIS-assisted probability sampling using gridded population data and satellite imagery replaces conventional sampling frames where population registers are absent (36). Application during ceasefire windows has been demonstrated in Gaza, where a representative survey of 2,000 households across 200 primary sampling units was conducted over six days (51). Mobile phone survey variants using random digit dialling have been applied in Burkina Faso and Cameroon, reaching conflict-affected populations excluded from conventional sampling frames (74, 77), addressing access constraints that have historically prevented direct estimation entirely.

Indirect, Composite, and Mortality-Adjacent Approaches

Thirteen indirect, composite, and mortality-adjacent approaches were identified. They draw on secondary or administrative data rather than primary field collection and operate primarily at district to national level.

The five composite severity frameworks use convergence of evidence across multiple indicators to classify crisis severity, including mortality. IPC is the most methodologically comprehensive, incorporating CMR and U5MR as formal evidence inputs alongside food security, nutrition, and livelihoods indicators, with explicit mortality thresholds for Phase 5 famine determination (CMR above 2 per 10,000 per day or U5MR above 4 per 10,000 per day)(106). Where mortality survey data are unavailable, phase classification relies on food security and nutrition proxies. IPC produces district and national classifications and has been applied across conflict-affected settings globally, with the most extensive application in the Sahel and Horn of Africa. FEWS NET produces monthly scenario-based food security outlooks using satellite-derived vegetation and rainfall data, staple food price monitoring, and livelihood assessments, projecting forward over a three-to-six-month window (107). Mortality risk is inferred indirectly from food security phase classifications rather than directly measured.

Cadre Harmonise applies an IPC-compatible methodology for West and Central Africa (111). The WHO Health Cluster PiN tool generates health sector People in Need estimates incorporating mortality data where available from surveys or surveillance, alongside disease burden and health access indicators (110). INFORM is a composite index aggregating approximately 80 secondary indicators across hazard, vulnerability, and coping capacity dimensions; U5MR is included as one mortality indicator and the index operates at national level only with no subnational disaggregation (133). Independent construct validation found that INFORM's indicators reduce to three latent factors explaining 46-53% of variance, with societal governance emerging as the dominant predictor of the crisis severity construct (108).

CBS indirect aggregates mortality signals from secondary sources, facility registers, burial records, and administrative databases, without direct community contact with bereaved households. Reporters function as conduits for existing data rather than primary witnesses. The approach generates real-time mortality signals at community and district level; precision depends on the quality and completeness of underlying secondary data sources, and population denominator estimation is a constraint on converting death counts to rates (112-115).

The statistical modelling approaches use combinations of existing data sources to generate mortality estimates beyond what any single source provides. Small Area Estimation (SAE) uses accumulated survey data combined with crisis proxy indicators, conflict event incidence, food security classifications, displacement estimates, to generate mortality estimates for subnational areas and time periods without direct survey coverage (117-119). Applied in Somalia using accumulated SMART survey data, it generated district-month excess mortality estimates across multiple drought and conflict periods (120, 121). It requires a historical survey dataset to train the model. Multiple Systems Estimation (MSE) uses two or more independent death documentation lists to estimate total deaths including those appearing in no single list, applying mark-recapture statistical logic (12, 122). Capture-recapture applies the same principle and could be classed as a sub-type of MSE, using exactly two lists (123, 124) or to validate the KIM (82). Non-standard list sources including graveyard records and civil society documentation have extended applicability beyond formal institutional sources (122). The independence assumption between lists is the critical methodological requirement across both approaches. Pooled retrospective survey analysis aggregates mortality estimates from multiple independently conducted surveys using databases such as Complex Emergencies Database (CEDAT) or accumulated rounds of SMART surveys within a single context, to

generate synthesised findings about mortality patterns, trends, and determinants (125-129). Delbiso et al. (2017) applied Bayesian Poisson meta-analysis to 88 small-scale surveys from Ethiopia and linked estimates spatially and temporally with FEWS NET food security and drought monitor data, demonstrating a method for integrating direct survey estimates with indirect severity indicators at district level (128).

The Bayesian demographic mortality model uses prior distributions for reporting rate and age-sex distribution of casualties to generate age- and sex-specific mortality estimates and life expectancy losses with credible intervals from a single administrative documentation source of uncertain completeness (130). Applied to Gaza 2023-2024, minimum data inputs were a total death count and population exposures (100). This distinguishes it from MSE and capture-recapture, which require multiple independent lists.

Satellite imagery-based cemetery analysis uses archive very high-resolution satellite imagery to track changes in burial incidence across sampled cemeteries, comparing observed burial rates against a counterfactual no-crisis baseline using conflict event incidence, food prices, and displacement as predictors (131). It requires no field access or population survey data. Applied to Yemen over 2011-2021, it produced a crisis-to-no-crisis burial rate ratio rather than a CMR; conversion to a mortality rate requires additional assumptions about burial coverage and population size. Cultural variation in burial practices is a further constraint on generalisability.

The forward-projecting infectious disease mortality model combines structured expert elicitation to quantify epidemic probability and crisis-adjusted transmission and case-fatality parameters with stochastic susceptible exposed infectious recovered (SEIR) compartmental modelling to project infection-attributable mortality under alternative crisis scenarios (132). Analyses are conducted by disease and age group with parameter uncertainty propagated stochastically. Applied to Gaza 2023-2024, projections were generated under ceasefire, status quo, and escalation scenarios. It is the only prospective indirect method in the landscape identified by this review.

Evidence Gap Map

Figure 2 presents an evidence gap map organising the 26 identified methods by level of application and category. The map reveals a consistent pattern across both direct and indirect

methods where method coverage is densest at national level and thinnest at local and locality level, which is precisely where humanitarian response decisions are most consequential and where mortality is least likely to be measured.

Two structural interface problems emerge from the map. The pathway from local to global, e.g., from community mortality signals generated by CBS, MPDSR, or the KIM to national and international severity determinations, is not standardised in any method identified by this review. The pathway from global to local, e.g., from national IPC or FEWS NET classifications to subnational risk profiling, which could inform locality-level resource allocation, is equally absent; global composite methods are not designed for disaggregation below district level and carry data input requirements that cannot be met at locality level in most conflict-affected settings.

