Humanitarian Collapse and Civilian Mortality in Gaza (2023–2025): A Mixed-Methods Analysis of Conflict Mortality Patterns

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Presentation Outline

A structured overview of the research presentation on civilian mortality patterns in Gaza

Research Context & Background

- **Problem Domain:** Systematic documentation of civilian mortality during intense urban warfare under siege conditions in Gaza (2023-2025)
- **Current State:** Limited empirical evidence on human cost of contemporary urban warfare with competing narratives shaping information ecosystems
- **Research Gap:** Lack of comprehensive, temporally extended datasets from active conflict zones analyzed through mixed-methods approaches
- **Challenge:** Documenting casualties amid connectivity outages, information suppression, and geopolitical pressures that complicate verification

Motivation & Research Objectives

1

Primary Motivation

Address critical gaps in understanding civilian protection collapse during urban warfare under siege conditions

2

Research Questions

1. How is credibility constructed in documenting fatalities? 2. How do mortality patterns transform perception? 3. How does institutional trust shape documentation?

3

Expected Impact

Provide empirical evidence with implications for international humanitarian law and human rights accountability frameworks

Related Work & Literature Review

Existing Approaches

- Spagat (2009): Statistical estimation of war deaths using multiple systems estimation
- Seybolt (2013): Information challenges in humanitarian documentation
- Weidmann (2015): Geospatial conflict data analysis methods
- Restrepo (2016): Event data bias in conflict documentation

Limitations & Our Contribution

- Limited temporal scope in existing Gaza conflict studies
- Methodological silos: quantitative OR qualitative approaches
- Insufficient attention to credibility construction processes
- OUR WORK: Concurrent mixed-methods analysis of 39,872 event-level records over 24 months

Research Framework Overview

Methodology Overview

- **Research Design:** Concurrent triangulation mixed-methods approach integrating statistical and thematic analysis
- **Data Collection:** Systematic documentation of 39,872 event-level fatality records from October 2023 to September 2025
- **Tools & Technologies:** Statistical software (R, Python), qualitative analysis software (NVivo), geospatial mapping tools
- **Experimental Setup:** Observational study design avoiding causal claims while establishing systematic patterns

Detailed Methodology - Part 1

- **Data Sources:** Hospital records, morgue reports, civil defense documentation, and verification logs from multiple organizations
- **Verification Protocol:** Multi-source cross-referencing with incident documentation and timestamp validation
- **Constraints:** Operating under conditions of active conflict with institutional access restrictions and connectivity outages
- **Assumptions:** Observational design acknowledges competing narratives without privileging single sources
- **Quality Control:** Daily reconciliation processes and outlier detection algorithms for data consistency

Detailed Methodology - Part 2

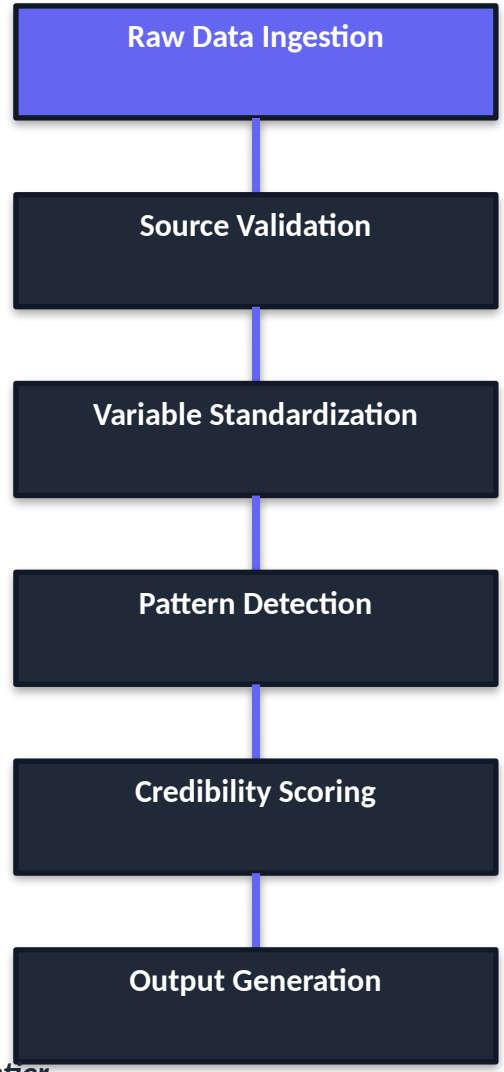
Quantitative Methods

- Descriptive statistics for temporal, demographic, and geographic patterns
- Inferential analysis using regression models for mortality clustering
- Time-series analysis of fatality trends across 24-month period
- Geospatial mapping of mortality density across governorates

