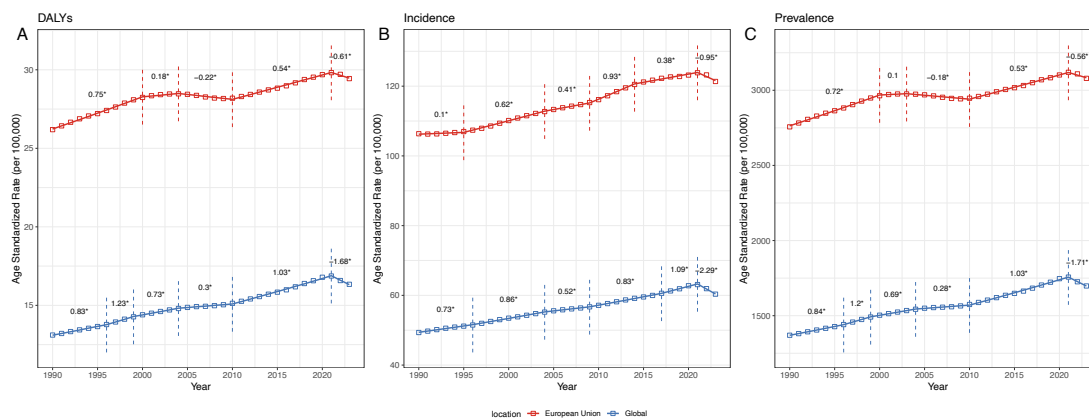
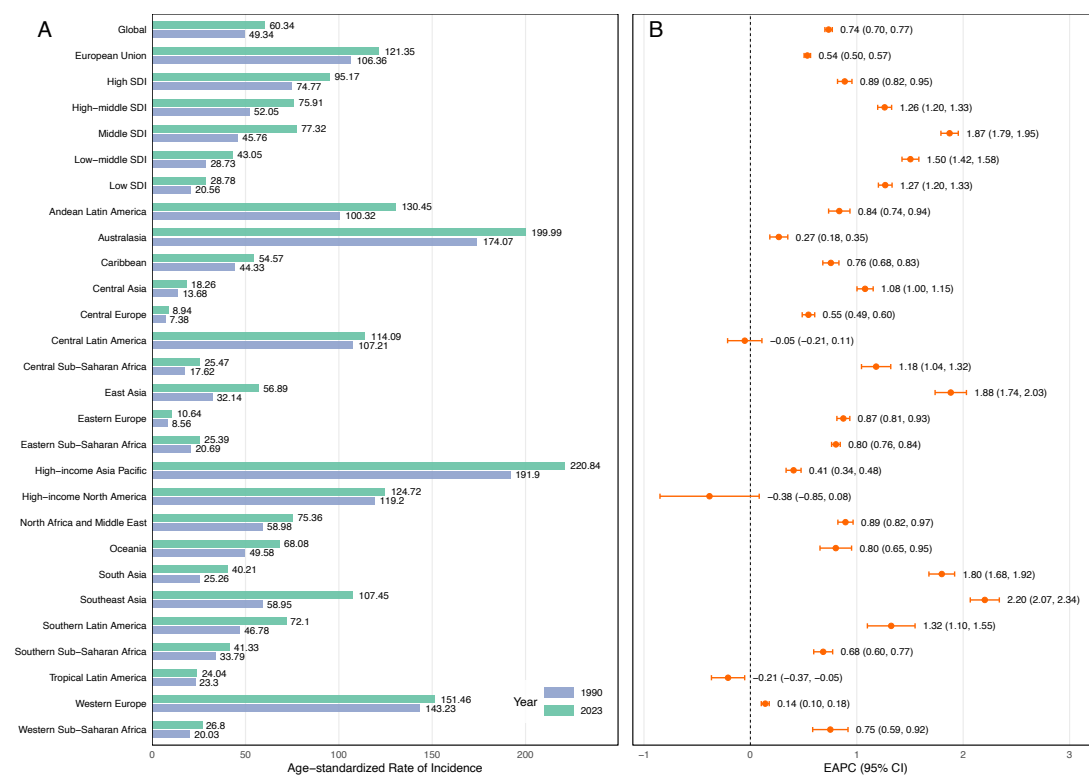


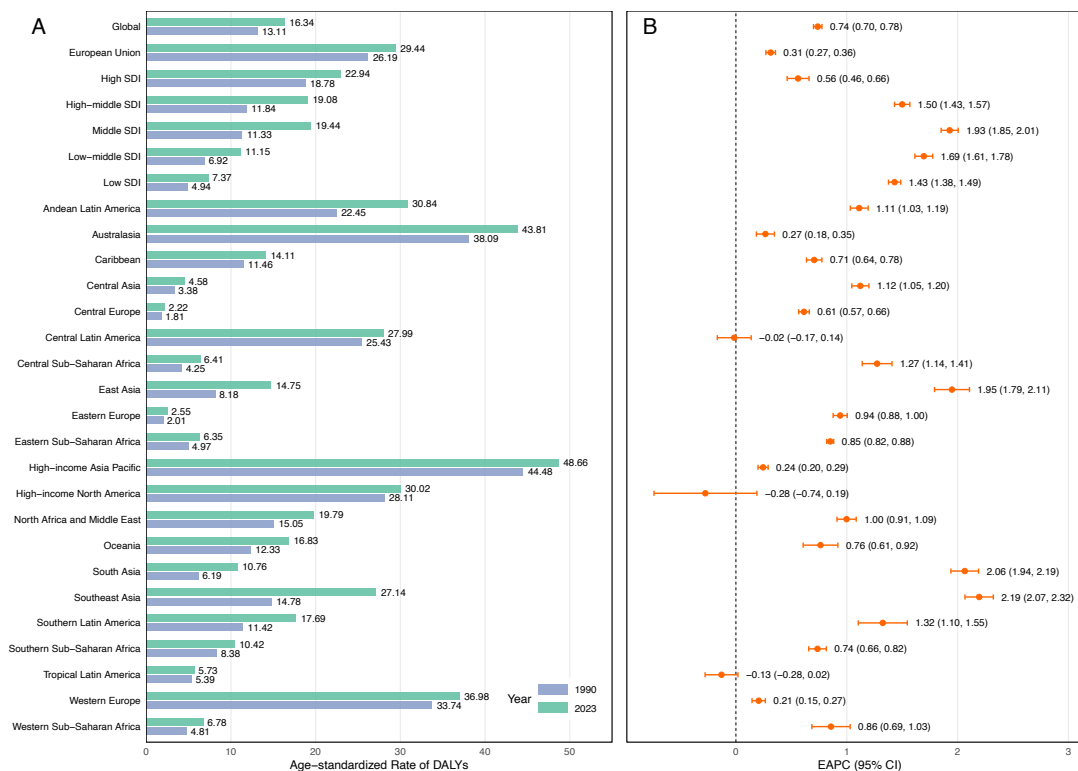


**Figure S1:** Joinpoint trends in PCOS age-standardized rates for Global and EU populations, 1990 to 2023. (A) ASDR, (B) ASIR, and (C) ASPR. Segment-specific APCs are annotated.

