Excess mortality in Gaza: Oct 7–26, 2023

Amid the ongoing war in Gaza, the accuracy of mortality reports from the Palestinian Ministry of Health (MoH) has been questioned.[1] We analysed an individual list of 7028 decedents released by the Palestinian MoH[2] covering the period from Oct 7 to 1500 h on Oct 26, 2023, and which, according to the source,[2] only featured individuals brought to health facilities and morgues. This list included national identification numbers, names, and ages, but no cause, date, or location of death.

Our initial examination suggested reasonable data quality. We identified one duplicated identification number, one instance of implausible age, and 281 deaths missing an identification number, altogether comprising 4·0% of the records, which we excluded from further analyses. However, we retained six records with identical names but different ages, because this is plausible given Palestinian naming customs. Identification numbers were highly correlated with age (figure A), with three diagonal correlation patterns suggestive of sequential identification numbers being assigned to people aged 0–29 years (birth years 1994–2023), 30–40 years (1983–93), and 41–50 years (1973–82), and three horizontal patterns possibly representing an earlier, cross-sectional registration system (people aged ≥50 years) and two catch-up registrations since then. We consider it implausible that these patterns would arise from data fabrication. Children younger than 18 years, women aged 18–59 years, and both men and women aged 60 years or older (groups that probably include few combatants) constituted 68·1% of analysable deaths (4594/6745; figure B).

We computed annualised age-specific and sex-specific mortality rates over the 20-day analysis period using UN Population Fund[3] projections from Aug 24, 2023, of the 2017 census (the projection assumes 2% under-enumeration, and a 33% decline in fertility and 50% decline in infant mortality between 2017 and 2023). Mortality increased with age (figure C), with a distinct peak among men aged 30–34 years, possibly reflecting combatant or civilian exposures (eg, first responders at bomb sites, journalists, and people going out to seek water and food for their families). Mortality rates among men and women aged 20–59 years based on Palestinian MoH data were broadly similar to the crude mortality rate in the same age bracket among UN Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) employees (teachers, health-care workers, and other staff),[4,5] as reported independently by UNRWA staff in Gaza to their headquarters in Jordan, and to the crude mortality rate among health-care workers, as published by the Palestinian MoH and WHO.[6–8] These comparisons further corroborate the validity of the Palestinian MoH dataset. Similarly, satellite imagery-based estimates conducted by Sky News analysis of NASA Open Street Maps of the percentage of buildings damaged in Gaza mirror those issued by the Gaza Ministry of Public Works (7% according to both sources).[10]

We used the age-specific mortality rates in 2021 in Gaza[3,9] (a year with 2 weeks of conflict and the COVID-19 pandemic affecting older people especially) as an approximate counterfactual (ie, baseline) mortality level and calculated mortality rate ratios (figure C). We showed high excess mortality among all age groups during the Oct 7–26, 2023 period, including among children younger than 1 year, for whom the mortality rate ratio (war to baseline) was 3·7.

The death reporting system currently being used by the Palestinian MoH was assessed in 2021, 2 years before the current war, and was found to under-report mortality by 13%.[9] Subsequently, steps were taken to improve its completeness.[11] Our use of this source as the 2021 counterfactual rate might have underestimated actual mortality at the time. Nevertheless, it is plausible that the current Palestinian MoH source also under-reports mortality because of the direct effect of the war on data capture and reporting, for example by omitting people whose bodies could not be recovered or brought to morgues (approximately 1000 by one account as reported to the Palestinian MoH by families and community),[12] and because of a time lag between death and recording, especially on the day of the report's release. Furthermore, Palestinian MoH data did not differentiate between combatant and civilian deaths or whether deaths were caused directly (eg, trauma injuries) or indirectly (eg, through service disruptions or inability to access health care) by the war. Date and location details were not published. Linking published names and identification numbers with those from UNRWA health service use or school attendance records or with official examinations results (*tawjihi*) would verify whether the names and identification numbers had previously been recorded. Triangulating the numbers of deaths against other conflict-sensitive indicators, for example reported airstrikes and social media data, could be used to enhance the estimation of the number of deaths and confidence in their validity.