Mortality estimation methods by level of application

LEVEL OF APPLICATION	DIRECT	INDIRECT, COMPOSITE & ADJACENT
01 **Local / Locality** (Individual, Household, Community)	Two-stage cluster survey Rapid / non-representative mortality survey Verbal Autopsy Key Informant Method (KIM) MADE-IN/MADE-FOR SMART Survey – mortality module MPDSR CBS – direct MSNA – mortality module Indirect demographic estimation (Brass Method) Body Count / Event-Based Documentation	CBS – indirect
02 **District**	Two-stage cluster survey (stratified) Rapid / non-representative mortality survey Key Informant Method (aggregated) MADE-IN/MADE-FOR SMART Survey – mortality module MPDSR (district aggregation) CBS – direct (district aggregation) Network Survival Analysis Sentinel Site Surveillance MSNA – mortality module Body Count / Event-Based Documentation (district aggregation)	IPC (district phase classifications) FEWS NET (district outlooks) Cadre Harmonise CBS – indirect Small-Area Estimation (SAE) Multiple Systems Estimation (MSE) Capture-Recapture Pooled Retrospective Survey Analysis Bayesian Demographic Mortality Model Satellite Imagery-Based Cemetery Analysis (district aggregation)
03 **National**	Two-stage cluster survey SMART Survey – mortality module MPDSR (national aggregation) Network Survival Analysis Body Count / Event-Based Documentation	IPC FEWS NET INFORM WHO Health Cluster PiN Cadre Harmonise MSNA – mortality module SAE MSE Capture-Recapture Pooled Retrospective Survey Analysis Bayesian Demographic Mortality Model
04 **Global**	Body Count / Event-Based Documentation	INFORM FEWS NET

CBS appears in both columns: direct (first-hand community reporter) and indirect (secondary data aggregation). SMART = Standardized Monitoring and Assessment of Relief and Transitions. MPDSR = Maternal and Perinatal Death Surveillance and Response. MSNA = Multi-Sector Needs Assessment. KIM = Key Informant Method. SAE = Small-Area Estimation. MSE = Multiple Systems Estimation. IPC = Integrated Food Security Phase Classification. FEWS NET = Famine Early Warning Systems Network. INFORM = Index for Risk Management.

Figure 2. Evidence gap map of 26 identified methods organised by level of application and category.

Discussion

This review identified 26 distinct methods for mortality estimation or monitoring in conflict-affected settings, representing the most comprehensive mapping of this landscape to date. The methodological landscape has diversified substantially since Checchi and Roberts documented its systematic failures in 2008, particularly in the post-2020 period where modelling, remote sensing, and network-based approaches have extended the reach of estimation into contexts where survey-based methods are infeasible (5). Yet the structural barriers to local-level direct mortality monitoring identified remain largely unresolved and a critical gap persists in that no indirect or composite method has documented application at community or locality level in conflict-affected settings. The discussion addresses two practical questions that follow from this finding. For settings where direct and indirect methods already operate, how can the existing toolkit be strengthened? For settings where the existing toolkit cannot function, what methodological innovations are available and how can they connect to the institutional frameworks through which mortality evidence drives humanitarian decisions?

The established toolkit: coverage, validation, and methodological constraints

The dominant methods in the landscape, two-stage cluster surveys, SMART, IPC, FEWS NET, and CBS, are institutionally embedded and widely operationalised, but several carry validation gaps relative to their institutional authority. INFORM is the only composite method for which independent construct validation has been conducted, finding that 46-53% of variance is explained by the index, and little to no equivalent validation exists for FEWS NET, IPC or the WHO Health Cluster PiN (108). For instance, the IPC famine determination criteria, against which many of these methods are ultimately calibrated, have been extensively discussed in the academic literature, with documented concerns about the evidence base for phase thresholds and the conditions under which convergence of evidence produces valid severity classifications (134, 135). Survey-based direct methods are better validated at the upper end of the landscape, with two-stage cluster surveys and SMART having established probability-based standards, but validation evidence thins rapidly toward lower-resource designs, and a substantial proportion of surveys conducted in humanitarian emergencies between 1993 and 2004 were found to have methodological quality issues (136, 137). Several methods have become operationally standard without equivalent investment in independent validation, representing methods of practice whose evidence base has not kept pace with their institutional reach (138).

Geographic concentration compounds this problem. Somalia, Iraq, Democratic Republic of the Congo (DRC), Central African Republic (CAR), Gaza, and South Sudan generate the majority of academic papers, and the settings most underrepresented in the methodological evidence base are those with the most severe access constraints (7). An estimated half of conflict deaths in a multi-source analysis were unaccounted for in major global datasets, with systematic undercounting concentrated in the least accessible settings (139). Method choice drives substantial differences in mortality estimates in the same conflict context, for example, estimates for Iraq ranged from approximately 47,000 using media-based body count to 151,000 from the Iraq Family Health Survey (IFHS) cluster survey to 601,000 from Burnham et al. (25, 37). Methodological innovations within existing designs, such as GIS-assisted probability sampling; mobile phone survey variants; ceasefire-window surveys; and the MSNA mortality module (36, 51, 74, 77), improve on rather than replace established methods, but their application remains limited in validation evidence and geographic scope. Sustained investment in data infrastructure is the enabling condition for the indirect toolkit. Somalia demonstrates that accumulated SMART survey data over two decades made district-month SAE modelling possible, enabling the Somalia Mortality Estimation Database (S-MED) which illustrates how pooled estimates can be consolidated into a real-time early warning platform (50, 120, 121). No equivalent investment exists in most other conflict-affected settings, and the methods that might generate it face the same access and feasibility constraints that motivate the need for indirect approaches in the first place.

Mortality estimation in inaccessible settings: post-2020 innovations and structural integration

The post-2020 literature has produced a diversification of approaches each addressing a specific access or infrastructure constraint. None of these innovations is currently designed to connect to the institutional frameworks through which mortality evidence translates into humanitarian decisions. Local mortality signals, from CBS, MPDSR, MADE-IN/MADE-FOR, SAE, MSE, network survival analysis, Bayesian demographic model outputs, and satellite imagery burial rate ratios, do not feed into IPC convergence-of-evidence processes, INFORM severity classifications, or MSNA mortality module or the humanitarian needs overview (HNO) in any standardised way. Where integration has occurred, as in Somalia where sentinel surveillance outputs have on occasion influenced IPC phase classifications, it has depended on active advocacy and sustained institutional relationships rather than any structural protocol (50). The global-to-local pathway is equally absent, as they are not designed for

disaggregation below district level and carry data input requirements that cannot be met at locality level in most settings, leaving no documented protocol for converting a national severity classification into a local risk profile. These failures are not resolvable through methodological development alone; they require governance decisions about which actors are authorised to translate local mortality signals into severity classifications and financing decisions about whether local actors generating mortality data receive resources as a result (9). The cluster system and HNO processes, including the Joint Intersectoral Analysis Framework (JIAF), represent the formal mechanisms through which local data is intended to aggregate upward, and their documented limitations are consistent with the structural gap identified by this review (134, 135, 140). The Grand Bargain localisation commitments have not been accompanied by equivalent commitments to local mortality monitoring capacity (141).