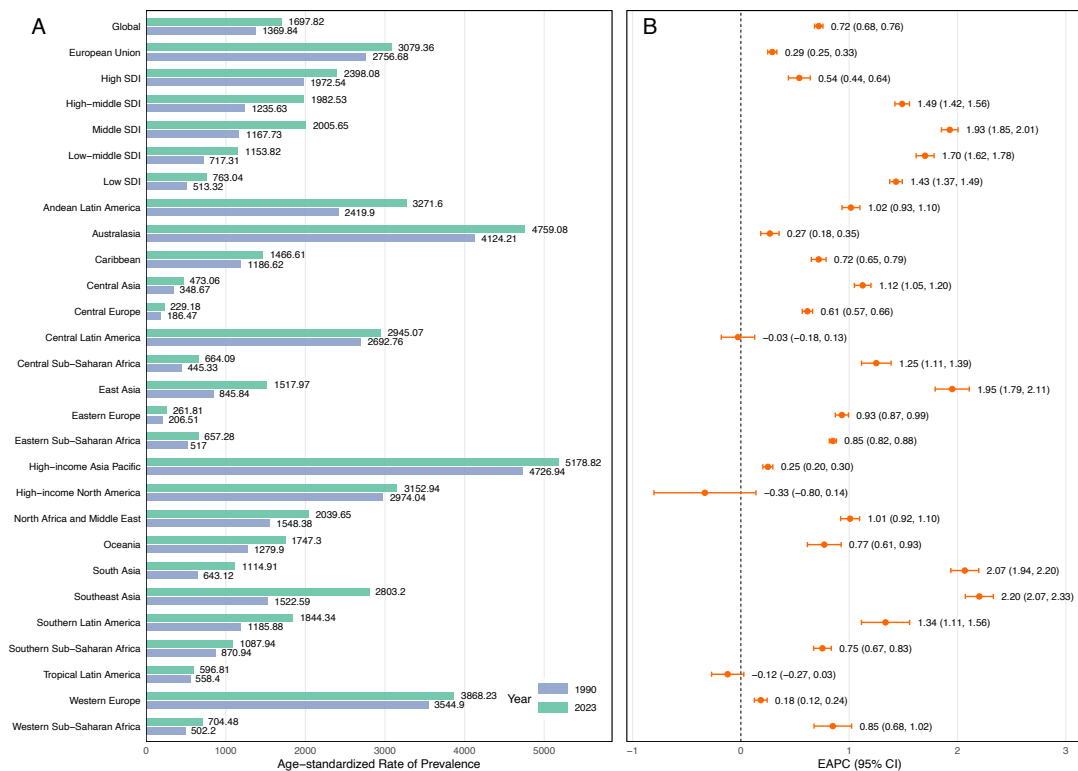
“\*” means significant ( $P < 0.05$ ).



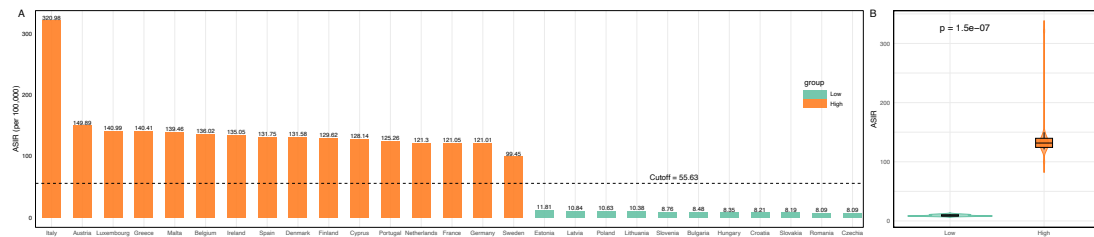
**Figure S2:** Regional burden of PCOS measured by ASIR across SDI quintiles and GBD regions, 1990 and 2023 (A), and corresponding EAPCs during 1990–2023 with 95% CI (B).



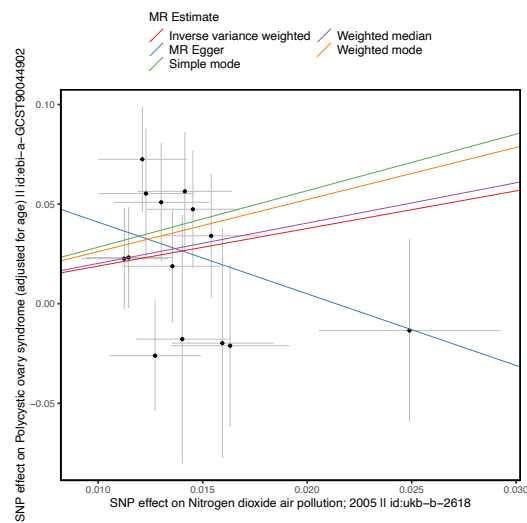
**Figure S3:** Regional burden of PCOS measured by ASDR across SDI quintiles and GBD regions, 1990 and 2023 (A), and corresponding EAPCs during 1990–2023 with 95% CI (B).



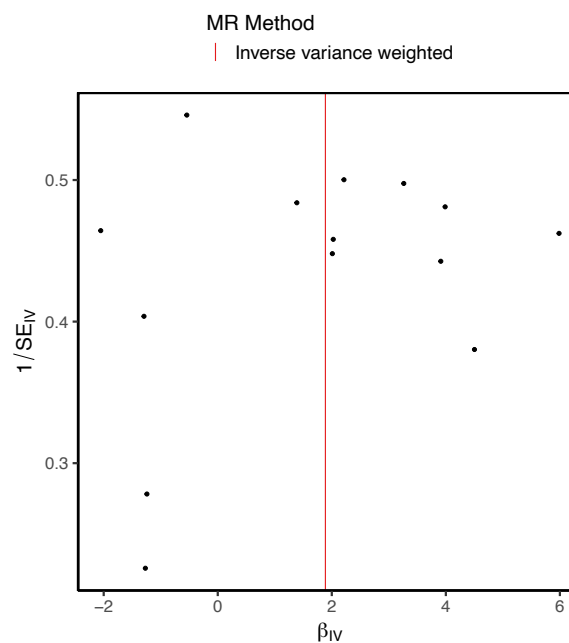
**Figure S4:** Regional burden of PCOS measured by ASPR across SDI quintiles and GBD regions, 1990 and 2023 (A), and corresponding EAPCs during 1990–2023 with 95% CI (B).



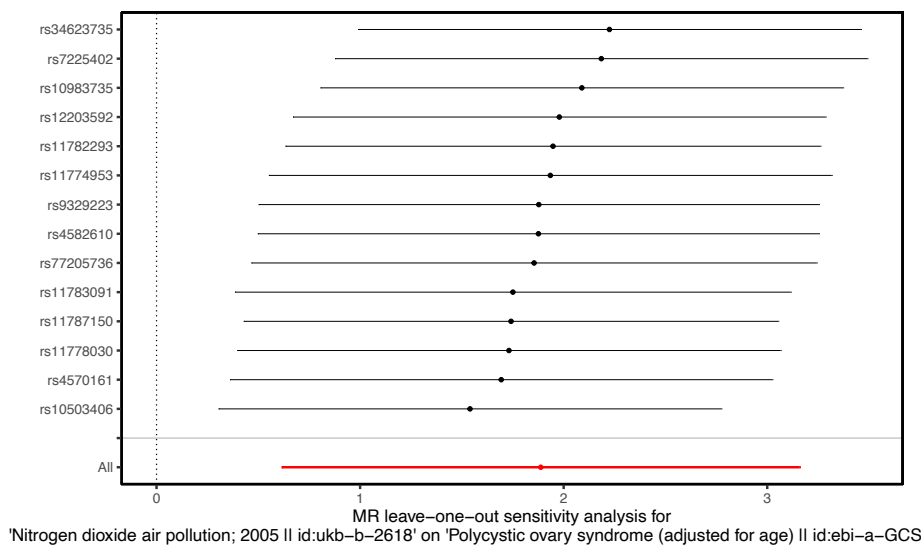
**Figure S5:** Truncated distribution of PCOS ASIR across EU countries in 2023. (A) Country-specific ASIR ranked in descending order with the cutoff used to define high- and low-ASIR groups. (B) Violin and box plots comparing ASIR distributions between the low- and high-ASIR groups.