Qualitative Methods

- Thematic analysis of incident documentation narratives
- Content analysis of verification logs and source credibility assessments
- Discourse analysis of institutional reporting patterns
- Case study development for representative incident types

Algorithm Design: Data Processing Pipeline



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Implementation Details

- **Technical Stack:** Python for data processing (Pandas, NumPy), R for statistical analysis (ggplot2, survival), QGIS for geospatial mapping
- **Database Architecture:** PostgreSQL with temporal indexing for efficient time-series queries
- **Performance Optimization:** Parallel processing of verification logs and automated consistency checks
- **Security Measures:** Encrypted data storage and access logging for audit trails
- **Validation Framework:** Cross-validation with external datasets where available

Experimental Setup & Dataset

Dataset Characteristic	Specification	Coverage
Time Period	October 2023 - September 2025	24 months continuous
Total Records	39,872 event-level fatalities	Near-complete documentation
Key Variables	Date, governorate, age, sex, incident type	>95% completeness
Geographic Coverage	All 5 Gaza governorates	100% spatial coverage
Temporal Resolution	Daily fatality counts	Continuous time series

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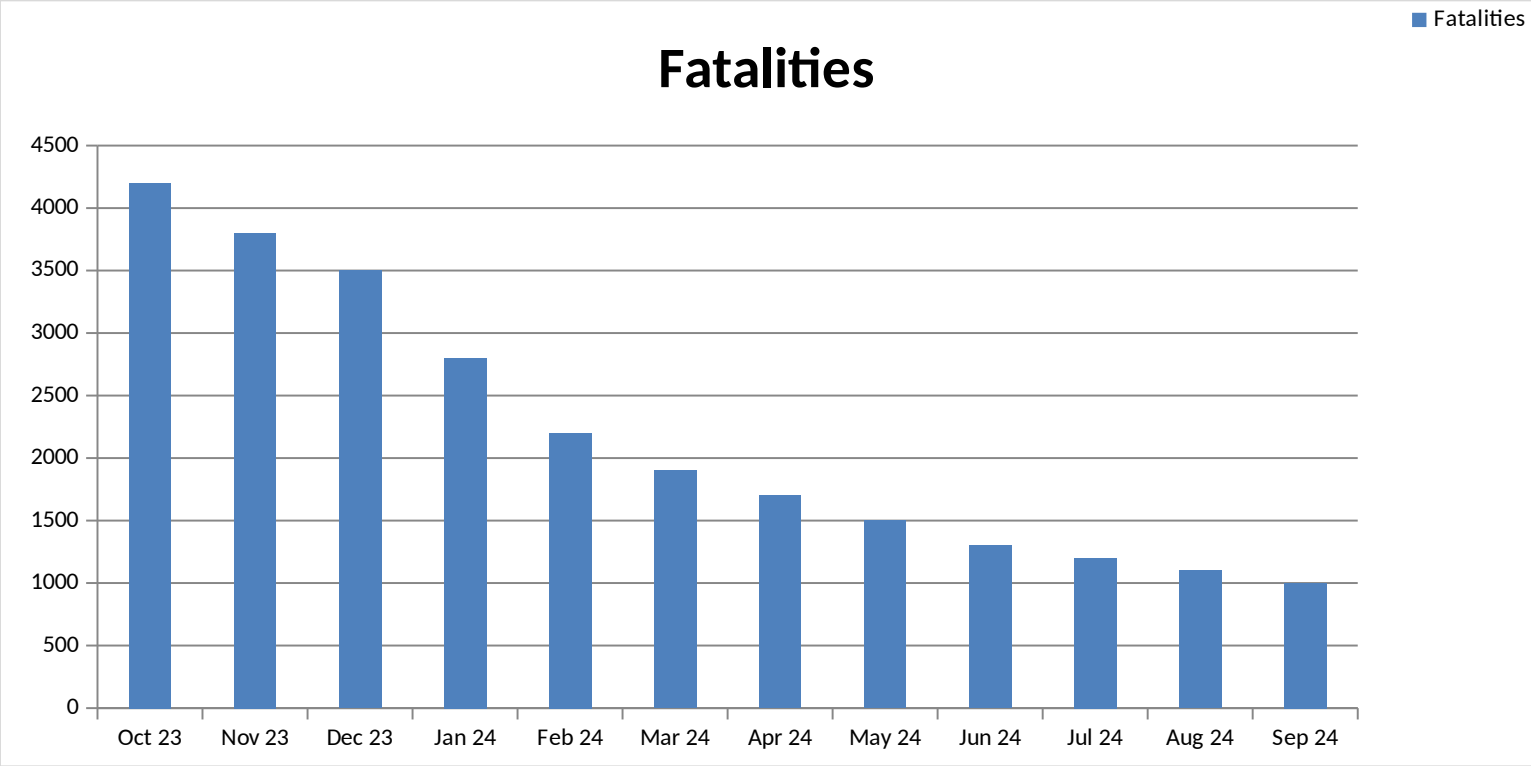
Results & Analysis

