

Supplementary Table 1. Excess deaths caused by famines in the twentieth century

Year	Region/country	Excess mortality (1,000s) by Devereux 2000¹	Excess mortality (1,000s) by alternative sources²⁻⁶
1903-06	Nigeria (Hausaland)	5	5
1906-07	Tanzania (south)	37.5	37.5
1913-14	West Africa (Sahel)	125	125
1914-18	Poland		300
1914-18	Africa		400
1914-19	Austro-Hungary		300
1915-18	Balkans		1000
1915-18	Persia/Iran		500
1916-18	Ottoman Empire		1,500-2,000
1916-19	Germany		500
1917-19	Tanzania (central)	30	30
1918	Italy		30
1918	Finland		8
1920-21	China (Gansu, Shaanxi)	500	500
1921-22	Soviet Union	9,000	8,000
1927	China (northwest)	3,000-6,000	3,000-6,000
1929	China (Hunan)	2,000	2000
1932-33	Soviet Union	7,000-8,000	2,600-3,900
1936	China		1,000-5,000
1939-45	Poland		900
1939-45	France		100
1940-45	Soviet Union		7,000-8,000
1943	China (Henan)	5,000	5,000
1943	India (Bengal)	2,100-3,000	2500
1942-44	Greece		300
1942-45	Java		1900
1944-45	Vietnam		1,000
1945-46	Austria		100
1939-46	Germany		200
1943-44	Rwanda	300	30
1944-45	Netherlands	10	10-30
1946-47	Soviet Union	2,000	1,000
1946-48	Cape Verde		30
1957-58	Ethiopia (Tigray)	100	397
1958-62	China	30,000-33,000	30,000-33,000
1966	Ethiopia (Wollo)	45-60	45-60
1967-70	Nigeria (Biafra)	1000	50-1,000

1969-74	West Africa (Sahel)	101	101
1972-73	India (Maharashtra)	130	130
1972-75	Ethiopia (Wollo/ Tigray)	200-500	200-500
1974-75	Somalia	20	20
1974	Bangladesh	1500	500
1979	Cambodia	1,500-2,000	500-800
1980-81	Uganda (Karamoja)	30	30
1982-85	Mozambique	100	100
1983-85	Ethiopia	590-1,000	590-1,000
1984-85	Sudan (Darfur/Kordofan)	250	100
1988	Sudan (south)	250	250
1991-93	Somalia	300-500	300
1995-99	North Korea	2,800-3,500	600-1,000
1998	Sudan (Bahr el Ghazal)	70	70
Total		70,000 to 80,000	81,000 to 92,000