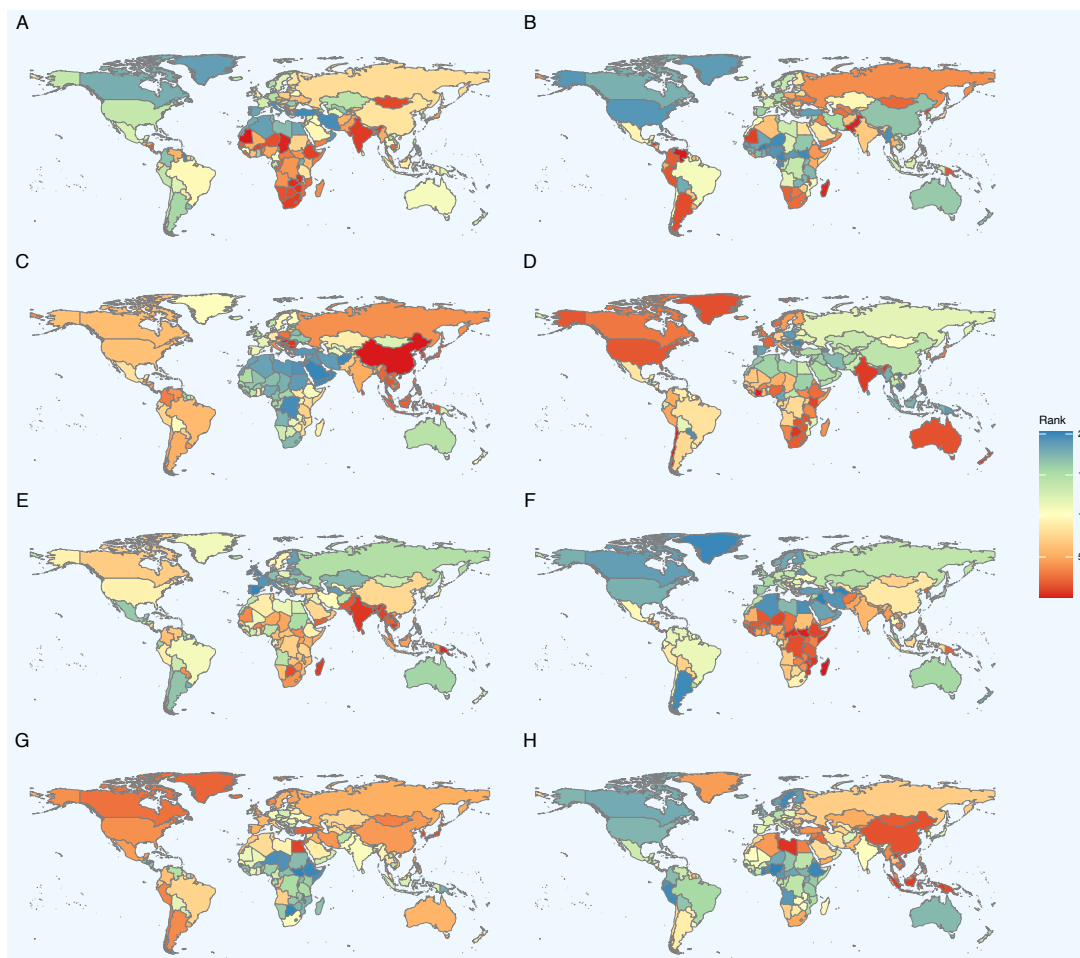
**Figure S6:** MR scatter plot for the effect of NO<sub>2</sub> exposure on PCOS risk, showing SNP-specific associations and fitted causal estimates using IVW, MR-Egger, weighted median, and mode-based methods.



**Figure S7:** MR funnel plot for the effect of NO<sub>2</sub> on PCOS risk using the IVW method.



**Figure S8:** Leave-one-out analysis for the MR association between NO<sub>2</sub> and PCOS risk.



**Figure S9:** Global maps of the eight SEVs significantly associated with PCOS incidence burden. Panels show the country-level rank distribution of Diet low in fruits (A), Diet low in nuts and seeds (B), Diet high in sodium (C), Childhood sexual abuse (D), Chewing tobacco (E), Household air pollution from solid fuels (F), Nitrogen dioxide pollution (G) and Secondhand smoke (H).

**Table S1:** Detailed information on the retained SNPs used as instrumental variables in the Mendelian randomization analysis, including R, F statistics, r.exposure, and r.outcome.

| SNP        | id.outcome         | id.exposure | R          | F          | r.exposure | r.outcome  |
|------------|--------------------|-------------|------------|------------|------------|------------|
| rs10503406 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00852401 | 33.1622711 | 0.00852401 | 0.00735991 |
| rs10983735 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00861408 | 33.8668137 | 0.00861408 | -0.0013891 |
| rs11774953 | ebi-a-GCST90044902 | ukb-b-2618  | -0.0083843 | 32.0841124 | -0.0083843 | -0.0017859 |
| rs11778030 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00856074 | 33.4487034 | 0.00856074 | 0.00460483 |
| rs11782293 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00935235 | 39.9212876 | 0.00935235 | -0.0007624 |
| rs11783091 | ebi-a-GCST90044902 | ukb-b-2618  | 0.0098185  | 44.0003803 | 0.0098185  | 0.00431757 |
| rs11787150 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00810457 | 29.9787477 | 0.00810457 | 0.00455371 |
| rs12203592 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00979905 | 43.8262695 | 0.00979905 | -0.0009191 |
| rs34623735 | ebi-a-GCST90044902 | ukb-b-2618  | 0.00872878 | 34.774801  | 0.00872878 | -0.0025336 |
| rs4570161  | ebi-a-GCST90044902 | ukb-b-2618  | 0.00938293 | 40.1827889 | 0.00938293 | 0.00510239 |
| rs4582610  | ebi-a-GCST90044902 | ukb-b-2618  | 0.00831451 | 31.5520933 | 0.00831451 | 0.00246828 |
| rs7225402  | ebi-a-GCST90044902 | ukb-b-2618  | -0.0085383 | 33.2731646 | -0.0085383 | 0.00078744 |
| rs77205736 | ebi-a-GCST90044902 | ukb-b-2618  | 0.01005118 | 46.1107795 | 0.01005118 | 0.00294476 |
| rs9329223  | ebi-a-GCST90044902 | ukb-b-2618  | -0.0081256 | 30.1342232 | -0.0081256 | -0.0023949 |

**Table S2:** Joinpoint regression results for temporal trends in age-standardized rates, showing segment-specific APCs with 95% CIs.

| location       | measure   | Model | Segment | Segment Start | Segment End | APC     | APC 95% LCL | APC 95% UCL | P-Value  |
|----------------|-----------|-------|---------|---------------|-------------|---------|-------------|-------------|----------|
| European Union | DALYs     | 4     | 0       | 1990          | 2000        | 0.7538  | 0.7278      | 0.7799      | 0        |
| European Union | DALYs     | 4     | 1       | 2000          | 2004        | 0.1844  | 0.0189      | 0.3501      | 0.030739 |
| European Union | DALYs     | 4     | 2       | 2004          | 2010        | -0.2176 | -0.292      | -0.143      | 0.000006 |
| European Union | DALYs     | 4     | 3       | 2010          | 2021        | 0.5391  | 0.513       | 0.5653      | 0        |
| European Union | DALYs     | 4     | 4       | 2021          | 2023        | -0.6076 | -0.9423     | -0.2717     | 0.001208 |
| European Union | Incidence | 5     | 0       | 1990          | 1995        | 0.0971  | 0.0398      | 0.1544      | 0.002322 |
| European Union | Incidence | 5     | 1       | 1995          | 2004        | 0.6186  | 0.5915      | 0.6456      | 0        |
| European Union | Incidence | 5     | 2       | 2004          | 2009        | 0.4138  | 0.3355      | 0.4921      | 0        |
| European Union | Incidence | 5     | 3       | 2009          | 2014        | 0.9312  | 0.8521      | 1.0104      | 0        |

