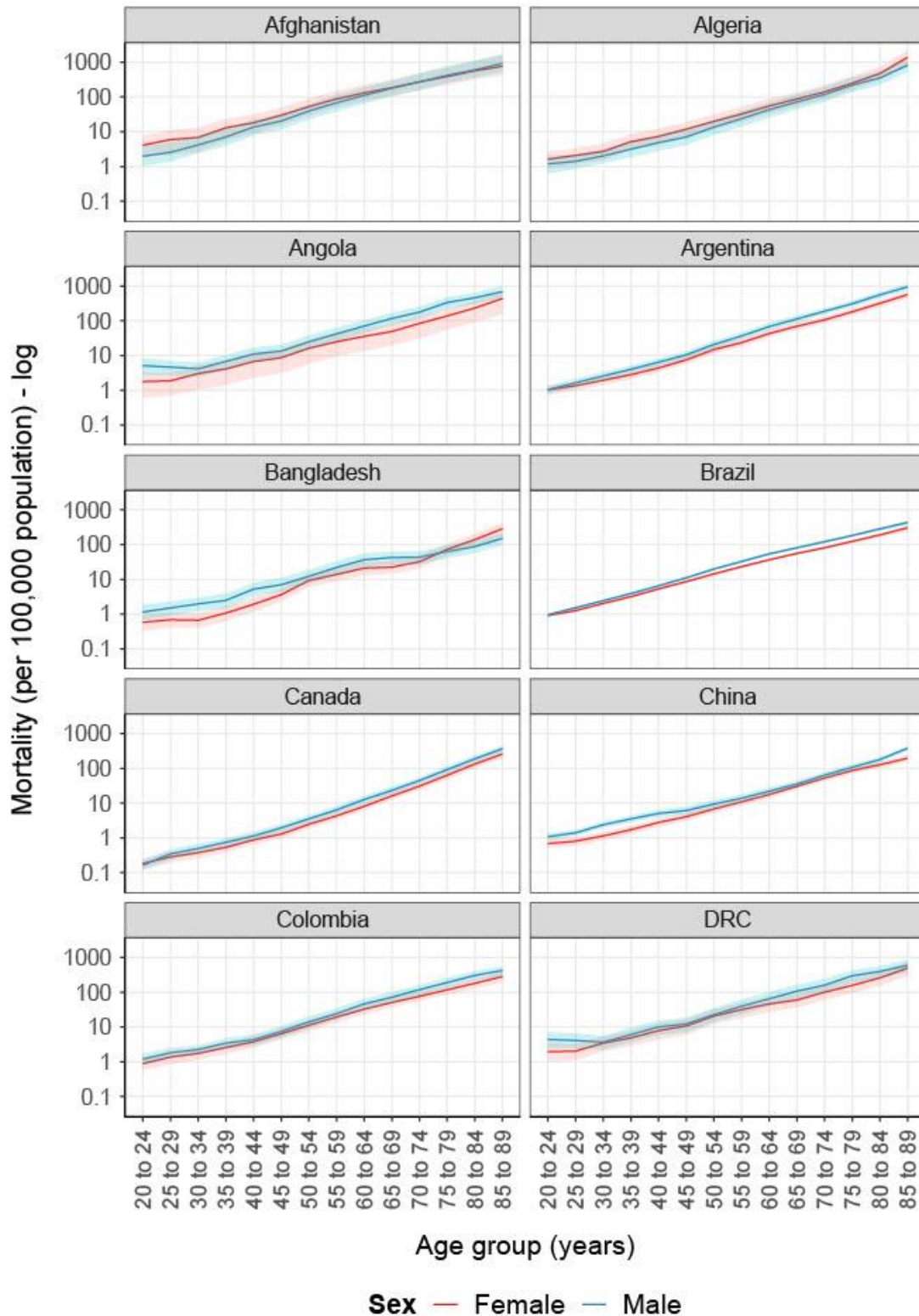
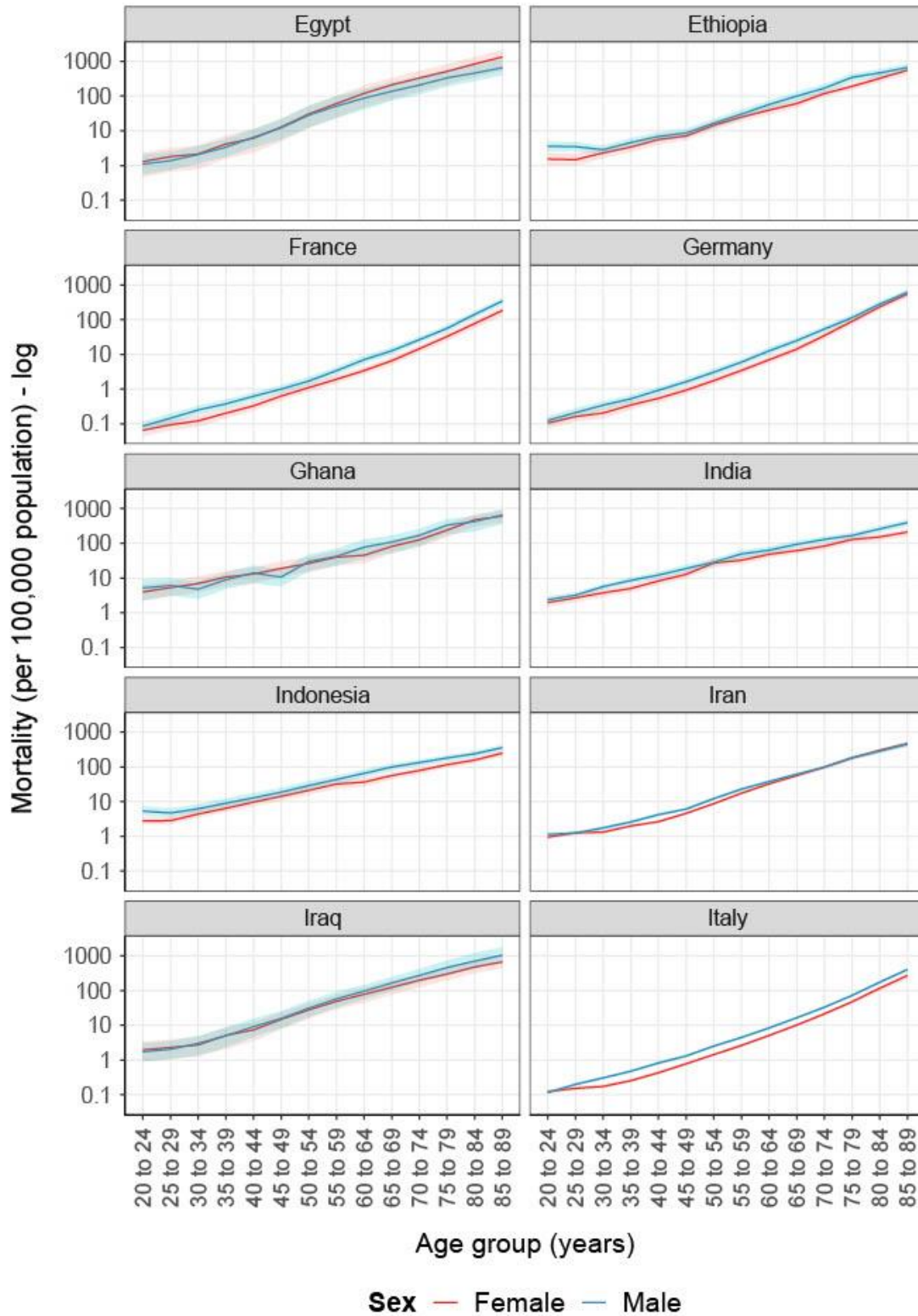
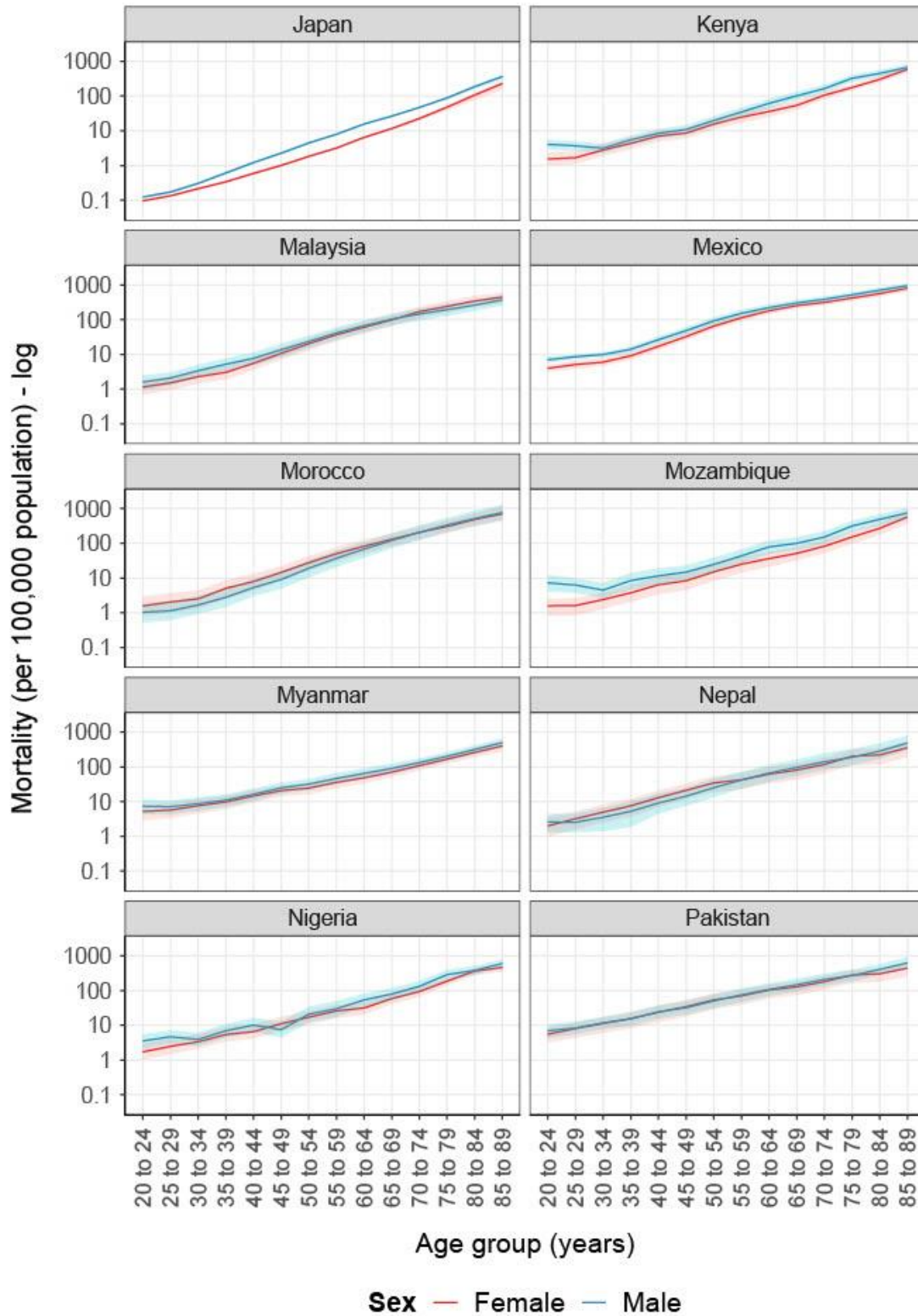