Our simple analysis indicates high excess mortality among Gazan population groups that are likely to be largely civilian, including humanitarian and health-care workers, indicating a substantial number of Palestinians killed during this period. Assessments of Palestinian MoH data validity in the 2014 conflict had shown them to be accurate,[1] and we saw no obvious reason to doubt the validity of the data between Oct 7 and Oct 26, 2023. As the war protracts and a ground operation sets in, it is likely that excess mortality from indirect causes (eg, treatment

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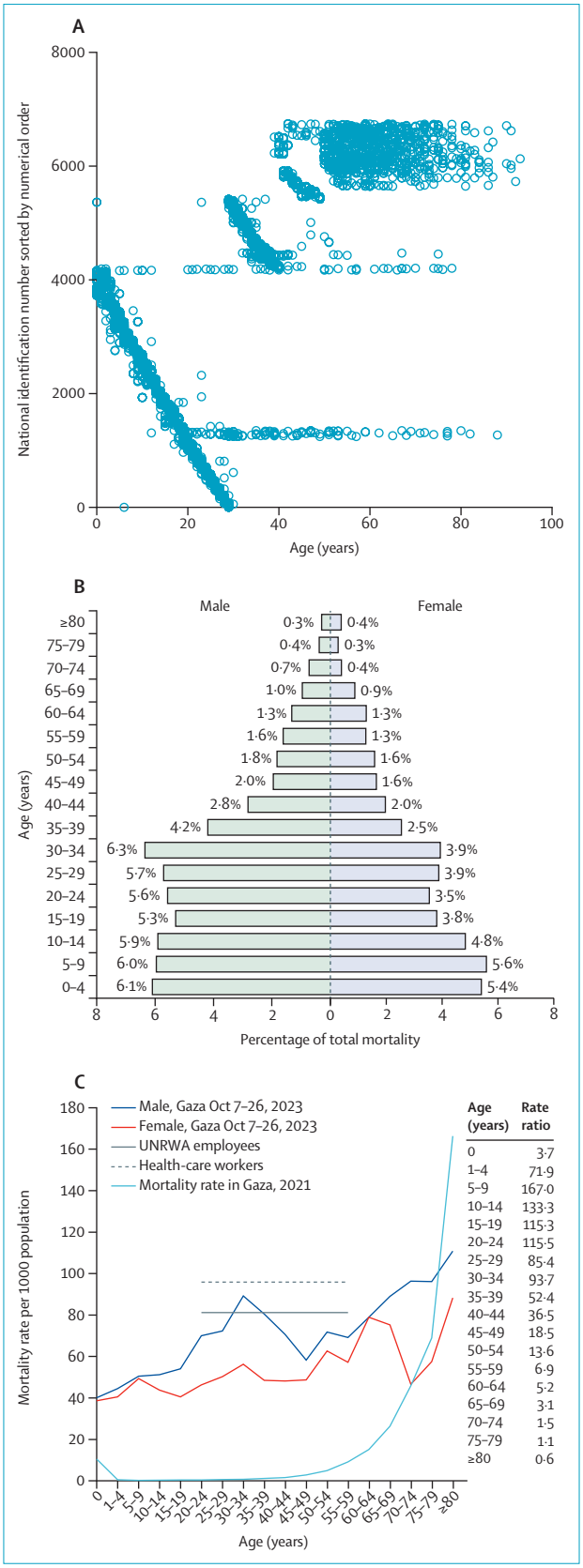

Figure: **Palestinian MoH deaths in Gaza between Oct 7 and Oct 26, 2023**
(A) Correlation of national identification number, ordered from smallest to largest, by age. (B) Pyramid of deaths by sex and age. (C) Annualised age-specific and sex-specific mortality rates per 1000 population for the Gaza population between Oct 7 and Oct 26, UNRWA employees, health-care workers, and the Gaza population in 2021, as well as the rate ratio of mortality rates between Oct 7 and Oct 26, 2023 compared with mortality rates in 2021. Annualised male and female mortality rates were calculated using mortality data from the Palestinian MoH for Gaza between Oct 7 and Oct 26, 2023,[2] and the UN Population Fund's projections for the 2023 population of Gaza based on the 2017 census.[3] Annualised UNRWA mortality rates were calculated on the basis of 53 UNRWA employees killed by Oct 26[4] and a total of 11 908 UNRWA employees in Gaza in 2022.[5] Annualised health-care worker mortality rates were calculated on the basis of the Palestinian MoH figures of 116 health-care workers killed by Oct 30,[6] and an estimated 18 404 health-care workers in Gaza.[7,8] The mortality rate ratio by age group compares annualised mortality rates between Oct 7 and Oct 26, 2023, to mortality rates in Gaza in 2021.[9] MoH=Ministry of Health. UNRWA=UN Relief and Works Agency for Palestine Refugees in the Near East.

interruptions for non-communicable diseases and unmanaged obstetric complications) will increasingly compound trauma injury deaths. Concurrently, Palestinian MoH information systems might degrade, causing further under-reporting or other biases. Robust, verifiable mortality tracking will be essential to inform humanitarian and political decisions and document their ultimate consequences.

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