| location | measure    | Model | Segment | Segment<br>Start | Segment<br>End | APC     | APC 95%<br>LCL | APC 95%<br>UCL | P-Value  |
|----------|------------|-------|---------|------------------|----------------|---------|----------------|----------------|----------|
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Incidence  | 5     | 4       | 2014             | 2021           | 0.3841  | 0.3405         | 0.4278         | 0        |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Incidence  | 5     | 5       | 2021             | 2023           | -0.95   | -1.2128        | -0.6864        | 0.000001 |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Prevalence | 4     | 0       | 1990             | 2000           | 0.7178  | 0.6955         | 0.7401         | 0        |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Prevalence | 4     | 1       | 2000             | 2003           | 0.1002  | -0.1745        | 0.3755         | 0.45607  |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Prevalence | 4     | 2       | 2003             | 2010           | -0.1754 | -0.2226        | -0.1282        | 0        |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Prevalence | 4     | 3       | 2010             | 2021           | 0.5343  | 0.5114         | 0.5571         | 0        |
| European |            |       |         |                  |                |         |                |                |          |
| Union    | Prevalence | 4     | 4       | 2021             | 2023           | -0.5629 | -0.8587        | -0.2663        | 0.000785 |
| Global   | DALYs      | 5     | 0       | 1990             | 1996           | 0.8315  | 0.7498         | 0.9133         | 0        |
| Global   | DALYs      | 5     | 1       | 1996             | 1999           | 1.2316  | 0.7489         | 1.7166         | 0.000048 |
| Global   | DALYs      | 5     | 2       | 1999             | 2004           | 0.728   | 0.5771         | 0.8791         | 0        |
| Global   | DALYs      | 5     | 3       | 2004             | 2010           | 0.3039  | 0.197          | 0.411          | 0.000014 |
| Global   | DALYs      | 5     | 4       | 2010             | 2021           | 1.029   | 0.9915         | 1.0666         | 0        |
| Global   | DALYs      | 5     | 5       | 2021             | 2023           | -1.6802 | -2.1505        | -1.2076        | 0.000001 |
| Global   | Incidence  | 5     | 0       | 1990             | 1996           | 0.7262  | 0.6658         | 0.7866         | 0        |
| Global   | Incidence  | 5     | 1       | 1996             | 2004           | 0.8599  | 0.8133         | 0.9066         | 0        |
| Global   | Incidence  | 5     | 2       | 2004             | 2009           | 0.5211  | 0.4135         | 0.6289         | 0        |
| Global   | Incidence  | 5     | 3       | 2009             | 2017           | 0.8298  | 0.7841         | 0.8756         | 0        |
| Global   | Incidence  | 5     | 4       | 2017             | 2021           | 1.0907  | 0.9138         | 1.268          | 0        |
| Global   | Incidence  | 5     | 5       | 2021             | 2023           | -2.2941 | -2.643         | -1.9439        | 0        |
| Global   | Prevalence | 5     | 0       | 1990             | 1996           | 0.8419  | 0.7597         | 0.9242         | 0        |
| Global   | Prevalence | 5     | 1       | 1996             | 1999           | 1.195   | 0.7152         | 1.6771         | 0.000062 |
| Global   | Prevalence | 5     | 2       | 1999             | 2004           | 0.6853  | 0.5365         | 0.8343         | 0        |
| Global   | Prevalence | 5     | 3       | 2004             | 2010           | 0.2799  | 0.177          | 0.3828         | 0.000024 |
| Global   | Prevalence | 5     | 4       | 2010             | 2021           | 1.0251  | 0.9877         | 1.0624         | 0        |
| Global   | Prevalence | 5     | 5       | 2021             | 2023           | -1.7099 | -2.1937        | -1.2237        | 0.000001 |

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**Table S3:** Observed annual age-standardized rates and fitted values from the Joinpoint model for each year.

| location | measure | year | val   | Model | Standard<br>Error | Flag | APC     | Joinpoints | Selected<br>Model |
|----------|---------|------|-------|-------|-------------------|------|---------|------------|-------------------|
| European |         |      |       |       |                   |      |         |            |                   |
| Union    | DALYs   | 1990 | 26.19 | 26.23 | 11.0338           |      | 0.7538* | 4          | 4                 |

| location | measure | year | val   | Model | Standard Error | Flag        | APC      | Joinpoints | Selected Model |
|----------|---------|------|-------|-------|----------------|-------------|----------|------------|----------------|
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1991 | 26.43 | 26.43 | 11.1968        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1992 | 26.66 | 26.63 | 11.3076        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1993 | 26.88 | 26.83 | 11.44          |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1994 | 27.06 | 27.03 | 11.6153        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1995 | 27.21 | 27.24 | 11.7527        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1996 | 27.41 | 27.44 | 11.8477        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1997 | 27.63 | 27.65 | 11.8428        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1998 | 27.88 | 27.86 | 11.8773        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 1999 | 28.09 | 28.07 | 11.7983        |             | 0.7538*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2000 | 28.24 | 28.28 | 11.8558        | Joinpoint 1 |          | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2001 | 28.35 | 28.33 | 11.8782        |             | 0.1844*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2002 | 28.42 | 28.38 | 11.9532        |             | 0.1844*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2003 | 28.46 | 28.44 | 12.0721        |             | 0.1844*  | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2004 | 28.47 | 28.49 | 12.1767        | Joinpoint 2 |          | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2005 | 28.44 | 28.43 | 12.0598        |             | -0.2176* | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2006 | 28.37 | 28.37 | 12.0608        |             | -0.2176* | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2007 | 28.27 | 28.3  | 12.0509        |             | -0.2176* | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2008 | 28.2  | 28.24 | 12.0288        |             | -0.2176* | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2009 | 28.17 | 28.18 | 12.0568        |             | -0.2176* | 4          | 4              |
| European |         |      |       |       |                |             |          |            |                |
| Union    | DALYs   | 2010 | 28.19 | 28.12 | 11.981         | Joinpoint 3 |          | 4          | 4              |

| location | measure   | year | val    | Model  | Standard Error | Flag        | APC      | Joinpoints | Selected Model |
|----------|-----------|------|--------|--------|----------------|-------------|----------|------------|----------------|
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2011 | 28.3   | 28.27  | 12.1607        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2012 | 28.43  | 28.42  | 12.2202        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2013 | 28.58  | 28.58  | 12.2235        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2014 | 28.72  | 28.73  | 12.2173        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2015 | 28.83  | 28.89  | 12.287         |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2016 | 28.98  | 29.04  | 12.3283        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2017 | 29.17  | 29.2   | 12.3623        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2018 | 29.38  | 29.36  | 12.426         |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2019 | 29.53  | 29.51  | 12.4243        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2020 | 29.69  | 29.67  | 12.5629        |             | 0.5391*  | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2021 | 29.82  | 29.83  | 12.5698        | Joinpoint 4 |          | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2022 | 29.71  | 29.65  | 12.7879        |             | -0.6076* | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | DALYs     | 2023 | 29.44  | 29.47  | 12.6621        |             | -0.6076* | 4          | 4              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1990 | 106.36 | 106.23 | 18.3832        |             | 0.0971*  | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1991 | 106.26 | 106.33 | 18.2355        |             | 0.0971*  | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1992 | 106.31 | 106.43 | 18.0649        |             | 0.0971*  | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1993 | 106.49 | 106.54 | 17.9475        |             | 0.0971*  | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1994 | 106.7  | 106.64 | 17.8536        |             | 0.0971*  | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1995 | 106.98 | 106.74 | 17.8417        | Joinpoint 1 |          | 5          | 5              |
| European |           |      |        |        |                |             |          |            |                |
| Union    | Incidence | 1996 | 107.38 | 107.4  | 17.8526        |             | 0.6186*  | 5          | 5              |



