**Supplementary Material**

**Excess total, sex- and age-specific all-cause mortality in 20 countries during 2020: a time series analysis using data from national primary sources**

**Supplementary Methods: Equations for the Statistical Analysis**

where D*y,w*= number of deaths in all age-groups in one week, P=mid-year population, and N*w*= number of weeks in the year.

where D*y,w,i*= number of deaths in the age-group in one week, P=mid-year population in age group i , and N*w*= number of weeks in the year.

where, index denotes the aggregate age groups (see Supplementary Table S2) and the standard population weights 𝑝𝑖𝑠 correspond to the respective broad age intervals in the WHO World Standard Population 2000-2025

**Table S1 - Summary of national data sources, period of available mortality data, time unit, availability of sex and age-specific data, and data quality of civil registration and vital statistics systems per country**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Partners** | **All cause deaths (2015-2020)** | | | | |  |  |  |  |
| **Access date** | **Source** | **Public data (Y/N)** | **Link (if available)** | **Notes** | **Time unit** | **Weekly sex specific data available** | **Weekly age specific data available** | **Data quality of civil registration and vital statistics systems\*** |
| **Australia** | Deakin University; Monash University | Latest - October 2021 | Australian Bureau of Statistics Provisional Mortality Statistics | Yes | [Link](https://www.abs.gov.au/statistics/health/causes-death/provisional-mortality-statistics) |  | ISO | YES | YES | Very High |
| **Austria** | Center of Public Health, Medical University of Vienna | July 21st, 2021 | Cause of death statistics by Statistics Austria | No |  |  | ISO | YES | YES | Very High |
| **Brazil** | Universidade Federal do Rio de Janeiro; Fluminense Federal University | July 9th 2021 | National Mortality Information System (Sistema de Informações sobre Mortalidade - SIM) | Yes | [Link](http://svs.aids.gov.br/dantps/centrais-de-conteudos/dados-abertos/sim/) |  | Epi | YES | YES | Medium - High |
| **Cyprus** | University of Nicosia | September 2021 | Cyprus death registry, Health Monitoring Unit, Ministry of Health | Yes |  |  | ISO | YES | YES | High |
| **Denmark** | Statistics Denmark | July 7th 2021 | Statistics Denmark | Yes |  |  | Epi | YES | YES | High |
| **England and Wales** | St George's, University of London | April 13th 2021 | Office for National Statistics | Yes | [Link](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales) |  | National | YES | YES | Very High |
| **Estonia** | National institute for Health Development | June 30th 2021 | Estonian Causes of Death Registry | Yes | [Link](https://statistika.tai.ee/pxweb/en/Andmebaas/Andmebaas__01Rahvastik__04Surmad/?tablelist=true) |  | ISO | YES | YES | Very High |
| **France** | EHESP, CNRS, ARENES - UMR 6051 | June 2021 | Institut National de la Statistique et des Etudes Economiques (INSEE) | Yes | [Link](https://www.insee.fr/fr/statistiques/4487988) |  | ISO | YES | YES | High-  Very High |
| **Georgia** | Tbilisi state university; National Center for Disease Control and Public Health | 2021 | Vital Registration system | Yes | [Link](https://www.geostat.ge/) |  | ISO | YES | YES | Low-Medium |