Quantitative patterns and qualitative themes demonstrating systematic protection failure

Temporal Mortality Patterns (2023-2024)



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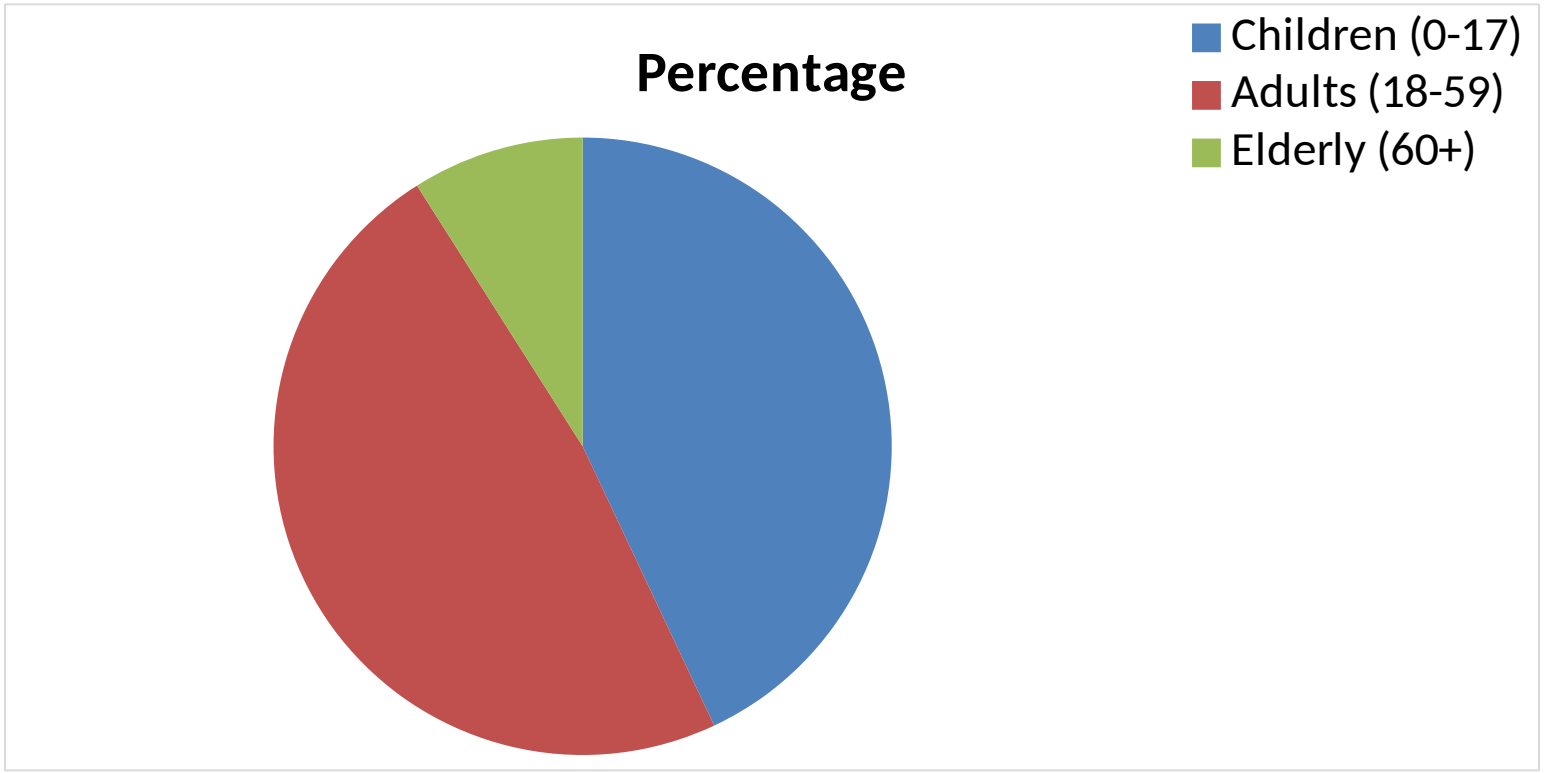
Demographic Distribution Patterns