| location | measure   | year | val    | Model  | Standard Error | Flag        | APC     | Joinpoints | Selected Model |
|----------|-----------|------|--------|--------|----------------|-------------|---------|------------|----------------|
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 1997 | 107.92 | 108.07 | 17.6456        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 1998 | 108.57 | 108.74 | 17.4029        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 1999 | 109.37 | 109.41 | 17.1986        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2000 | 110.14 | 110.08 | 17.1441        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2001 | 110.86 | 110.77 | 17.7785        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2002 | 111.53 | 111.45 | 18.2014        |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2003 | 112.18 | 112.14 | 18.304         |             | 0.6186* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2004 | 112.71 | 112.83 | 18.3645        | Joinpoint 2 |         | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2005 | 113.31 | 113.3  | 18.599         |             | 0.4138* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2006 | 113.81 | 113.77 | 18.6381        |             | 0.4138* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2007 | 114.27 | 114.24 | 18.6329        |             | 0.4138* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2008 | 114.72 | 114.71 | 18.7372        |             | 0.4138* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2009 | 115.3  | 115.19 | 18.9335        | Joinpoint 3 |         | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2010 | 116.14 | 116.26 | 19.162         |             | 0.9312* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2011 | 117.25 | 117.34 | 19.228         |             | 0.9312* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2012 | 118.43 | 118.44 | 19.3889        |             | 0.9312* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2013 | 119.52 | 119.54 | 19.659         |             | 0.9312* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2014 | 120.49 | 120.65 | 20.0503        | Joinpoint 4 |         | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2015 | 121.2  | 121.12 | 20.4747        |             | 0.3841* | 5          | 5              |
| European |           |      |        |        |                |             |         |            |                |
| Union    | Incidence | 2016 | 121.72 | 121.58 | 20.8453        |             | 0.3841* | 5          | 5              |

| location | measure    | year | val     | Model   | Standard Error | Flag        | APC      | Joinpoints | Selected Model |
|----------|------------|------|---------|---------|----------------|-------------|----------|------------|----------------|
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2017 | 122.26  | 122.05  | 21.0331        |             | 0.3841*  | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2018 | 122.66  | 122.52  | 21.219         |             | 0.3841*  | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2019 | 122.78  | 122.99  | 21.2957        |             | 0.3841*  | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2020 | 123.18  | 123.46  | 21.166         |             | 0.3841*  | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2021 | 123.85  | 123.93  | 22.024         | Joinpoint 5 |          | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2022 | 123.24  | 122.76  | 21.7533        |             | -0.9500* | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Incidence  | 2023 | 121.35  | 121.59  | 21.4161        |             | -0.9500* | 5          | 5              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1990 | 2756.68 | 2763.48 | 447.1371       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1991 | 2782.24 | 2783.32 | 444.6573       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1992 | 2806.41 | 2803.29 | 444.1511       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1993 | 2828.41 | 2823.42 | 442.9504       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1994 | 2847.54 | 2843.69 | 442.814        |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1995 | 2863.82 | 2864.1  | 441.6928       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1996 | 2882.24 | 2884.66 | 443.7108       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1997 | 2904.56 | 2905.36 | 445.783        |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1998 | 2928.02 | 2926.22 | 447.1689       |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 1999 | 2948.72 | 2947.23 | 445.992        |             | 0.7178*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2000 | 2963.6  | 2968.38 | 448.2701       | Joinpoint 1 |          | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2001 | 2971.81 | 2971.35 | 451.0586       |             | 0.1002   | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2002 | 2975.34 | 2974.33 | 447.332        |             | 0.1002   | 4          | 4              |

| location | measure    | year | val     | Model   | Standard Error | Flag        | APC      | Joinpoints | Selected Model |
|----------|------------|------|---------|---------|----------------|-------------|----------|------------|----------------|
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2003 | 2975.75 | 2977.31 | 453.6837       | Joinpoint 2 |          | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2004 | 2973.82 | 2972.09 | 456.8118       |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2005 | 2969.72 | 2966.87 | 465.2953       |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2006 | 2962.74 | 2961.67 | 461.1443       |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2007 | 2953.36 | 2956.48 | 455.5466       |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2008 | 2945.97 | 2951.29 | 452.084        |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2009 | 2943    | 2946.12 | 450.0188       |             | -0.1754* | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2010 | 2947.13 | 2940.95 | 449.787        | Joinpoint 3 |          | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2011 | 2958.73 | 2956.66 | 457.85         |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2012 | 2973.91 | 2972.46 | 466.993        |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2013 | 2990.19 | 2988.34 | 471.7434       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2014 | 3005.46 | 3004.3  | 476.0316       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2015 | 3017.16 | 3020.36 | 479.8766       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2016 | 3031.49 | 3036.49 | 484.9927       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2017 | 3050.56 | 3052.71 | 492.7414       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2018 | 3069.99 | 3069.02 | 500.3193       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2019 | 3083.42 | 3085.42 | 509.0796       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2020 | 3101.95 | 3101.91 | 516.9843       |             | 0.5343*  | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2021 | 3119.61 | 3118.48 | 513.4713       | Joinpoint 4 |          | 4          | 4              |
| European |            |      |         |         |                |             |          |            |                |
| Union    | Prevalence | 2022 | 3109.22 | 3100.92 | 509.7076       |             | -0.5629* | 4          | 4              |

| location | measure    | year | val     | Model   | Standard<br>Error | Flag        | APC      | Joinpoints | Selected<br>Model |
|----------|------------|------|---------|---------|-------------------|-------------|----------|------------|-------------------|
| European |            |      |         |         |                   |             |          |            |                   |
| Union    | Prevalence | 2023 | 3079.36 | 3083.47 | 503.9902          |             | -0.5629* | 4          | 4                 |
| Global   | DALYs      | 1990 | 13.11   | 13.1    | 5.8339            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1991 | 13.21   | 13.21   | 5.8763            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1992 | 13.33   | 13.32   | 5.9318            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1993 | 13.44   | 13.43   | 5.9826            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1994 | 13.54   | 13.55   | 6.0349            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1995 | 13.65   | 13.66   | 6.0852            |             | 0.8315*  | 5          | 5                 |
| Global   | DALYs      | 1996 | 13.78   | 13.77   | 6.1316            | Joinpoint 1 |          | 5          | 5                 |
| Global   | DALYs      | 1997 | 13.94   | 13.94   | 6.2015            |             | 1.2316*  | 5          | 5                 |
| Global   | DALYs      | 1998 | 14.12   | 14.11   | 6.2541            |             | 1.2316*  | 5          | 5                 |
| Global   | DALYs      | 1999 | 14.27   | 14.29   | 6.3044            | Joinpoint 2 |          | 5          | 5                 |
| Global   | DALYs      | 2000 | 14.4    | 14.39   | 6.3336            |             | 0.7280*  | 5          | 5                 |
| Global   | DALYs      | 2001 | 14.5    | 14.5    | 6.3783            |             | 0.7280*  | 5          | 5                 |
| Global   | DALYs      | 2002 | 14.61   | 14.6    | 6.4273            |             | 0.7280*  | 5          | 5                 |
| Global   | DALYs      | 2003 | 14.71   | 14.71   | 6.4834            |             | 0.7280*  | 5          | 5                 |
| Global   | DALYs      | 2004 | 14.8    | 14.82   | 6.5389            | Joinpoint 3 |          | 5          | 5                 |
| Global   | DALYs      | 2005 | 14.87   | 14.86   | 6.5815            |             | 0.3039*  | 5          | 5                 |
| Global   | DALYs      | 2006 | 14.92   | 14.91   | 6.606             |             | 0.3039*  | 5          | 5                 |
| Global   | DALYs      | 2007 | 14.94   | 14.95   | 6.6168            |             | 0.3039*  | 5          | 5                 |
| Global   | DALYs      | 2008 | 14.98   | 15      | 6.6418            |             | 0.3039*  | 5          | 5                 |
| Global   | DALYs      | 2009 | 15.04   | 15.04   | 6.6642            |             | 0.3039*  | 5          | 5                 |
| Global   | DALYs      | 2010 | 15.13   | 15.09   | 6.7013            | Joinpoint 4 |          | 5          | 5                 |
| Global   | DALYs      | 2011 | 15.26   | 15.24   | 6.7649            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2012 | 15.41   | 15.4    | 6.8315            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2013 | 15.56   | 15.56   | 6.8912            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2014 | 15.71   | 15.72   | 6.9765            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2015 | 15.84   | 15.88   | 7.0189            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2016 | 15.99   | 16.04   | 7.0926            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2017 | 16.18   | 16.21   | 7.1658            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2018 | 16.39   | 16.37   | 7.2631            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2019 | 16.57   | 16.54   | 7.3686            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2020 | 16.79   | 16.71   | 7.4407            |             | 1.0290*  | 5          | 5                 |
| Global   | DALYs      | 2021 | 16.87   | 16.89   | 7.4699            | Joinpoint 5 |          | 5          | 5                 |
| Global   | DALYs      | 2022 | 16.58   | 16.6    | 7.3699            |             | -1.6802* | 5          | 5                 |
| Global   | DALYs      | 2023 | 16.34   | 16.32   | 7.2865            |             | -1.6802* | 5          | 5                 |
| Global   | Incidence  | 1990 | 49.34   | 49.4    | 8.2418            |             | 0.7262*  | 5          | 5                 |
| Global   | Incidence  | 1991 | 49.74   | 49.76   | 8.3063            |             | 0.7262*  | 5          | 5                 |
| Global   | Incidence  | 1992 | 50.17   | 50.12   | 8.3737            |             | 0.7262*  | 5          | 5                 |
| Global   | Incidence  | 1993 | 50.57   | 50.49   | 8.4364            |             | 0.7262*  | 5          | 5                 |