| **Israel** | Ministry of Health | Feb 1st 2021 | Ministry of Health Israel | No |  |  | Epi | YES | YES | High-  Very High |
| **Italy** | University of Perugia | May 18th 2021 | ISTAT (Italian Institute of Statistics) | Yes |  | Acknowledge ISS support. | Epi | YES | YES | Medium – High |
| **Mauritius** | University of Mauritius; Statistics Mauritius |  | Statistics Mauritius | No |  | Data can be provided on request. | National | YES | YES | High |
| **Northern Ireland** | St George's, University of London | May 18th 2021 | Northern Ireland Statistics and Research Agency | Yes | [Link](https://www.nisra.gov.uk/publications/historical-weekly-deaths-data) |  | National | NO | YES | Very High |
| **Norway** | University of Oslo | September 2021 | Statistics Norway | Yes | [Link](https://www.ssb.no/en/statbank/list/dode) |  | ISO | YES | YES | Very High |
| **Peru** | Universidad del Pacífico | 2020-2021 | Ministerio de Salud-Centro Nacional de Epidemiología, Prevención y Control de Enfermedades | Yes |  |  | ISO | YES | YES | Medium |
| **Scotland** | St George's, University of London | April 13th 2020 | National Records of Scotland | Yes | [Link](https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/weekly-and-monthly-data-on-births-and-deaths/weekly-data-on-births-and-deaths) | We used "weekly-march-21-tab-2" for the historical all-cause-mortality data. At the time of writing (23/12/21) "weekly-november-21-tab-2" is available on this link. Death by cause by week for respiratory, cancer, circulatory (I100-I99) and Influenza and pneumonia (J09-J18) was supplied on request by the National Records of Scotland on 15 April 2021. | ISO | YES | NO | Very High |
| **Slovenia** | National Institute of Public Health | July 29th 2021 | Central Registry of Patient Data | No |  | The data on all-cause mortality in Slovenia are updated and sent to EuroMOMO network weekly. They are published on the website https://www.euromomo.eu/graphs-and-maps. As they are updated every week, there may be slight changes in numbers. | ISO | YES | YES | High-  Very High |
| **Sweden** | Karolinska Institutet | August 13th 2021 | Statistics Sweden |  | [Link](https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/doda-i-sverige/) | All-cause mortality statistics are publically available (including stratification by age and sex categories) but not as detailed as required by C-MOR. | ISO | YES | YES | High-  Very High |
| **United States** | University of South Carolina | July 23rd 2021 | Human Mortality Database/Max Planck, National Center for Health Statistics (NCHS) | Yes | [Link](http://www.ukrstat.gov.ua/) | Data before epi week 5 in 2020 are from the Human Mortality Database/Max Planck, and data after epi week 5 in 2020 (included) are from NCHS. | Epi | YES | YES | High-  Very High |
| **Ukraine** | Bogomolets National Medical University | June 19th-29th 2021 | State Statistics Service of Ukraine | Yes | [Link](https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-by-Week-Sex-and-Age/vsak-wrfu) | Publicly available data was just for the months. | ISO | YES | YES | Low - Medium |