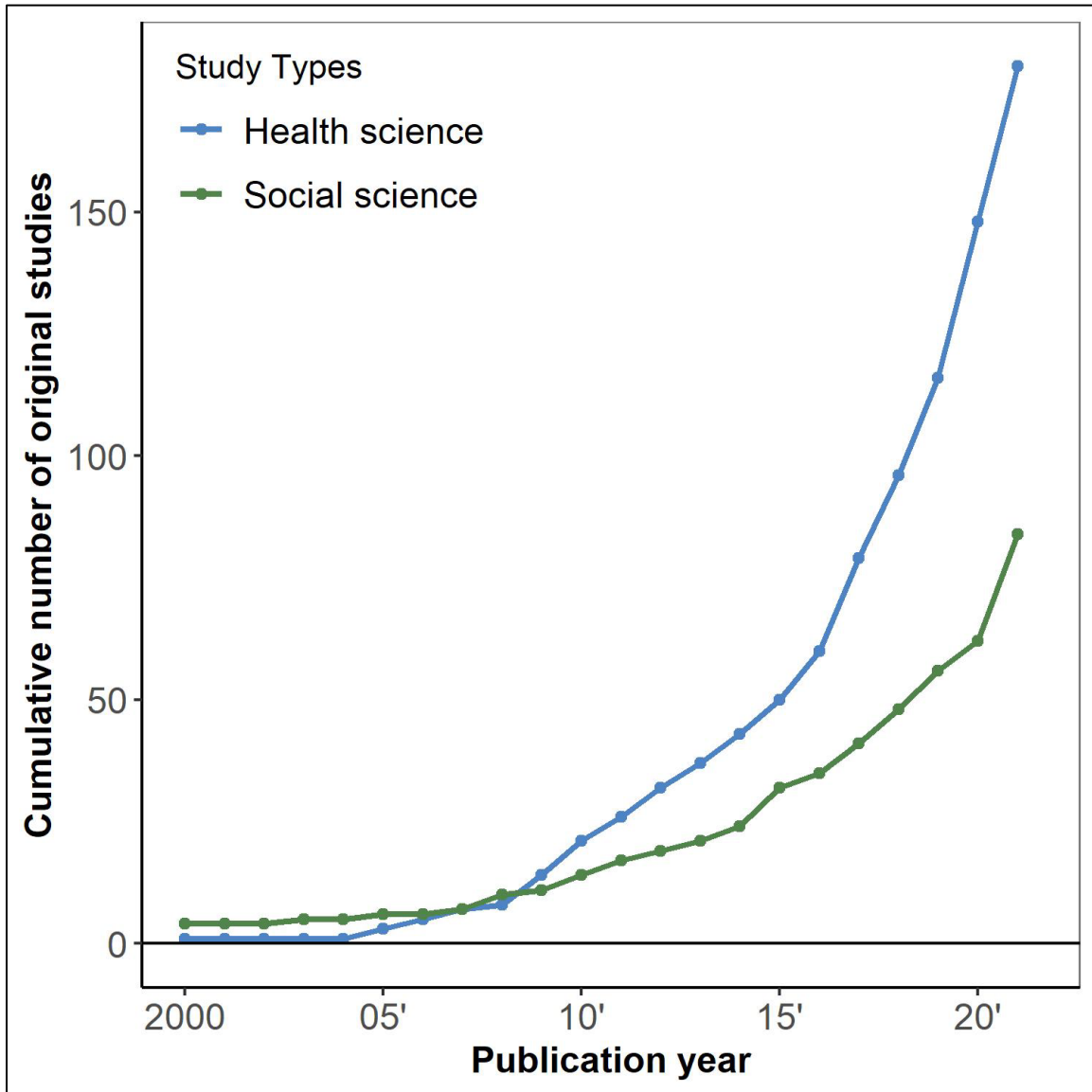
Supplementary Table 2. Excess Deaths and Exposed Births to the Ukrainian famine of 1932-33, the Dutch famine of 1944-45, and the Chinese famine of 1959-61

First author and publication year	Excess deaths during the famine	Births exposed to the famine prenatally	Data source	Methods and assumptions
The Ukrainian famine of 1932-33				
Vallin 2002 ⁷	4.6 million	NR	Population census in 1926, 1939, and 1959	Estimates were made through the reconstruction of annual demographic changes.
Meslé 2008 ⁸	2.6 million	0.6 million	Life tables in 1926 and 1939	Estimates were made by applying the probabilities of survival if there had been no crisis affect.
Rudnytskyi 2015 ⁹	3.9 million	0.6 million	Population census in 1926, 1927, and 1939	Adjustments were made by correcting population data and adding migration data.
The Dutch famine of 1944-45				
Banning 1946 ¹⁰	10,000	NR	Death data in seven towns in seven towns in the western Netherlands	The number of excess deaths was doubled by assuming the remaining towns would contribute to a similar number of famine deaths.
Burger 1948 ¹¹	>10,000	NR	Weekly data on the total number of deaths for Amsterdam, Rotterdam, and The Hague	The estimates were made by summarizing weekly data.
Stein 1975 ¹²	NR	13,000	Population birth records in the western Netherlands in the 1940s	The number of births exposed prenatally to the famine was documented in western Netherlands.
Trienekens 1985 ¹³	16,000	NR	Amsterdam death rates in 1945	Trienekens assumed that the mortality pattern in Amsterdam would be similar to other places in the west.
Ekamper 2017 ⁶	20,000-30,000	NR	National cause of death registry	The difference in difference methods has been applied.
The Chinese famine of 1959-61				
Aird 1982 ¹⁴	Over 23 million	NR	Population census in 1953 and 1964	There were a 5-million decrease in population comparing 1961 to 1957 and an estimate of over 18 million population growth in 1958 and 1959, which led to an estimate of over 23 million excess deaths in 1960-61.
Jin 1993 ¹⁵	Over 40 million	NR	Population census (year not specified)	Excess deaths was estimated by a formula: population size at the end of the year-(1+ birth rate-natural death rate)*population size at the