In the most data-sparse settings, structured expert elicitation (SEE) may be the only feasible basis for local mortality risk profiling. Expert judgment is already embedded informally throughout the indirect method landscape, in IPC technical working group consensus processes, JIAF severity classification, and INFORM indicator weighting, but has not been formalised as a mortality estimation approach in its own right. Validated frameworks for structured expert elicitation are well established in other health fields (142-145), but have few documented applications to humanitarian mortality estimation (132, 146). Developing a validated expert elicitation protocol drawing community knowledge, practitioner experience, and specialist epidemiological judgment represents a priority gap for future work.

Political economy of mortality measurement

Organisational risk calculations shape whether surveys are commissioned, where they are conducted, and whether findings are published, with documented variation in the willingness of different organisations to release high mortality findings by institutional type, mandate, and funding relationship (9, 147). The highest institutional authority composite methods have the most concentrated governance and the most documented political constraints. For instance, IPC phase classifications are subject to negotiated consensus across multiple documented contexts; FEWS NET is shaped by funder strategic interests; and Health Cluster PiN estimates are subject to inflation incentives because the same actors who estimate needs compete for resources on that basis (9, 138).

Local mortality data can carry greater political sensitivity than national data, whereby district-level estimates imply specific responsibility of local authorities, armed groups, or humanitarian actors in ways that national figures do not (148, 149). Methods with lower institutional visibility are more resilient to political obstruction, and approaches requiring no host government cooperation or formal ethics committee approval have a structural operational advantage in settings where government is a party to the crisis (89, 90). Across six conflict-affected Eastern Mediterranean countries, 94% of survey respondents considered mortality surveys important, but significant proportions reported distrust of collecting institutions and concerns about retaliation and political manipulation (149). Any framework for local mortality monitoring that does not account for these dynamics from the outset is unlikely to achieve its stated objectives.

Towards a framework for local mortality monitoring

No single method is sufficient for local mortality monitoring in conflict-affected settings. A practical framework will need to combine approaches calibrated to the data infrastructure and access conditions of each specific context, drawing on prospective CBS to detect mortality signals, periodic representative or rapid non-representative surveys to generate point estimates with associated uncertainty, indirect modelling where historical data permits, and expert elicitation where all other approaches are infeasible. The appropriate combination will differ by setting. In Somalia, SAE modelling using accumulated survey data represents the most powerful currently available approach (120, 121); in Gaza, capture-recapture and Bayesian demographic modelling have demonstrated feasibility where civil society documentation sources exist (100, 130). In most other conflict-affected settings, the starting point will be approaches with the lowest data infrastructure requirements. Investment in secondary data systems including health facility reporting, civil documentation, conflict event monitoring, and displacement tracking is itself investment in mortality monitoring capacity, as it creates the inputs that indirect methods require (50, 117). The wider literature on health management information systems (HMIS) strengthening in fragile and conflict-affected states documents the minimum health information infrastructure required to sustain mortality monitoring over time (150, 151), and the humanitarian-development nexus literature is directly relevant to the financing argument. Noting that short-term humanitarian funding cycles cannot sustain the data infrastructure that mortality monitoring at local level requires, and the transition from humanitarian to development financing is precisely the moment at which monitoring capacity built during acute emergencies collapses (152, 153). This review provides the method inventory from which context-specific framework development can begin; the subsequent steps of testing method combinations in specific settings and developing the

expert elicitation protocol for mortality estimation are the subject of future work this review is intended to inform.

Limitations

The grey literature search, while systematic in its approach across repositories, cannot claim exhaustive coverage of all operational methods and guidance documents in use across the humanitarian system. Methods developed at national or regional level, or embedded within country-specific coordination mechanisms, may not have been captured through the repositories searched. The academic database search was restricted to six databases and used English search terms, although papers in any language were included, which may have resulted in the exclusion of relevant papers indexed in other languages or indexed in databases not searched. Title and abstract screening and full-text review were conducted by a small review team, and while piloting and calibration exercises were conducted to ensure consistency, inter-rater reliability was not formally assessed.

The review included papers describing or applying mortality estimation methods in conflict-affected settings, but the definition of conflict-affected was applied pragmatically rather than using a formal conflict classification system, which introduces some subjectivity in inclusion decisions at the margins. Several methods identified in this review, particularly those emerging from the post-2020 literature, are represented by a small number of papers from a small number of settings, limiting the conclusions that can be drawn about their performance, generalisability, and validation status. The evidence gap map represents the landscape of documented method application as captured by the included literature; it does not capture informal, unpublished, or organisationally proprietary applications of these methods that may exist in practice. The review also did not formally assess the quality of included papers or methods using a standardised quality appraisal tool.

Finally, the rapid pace of methodological development in this field, particularly in statistical modelling and remote sensing approaches, means that the landscape described here may evolve substantially over the period between manuscript completion and publication.

Conclusions

This scoping review maps a methodological landscape that is more diverse than has previously been documented, spanning 26 distinct methods for mortality estimation or monitoring in conflict-affected settings. The landscape has diversified substantially in the post-

2020 period, with modelling, remote sensing, and network-based approaches extending the reach of estimation into contexts where survey-based methods are infeasible. Despite this diversification, a structural gap remains where there is no indirect or composite method with documented application at community or locality level in conflict-affected settings, and the data infrastructure and political will required to support indirect estimation at local level is absent in most crisis-affected contexts.

The review identifies two structural pathway failures that compound this gap. Local mortality signals have no standardised route into national or international severity classifications, and global composite methods are not designed for disaggregation to local level. These failures are governance and financing problems as much as methodological ones and will not be resolved through method development alone.

The feasibility of mortality estimation is inversely related to methodological rigour across the landscape, and method choice drives substantial differences in mortality estimates for the same conflict context. Any practical framework for local mortality monitoring will need to combine approaches calibrated to the data infrastructure and access conditions of each specific setting, incorporating prospective surveillance, periodic survey-based estimation, indirect modelling where data permits, and structured expert elicitation where all other approaches are infeasible. Investment in secondary data systems is itself investment in mortality monitoring capacity.