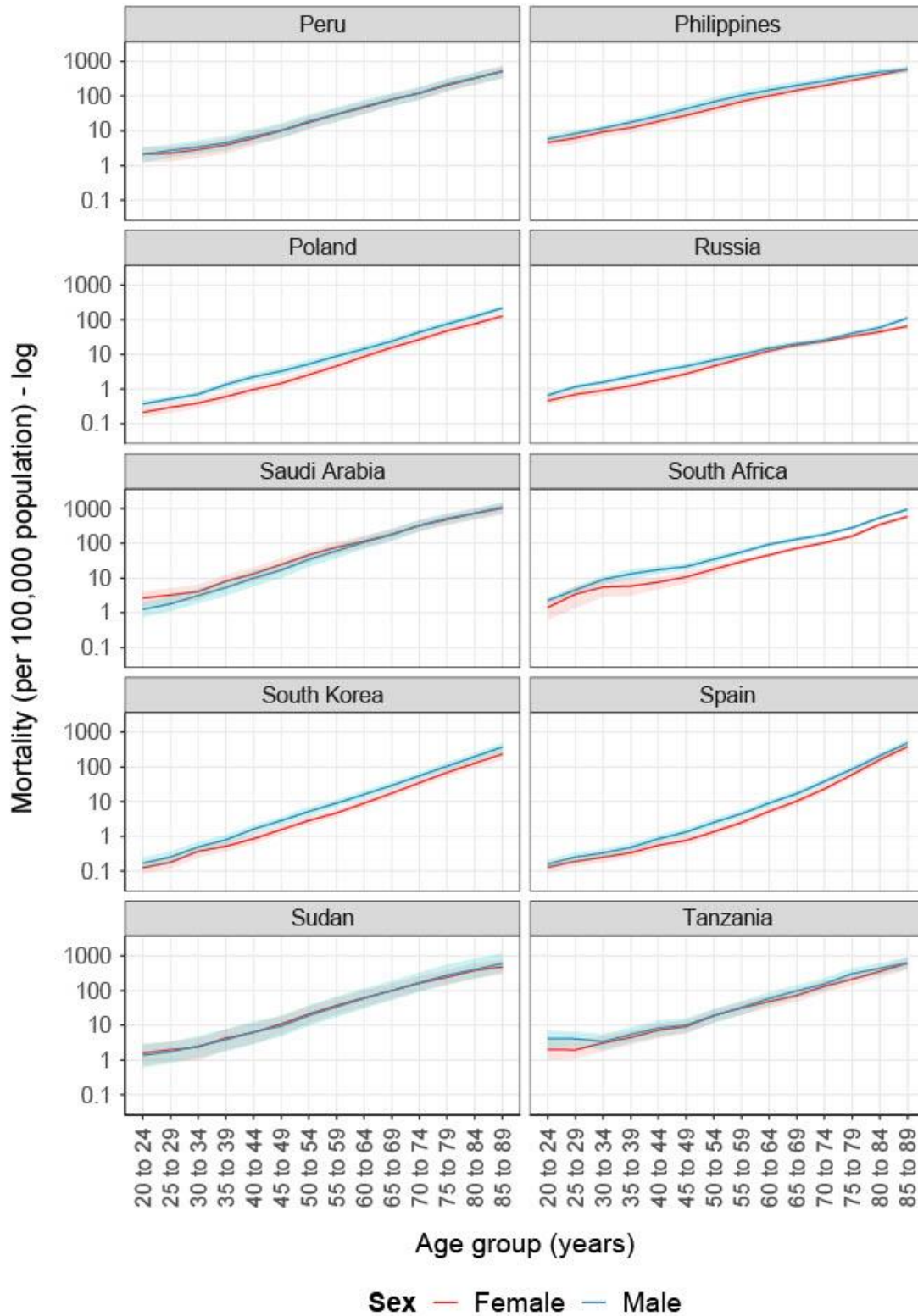
Figure S2 Global sex-specific age-standardized mortality rates (per 100,000 population) for chronic kidney disease (CKD), ischemic heart disease (IHD) and stroke in 1990, 2000, 2010 and 2019.

Figure S3 Sex-specific chronic kidney disease (CKD) mortality rates (per 100,000 population) in 2019, plotted by age group, for each of the 50 selected countries.









