ISSN: 2833-9320

Short Communication

International Journal of Health Policy Planning

Revisiting Gaza Mortality Estimates: Adjusted for Non-Sampling Zero-Survivor Households

Ron Roberts[1*] and Joel Vos[2]

[1]*Kingston University, Department of Psychology, United Kingdom*

[2]*Metanoia Institute, United Kingdom*

[*]Corresponding Author
Ron Roberts, Department of Psychology, Kingston University, United Kingdom.
Email: r.roberts@kingston.ac.uk.

Submitted: 2025, Sep 02; **Accepted:** 2025, Oct 08; **Published:** 2025, Oct 15

Citation: Roberts, R., Vos, J. (2025). Revisiting Gaza Mortality Estimates: Adjusted for Non-Sampling Zero-Survivor Households. *Int J Health Policy Plann, 4*(4), 01-03.

Abstract

Current Gaza mortality estimates systematically undercount deaths by failing to account for zero-survivor households. We argue that adjusting for this factor and multi-family cohabitation yields significantly higher figures than previously reported. If we assume 3% zero-survivor households with 75% multi-family cohabitation, mortality estimates increase to 152,395-179,555 direct and indirect deaths (6.92-8.16% of the pre-war population).

1. Introduction

Mortality estimates from the Gaza war beginning October 7, 2023, face systematic underestimation across all methodologies (see Table 1). The Gaza Ministry of Health (GMoH) relies primarily on hospital records, but 654 documented attacks on healthcare facilities have severely compromised record-keeping capacity [1]. Bodies may remain unreported due to inaccessible hospitals or cultural burial practices [2]. Airwars reports substantial undercounting in GMoH's named casualty lists [3]. Additionally, zero-survivor households may result in bodies remaining unrecovered, unidentified, and unreported when buried in mass graves or rubble. Online data collection methods face limitations from Gaza's damaged communications infrastructure, with 70% of networks destroyed and frequent blackouts precisely when mortality reporting would occur [4]. The London School of Hygiene & Tropical Medicine's capture-recapture analysis explicitly excluded missing persons potentially deceased under rubble [5].

The Gaza Mortality Survey (GMS) by Spagat et al. attempted to overcome these limitations through face-to-face interviews yet acknowledged "downward bias" from non-sampling households with zero survivors or no surviving adults [6]. This critical bias remains unaddressed in all current estimates. Gaza's exceptionally high population density (6,024 people/km² average, reaching 161,532 people/km² in Beach Camp) dramatically increases vulnerability compared to other conflict zones (20-300 people/km² in Rwanda, Syria, Bosnia, Darfur, Iraq, and Yemen) [7]. This density exacerbates full-family casualties from single strikes. The UN reported 35% of Gaza buildings had been destroyed by February 2024, and by September 2025, estimated 92% of all housing units there had been destroyed or damaged. These figures suggest substantial numbers remain buried [8].

Additionally, multi-family cohabitation prevalent at 50-75% pre-war and likely higher post-displacement further complicates mortality accounting [9]. The documented 2,200 zero-survivor households as of May 2025 likely underestimates the true figure and doesn't account for the 1.41 multiplier for individuals missing under rubble [10,11]. Table 1 outlines major mortality estimation methodologies. Table 2 presents our adjusted confidence intervals incorporating zero-survivor households and multi-family cohabitation levels applied to the Gaza Household Survey figures, with equivalent findings to the capture-recapture study based on morgue records, online surveys, and social media reports [5,6]. While our data assume the same ratio of direct to indirect deaths as the Gaza Mortality Survey, it is probable that there remains a significant undercount of indirect deaths, for instance due to starvation, non-communicable diseases, endemic infectious disease, epidemics and neonatal health complications, these may be higher due to the unique population density and household composition in Gaza, which may lead to a quicker spread of diseases and increased vulnerability of humanitarian transport routes in densely populated areas [12-14]. Mortality figures during conflicts typically undergo substantial upward revision post-conflict (by factors of 0.7-23.3)

[15-18]. Given Gaza's unprecedented population density and documented destruction scale, current estimates therefore likely represent significant undercounts.

While it is impossible to make a precise estimation of the multiplier factors for zero-survivor households and indirect deaths, our calculations indicate the importance of adjusting the figures for the non-sampling of zero-survivor households and household composition. As the authors of the Gaza Mortality Survey noted in their conclusions, the ratio of non-violent deaths to violent deaths may well have grown since the period of data collection. Therefore, our own figures are still likely to be conservative and to seriously under-estimate the present death toll. These are based on assumptions of 3% zero-survivor households with on average 75% multi-family cohabitation. On this basis mortality estimates increase to 152,395-179,555 direct and indirect deaths, representing between 6.92%-8.16% of the pre-war population.