References

1. National Research Council (US) Roundtable on the Demography of Forced Migration. Forced Migration & Mortality. Reed H, Keely C, editors. Washington (DC): National Academies Press (US); 2001.
2. Ferrario A, Mahgoub EAA, Warsame A. Monitoring mortality in fragile and conflict affected settings. BMJ. 2025;389:r908.
3. Murray CJL, King G, Lopez AD, Tomijima N, Krug EG. Armed conflict as a public health problem. BMJ. 2002;324(7333):346.
4. Levy BS, Sidel VW. Documenting the Effects of Armed Conflict on Population Health. Annu Rev Public Health. 2016;37:205-18.
5. Checchi F, Roberts L. Documenting mortality in crises: what keeps us from doing better. PLoS Med. 2008;5(7):e146.
6. Sphere. The Sphere Project: Humanitarian Charter and Minimum Standards in Humanitarian Response. Geneva, Switzerland; 2018.
7. Erhardt-Ohren B, McCoy SI, Feehan DM, Haar RJ, Prata N. Maternal mortality estimation methodologies: a scoping review and evaluation of suitability for use in humanitarian settings. Conflict and Health. 2024;18(1):75.
8. Guha-Sapir D, Checchi F. Science and politics of disaster death tolls. BMJ. 2018;362:k4005.
9. Palmer J, Alhaffar M, Garba B, Hassan J, Ratnayake R, Seal A, et al. The politics and challenges of measuring mortality for humanitarian decision-making in Somalia, the Central African Republic and Bangladesh. medRxiv. 2025.
10. Spiegel P, Martinez E, Abrahim O, Undie C-C, Altare C, Schmid B, et al. Johns Hopkins Center for Humanitarian Health–Lancet Commission on health, conflict, and forced displacement: health in a world of crises and impunity. The Lancet. 2026;407(10543):2065-140.
11. Palmer J. Mortality Estimation in Crises blog series [Internet]. London School of Hygiene and Tropical Medicine, editor. London, UK: ELRHA. 2026. Available from: https://www.elrha.org/news-blogs/whos-counting-tigrays-hidden-mortality-data-crisis.
12. Dahab M, AbuKoura R, Checchi F, Ahmed A, Abdalla O, Ibrahim M, et al. War-time mortality in Sudan: a multiple systems estimation analysis. Lancet Glob Health. 2025;13(9):e1583-e90.
13. Olson S, Babiker A, Mohamed A, Ouchtar Y, Eissa Bassi A, Skrip L, et al.: BMJ GH Blogs. 2025. Available from: https://blogs.bmj.com/bmjgh/2025/05/31/famine-and-the-need-for-a-collective-voice-in-sudan/.
14. Pollock D, Peters M, Tricco A, Munn Z, Jia R, Alexander L, et al. Scoping reviews', in E Aromataris, C Lockwood, K Porritt, B Pilla, Z Jordan (eds), . Adelaide: JBI; 2020.
15. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169(7):467-73.
16. Spiegel PB, Salama P. War and mortality in Kosovo, 1998-99: An epidemiological testimony. Lancet. 2000;355(9222):2204-9.
17. Assefa F, Jabarkhil MZ, Salama P, Spiegel P. Malnutrition and mortality in Kohistan District, Afghanistan, April 2001. JAMA. 2001;286(21):2723-8.
18. Salama P, Assefa F, Talley L, Spiegel P, van Der Veen A, Gotway CA. Malnutrition, measles, mortality, and the humanitarian response during a famine in Ehiopia. JAMA. 2001;286(5):563-71.
19. Renzaho A, Renzaho C. In the shadow of the volcanoes: the impact of intervention on the nutrition and health status of Rwandan refugee children in Zaire two years on from the exodus. Nutrition & Dietetics. 2003;60(2):85-91.
20. Grein T, Checchi F, Escriba JM, Tamrat A, Karunakara U, Stokes C, et al. Mortality among displaced former UNITA members and their families in Angola: a retrospective cluster survey. BMJ. 2003;327(7416):650.

21. Roberts L, Zantop M, Ngoy P, Lubula C, Mweze L, Mone C. Elevated mortality associated with armed conflict - Democratic Republic of Congo, 2002. Morbidity and Mortality Weekly Report. 2003;52(20):469-71.
22. Depoortere E, Checchi F, Broillet F, Gerstl S, Minetti A, Gayraud O, et al. Violence and mortality in West Darfur, Sudan (2003-04): epidemiological evidence from four surveys. Lancet. 2004;364(9442):1315-20.
23. Grandesso F, Sanderson F, Kruijt J, Koene T, Brown V. Mortality and malnutrition among populations living in South Darfur, Sudan: results of 3 surveys, September 2004. JAMA. 2005;293(12):1490-4.
24. Renzaho A. Mortality, malnutrition and the humanitarian response to the food crises in Lesotho. Journal of Emergency Primary Health Care. 2006;4(4):15p-p.
25. Burnham G, Lafta R, Doocy S, Roberts L. Mortality after the 2003 invasion of Iraq: a cross-sectional cluster sample survey. Lancet. 2006;368(9545):1421-8.
26. Coghlan B, Brennan RJ, Ngoy P, Dofara D, Otto B, Clements M, et al. Mortality in the Democratic Republic of Congo: a nationwide survey. Lancet. 2006;367(9504):44-51.
27. Lee TJ, Mullany LC, Richards AK, Kuiper HK, Maung C, Beyrer C. Mortality rates in conflict zones in Karen, Karenni, and Mon states in eastern Burma. Tropical Medicine and International Health. 2006;11(7):1119-27.
28. Doocy S, Burnham G, Robinson C. Estimating demographic indicators in a conflict-affected population in eastern Sudan. Prehosp Disaster Med. 2007;22(2):112-9.
29. Laaksonen S. Retrospective two-stage cluster sampling for mortality in Iraq. INTERNATIONAL JOURNAL OF MARKET RESEARCH. 2008;50(3):403-17.
30. Coghlan B, Ngoy P, Mulumba F, Hardy C, Bemo VN, Stewart T, et al. Update on mortality in the Democratic Republic of Congo: results from a third nationwide survey. Disaster Med Public Health Prep. 2009;3(2):88-96.
31. Doocy S, Lewy D, Guenther T, Larrance R. Mortality, nutrition and health in Lofa County Liberia five years post-conflict. World Health Popul. 2010;12(2):23-33.
32. Vinck P, Pham PN. Association of exposure to violence and potential traumatic events with self-reported physical and mental health status in the Central African Republic. JAMA. 2010;304(5):544-52.
33. CDC. Notes from the field: malnutrition and mortality --- Southern Somalia, July 2011. MMWR: Morbidity & Mortality Weekly Report. 2011;60(30):1026-7.
34. Moloney GM, Odundo EO, Masese LM, Busili AR, Oguta TJ, Waweru JM, et al. Malnutrition and mortality - Southern Somalia, July 2011. Morbidity and Mortality Weekly Report. 2011;60(30):1026-7.
35. Alfaro S, Myer K, Ali I, Roberts L. Estimating human rights violations in South Kivu Province, Democratic Republic of the Congo: A population-based survey. VULNERABLE CHILDREN AND YOUTH STUDIES. 2012;7(3):201-10.
36. Galway L, Bell N, Sae AS, Hagopian A, Burnham G, Flaxman A, et al. A two-stage cluster sampling method using gridded population data, a GIS, and Google Earth(TM) imagery in a population-based mortality survey in Iraq. Int J Health Geogr. 2012;11(101152198):12.
37. Hagopian A, Flaxman AD, Takaro TK, Esa Al Shatari SA, Rajaratnam J, Becker S, et al. Mortality in Iraq associated with the 2003-2011 war and occupation: findings from a national cluster sample survey by the university collaborative Iraq Mortality Study. PLoS Med. 2013;10(10):e1001533.
38. Carrion Martin AI, Bil K, Salumu P, Baabo D, Singh J, Kik C, et al. Mortality rates above emergency threshold in population affected by conflict in North Kivu, Democratic Republic of Congo, July 2012-April 2013. PLoS Negl Trop Dis. 2014;8(9):e3181.
39. Bilukha OO, Jayasekaran D, Burton A, Faender G, King'ori J, Amiri M, et al. Nutritional status of women and child refugees from Syria - Jordan, April-May 2014. Morbidity and Mortality Weekly Report. 2014;63(29):638-9.
40. Kandala NB, Mandungu TP, Mbela K, Nzita KP, Kalambayi BB, Kayembe KP, et al. Child mortality in the Democratic Republic of Congo: cross-sectional evidence of the effect of geographic location and prolonged conflict from a national household survey. BMC Public Health. 2014;14(100968562):266.