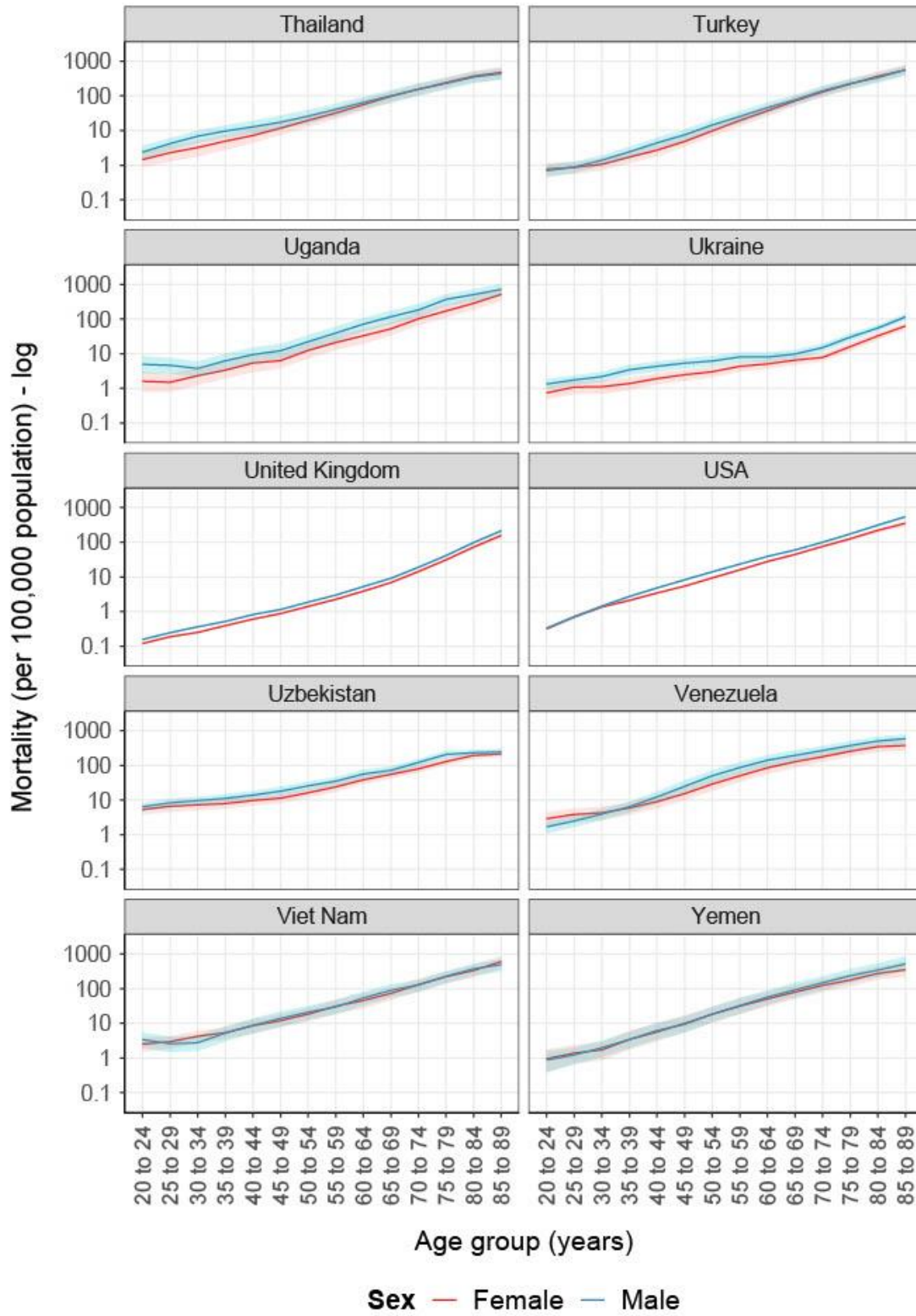


Table S1 The International Classification of Diseases and Injuries (ICD)-9 and ICD-10 codes used in the Global Burden of Disease (GBD) Study to ascertain different categories of chronic kidney disease (CKD) aetiology, ischemic heart disease (IHD) and stroke.¹

| Cause & aetiology | ICD 9 Codes | ICD 10 Codes |
|--------------------------|---|--|
| CKD | 249.4-249.41, 250.4-250.49, 285.21, 403-404.93, 581-587.9, 753.0-753.4, 753.6-753.9, V13.03-V13.09, V18.6, V18.69, V42.0, V45.1-V45.12, V45.73, V56-V56.8, V59.4, V81.5-V81.6 | D63.1, E08.2-E08.29, E10.2-E10.29, E11.2-E11.29, E12.2, E13.2-E13.29, E14.2, I12-I13.9, N02-N08.8, N15.0, N17-N19, Q60-Q63.2, Q63.8-Q63.9, Q64.2-Q64.9, Z49-Z49.32, Z52.4, Z99.2 |
| Type 1 diabetes mellitus | 250.4, 250.41, 250.43-250.49 | E10.2-E10.29 |
| Type 2 diabetes mellitus | 250.40, 250.42 | E11.2-E11.29 |
| Hypertension | 403-404.93 | I12-I13.9 |
| Glomerulonephritis | 581-583.9 | N03-N06.9, N08-N08.8 |
| Other | 753.0-753.4, 753.6-753.9 | N02-N02.9, N07-N07.9, Q60-Q63.2, Q63.8-Q63.9, Q64.2-Q64.9 |
| IHD | 410-414.9, V17.3 | I20-I21.6, I21.9-I25.9, Z82.4-Z82.49 |
| Stroke | 430-439.6, V12.54, V17.1 | G45-G46.8, I60-I62, I62.9-I64, I64.1, I65-I69.998, Z82.3 |

Table S2 Changes in age-standardized chronic kidney disease (CKD) mortality rates (per 100,000 population) for males and females in each of the 50 countries. Numbers in parentheses are 95% Uncertainty Intervals (UIs).