Abbreviations: ISO: International Organization for Standardization; Epi: epidemiological

\* Source: Mikkelsen L, Phillips DE, AbouZahr C, et al. A global assessment of civil registration and vital statistics systems: monitoring data quality and progress. The Lancet. Elsevier; 2015 Oct 3;386(10001):1395–1406. Reference years: 2005-2012

**Table S2 – Description of aggregate age groups created for the age-standardization according to age-specific all-cause mortality data availability**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Country | Age groups (a)  (<15, 15-44, 45-64, 65+) | Age groups (b)  (<19, 20-49, 50-69, 70+) | Age groups (c)  (<19, 20-49, 50-64, 65+) | Age groups (d)  (<15, 15--64, 65+) | Age groups (e)  (<19, 20-54, 55-69, 70+) |
| Australia | **x** |  |  |  |  |
| Austria |  |  | **x** |  |  |
| Brazil | **x** | **x** |  |  |  |
| Cyprus |  | **x** |  |  |  |
| Denmark | **x** | **x** |  |  |  |
| England and Wales | **x** |  |  |  |  |
| Estonia |  | **x** |  |  |  |
| France |  | **x** |  |  |  |
| Georgia | **x** | **x** |  |  |  |
| Israel | **x** |  |  |  |  |
| Italy | **x** | **x** |  |  |  |
| Mauritius |  | **x** |  |  |  |
| Northern Ireland |  |  |  |  |  |
| Norway | **x** | **x** |  |  |  |
| Peru | **x** |  |  |  |  |
| Scotland |  |  |  |  |  |
| Slovenia | **x** |  |  |  |  |
| Sweden |  | **x** |  |  |  |
| United States |  |  |  | **x** |  |
| Ukraine |  |  |  |  | **x** |