41. Lafta R, Al-Shatari S, Cherewick M, Galway L, Mock C, Hagopian A, et al. Injuries, Death, and Disability Associated with 11 Years of Conflict in Baghdad, Iraq: A Randomized Household Cluster Survey. PLoS One. 2015;10(8):e0131834.
42. Odjidja EN, Hakizimana S. Data on acute malnutrition and mortality among under-5 children of pastoralists in a humanitarian setting: a cross-sectional Standardized Monitoring and Assessment of Relief and Transitions Study. BMC Res Notes. 2019;12(1):434.
43. Robinson E, Crispino V, Ouabo A, Soung Iballa FB, Kremer R, Serbassi ME, et al. Mortality and health survey, Walikale, Democratic Republic of the Congo, 2017: an example of the use of survey data for humanitarian program planning. Confl Health. 2019;13(1):56.
44. Jarrett P, Zadravecz FJ, O'Keefe J, Nshombo M, Karume A, Roberts L. Evaluation of a population mobility, mortality, and birth surveillance system in South Kivu, Democratic Republic of the Congo. Disasters. 2020;44(2):390-407.
45. Robinson E, Lee L, Roberts LF, Poelhekke A, Charles X, Ouabo A, et al. Mortality beyond emergency threshold in a silent crisis- results from a population-based mortality survey in Ouaka prefecture, Central African Republic, 2020. Confl Health. 2021;15(1):50.
46. Alrashid Alhiraki O, Fahham O, Dubies HA, Abou Hatab J, Ba'Ath ME. Conflict-related excess mortality and disability in Northwest Syria. BMJ Glob Health. 2022;7(5).
47. Gang KBA, O'Keeffe J, Anonymous, Roberts L. Cross-sectional survey in Central African Republic finds mortality 4-times higher than UN statistics: how can we not know the Central African Republic is in such an acute humanitarian crisis? Confl Health. 2023;17(1):21.
48. Caleo G, Lokuge K, Kardamanidis K, Greig J, Belava J, Kilbride E, et al. Methodological issues of retrospective surveys for measuring mortality of highly clustered diseases: case study of the 2014-16 Ebola outbreak in Bo District, Sierra Leone. Glob Health Action. 2024;17(1):2331291.
49. Legesse AY, Teka Tseghay H, Abraha HE, Fisseha G, Ebrahim MM, Tsadik M, et al. Maternal mortality during war time in Tigray, Ethiopia: A community-based study. BJOG. 2024;131(6):786-94.
50. Ratnayake R, Ouchtar Y, Ahmed YA, Mohamoud JH, Jelle M, Seal A, et al. The Somalia Mortality Estimation Database (S-MED): a Bird's Eye View of Mortality and its Determinants. medRxiv. 2025.
51. Spagat M, Pedersen J, Shikaki K, Robbins M, Bendavid E, Hegre H, et al. Violent and non-violent death tolls for the Gaza conflict: new primary evidence from a population-representative field survey. Lancet Glob Health. 2026;14(4):e552-e9.
52. Emergency Nutrition Network. Cross-sectional assessment of retrospective mortality in humanitarian emergencies 2010 [Available from: https://www.ennonline.net/fex/38/en/cross-sectional-assessment-retrospective-mortality-humanitarian-emergencies.
53. Pecoul B, Cohen O, Michelet MJ. Mozambique: mortality among displaced persons. Lancet. 1990;335:650 PT - Journal article.
54. CDC. Population-based mortality assessment--Baidoa and Afgoi, Somalia, 1992. MMWR Morbidity and mortality weekly report. 1992;41(49):913-7.
55. Manoncourt S, Doppler B, Enten F, Nur AE, Mohamed AO, Vial P, et al. Public health consequences of the civil war in Somalia, April, 1992. Lancet. 1992;340(8812):176-7.
56. Moore PS, Marfin AA, Quenemoen LE, Gessner BD, Ayub YS, Miller DS, et al. Mortality rates in displaced and resident populations of central Somalia during 1992 famine. Lancet. 1993;341(8850):935-8.
57. Yip R. Acute malnutrition and high childhood mortality related to diarrhea. Lessons from the 1991 Kurdish refugee crisis. JAMA: The Journal of the American Medical Association. 1993;270(5):587-90.
58. Gessner BD. Mortality rates, causes of death, and health status among displaced and resident populations of Kabul, Afghanistan. JAMA. 1994;272(5):382-5.
59. CDC. Mortality during a famine--Gode district, Ethiopia, July 2000. MMWR Morbidity and mortality weekly report. 2001;50(15):285-8.
60. Talley L. An Investigation of Increasing Mortality among Congolese Refugees in Lugufu Camp, Tanzania, May-June 1999. Journal of Refugee Studies. 2001;14(4):412-27.