| Country | Female mortality rate (per 100,000 population) | | | Male mortality rate (per 100,000 population) | | |
|---------------|--|-------------------------|-------------------|--|-------------------------|-------------------|
| | 1990 | 2019 | Percentage change | 1990 | 2019 | Percentage change |
| Global | 13.9 (12.9-14.8) | 15.8 (14.2-17.1) | 13.7 | 19.6 (18.2-21.2) | 21.6 (19.9-23.3) | 10.4 |
| Afghanistan | 54.6 (39.8-87.8) | 50.1 (35.2-84.9) | -8.3 | 56.7 (40.4-83.7) | 48.5 (34.1-75.1) | -14.4 |
| Algeria | 41.6 (29.9-66.9) | 38.3 (28.6-54.3) | -8.0 | 36.5 (28.6-47.4) | 26.8 (20.5-35.7) | -26.6 |
| Angola | 17.4 (6.7-25.5) | 18. (7.8-25.2) | 3.6 | 37.9 (26.9-46.3) | 33.9 (27.1-41.2) | -10.5 |
| Argentina | 18.3 (16.9-19.8) | 22.9 (20.3-25.3) | 24.6 | 31. (29.1-32.8) | 36.7 (33.6-39.8) | 18.5 |
| Bangladesh | 11.3 (7.2-14.7) | 10.4 (8.-13.1) | -7.6 | 15.8 (10.7-19.4) | 11.5 (9.1-14.4) | -27.1 |
| Brazil | 16.8 (15.6-17.7) | 15.8 (14.1-17.) | -6.1 | 22.8 (21.5-23.8) | 22.4 (20.5-23.7) | -2.1 |
| Canada | 7.1 (6.2-7.7) | 8.2 (6.9-9.4) | 16.4 | 10.8 (9.8-11.5) | 11.6 (10.4-12.8) | 8.0 |
| China | 12.1 (10.2-14.) | 9.6 (7.8-11.4) | -20.6 | 14.8 (12.6-17.4) | 13.9 (11.6-16.6) | -6.1 |
| Colombia | 19.8 (18.1-21.3) | 14.4 (11.1-18.1) | -27.3 | 22.7 (21.1-24.1) | 21.4 (16.5-27.2) | -6.0 |
| DRC | 23.5 (18.7-28.4) | 21. (15.1-27.4) | -10.5 | 37.7 (31.3-44.6) | 30.2 (23.5-37.1) | -20.0 |
| Egypt | 44.5 (25.5-58.9) | 57.5 (26.8-81.2) | 29.3 | 34.2 (26.9-44.8) | 36. (23.2-58.5) | 5.2 |
| Ethiopia | 32.6 (23.8-41.3) | 21.5 (18.-25.2) | -34.0 | 46.3 (36.8-56.8) | 30.5 (24.7-37.3) | -34.1 |
| France | 6.2 (5.4-6.8) | 5.1 (4.-5.9) | -17.8 | 11.9 (10.8-12.8) | 9.1 (7.8-10.1) | -23.0 |
| Germany | 6.3 (5.8-6.7) | 13.4 (11.3-14.9) | 113.2 | 8.5 (8.-9.) | 16.6 (14.7-18.1) | 94.7 |
| Ghana | 30.1 (21.4-44.4) | 30. (21.8-37.6) | -0.5 | 25.5 (19.2-31.9) | 34.2 (21.6-44.6) | 33.9 |
| India | 17.9 (13.5-21.6) | 16.9 (13.6-20.6) | -5.3 | 27.4 (22.8-33.3) | 25.5 (20.9-30.6) | -7.2 |
| Indonesia | 19. (16.2-22.3) | 16.9 (13.7-20.1) | -11.2 | 23.6 (20.4-27.2) | 25.8 (21.1-30.7) | 9.5 |
| Iran | 22.6 (19.6-31.5) | 19.4 (17.3-20.9) | -14.3 | 25.6 (22.5-28.4) | 20.2 (18.-22.) | -21.2 |
| Iraq | 44.6 (33.5-66.3) | 35.3 (27.6-45.8) | -20.8 | 48.4 (37.3-68.8) | 49.9 (36.9-72.5) | 3.1 |