Full Name	Time Period	Data Collection Method	Estimated Mortality
Gaza Ministry of Health (GMoH) – (Figures cited in formal reports by UN, WHO, ICC)	Oct 7, 2023 - June 2025	Hospital morgue data, online survey collection, and media reports. Electronic health information system that tracks individual deaths from traumatic injury.	56,400
Israeli Government Estimates (IGE)	Oct 7, 2023 – June 2025	Military intelligence and security assessments. Relies on operational reports and internal monitoring systems. No known information about methodology behind estimates.	~30,000
London School of Hygiene & Tropical Medicine (LSHTM) [5]	Oct 7, 2023 - June 30, 2024	Three-list capture-recapture analysis using: (1) MoH hospital morgue data, (2) MoH online survey, and (3) Social Media obituaries. Statistical modelling to identify overlap and estimate total deaths.	64,260 direct deaths (95% CI: 63,600 - 86,800)
Gaza Mortality Survey (GMS) [6].	Oct 7, 2023 - Jan 5, 2025	Household survey of 2,000 representative households covering 9,729 individuals. Used stratified two-stage cluster sampling across enumeration areas, built-up shelters, and tent gatherings.	75,200 direct deaths (95% CI: 63,600-86,800)
Armed Conflict Location & Event Data Project (ACLED)	Oct 7, 2023 - June 20, 2025	Media monitoring, reports from civil society organizations, and government sources. Event-based documentation with geographic specificity.	63,852
Palestine Datasets Platform (PDP)	Oct 7, 2023 – June 2025	Aggregation of multiple data sources, including local reports, casualty documentation efforts, and cross-referencing with other monitoring systems.	56,311

Table 1: Data Collection Methods by Source

	Multi-Family Cohabitation			
% Zero-Survivor Households	**0% MFC**	**25% MFC**	**50% MFC**	**75% MFC**
0.5% (1,900)	77,455 -104,610	79,033 – 106,188	80,610 – 107,765	82,188 - 110,920
1.0% (3,800)	86,760 -113,915	89,915 – 117,070	93,070 – 120,230	99,380 - 126,540
2.0% (7,600)	105,370-132,525	111,680 – 138,835	118,000 – 145, 160	124,310-151,470
3.0% (11,400)	123,980-151,135	133,445 - 160,600	142,930 – 170,090	152,395-179,555
4.0% (15,200)	142,590-169,745	155,210 - 182,365	167,830 – 194,985	180,450-207,605
5.0% (19,000)	161,200-188,355	176,975 - 204,130	192,790 – 219,950	208,565-235,725
Each cell shows the adjusted 95% confidence interval for total deaths, assuming systematic exclusion of zero-survivor households. Formula: Adjusted CI = Base CI + Additional Deaths, where additional deaths = Homes × [(1 – MF%) + MF% × 2] × 4.9				

Table 2: Adjusted Confidence Intervals by Household Loss x Multi-Family Cohabitation (95% CI)

Accurately recording the complete magnitude of destruction serves dual purposes: preserving historical truth while honouring all victims' suffering and fulfilling essential legal obligations under international humanitarian law.

References

1. World Health Organization. Health Cluster Bulletin: Gaza Strip. Regular situation reports citing Gaza MoH data, 2023-2025.
2. Stamatopoulou-Robbins, S. (2024). The Human Toll: Indirect Deaths from War in Gaza and West Bank, October 7, 2023 Forward. *Watson Institute for International & Public Affairs, Brown University, 7*.
3. Airwars. Gaza Casualty Assessment: Methodological Review of Gaza Ministry of Health Figures. *Airwars Report*, May 2025.
4. United Nations Office for the Coordination of Humanitarian Affairs (OCHA). (2025). Humanitarian Situation Update #297 | Gaza Strip.
5. Jamaluddine, Z., Abukmail, H., Aly, S., Campbell, O. M., & Checchi, F. (2025). Traumatic injury mortality in the Gaza Strip from Oct 7, 2023, to June 30, 2024: a capture–recapture analysis. *The Lancet, 405*(10477), 469-477.
6. Spagat M, Guha-Sapir D, Abu-Raddad LJ, et al. The Gaza Mortality Survey: A population-based assessment of mortality in the Gaza Strip, October 7, 2023 - January 5, 2025. *medRxiv* 2025.
7. Palestinian Central Bureau of Statistics (PCBS). (2023). Population Density Report: Gaza Strip 2023. PCBS Statistical Yearbook.
8. United Nations Satellite Centre (UNOSAT). (2025). Damage assessment of the Gaza Strip. February 2024. OCHR (2025) Reported impact snapshot | Gaza Strip.
9. United Nations Relief and Works Agency (UNRWA). Occupied Palestinian territory. (2015). Emergency Appeal. Annual Report.
10. New Arab. 'They want to erase us': Israel wipes out over 2,200 Palestinian families in Gaza (2025).
11. UN Office of the High Commissioner for Human Rights (OHCHR). Update Report on the Situation in Gaza. (2024).
12. Khatib, R., McKee, M., & Yusuf, S. (2024). Counting the dead in Gaza: difficult but essential. *The Lancet, 404*(10449), 237-238.
13. Sah, S. (2024). Infectious diseases are being allowed to run rampant in Gaza. *bmj, 387*.
14. Jamaluddine Z, Chen Z, Abukmail H, et al. Crisis in Gaza: scenario-based health impact projections. Report one: Feb 7 to Aug 6, 2024.
15. Hagopian, A., Flaxman, A. D., Takaro, T. K., Esa Al Shatari, S. A., Rajaratnam, J., Becker, S., ... & Burnham, G. (2013). 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 medicine, 10*(10), e1001533.
16. Verpoorten, M. (2020). How many died in Rwanda?. *Journal of Genocide Research, 22*(1), 94-103.
17. Onder, H., Hayati, F., Sayeed, H. I., Dajani, I. K., Mousley, P. J., Pande, A., ... & Le Borgne, E. (2017). The Toll of war: the economic and social consequences of the conflict in Syria.
18. Moyer, J. D., Bohl, D., Hanna, T., Mapes, B. R., & Rafa, M. (2019). Assessing the impact of war on development in Yemen. *Sana'a: United Nations Development Programme (UNDP), 9*.

Copyright: *©2025 Ron Roberts, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*