61. Piola P, Tachon JL, Brown V, Ligozat L, Veyrier E, Nierle T, et al. Rapid assessment of mortality and malnutrition in Afghanistan. JAMA. 2002;288(10):1233-4.
62. CDC. Elevated mortality associated with armed conflict--Democratic Republic of Congo, 2002. MMWR - Morbidity & Mortality Weekly Report. 2003;52(20):469-71.
63. Saeed IE, Ahmed ES. Determinants of malaria mortality among displaced people in Khartoum state, Sudan. Eastern Mediterranean Health Journal. 2003;9(4):593-600.
64. Nathan N, Tatay M, Piola P, Lake S, Brown V. High mortality in displaced populations of northern Uganda. Lancet. 2004;363(9418):1402.
65. Ahoua L, Tamrat A, Duroch F, Grais RF, Brown V. High mortality in an internally displaced population in Ituri, Democratic Republic of Congo, 2005: results of a rapid assessment under difficult conditions. Global public health. 2006;1(3):195-204.
66. Bradt DA, Drummond CM. Delayed recognition of excess mortality in West Timor. Emerg Med Australas. 2008;20(1):70-7.
67. Guerrier G, Zounoun M, Delarosa O, Defourny I, Lacharite M, Brown V, et al. Malnutrition and mortality patterns among internally displaced and non-displaced population living in a camp, a village or a town in Eastern Chad. PLoS One. 2009;4(11):e8077.
68. Alberti KP, Grellety E, Lin YC, Polonsky J, Coppens K, Encinas L, et al. Violence against civilians and access to health care in North Kivu, Democratic Republic of Congo: three cross-sectional surveys. Confl Health. 2010;4(101286573):17.
69. Garfield R, Polonsky J. Changes in mortality rates and humanitarian conditions in Darfur, Sudan 2003-2007. Prehosp Disaster Med. 2010;25(6):496-502.
70. Andresen E, Bilukha O, Menkir Z, Gayford M, Kavosa M, Wtsadik M, et al. Notes from the field: malnutrition and elevated mortality among refugees from South Sudan - Ethiopia, June-July 2014. MMWR Morbidity and mortality weekly report. 2014;63(32):700-1.
71. Parmar PK, Benjamin-Chung J, Smith LS, Htoo SN, Laeng S, Lwin A, et al. Health and human rights in eastern Myanmar prior to political transition: a population-based assessment using multistaged household cluster sampling. BMC Int Health Hum Rights. 2014;14(101088678):15.
72. Coldiron ME, Roederer T, Llosa AE, Bouhenia M, Madi S, Sury L, et al. Retrospective mortality among refugees from the Central African Republic arriving in Chad, 2014. Confl Health. 2017;11(101286573):7.
73. Vernier L, Cramond V, Hoetjes M, Lenglet A, Hoare T, Malaeb R, et al. High levels of mortality, exposure to violence and psychological distress experienced by the internally displaced population of Ein Issa camp prior to and during their displacement in Northeast Syria, November 2017. Confl Health. 2019;13:33.
74. Gignoux EMH, Donfack Sontsa OT, Mudasiru A, Eyong J, Ntone R, Tamakloe Koku M, et al. A telephone based assessment of the health situation in the far north region of Cameroon. Confl Health. 2020;14(1):82.
75. Tsadik M, Legesse AY, Teka H, Abraha HE, Fisseha G, Ebrahim MM, et al. Neonatal mortality during the war in Tigray: a cross-sectional community-based study. Lancet Glob Health. 2024;12(5):e868-e74.
76. Simons E, Ouedraogo P, Garnier C, Nicolet C, Sayyad-Hilario J, Villet E, et al. High mortality and violence among refugees and returnees from West Darfur, Sudan arriving in Chad, 2023: results from three retrospective mortality surveys. BMJ Glob Health. 2025;10(6).
77. Dianou K, Masquelier B, Helleringer S, Lankoande B, Soura AB, Billa O, et al. Under-Five Mortality in Humanitarian Emergencies: A Comparison of Face-to-Face and Mobile Phone Survey Estimates From Burkina Faso. Trop Med Int Health. 2026.
78. SMART. Standardized Monitoring and Assessment of Relief and Transitions 2002 [Available from: https://smartmethodology.org/.
79. REACH, IMPACT Initiatives, ACTED, UNOSAT. MSNA: Multi-Sector Needs Assessment 2010 [Available from: https://www.impact-initiatives.org/what-we-do/reach/.
80. Roberts B, Morgan OW, Sultani MG, Nyasulu P, Rwebangila S, Sondorp E, et al. Economic feasibility of a new method to estimate mortality in crisis-affected and resource-poor settings. PLoS One. 2011;6(9):e25175.

81. Potts A, Myer K, Roberts L. Measuring human rights violations in a conflict-affected country: results from a nationwide cluster survey in Central African Republic. Confl Health. 2011;5(1):4.
82. Roberts B, Morgan OW, Sultani MG, Nyasulu P, Rwebangila S, Myatt M, et al. A new method to estimate mortality in crisis-affected and resource-poor settings: validation study. Int J Epidemiol. 2010;39(6):1584-96.
83. FANTA Project. Key Informant Method [Available from: https://www.fantaproject.org/research/mortality-informant-method.
84. Immpact. Maternal Death from Informants and Maternal Death Follow-on Review (MADE-IN/MADE-FOR). University of Aberdeen; 2007.
85. McGowan CR, Alhaffar M, Ekoriko P, Al-Refai S, Badr J, Bell L, et al. Adult mortality patterns in Yemen before and during armed conflict: evidence from a web survey of the global diaspora. Confl Health. 2023;17(1):36.
86. McGowan CR, Cassidy-Seyoum SA, Ekoriko P, Alhaffar M, Cassini L, Palmer J, et al. Conflict-attributable mortality in Tigray Region, Ethiopia: Evidence from a survey of the Tigrayan diaspora. Popul Health Metr. 2025;23(1):19.
87. Breen CF, Rahman S, Kay C, Smits J, Azar A, Ahuka S, et al. Estimating death rates in complex humanitarian emergencies using the network survival method. Am J Epidemiol. 2026;195(1):49-59.
88. Black B, Rijnberg N, Solomon K, Kahsay D, Gebru M, Teklehaimanot BF, et al. Lessons learned from applying a "Rapid Maternal Death Surveillance and Response" tool in conflict-affected Tigray, Ethiopia. BMC Pregnancy Childbirth. 2025;25(Suppl 1):1017.
89. Mary M, Tappis H, Scudder E, Creanga AA. Community-based maternal and perinatal death surveillance and response: a comparative case study of implementation realities from humanitarian contexts. BMC public health. 2025;25(1):3256.
90. Mary M, Tappis H, Scudder E, Creanga AA. Complexities of implementing Maternal and Perinatal Death Surveillance and Response in crisis-affected contexts: a comparative case study. Confl Health. 2024;18(1):45.
91. WHO. Maternal and Perinatal Death Surveillance and Response (MPDSR) 2013 [Available from: https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/maternal-health/maternal-and-perinatal-death-surveillance-and-response.
92. Bowden S, Braker K, Checchi F, Wong S. Implementation and utilisation of community-based mortality surveillance: a case study from Chad. Confl Health. 2012;6(1):11.
93. Ibrahim MM, Omar HM, Persson LA, Wall S. Child mortality in a collapsing African society. Bulletin of the World Health Organization. 1996;74(5):547-52.
94. WHO. Community based surveillance 2014 [Available from: https://www.afro.who.int/publications/community-based-surveillance.
95. Bartlett LA, Jamieson DJ, Kahn T, Sultana M, Wilson HG, Duerr A. Maternal mortality among Afghan refugees in Pakistan, 1999-2000. Lancet. 2002;359(9307):643-9.
96. Caleo GM, Sy AP, Balandine S, Polonsky J, Palma PP, Grais RF, et al. Sentinel site community surveillance of mortality and nutritional status in southwestern Central African Republic, 2010. Popul Health Metr. 2012;10(1):18.
97. Adam MH, Garba B, Dahie HA, Baruch J, Polonsky JA, Hassan J, et al. Community-based mortality surveillance among internally displaced vulnerable populations in Banadir region, Somalia, 2022-2023. Front Public Health. 2025;13:1582558.
98. TOOLE M, BASIKILA P, MALE S, LINDGREN J, ROBERTS L, ROBINSON D, et al. PUBLIC-HEALTH IMPACT OF RWANDAN REFUGEE CRISIS - WHAT HAPPENED IN GOMA, ZAIRE, IN JULY-1994. LANCET. 1995;345(8946):339-44.
99. Goers M, Leidman E, Sultan AS, Hassan A, Bilukha O. Injury-related deaths before and during the Islamic State insurgency - Baghdad, Iraq, 2010-2015. Confl Health. 2020;14(1):8.
100. Jamaluddine Z, Checchi F, Campbell OMR. Excess mortality in Gaza: Oct 7-26, 2023. Lancet. 2023;402(10418):2189-90.