| Italy | 8.1 (7.5-8.5) | 7.2 (6.-8.) | -11.3 | 12.7 (11.9-13.1) | 10.9 (9.5-11.6) | -14.3 |
| Japan | 10.9 (9.6-11.6) | 6.9 (5.2-7.9) | -36.9 | 16. (14.9-16.6) | 11.6 (10.-12.5) | -27.6 |
| Kenya | 16.9 (14.2-21.3) | 21. (16.7-26.2) | 24.5 | 25.2 (19.7-33.) | 30.8 (23.9-38.7) | 22.2 |
| Malaysia | 21.9 (19.4-24.9) | 26.6 (21.1-32.8) | 21.5 | 27.8 (24.7-31.3) | 24.5 (19.1-30.5) | -11.9 |
| Mexico | 31.5 (29.3-32.9) | 56.8 (47.5-68.2) | 80.6 | 30. (28.3-31.1) | 71.5 (59.1-86.7) | 138.3 |
| Morocco | 27.8 (22.2-43.3) | 36.3 (27.4-49.) | 30.5 | 31.7 (24.7-45.3) | 35.4 (25.1-50.2) | 11.9 |
| Mozambique | 18.1 (14.7-22.2) | 19.8 (15.-26.) | 9.2 | 28.7 (22.1-38.5) | 34.7 (27.8-42.3) | 21.0 |
| Myanmar | 30.4 (23.2-41.) | 24.5 (20.6-30.5) | -19.5 | 31.8 (23.5-41.5) | 30.2 (25.8-36.) | -4.9 |
| Nepal | 17.2 (10.9-23.1) | 24.2 (14.8-31.9) | 40.4 | 19.4 (13.8-29.5) | 26.1 (18.1-40.8) | 34.3 |
| Nigeria | 26. (19.5-35.8) | 21.6 (16.-27.9) | -16.8 | 29.8 (22.4-39.6) | 28.3 (20.4-38.9) | -5.0 |
| Pakistan | 24.1 (14.-31.4) | 37.5 (23.4-50.7) | 55.5 | 28.1 (19.6-45.) | 42.3 (30.3-59.3) | 50.6 |
| Peru | 22.4 (19.5-25.7) | 24.6 (18.3-31.9) | 9.8 | 25.9 (22.4-29.7) | 24.8 (18.-32.6) | -4.3 |
| Philippines | 36.3 (32.1-41.3) | 39.4 (31.1-48.9) | 8.6 | 40.3 (35.-46.8) | 50.9 (39.4-63.9) | 26.4 |
| Poland | 8.5 (8.-8.7) | 5.2 (4.1-6.6) | -38.7 | 14.2 (13.7-14.6) | 8.7 (7.2-10.7) | -38.6 |
| South Korea | 9.5 (8.7-10.4) | 7.8 (6.4-9.) | -17.9 | 17.4 (16.2-19.3) | 12.5 (11.-14.2) | -28.0 |
| Russia | 4.8 (4.6-5.1) | 4.6 (3.8-5.4) | -4.6 | 7. (6.7-7.2) | 6.3 (5.3-7.4) | -10.0 |
| Saudi Arabia | 43.5 (34.6-54.4) | 53.5 (40.3-68.1) | 22.8 | 52.4 (39.2-67.2) | 52.7 (42.4-64.6) | 0.6 |

| | | | | | | |
|--------------|------------------|------------------|-------|------------------|------------------|-------|
| South Africa | 17.5 (15.5-20.1) | 24.3 (21.4-26.9) | 39.1 | 28.9 (26.-33.2) | 41.8 (38.2-45.2) | 44.3 |
| Spain | 12.6 (11.1-13.8) | 9.8 (7.9-11.3) | -22.4 | 18.5 (16.9-19.8) | 13. (11.5-14.5) | -29.4 |
| Sudan | 26.8 (19.8-40.7) | 27.4 (18.-40.7) | 2.0 | 30.4 (23.2-45.5) | 29.4 (19.1-51.8) | -3.4 |
| Thailand | 22.5 (19.1-26.5) | 27.1 (20.4-35.3) | 20.8 | 38.2 (32.1-45.2) | 28.6 (21.7-37.8) | -25.2 |
| Turkey | 30.6 (24.3-46.5) | 22.6 (18.-27.9) | -26.2 | 40.9 (30.7-60.6) | 24.5 (19.5-30.1) | -40.0 |