**Table S3 -** **Comparison of weekly observed mortality rates between 2015-2019 vs. 2020**

|  |  |  |
| --- | --- | --- |
|  | **mean (SD) of weekly mortality rate (per 100,000 population)** | |
| **Country** | **2015-2019** | **2020** |
| **Australia** | 11·0 (0·9) | 10·5 (0·5) |
| **Austria** | 18·1 (2·0) | 19·5 (3·5) |
| **Brazil** | 12·1 (0·6) | 13·7 (1·6) |
| **Cyprus** | 13·1 (2·3) | 13·4 (2·5) |
| **Denmark** | 17·8 (1·5) | 17·9 (1·3) |
| **England & Wales** | 17·4 (2·3) | 19·4 (5·1) |
| **Estonia** | 22·3 (2·4) | 22·6 (1·9) |
| **France** | 17·5 (1·8) | 18·9 (3·1) |
| **Georgia** | 24·7 (3·0) | 26·1 (6·2) |
| **Israel** | 10·0 (1·2) | 10·3 (1·0) |
| **Italy** | 20·6 (2·6) | 23·1 (5·7) |
| **Mauritius** | 15·5 (2·3) | 16·5 (1·8) |
| **Northern Ireland** | 16·1 (2·5) | 17·7 (2·8) |
| **Norway** | 14·8 (1·4) | 14·4 (1·1) |
| **Peru** | 6·5 (0·6) | 12·3 (5·3) |
| **Scotland** | 20·4 (2·5) | 22·4 (4·4) |
| **Slovenia** | 18·6 (2·5) | 22·5 (6·4) |
| **Sweden** | 17·0 (1·7) | 17·7 (2·8) |
| **Ukraine** | 16·5 (1·0) | 19·7 (2·3) |
| **USA** | 25·2 (7·0) | 27·1 (5·3) |

*SD, standard deviation.*

**Table S4 - Cumulative observed and expected mortality rates per 100,000 population for 2020; total population**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Crude mortality rate (CMR)** | | | | | | | **Age standardized mortality rate (ASMR)** | | | | | | | |
| **Country** | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Upper limit of 95% CI of Expected mortality rate** | **Difference using the Lower limit of 95% CI of Expected mortality rate** |  | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Upper limit of 95% CI of Expected mortality rate** | **Difference using the Lower limit of 95% CI of Expected mortality rate** |
| **Australia** | 548 | 563 | 556 | 569 | -15↓ | -22 | -8 |  | 305 | 321 | 315 | 328 | -16↓ | -23 | -10 |
| **Austria** | 1019 | 939 | 921 | 958 | 80↑ | 61 | 98 |  | 485 | 451 | 442 | 459 | 34↑ | 26 | 43 |
| **Brazil** | 716 | 640 | 633 | 647 | 76↑ | 69 | 83 |  | 634 | 570 | 563 | 576 | 65↑ | 58 | 71 |
| **Cyprus** | 698 | 700 | 678 | 722 | -2 | -25 | 20 |  | 377 | 377 | 365 | 390 | 0.2 | -12 | 13 |
| **Denmark** | 930 | 940 | 928 | 952 | -10 | -22 | 1 |  | 437 | 439 | 434 | 445 | -3 | -9 | 3 |
| **England & Wales** | 1012 | 892 | 875 | 909 | 120↑ | 102 | 137 |  | 512 | 454 | 445 | 462 | 58↑ | 50 | 67 |
| **Estonia** | 1171 | 1152 | 1129 | 1176 | 19 | -5 | 42 |  | 564 | 545 | 533 | 556 | 19↑ | 8 | 31 |
| **France** | 980 | 926 | 913 | 938 | 54↑ | 42 | 67 |  | 433 | 413 | 408 | 419 | 20↑ | 14 | 25 |
| **Georgia** | 1351 | 1223 | 1197 | 1250 | 127↑ | 101 | 154 |  | 834 | 760 | 744 | 777 | 74↑ | 58 | 90 |
| **Israel** | 532 | 503 | 496 | 510 | 29↑ | 22 | 36 |  | 388 | 369 | 363 | 374 | 19↑ | 14 | 25 |
| **Italy** | 1195 | 1073 | 1054 | 1093 | 122↑ | 103 | 141 |  | 472 | 343 | 325 | 362 | 128↑ | 110 | 146 |
| **Mauritius** | 869 | 906 | 885 | 927 | -38↓ | -59 | -17 |  | 647 | 672 | 656 | 688 | -25↓ | -42 | -9 |
| **Northern Ireland** | 921 | 832 | 809 | 856 | 88↑ | 64 | 112 |  | 512 | 471 | 457 | 484 | 42↑ | 28 | 55 |
| **Norway** | 748 | 751 | 741 | 761 | -3 | -13 | 7 |  | 391 | 393 | 387 | 398 | -2 | -7 | 4 |
| **Peru** | 639 | 380 | 374 | 386 | 259↑ | 253 | 265 |  | 614 | 368 | 362 | 373 | 246↑ | 241 | 252 |
| **Scotland** | 1165 | 1056 | 1035 | 1077 | 108↑ | 87 | 129 |  | - | - | - | - | - | - | - |
| **Slovenia** | 1159 | 1013 | 991 | 1035 | 146↑ | 125 | 168 |  | 524 | 465 | 455 | 476 | 59↑ | 49 | 69 |
| **Sweden** | 913 | 832 | 821 | 842 | 82↑ | 71 | 93 |  | 383 | 349 | 344 | 354 | 34↑ | 29 | 39 |
| **Ukraine** | 1398 | 1281 | 1188 | 1375 | 117↑ | 22 | 209 |  | 782 | 738 | 684 | 793 | 44 | -10 | 98 |
| **USA** | 1018 | 876 | 868 | 884 | 142↑ | 133 | 150 |  | 643 | 553 | 547 | 560 | 90↑ | 83 | 96 |