101. Granich R, Gupta S, Rose V. Childhood mortality during Gaza genocide in 2024: A comparative analysis with global disease burden. Scand J Public Health. 2025:14034948251389044.
102. ACLED. Conflict data 2005 [Available from: https://acleddata.com/conflict-data.
103. Seal AJ, Jelle M, Grijalva-Eternod CS, Mohamed H, Ali R, Fottrell E. Use of verbal autopsy for establishing causes of child mortality in camps for internally displaced people in Mogadishu, Somalia: a population-based, prospective, cohort study. Lancet Glob Health. 2021;9(9):e1286-e95.
104. WHO. Verbal autopsy standards: The 2016 WHO verbal autopsy instrument 2016 [Available from: https://www.who.int/publications/m/item/verbal-autopsy-standards-the-2016-who-verbal-autopsy-instrument.
105. Singh K, Karunakara U, Burnham G, Hill K. Using indirect methods to understand the impact of forced migration on long-term under-five mortality. J Biosoc Sci. 2005;37(6):741-60.
106. IPC. Intergrated Food Security Phase Classification [Available from: https://www.ipcinfo.org/.
107. FEWS Net. Famine Early Warning Systems Network 1985 [Available from: https://fews.net/.
108. Lopez VK, Nika A, Blanton C, Talley L, Garfield R. Can severity of a humanitarian crisis be quantified? Assessment of the INFORM severity index. Global Health. 2023;19(1):7.
109. ACAPS. INFORM Severity Index: Assessing the severity of humanitarian crises to support evidence-based decision-making 2022 [Available from: https://www.acaps.org/en/thematics/all-topics/inform-severity-index.
110. WHO. Global Health Cluster (GHC) Guidance Note on Health People in Need (PiN) and Severity Calculation Version 3.1. 2024.
111. Cadre Harmonisé. Analyse et identification des zones à risque et des populations en insécurité alimentaire et nutritionnelle 2023 [Available from: http://cadreharmonise.org/.
112. BABILLE M, DECOLOMBANI P, GUERRA R, ZAGARIA N, ZANETTI C. POST-EMERGENCY EPIDEMIOLOGIC SURVEILLANCE IN IRAQI-KURDISH REFUGEE CAMPS IN IRAN. DISASTERS. 1994;18(1):58-75.
113. Dowell SF, Toko A, Sita C, Piarroux R, Duerr A, Woodruff BA. Health and nutrition in centers for unaccompanied refugee children. Experience from the 1994 Rwandan refugee crisis. JAMA. 1995;273(22):1802-6.
114. CDC. Cholera outbreak among Rwandan refugees--Democratic Republic of Congo, April 1997. MMWR - Morbidity & Mortality Weekly Report. 1998;47(19):389-91.
115. Chelwa NM, Likwa RN, Banda J. Under-five mortality among displaced populations in Meheba refugee camp, Zambia, 2008-2014. Arch Public Health. 2016;74:49.
116. Social Science in Humanitarian Action Platform (SSHAP). Community-Based Surveillance in Public Health 2023 [Available from: https://www.socialscienceinaction.org/resources/key-considerations-community-based-surveillance-in-public-health/.
117. Checchi F, Testa A, Gimma A, Koum-Besson E, Warsame A. A method for small-area estimation of population mortality in settings affected by crises. Popul Health Metr. 2022;20(1):4.
118. Checchi F, Gimma A, Jarvis CI, van Zandvoort K, Warsame A. The death toll of armed conflict and food insecurity in north-east Nigeria, 2016-2019: a statistical study. medRxiv. 2022.
119. Checchi F, Jarvis CI, van Zandvoort K, Warsame A. Mortality among populations affected by armed conflict in northeast Nigeria, 2016 to 2019. Proc Natl Acad Sci U S A. 2023;120(30):e2217601120.
120. Warsame A, Frison S, Checchi F. Drought, armed conflict and population mortality in Somalia, 2014-2018: A statistical analysis. PLOS Glob Public Health. 2023;3(4):e0001136.
121. Ouchtar Y, Ali DA, Ahmed YA, Adam MH, Dirie NI, Warsame A, et al. Drought-attributable mortality in Somalia, 2015–2024: a retrospective and modelling study. The Lancet Regional Health - Africa. 2026:100072.