				end of the previous year+underreported population size.
Ashton et al. 1984 ⁴	30 million	NR	Population census in 1964; Statistical yearbook of China, 1983	Excess deaths were estimated as the difference between estimated actual deaths and deaths in absence of the famine.
Peng 1987 ¹⁶	23 million	NR	Local population census from provinces published in 1980s; Statistical yearbook of China, 1983	Estimates of excess death were made for 14 provinces (14.2 million) and then extrapolated to the whole country.
Cao 2005 ¹⁷	32.5 million	30-40 million	Population census in 1953 and 1964; local archives	Local archives can be used to minimize bias in population census.

Footnote: NR: Not reported

Supplementary Figure 1. The cumulative number of original research articles on the Great Chinese Famine of 1959-61



Footnote: Five electronic English- and Chinese-language databases were searched for Chinese famine studies on health outcomes from inception to September, 2022: PubMed, EMBASE, Web of Science, Wanfang Data, and the Chinese National Knowledge Infrastructure (CNKI). The following broad search terms in English and Chinese were used to identify related studies, including journal articles, degree theses, and conference manuscripts: (([China OR Chinese] AND (famine OR undernutrition OR starvation OR malnutrition)) OR great leap forward OR great famine). Studies meeting the following criteria were included: (a) the study was original research; (b) the Chinese famine of 1959–1961 was the exposure of interest; (c) clear information about the study design and results was provided. Comments, letters and reviews were not included. Review articles and reference lists were screened for additional relevant studies.

References

1. Devereux S. Famine in the twentieth century. *IDS Working Paper* 2000; (105).
2. Ó Gráda C. Famine: a short history. New Jersey: Princeton University Press; 2009.
3. Ó Gráda C. The Hidden Victims: Civilian Casualties of the Two World Wars. New Jersey: Princeton University Press; 2024.
4. Ashton B, Hill K, Piazza A, Zeitz R. Famine in China, 1958-61. *Popul Dev Rev* 1984; 613-45.
5. Thibon C. Famine yesterday and today in Burundi. In: Dyson T, Ó Gráda C, eds. Famine demography: perspectives from the past and present: OUP Oxford; 2002.
6. Ekamper P, Bijwaard G, van Poppel F, Lumey LH. War-related excess mortality in The Netherlands, 1944-45: New estimates of famine- and non-famine-related deaths from national death records. *Hist Methods* 2017; **50**(2): 113-28.
7. Vallin J, Meslé F, Adamets S, Pyrozhev S. A new estimate of Ukrainian population losses during the crises of the 1930s and 1940s. *Popul Stud (Camb)* 2002; **56**(3): 249-63.
8. Meslé F, Vallin J, Andreev E. Demographic consequences of the great famine: then and now. *Harv Ukr Stud* 2008; **30**(1/4): 217-41.
9. Rudnytskyi O, Levchuk N, Wolowyna O, Shevchuk P, Kovbasiuk A. Demography of a man-made human catastrophe: The case of massive famine in Ukraine 1932-1933. *Can Stud Popul* 2015; **42**(1-2): 53-80.
10. Banning C. Food shortage and public health, first half of 1945. *Annals Am Acad Pol & Soc Sci* 1946; **245**(1): 93-110.
11. Burger GCE, Drummond JCS, H.R. Malnutrition and starvation in western Netherlands: September 1944-July 1945. General State Print Office. 1948.
12. Stein Z, Susser M, Saenger G, Marolla F. Famine and human development: The Dutch hunger winter of 1944-1945. New York, NY, US: Oxford University Press; 1975.
13. Trienekens GMT. Tussen ons volk en de honger: de voedselvoorziening, 1940-1945: Wageningen University and Research; 1985.
14. Aird JS. Population studies and population policy in China. *Popul Dev Rev* 1982: 267-97.
15. Jin H. Memorandum on the 'Three-year Natural Disaster' (in Chinese). *Society* 1993; (4-5): 13-22.
16. Peng X. Demographic consequences of the Great Leap Forward in China's provinces. *Popul Dev Rev* 1987: 639-70.
17. Cao S. The deaths of China's population and its root cause during 1959-1961 (in Chinese). *Popul Sci Chin* 2005; (1): 3.