\*For all countries, the sum of observed and expected deaths is up to week 52, with the exception of England & Wales and Scotland (up to week 51), N. Ireland (up to week 50), and Mauritius for weeks 2-52

↑ Indicates statistically significant excess all-cause mortality using the sum of deaths for the whole of 2020

↓ Indicates a statistically significant reduction all-cause mortality using the sum of deaths for the whole of 2020

**Table S5 – Comparison of the cumulative observed and expected mortality rate for the whole year (2020); crude mortality rate (CMR) by sex**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Males** | | | | | | |  | **Females** | | | | | | |
| **Country** | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |  | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |
| **Australia** | 554 | 569 | 562 | 575 | -15↓ | -21 | -8 |  | 541 | 556 | 550 | 563 | -15↓ | -22 | -9 |
| **Austria** | 1024 | 933 | 915 | 952 | 90↑ | 72 | 108 |  | 1014 | 945 | 925 | 966 | 69↑ | 49 | 90 |
| **Brazil** | 817 | 718 | 711 | 726 | 99↑ | 92 | 106 |  | 617 | 563 | 557 | 570 | 54↑ | 47 | 60 |
| **Cyprus** | 751 | 756 | 727 | 786 | -5 | -35 | 24 |  | 646 | 646 | 617 | 675 | 0 | -29 | 29 |
| **Denmark** | 958 | 966 | 952 | 981 | -8 | -22 | 6 |  | 901 | 914 | 901 | 928 | -13 | -27 | 1 |
| **England & Wales** | 1035 | 908 | 892 | 924 | 127↑ | 111 | 143 |  | 989 | 876 | 858 | 895 | 112↑ | 93 | 131 |
| **Estonia** | 1169 | 1139 | 1110 | 1169 | 30↑ | 0 | 59 |  | 1173 | 1164 | 1136 | 1193 | 9 | -20 | 37 |
| **France** | 1015 | 952 | 941 | 964 | 62↑ | 50 | 74 |  | 948 | 901 | 887 | 915 | 47↑ | 33 | 61 |
| **Georgia** | 1469 | 1318 | 1290 | 1347 | 151↑ | 122 | 179 |  | 1243 | 1137 | 1107 | 1167 | 106↑ | 76 | 135 |
| **Israel** | 548 | 510 | 502 | 519 | 38↑ | 29 | 46 |  | 516 | 496 | 487 | 505 | 20↑ | 11 | 29 |
| **Italy** | 1195 | 1059 | 1042 | 1076 | 135↑ | 118 | 152 |  | 1196 | 1086 | 1065 | 1108 | 110↑ | 88 | 132 |
| **Mauritius** | 985 | 1000 | 971 | 1028 | -15 | -44 | 14 |  | 755 | 816 | 791 | 841 | -60↓ | -85 | -35 |
| **Norway** | 731 | 727 | 715 | 740 | 4 | -8 | 16 |  | 765 | 775 | 761 | 789 | -10 | -24 | 4 |
| **Peru** | 770 | 410 | 404 | 417 | 360↑ | 353 | 366 |  | 510 | 350 | 344 | 356 | 160↑ | 154 | 166 |
| **Scotland** | 1196 | 1073 | 1052 | 1094 | 123↑ | 101 | 144 |  | 1135 | 1045 | 1020 | 1071 | 90↑ | 65 | 115 |
| **Slovenia** | 1143 | 1006 | 980 | 1033 | 137↑ | 110 | 163 |  | 1176 | 1019 | 993 | 1046 | 156↑ | 130 | 183 |
| **Sweden** | 909 | 811 | 800 | 823 | 97↑ | 86 | 109 |  | 918 | 852 | 838 | 865 | 66↑ | 53 | 80 |
| **Ukraine** | 1651 | 1405 | 1269 | 1546 | 246↑ | 105 | 382 |  | 1179 | 1173 | 1058 | 1292 | 5 | -113 | 120 |
| **USA** | 1076 | 1006 | 997 | 1015 | 70↑ | 62 | 79 |  | 961 | 749 | 742 | 757 | 211↑ | 204 | 219 |

Northern Ireland is excluded due to the lack of sex-specific all-cause mortality data

\*For all countries, the sum of observed and expected deaths is up to week 52, with the exception of England & Wales and Scotland (up to week 51), and Mauritius for weeks 2-52

↑ Indicates statistically significant excess all-cause mortality using the sum of deaths for the whole of 2020

↓ Indicates a statistically significant reduction all-cause mortality using the sum of deaths for the whole of 2020