122. Silva R, Ball P. The demography of conflict-related mortality in timor-leste (1974-1999): Reflections on empirical quantitative measurement of civilian killings, disappearances, and famine-related deaths2008 2008. 117-39 p.
123. Dahab M, Abdelmagid N, Kodouda A, Checchi F. Deaths, injuries and detentions during civil demonstrations in Sudan: a secondary data analysis. Confl Health. 2019;13(1):16.
124. Jamaluddine Z, Abukmail H, Aly S, Campbell OMR, Checchi F. Traumatic injury mortality in the Gaza Strip from Oct 7, 2023, to June 30, 2024: a capture-recapture analysis. Lancet. 2025;405(10477):469-77.
125. Spiegel P, Sheik M, Gotway-Crawford C, Salama P. Health programmes and policies associated with decreased mortality in displaced people in postemergency phase camps: a retrospective study. Lancet. 2002;360(9349):1927-34.
126. Degomme O, Guha-Sapir D. Patterns of mortality rates in Darfur conflict. Lancet. 2010;375(9711):294-300.
127. Heudtlass P, Speybroeck N, Guha-Sapir D. Excess mortality in refugees, internally displaced persons and resident populations in complex humanitarian emergencies (1998-2012) - insights from operational data. Confl Health. 2016;10:15.
128. Delbiso TD, Altare C, Rodriguez-Llanes JM, Doocy S, Guha-Sapir D. Drought and child mortality: a meta-analysis of small-scale surveys from Ethiopia. Sci Rep. 2017;7(1):2212.
129. Ogbu TJ, Scales SE, de Almeida MM, van Loenhout JAF, Speybroeck N, Guha-Sapir D. Predictors of exceeding emergency under-five mortality thresholds using small-scale survey data from humanitarian settings (1999 - 2020): considerations for measles vaccination, malnutrition, and displacement status. Arch Public Health. 2022;80(1):160.
130. Gomez-Ugarte AC, Chen I, Acosta E, Basellini U, Alburez-Gutierrez D. Accounting for uncertainty in conflict mortality estimation: an application to the Gaza War in 2023-2024. Popul Health Metr. 2025;23(1):55.
131. Checchi F, Koum Besson E, Ali O, Alhaffar M, Saeed N, Vasquez Y, et al. Population mortality before and during armed conflict in Yemen: geospatial and statistical analysis of cemetery data. medRxiv. 2023.
132. Checchi F, Barnsley G, Jamaluddine Z, Abukmail H, Chen Z, Spiegel PB, et al. Projecting excess mortality due to infectious diseases during a crisis: methods and application to the Gaza Strip, 2023-2024. medRxiv. 2025.
133. ACAPS. INFORM Severity Index: Assessing the severity of humanitarian crises to support evidence-based decision-making 2026 [Available from: https://www.acaps.org/en/thematics/all-topics/inform-severity-index.
134. Maxwell D, Hailey P, Naumova E. Data for famine and extreme emergencies: challenges and opportunities. Journal of Public Health Policy. 2026;47(1):148-60.
135. Maxwell D, Khalif A, Hailey P, Checchi F. Viewpoint: Determining famine: Multi-dimensional analysis for the twenty-first century. Food Policy. 2020;92:101832.
136. Prudhon C, Spiegel PB. A review of methodology and analysis of nutrition and mortality surveys conducted in humanitarian emergencies from October 1993 to April 2004. Emerg Themes Epidemiol. 2007;4:10.
137. Cairns KL, Woodruff BA, Myatt M, Bartlett L, Goldberg H, Roberts L. Cross-sectional survey methods to assess retrospectively mortality in humanitarian emergencies. Disasters. 2009;33(4):503-21.
138. Colombo S, Terracini B. Estimating and interpreting mortality data in conflicts: Challenges, controversies, and significance. Epidemiol Prev. 2025;49(1):84-90.
139. Obermeyer Z, Murray CJL, Gakidou E. Fifty years of violent war deaths from Vietnam to Bosnia: analysis of data from the world health survey programme. BMJ. 2008;336(7659):1482.
140. UNOCHA. Joint and Intersectoral Analysis Framework (JIAF) 2 Technical Manual 2024 [Available from: https://www.unocha.org/publications/report/world/joint-and-intersectoral-analysis-framework-jiaf-2-technical-manual-july-2024.
141. The Grand Bargain. Workstream 2: Localisation 2022 [Available from: https://gblocalisation.ifrc.org/.

142. O'Hagan A, Buck CE, Daneshkhah A, Eiser JR, Garthwaite PH, Jenkinson DJ, et al. Uncertain Judgements: Eliciting Expert Probabilities. Chichester: John Wiley; 2006.
143. Cooke RM. Experts in Uncertainty: Opinion and Subjective Probability in Science. New York: Oxford University Press; 1992.
144. Hanea AM, McBride MF, Burgman MA, Wintle BC. Classical meets modern in the IDEA protocol for structured expert judgement. Journal of Risk Research. 2018;21(4):417-33.
145. Hemming V, Burgman MA, Hanea AM, McBride MF, Wintle BC. A practical guide to structured expert elicitation using the IDEA protocol. Methods in Ecology and Evolution. 2018;9(1):169-80.
146. Gaddy H, Gargiulo M. Can we estimate crisis death tolls by subtracting total population estimates? A critical review and appraisal. DEMOGRAPHIC RESEARCH. 2025;52.
147. Donini A, Maxwell D. From face-to-face to face-to-screen: remote management, effectiveness and accountability of humanitarian action in insecure environments. International Review of the Red Cross. 2013;95(890):383-413.
148. Ratnayake R, Tammaro M, Tiffany A, Kongelf A, Polonsky JA, McClelland A. People-centred surveillance: a narrative review of community-based surveillance among crisis-affected populations. Lancet Planet Health. 2020;4(10):e483-e95.
149. Mahgoub EAA, Alshalah A, El Halabi F, Mamoun M, Fare'a AAM, Elomeiri L, et al. Public perceptions of mortality studies in conflict-affected areas of the Eastern Mediterranean Region: an exploratory study. Conflict and Health. 2026;20(1):62.
150. Hotchkiss DR, Aqil A, Lippeveld T, Mukooyo E. Evaluation of the Performance of Routine Information System Management (PRISM) framework: evidence from Uganda. BMC Health Services Research. 2010;10(1):188.
151. Witter S, Palmer N, Balabanova D, Mounier-Jack S, Martineau T, Klicpera A, et al. Health system strengthening-Reflections on its meaning, assessment, and our state of knowledge. Int J Health Plann Manage. 2019;34(4):e1980-e9.
152. Metcalfe-Hough V. Collaborative advocacy between humanitarian and human rights actors: Opportunities and challenges. ODI; 2021.
153. Bogale B, Scambler S, Mohd Khairuddin AN, Gallagher JE. Health system strengthening in fragile and conflict-affected states: A review of systematic reviews. PLOS ONE. 2024;19(6):e0305234.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CLEARSUDANAnnex1SearchStrings21Sep26.docx
- CLEARSUDANAnnex2IncludedPapers21Sep26.docx
- CLEARSUDANAnnex3Excluded21Sep26.docx
- CLEARSUDANAnnex426Methods.docx
- CLEARSUDANAnnex5PRISMAScRChecklist2Oct26.docx