| location | measure    | year | val     | Model   | Standard<br>Error | Flag        | APC      | Joinpoints | Selected<br>Model |
|----------|------------|------|---------|---------|-------------------|-------------|----------|------------|-------------------|
| Global   | Incidence  | 1994 | 50.9    | 50.85   | 8.4909            |             | 0.7262*  | 5          | 5                 |
| Global   | Incidence  | 1995 | 51.17   | 51.22   | 8.537             |             | 0.7262*  | 5          | 5                 |
| Global   | Incidence  | 1996 | 51.5    | 51.59   | 8.5352            | Joinpoint 1 |          | 5          | 5                 |
| Global   | Incidence  | 1997 | 51.97   | 52.04   | 8.5594            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 1998 | 52.51   | 52.49   | 8.6025            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 1999 | 53.04   | 52.94   | 8.6511            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 2000 | 53.46   | 53.39   | 8.6869            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 2001 | 53.84   | 53.85   | 8.7043            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 2002 | 54.29   | 54.31   | 8.7373            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 2003 | 54.76   | 54.78   | 8.8237            |             | 0.8599*  | 5          | 5                 |
| Global   | Incidence  | 2004 | 55.2    | 55.25   | 8.8689            | Joinpoint 2 |          | 5          | 5                 |
| Global   | Incidence  | 2005 | 55.57   | 55.54   | 8.9257            |             | 0.5211*  | 5          | 5                 |
| Global   | Incidence  | 2006 | 55.86   | 55.83   | 8.9313            |             | 0.5211*  | 5          | 5                 |
| Global   | Incidence  | 2007 | 56.12   | 56.12   | 8.9226            |             | 0.5211*  | 5          | 5                 |
| Global   | Incidence  | 2008 | 56.38   | 56.41   | 8.9193            |             | 0.5211*  | 5          | 5                 |
| Global   | Incidence  | 2009 | 56.71   | 56.71   | 8.9354            | Joinpoint 3 |          | 5          | 5                 |
| Global   | Incidence  | 2010 | 57.14   | 57.18   | 8.993             |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2011 | 57.64   | 57.65   | 9.1123            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2012 | 58.16   | 58.13   | 9.2405            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2013 | 58.69   | 58.61   | 9.3685            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2014 | 59.15   | 59.1    | 9.4991            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2015 | 59.54   | 59.59   | 9.6368            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2016 | 59.98   | 60.08   | 9.7174            |             | 0.8298*  | 5          | 5                 |
| Global   | Incidence  | 2017 | 60.59   | 60.58   | 9.8222            | Joinpoint 4 |          | 5          | 5                 |
| Global   | Incidence  | 2018 | 61.27   | 61.24   | 9.9414            |             | 1.0907*  | 5          | 5                 |
| Global   | Incidence  | 2019 | 61.89   | 61.91   | 10.0577           |             | 1.0907*  | 5          | 5                 |
| Global   | Incidence  | 2020 | 62.76   | 62.59   | 10.5069           |             | 1.0907*  | 5          | 5                 |
| Global   | Incidence  | 2021 | 63.09   | 63.27   | 10.3795           | Joinpoint 5 |          | 5          | 5                 |
| Global   | Incidence  | 2022 | 61.93   | 61.82   | 10.4242           |             | -2.2941* | 5          | 5                 |
| Global   | Incidence  | 2023 | 60.34   | 60.4    | 10.16             |             | -2.2941* | 5          | 5                 |
| Global   | Prevalence | 1990 | 1369.84 | 1369.56 | 227.3196          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1991 | 1380.71 | 1381.09 | 229.6504          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1992 | 1392.88 | 1392.72 | 231.2726          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1993 | 1404.69 | 1404.44 | 232.7482          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1994 | 1416.09 | 1416.26 | 234.1002          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1995 | 1427.25 | 1428.19 | 235.3911          |             | 0.8419*  | 5          | 5                 |
| Global   | Prevalence | 1996 | 1440.91 | 1440.21 | 236.7463          | Joinpoint 1 |          | 5          | 5                 |
| Global   | Prevalence | 1997 | 1457.5  | 1457.42 | 238.336           |             | 1.1950*  | 5          | 5                 |
| Global   | Prevalence | 1998 | 1474.94 | 1474.84 | 239.9545          |             | 1.1950*  | 5          | 5                 |
| Global   | Prevalence | 1999 | 1491.13 | 1492.46 | 241.5202          | Joinpoint 2 |          | 5          | 5                 |

| location | measure    | year | val     | Model   | Standard Error | Flag        | APC      | Joinpoints | Selected Model |
|----------|------------|------|---------|---------|----------------|-------------|----------|------------|----------------|
| Global   | Prevalence | 2000 | 1503.23 | 1502.69 | 242.9457       |             | 0.6853*  | 5          | 5              |
| Global   | Prevalence | 2001 | 1513.68 | 1512.99 | 243.0964       |             | 0.6853*  | 5          | 5              |
| Global   | Prevalence | 2002 | 1524.21 | 1523.36 | 243.5594       |             | 0.6853*  | 5          | 5              |
| Global   | Prevalence | 2003 | 1534.05 | 1533.8  | 244.4919       |             | 0.6853*  | 5          | 5              |
| Global   | Prevalence | 2004 | 1542.87 | 1544.31 | 244.7642       | Joinpoint 3 |          | 5          | 5              |
| Global   | Prevalence | 2005 | 1549.76 | 1548.63 | 244.8775       |             | 0.2799*  | 5          | 5              |
| Global   | Prevalence | 2006 | 1554.02 | 1552.96 | 244.5754       |             | 0.2799*  | 5          | 5              |
| Global   | Prevalence | 2007 | 1556.54 | 1557.31 | 244.276        |             | 0.2799*  | 5          | 5              |
| Global   | Prevalence | 2008 | 1559.41 | 1561.67 | 244.5083       |             | 0.2799*  | 5          | 5              |
| Global   | Prevalence | 2009 | 1565.06 | 1566.04 | 245.9022       |             | 0.2799*  | 5          | 5              |
| Global   | Prevalence | 2010 | 1574.74 | 1570.42 | 248.3721       | Joinpoint 4 |          | 5          | 5              |
| Global   | Prevalence | 2011 | 1588.13 | 1586.52 | 252.233        |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2012 | 1603.67 | 1602.78 | 256.5509       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2013 | 1620.1  | 1619.21 | 261.1078       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2014 | 1635.54 | 1635.81 | 264.9828       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2015 | 1648.51 | 1652.58 | 268.4196       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2016 | 1663.59 | 1669.52 | 272.0592       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2017 | 1683.13 | 1686.63 | 276.4965       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2018 | 1704.03 | 1703.92 | 282.1966       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2019 | 1722.78 | 1721.39 | 287.0986       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2020 | 1746.47 | 1739.04 | 291.1808       |             | 1.0251*  | 5          | 5              |
| Global   | Prevalence | 2021 | 1756.81 | 1756.86 | 288.5319       | Joinpoint 5 |          | 5          | 5              |
| Global   | Prevalence | 2022 | 1725.74 | 1726.82 | 292.7095       |             | -1.7099* | 5          | 5              |
| Global   | Prevalence | 2023 | 1697.82 | 1697.3  | 287.0598       |             | -1.7099* | 5          | 5              |

“\*” means significant ( $P < 0.05$ ).