**Table S6 – Comparison of the cumulative observed and expected mortality rate for the whole year (2020); age-standardized mortality rate (ASMR) by sex**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Males** | | | | | | |  | **Females** | | | | | | |
| **Country** | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |  | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |
| **Australia** | 327 | 333 | 328 | 338 | -6↓ | -11 | -1 |  | 264 | 269 | 265 | 274 | -6↓ | -10 | -1 |
| **Austria** | 547 | 503 | 493 | 512 | 44↑ | 34 | 54 |  | 430 | 404 | 395 | 412 | 26↑ | 17 | 35 |
| **Brazil** | 788 | 691 | 684 | 698 | 97↑ | 89 | 104 |  | 504 | 462 | 456 | 468 | 42↑ | 36 | 48 |
| **Cyprus** | 440 | 443 | 425 | 461 | -3 | -21 | 15 |  | 320 | 318 | 303 | 333 | 2 | -13 | 17 |
| **Denmark** | 486 | 488 | 481 | 496 | -2 | -10 | 5 |  | 390 | 393 | 387 | 399 | -3 | -9 | 4 |
| **England & Wales** | 567 | 499 | 491 | 508 | 68↑ | 59 | 77 |  | 461 | 411 | 403 | 419 | 50↑ | 41 | 58 |
| **Estonia** | 748 | 720 | 701 | 740 | 28↑ | 9 | 47 |  | 426 | 414 | 403 | 425 | 13↑ | 1 | 24 |
| **France** | 516 | 488 | 482 | 494 | 28↑ | 22 | 34 |  | 361 | 347 | 342 | 352 | 14↑ | 8 | 19 |
| **Georgia** | 1100 | 993 | 972 | 1015 | 107↑ | 85 | 128 |  | 632 | 579 | 564 | 594 | 53↑ | 38 | 69 |
| **Israel** | 444 | 413 | 406 | 421 | 30↑ | 23 | 37 |  | 336 | 326 | 320 | 333 | 9↑ | 3 | 15 |
| **Italy** | 528 | 473 | 465 | 480 | 55↑ | 47 | 62 |  | 423 | 389 | 381 | 397 | 34↑ | 27 | 42 |
| **Mauritius** | 801 | 805 | 780 | 829 | -4 | -28 | 21 |  | 505 | 549 | 531 | 566 | -44↓ | -62 | -26 |
| **Norway** | 417 | 399 | 392 | 406 | 17↑ | 10 | 24 |  | 366 | 370 | 364 | 377 | -4 | -11 | 3 |
| **Peru** | 772 | 409 | 402 | 416 | 363↑ | 356 | 369 |  | 475 | 328 | 322 | 334 | 147↑ | 141 | 153 |
| **Slovenia** | 594 | 529 | 515 | 545 | 65↑ | 50 | 80 |  | 458 | 404 | 394 | 415 | 54↑ | 43 | 64 |
| **Sweden** | 420 | 374 | 369 | 380 | 45↑ | 40 | 51 |  | 348 | 324 | 319 | 330 | 23↑ | 18 | 28 |
| **Ukraine** | 1219 | 1040 | 940 | 1144 | 179↑ | 75 | 279 |  | 531 | 516 | 460 | 574 | 15 | -43 | 71 |
| **USA** | 744 | 634 | 627 | 641 | 110↑ | 103 | 117 |  | 548 | 477 | 471 | 483 | 71↑ | 65 | 77 |

Northern Ireland is excluded due to the lack of sex-specific all-cause mortality data; Scotland is not included due to inability to calculate ASMR.

\*For all countries, the sum of observed and expected deaths is up to week 52, with the exception of England & Wales and Scotland (up to week 51), and Mauritius for weeks 2-52

↑ Indicates statistically significant excess all-cause mortality using the sum of deaths for the whole of 2020

↓ Indicates a statistically significant reduction all-cause mortality using the sum of deaths for the whole of 2020