| Uganda | 17.3 (12.5-25.7) | 19.4 (15.-26.8) | 12.5 | 34.2 (26.2-42.2) | 34.9 (26.-43.) | 2.0 |
| Ukraine | 1.8 (1.7-1.9) | 3. (2.4-3.6) | 61.1 | 3.4 (3.2-3.6) | 5.4 (4.5-6.4) | 57.4 |
| UK | 4.5 (4.1-4.7) | 4.7 (4.1-5.1) | 4.0 | 7.2 (6.8-7.5) | 6.1 (5.6-6.5) | -15.2 |
| Tanzania | 22.3 (18.-28.1) | 25.2 (21.-30.1) | 13.0 | 31.7 (26.-38.5) | 29.7 (24.2-36.2) | -6.3 |
| US | 8.5 (7.7-8.9) | 15.1 (13.4-16.6) | 78.7 | 12.5 (11.7-13.) | 21.4 (19.8-22.4) | 70.9 |
| Uzbekistan | 13.6 (10.9-21.9) | 16.9 (14.4-19.6) | 24.4 | 16. (14.5-18.) | 23.7 (20.4-27.2) | 48.2 |
| Venezuela | 13.5 (12.5-14.6) | 29.8 (22.6-38.7) | 120.0 | 19.3 (18.-20.5) | 45.2 (34.5-57.9) | 134.4 |
| Viet Nam | 31.5 (24.9-38.6) | 26.5 (19.9-31.9) | -16.0 | 25. (19.2-35.3) | 26.3 (20.1-31.7) | 5.0 |
| Yemen | 22.1 (15.8-34.5) | 21. (15.9-28.9) | -5.3 | 29.6 (21.9-42.1) | 25.7 (19.-35.3) | -13.2 |

Table S3 Poisson regression estimates, with p values, for the association between 5-year age group and sex (coded as 0 for males and 1 for females) and the rate of chronic kidney disease (CKD) mortality, modelling age as a categorical variable.

| Coefficient | Estimate | p value |
|-------------------------|----------|---------|
| Intercept | 0.0002 | <0.001 |
| 25-29 | 0.18 | <0.001 |
| 30-34 | 0.12 | <0.001 |
| 35-39 | 0.90 | <0.001 |
| 40-44 | 0.20 | <0.001 |
| 45-49 | 0.19 | <0.001 |
| 50-54 | 3.03 | <0.001 |
| 55-59 | 4.24 | <0.001 |
| 60-64 | 2.86 | <0.001 |
| 65-69 | 4.05 | <0.001 |
| 70-74 | 7.59 | <0.001 |
| 75-79 | 6.16 | <0.001 |
| 80-84 | 2.64 | <0.001 |
| 85-89 | 6.35 | <0.001 |
| Sex (reference: Male) | 0.76 | <0.001 |
| 25-29 x sex interaction | 0.97 | 0.47 |
| 30-34 x sex interaction | 0.95 | 0.96 |
| 35-39 x sex interaction | 0.93 | 0.19 |
| 40-44 x sex interaction | 0.98 | 0.31 |
| 45-49 x sex interaction | 0.96 | 0.98 |
| 50-54 x sex interaction | 1.15 | <0.001 |
| 55-59 x sex interaction | 1.13 | <0.001 |
| 60-64 x sex interaction | 1.16 | <0.001 |
| 65-69 x sex interaction | 1.06 | <0.001 |
| 70-74 x sex interaction | 1.12 | <0.001 |
| 75-79 x sex interaction | 1.26 | <0.001 |
| 80-84 x sex interaction | 1.29 | <0.001 |
| 85-89 x sex interaction | 1.49 | <0.001 |

References

1. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2020.2020 [Available from: <http://ghdx.healthdata.org/gbd-results-tool>].