**Table S4:** Annual age-standardized rates by country and year.

| location | year | DALYs               | Prevalence                | Incidence              |
|----------|------|---------------------|---------------------------|------------------------|
| Austria  | 1990 | 36.12 (16.68,75.06) | 3733.32 (2678.94,5075.92) | 144.36 (104.10,200.83) |
| Austria  | 2023 | 37.62 (17.01,80.17) | 3896.30 (2798.61,5305.63) | 149.89 (106.40,209.10) |
| Belgium  | 1990 | 28.97 (12.49,60.81) | 2993.09 (2101.74,4268.12) | 116.38 (80.46,168.29)  |
| Belgium  | 2023 | 34.23 (15.07,76.16) | 3536.36 (2506.07,5074.99) | 136.02 (93.88,190.07)  |
| Bulgaria | 1990 | 1.65 (0.71,3.43)    | 171.08 (107.76,256.95)    | 6.76 (4.36,9.98)       |
| Bulgaria | 2023 | 2.09 (0.92,4.70)    | 215.78 (140.94,317.71)    | 8.48 (5.68,12.40)      |
| Croatia  | 1990 | 1.52 (0.61,3.22)    | 157.07 (100.01,241.45)    | 6.24 (4.16,9.37)       |
| Croatia  | 2023 | 2.03 (0.82,4.52)    | 209.23 (133.95,303.46)    | 8.21 (5.35,11.92)      |
| Cyprus   | 1990 | 22.23 (9.82,47.91)  | 2292.63 (1564.81,3220.86) | 89.37 (60.95,127.43)   |
| Cyprus   | 2023 | 31.56 (14.06,68.54) | 3279.54 (2255.25,4588.29) | 128.14 (89.30,177.69)  |
| Czechia  | 1990 | 1.57 (0.66,3.45)    | 162.01 (102.28,240.72)    | 6.40 (4.03,9.66)       |

| location    | year | DALYs                | Prevalence                 | Incidence              |
|-------------|------|----------------------|----------------------------|------------------------|
| Czechia     | 2023 | 2.00 (0.85,4.43)     | 206.62 (135.43,307.88)     | 8.09 (5.41,11.88)      |
| Denmark     | 1990 | 24.04 (11.06,50.12)  | 2544.71 (1759.03,3491.66)  | 104.99 (71.70,146.57)  |
| Denmark     | 2023 | 31.15 (14.41,66.59)  | 3268.95 (2362.11,4500.48)  | 131.58 (91.82,185.70)  |
| Estonia     | 1990 | 2.08 (0.88,4.29)     | 213.33 (144.52,310.01)     | 8.59 (6.00,12.21)      |
| Estonia     | 2023 | 2.92 (1.22,6.62)     | 299.65 (200.79,437.03)     | 11.81 (8.16,16.76)     |
| Finland     | 1990 | 25.12 (11.35,52.51)  | 2626.57 (1818.16,3675.17)  | 105.13 (71.35,152.10)  |
| Finland     | 2023 | 31.63 (14.09,68.79)  | 3293.46 (2344.36,4581.07)  | 129.62 (91.28,185.62)  |
| France      | 1990 | 24.68 (10.70,53.35)  | 2522.72 (1795.33,3562.17)  | 97.67 (70.07,139.04)   |
| France      | 2023 | 30.56 (13.08,67.19)  | 3147.43 (2179.95,4411.37)  | 121.05 (82.00,173.58)  |
| Germany     | 1990 | 23.55 (10.85,49.95)  | 2467.24 (1736.11,3322.48)  | 99.40 (69.69,137.78)   |
| Germany     | 2023 | 28.96 (12.87,61.11)  | 3034.27 (2165.88,4187.07)  | 121.01 (88.02,171.00)  |
| Greece      | 1990 | 27.88 (12.13,58.73)  | 2886.98 (1989.83,4093.23)  | 112.91 (77.39,158.20)  |
| Greece      | 2023 | 34.36 (14.71,73.23)  | 3577.70 (2520.39,5021.41)  | 140.41 (98.88,202.81)  |
| Hungary     | 1990 | 1.68 (0.72,3.75)     | 174.61 (110.35,264.11)     | 6.91 (4.50,10.24)      |
| Hungary     | 2023 | 2.07 (0.84,4.63)     | 212.46 (141.20,314.23)     | 8.35 (5.66,12.17)      |
| Ireland     | 1990 | 26.92 (11.93,56.16)  | 2782.42 (1951.89,3959.23)  | 109.10 (77.47,153.17)  |
| Ireland     | 2023 | 33.11 (14.97,69.49)  | 3445.04 (2361.93,4725.93)  | 135.05 (92.16,183.39)  |
| Italy       | 1990 | 79.89 (36.19,167.84) | 8558.56 (6295.30,11583.73) | 361.56 (258.96,504.62) |
| Italy       | 2023 | 75.99 (34.22,161.68) | 8019.67 (5763.97,10899.76) | 320.98 (227.93,451.97) |
| Latvia      | 1990 | 2.05 (0.92,4.36)     | 211.54 (145.15,310.19)     | 8.53 (5.97,12.44)      |
| Latvia      | 2023 | 2.66 (1.13,5.65)     | 273.73 (184.69,405.95)     | 10.84 (7.39,15.69)     |
| Lithuania   | 1990 | 1.86 (0.78,4.02)     | 192.39 (125.59,284.14)     | 7.78 (5.20,11.47)      |
| Lithuania   | 2023 | 2.54 (1.05,5.57)     | 262.05 (176.26,376.44)     | 10.38 (7.11,14.78)     |
| Luxembourg  | 1990 | 27.25 (12.28,57.91)  | 2824.56 (1961.87,4002.97)  | 110.81 (76.04,158.48)  |
| Luxembourg  | 2023 | 34.47 (15.22,73.52)  | 3591.63 (2454.71,5046.05)  | 140.99 (99.20,198.35)  |
| Malta       | 1990 | 25.70 (11.48,57.12)  | 2654.32 (1906.80,3754.55)  | 103.70 (72.57,147.15)  |
| Malta       | 2023 | 34.36 (15.32,73.72)  | 3571.08 (2514.30,4958.01)  | 139.46 (97.29,194.63)  |
| Netherlands | 1990 | 24.05 (10.88,49.42)  | 2491.65 (1740.51,3516.15)  | 97.47 (69.06,138.46)   |
| Netherlands | 2023 | 29.72 (13.66,63.98)  | 3101.68 (2213.98,4378.84)  | 121.30 (85.91,170.84)  |
| Poland      | 1990 | 2.49 (1.05,5.16)     | 256.49 (170.22,379.32)     | 10.16 (6.98,15.00)     |
| Poland      | 2023 | 2.65 (1.12,5.76)     | 272.84 (187.75,377.92)     | 10.63 (7.49,14.87)     |
| Portugal    | 1990 | 23.19 (10.12,50.14)  | 2401.91 (1666.88,3414.87)  | 93.61 (66.21,128.95)   |
| Portugal    | 2023 | 30.86 (13.62,63.30)  | 3211.32 (2296.87,4500.39)  | 125.26 (87.95,175.28)  |
| Romania     | 1990 | 1.42 (0.57,3.17)     | 146.27 (92.29,218.81)      | 5.82 (3.76,8.65)       |
| Romania     | 2023 | 2.00 (0.82,4.27)     | 206.19 (138.43,307.18)     | 8.09 (5.52,12.08)      |
| Slovakia    | 1990 | 1.46 (0.59,3.26)     | 150.96 (94.45,228.15)      | 6.01 (3.87,9.01)       |
| Slovakia    | 2023 | 2.01 (0.83,4.55)     | 207.75 (131.22,306.87)     | 8.19 (5.38,12.24)      |
| Slovenia    | 1990 | 1.53 (0.65,3.52)     | 159.84 (106.04,240.05)     | 6.42 (4.35,9.48)       |
| Slovenia    | 2023 | 2.12 (0.87,4.58)     | 221.50 (146.58,333.77)     | 8.76 (5.88,12.88)      |
| Spain       | 1990 | 24.74 (11.20,51.91)  | 2604.80 (1800.71,3638.55)  | 105.68 (71.66,148.38)  |
| Spain       | 2023 | 31.36 (14.27,66.20)  | 3300.91 (2283.90,4567.54)  | 131.75 (91.61,187.47)  |