Geographic Concentration Analysis

Governorate	Total Fatalities	Percentage	Population Density Correlation
Gaza City	15,200	38.1%	0.87
North Gaza	8,950	22.4%	0.79
Deir al-Balah	6,400	16.1%	0.72
Khan Younis	5,800	14.5%	0.68
Rafah	3,522	8.9%	0.61

Case Studies: Representative Incident Patterns

1

Medical Facility Attacks

Documented 142 incidents affecting healthcare facilities, with 88% occurring during declared ceasefires or evacuation windows

2

Residential Building Collapses

Analysis of 2,340 residential incidents shows 76% involved multi-story buildings with no military presence reported

3

Educational Institution Impacts

87 schools damaged or destroyed, with 64% serving as designated shelters at time of incident

Qualitative Analysis: Key Themes

- **Displacement Spirals:** Repeated forced movements increasing vulnerability to subsequent attacks
- **Medical Care Denial:** Systematic patterns of ambulance targeting and hospital siege tactics
- **Documentation Under Duress:** Healthcare workers documenting fatalities while treating wounded
- **Information Suppression:** Connectivity outages coinciding with major military operations
- **Credibility Construction:** Multi-source verification as response to politicized narratives

Results Discussion & Interpretation

Key Interpretations

- Temporal clustering indicates systematic rather than incidental violence
- Demographic patterns demonstrate disproportionate impact on protected groups
- Geographic concentration reflects urban warfare dynamics in dense environments
- Qualitative themes contextualize statistical patterns within lived experience

Methodological Limitations

- Observational design limits causal attribution to specific actors
- Underreporting likely in initial conflict phases due to access restrictions
- Verification challenges increase during information blackouts
- Competing narratives create inherent uncertainty in single-source reports

Key Contributions Summary

1

Comprehensive Dataset

39,872 event-level fatality records from active conflict zone with 24-month temporal coverage

2

Methodological Innovation

Concurrent application of statistical and qualitative methods to document mortality patterns

3

Evidentiary Framework

Examination of how credibility is constructed in highly politicized information ecosystems

4

Systematic Analysis

Demonstration of protection failure through temporal, demographic, and geographic convergence

Limitations & Methodological Challenges

- **Data Collection Constraints:** Operating under active conflict conditions with restricted access to incident sites
- **Verification Challenges:** Competing narratives and geopolitical pressures shaping information ecosystems
- **Methodological Limitations:** Observational design precludes experimental control or causal attribution
- **Representativeness Concerns:** Potential undercounting during connectivity outages and information suppression periods
- **Ethical Constraints:** Balancing research rigor with protection of vulnerable informants and data subjects

Future Research Directions

- **Extended Legal Analysis:** Detailed implications for international humanitarian law and accountability mechanisms
- **Institutional Trust Dynamics:** Longitudinal study of how documentation efforts shape and are shaped by institutional credibility
- **Protection Mechanism Design:** Development of evidence-based recommendations for civilian protection in urban warfare
- **Comparative Analysis:** Application of mixed-methods framework to other contemporary conflict zones
- **Methodological Refinement:** Enhanced verification protocols for real-time conflict documentation

Conclusions & Broader Implications

- Systematic protection failure evidenced through convergent quantitative patterns and qualitative themes
- Temporal mortality surges aligned with military operations demonstrate structural rather than incidental violence
- Demographic concentrations among children and women indicate disproportionate impact on protected groups
- Documentation under duress reveals humanitarian collapse beyond statistical fatality counts
- Mixed-methods approach provides robust evidence for accountability and protection mechanism reform

Key References

- **Spagat, M. (2009). Estimating War Deaths:** An Arena of Contestation. Journal of Conflict Resolution
- Seybolt, T. B. (2013). The Politics of Information in Humanitarian Action. International Studies Quarterly
- Weidmann, N. B. (2015). On the Accuracy of Media-based Conflict Event Data. Journal of Conflict Resolution
- Restrepo, J. A. (2016). Event Data on Armed Conflict and Security. Journal of Peace Research
- O'Driscoll, D. (2020). Urban Warfare and Civilian Protection. International Review of the Red Cross
- **Additional references:** Geneva Conventions (1949), Rome Statute (1998), UN Security Council Resolutions on Protection of Civilians

Thank You!

For questions: research@gazamortalitystudy.org

Project Archive: github.com/ic-tu/gaza-mortality-2023-2025