**Table S7 – Comparison of the cumulative observed and expected mortality rate for the whole year (2020); by age group**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |  | **Observed mortality rate / 100,000 population\*** | **Expected mortality rate / 100,000 population \*** | **Lower limit of 95% CI of Expected mortality rate** | **Upper limit of 95% CI of mortality rate** | **Difference (Observed-Expected mortality rate)** | **Difference using the Lower limit of 95% CI of Expected mortality rate** | **Difference using the Upper limit of 95% CI of Expected mortality rate** |
| **<65** | | | | | | | |  | **65+** | | | | | | |
| **Australia** | 82 | 86 | 84 | 89 | -4↓ | -7 | -1 |  | 2970 | 3042 | 3011 | 3074 | -72↓ | -104 | -41 |
| **Austria** | 176 | 170 | 166 | 174 | 6↑ | 3 | 10 |  | 4564 | 4193 | 4106 | 4281 | 371↑ | 283 | 458 |
| **Brazil** | 306 | 274 | 269 | 278 | 33↑ | 28 | 37 |  | 4563 | 4085 | 4052 | 4119 | 477↑ | 443 | 511 |
| **Denmark** | 164 | 166 | 161 | 170 | -1 | -6 | 3 |  | 3961 | 3993 | 3939 | 4046 | -32 | -85 | 22 |
| **England & Wales** | 187 | 170 | 167 | 174 | 16↑ | 13 | 20 |  | 4612 | 4033 | 3949 | 4119 | 579↑ | 493 | 663 |
| **Georgia** | 397 | 366 | 357 | 374 | 32↑ | 23 | 40 |  | 6648 | 6001 | 5850 | 6154 | 647↑ | 495 | 798 |
| **Israel** | 103 | 103 | 100 | 106 | 0 | -3 | 3 |  | 3557 | 3321 | 3269 | 3373 | 236↑ | 184 | 287 |
| **Italy** | 156 | 149 | 146 | 153 | 7↑ | 3 | 10 |  | 4617 | 3125 | 2922 | 3333 | 1492↑ | 1284 | 1695 |
| **N. Ireland** | 197 | 183 | 175 | 191 | 14↑ | 5 | 22 |  | 4486 | 4043 | 3918 | 4169 | 443↑ | 318 | 568 |
| **Norway** | 122 | 123 | 119 | 126 | -1 | -4 | 3 |  | 3692 | 3707 | 3652 | 3762 | -15 | -70 | 40 |
| **Peru** | 255 | 154 | 150 | 157 | 101↑ | 98 | 105 |  | 4659 | 2763 | 2719 | 2808 | 1896↑ | 1851 | 1940 |
| **Slovenia** | 203 | 198 | 191 | 206 | 5 | -3 | 12 |  | 4815 | 4130 | 4031 | 4228 | 685↑ | 587 | 784 |
| **USA** | 317 | 270 | 265 | 275 | 47↑ | 42 | 51 |  | 4533 | 3918 | 3888 | 3947 | 615↑ | 585 | 645 |
| **<70** | | | | | | | |  | **70+** | | | | | | |
| **Brazil** | 271 | 241 | 237 | 246 | 29↑ | 25 | 34 |  | 2935 | 2570 | 2547 | 2592 | 365↑ | 343 | 387 |
| **Cyprus** | 173 | 173 | 163 | 183 | 1 | -9 | 11 |  | 4830 | 4855 | 4679 | 5032 | -25 | -202 | 151 |
| **Denmark** | 160 | 162 | 158 | 166 | -2 | -6 | 2 |  | 4898 | 4901 | 4829 | 4974 | -3 | -75 | 70 |
| **Estonia** | 390 | 365 | 353 | 377 | 25↑ | 13 | 37 |  | 5941 | 5912 | 5772 | 6052 | 30 | -111 | 169 |
| **France** | 242 | 241 | 236 | 245 | 1 | -3 | 5 |  | 5184 | 4801 | 4722 | 4879 | 383↑ | 304 | 461 |
| **Georgia** | 529 | 482 | 472 | 492 | 47↑ | 37 | 57 |  | 8802 | 7985 | 7779 | 8193 | 817↑ | 609 | 1023 |
| **Italy** | 219 | 204 | 200 | 208 | 14↑ | 10 | 18 |  | 5813 | 5180 | 5078 | 5283 | 633↑ | 530 | 735 |
| **Mauritius** | 484 | 504 | 490 | 519 | -20↓ | -35 | -6 |  | 5558 | 5825 | 5624 | 6030 | -268↓ | -472 | -66 |
| **Norway** | 171 | 170 | 166 | 174 | 1 | -3 | 5 |  | 4804 | 4823 | 4747 | 4898 | -18 | -94 | 57 |
| **Sweden** | 167 | 156 | 153 | 159 | 11↑ | 8 | 15 |  | 5106 | 4600 | 4534 | 4666 | 506↑ | 440 | 572 |
| **Ukraine** | 492 | 551 | 509 | 594 | -59↓ | -103 | -17 |  | 8744 | 7274 | 6687 | 7877 | 1470↑ | 867 | 2057 |

Scotland is not included due to unavailability of age-specific weekly mortality data.

\*For all countries, the sum of observed and expected deaths is up to week 52, with the exception of England & Wales and Scotland (up to week 51), N. Ireland (up to week 50), and Mauritius for weeks 2-52

↑ Indicates statistically significant excess all-cause mortality using the sum of deaths for the whole of 2020

↓ Indicates a statistically significant reduction all-cause mortality using the sum of deaths for the whole of 2020

**Figure S1 Weekly z-score of crude all-cause mortality rate for total population**

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**Figure S2 – Weekly z-score of crude all-cause mortality rate by sex**

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**Figure S3 – Observed against expected mortality rate by more detailed age breakdowns for the countries observing substantial excess mortality in younger age groups**

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