| location | year | DALYs               | Prevalence                | Incidence            |
|----------|------|---------------------|---------------------------|----------------------|
| Sweden   | 1990 | 21.00 (9.15,45.02)  | 2153.11 (1495.39,3031.12) | 82.85 (58.28,117.10) |
| Sweden   | 2023 | 24.83 (10.79,52.16) | 2569.59 (1766.20,3616.23) | 99.45 (68.09,138.86) |

**Table S5:** Estimated annual percentage change (EAPC) in age-standardized rates by country during 1990–2023.

| location    | DALYs               | Incidence           | Prevalence          |
|-------------|---------------------|---------------------|---------------------|
| Austria     | -0.08 (-0.15,-0.01) | -0.06 (-0.14,0.01)  | -0.06 (-0.13,0.01)  |
| Belgium     | 0.37 (0.20,0.55)    | 0.36 (0.18,0.54)    | 0.38 (0.20,0.56)    |
| Bulgaria    | 0.77 (0.72,0.81)    | 0.77 (0.72,0.81)    | 0.77 (0.73,0.82)    |
| Croatia     | 1.00 (0.90,1.10)    | 0.98 (0.88,1.09)    | 1.00 (0.90,1.11)    |
| Cyprus      | 1.20 (1.04,1.37)    | 1.25 (1.08,1.43)    | 1.22 (1.06,1.39)    |
| Czechia     | 0.73 (0.66,0.80)    | 0.72 (0.66,0.78)    | 0.74 (0.67,0.80)    |
| Denmark     | 0.76 (0.63,0.89)    | 0.66 (0.56,0.76)    | 0.73 (0.61,0.85)    |
| Estonia     | 1.35 (1.25,1.45)    | 1.28 (1.19,1.38)    | 1.35 (1.25,1.45)    |
| Finland     | 0.67 (0.62,0.72)    | 0.66 (0.61,0.70)    | 0.67 (0.62,0.71)    |
| France      | 0.66 (0.62,0.70)    | 0.66 (0.62,0.71)    | 0.67 (0.63,0.71)    |
| Germany     | 0.62 (0.56,0.68)    | 0.59 (0.54,0.63)    | 0.62 (0.57,0.67)    |
| Greece      | 0.44 (0.28,0.60)    | 0.50 (0.32,0.67)    | 0.47 (0.30,0.63)    |
| Hungary     | 0.63 (0.56,0.71)    | 0.62 (0.55,0.69)    | 0.63 (0.55,0.70)    |
| Ireland     | 0.60 (0.51,0.69)    | 0.63 (0.54,0.73)    | 0.62 (0.53,0.71)    |
| Italy       | -0.32 (-0.43,-0.21) | -0.59 (-0.72,-0.45) | -0.38 (-0.50,-0.26) |
| Latvia      | 1.03 (0.95,1.11)    | 0.98 (0.90,1.05)    | 1.03 (0.95,1.10)    |
| Lithuania   | 1.21 (1.12,1.31)    | 1.16 (1.06,1.25)    | 1.22 (1.12,1.31)    |
| Luxembourg  | 0.74 (0.68,0.80)    | 0.76 (0.69,0.83)    | 0.75 (0.69,0.81)    |
| Malta       | 0.83 (0.70,0.96)    | 0.87 (0.72,1.01)    | 0.85 (0.71,0.98)    |
| Netherlands | 0.64 (0.60,0.68)    | 0.67 (0.62,0.72)    | 0.66 (0.61,0.71)    |
| Poland      | 0.04 (-0.03,0.11)   | -0.03 (-0.11,0.06)  | 0.04 (-0.03,0.11)   |
| Portugal    | 0.67 (0.50,0.84)    | 0.69 (0.51,0.87)    | 0.67 (0.50,0.84)    |
| Romania     | 1.17 (1.10,1.23)    | 1.15 (1.08,1.22)    | 1.18 (1.11,1.24)    |
| Slovakia    | 1.02 (0.97,1.07)    | 1.01 (0.96,1.06)    | 1.02 (0.97,1.07)    |
| Slovenia    | 1.09 (0.98,1.21)    | 1.04 (0.93,1.15)    | 1.09 (0.97,1.20)    |
| Spain       | 0.63 (0.50,0.76)    | 0.55 (0.43,0.67)    | 0.61 (0.49,0.73)    |
| Sweden      | 0.56 (0.32,0.80)    | 0.61 (0.38,0.85)    | 0.58 (0.34,0.82)    |

**Table S6:** Annual age-standardized rates by SDI quintile and GBD region.

| location             | year | DALYs               | Prevalence                | Incidence                 |
|----------------------|------|---------------------|---------------------------|---------------------------|
| Andean Latin America | 1990 | 22.45 (9.96,48.26)  | 2419.90 (1685.50,3353.98) | 100.32 (69.62,142.95)     |
| Andean Latin America | 2023 | 30.84 (13.88,67.14) | 3271.60 (2307.15,4456.63) | 130.45 (91.87,180.83)     |
| Australasia          | 1990 | 38.09 (17.47,79.21) | 4124.21 (3092.59,5372.57) | 174.07<br>(130.44,228.76) |



| location                     | year | DALYs                   | Prevalence                | Incidence                 |
|------------------------------|------|-------------------------|---------------------------|---------------------------|
| Australasia                  | 2023 | 43.81 (19.81,94.81)     | 4759.08 (3431.30,6496.61) | 199.99<br>(144.51,275.50) |
| Caribbean                    | 1990 | 11.46 (5.06,24.29)      | 1186.62 (823.07,1683.66)  | 44.33 (30.66,62.80)       |
| Caribbean                    | 2023 | 14.11 (6.22,30.64)      | 1466.61 (1013.54,2056.43) | 54.57 (37.99,78.47)       |
| Central Asia                 | 1990 | 3.38 (1.47,7.31)        | 348.67 (236.92,505.61)    | 13.68 (9.63,19.65)        |
| Central Asia                 | 2023 | 4.58 (1.99,10.01)       | 473.06 (318.39,670.28)    | 18.26 (12.71,25.93)       |
| Central Europe               | 1990 | 1.81 (0.76,3.93)        | 186.47 (121.55,279.82)    | 7.38 (5.00,10.93)         |
| Central Europe               | 2023 | 2.22 (0.94,4.81)        | 229.18 (155.47,331.07)    | 8.94 (6.24,12.92)         |
| Central Latin America        | 1990 | 25.43 (11.34,54.07)     | 2692.76 (1888.41,3709.41) | 107.21 (75.05,153.49)     |
| Central Latin America        | 2023 | 27.99 (12.43,58.95)     | 2945.07 (2081.98,4037.13) | 114.09 (81.20,160.81)     |
| Central Sub-Saharan Africa   | 1990 | 4.25 (1.85,9.45)        | 445.33 (306.58,643.89)    | 17.62 (12.44,24.95)       |
| Central Sub-Saharan Africa   | 2023 | 6.41 (2.77,13.80)       | 664.09 (457.16,953.40)    | 25.47 (17.82,35.70)       |
| East Asia                    | 1990 | 8.18 (3.57,18.33)       | 845.84 (591.91,1182.80)   | 32.14 (23.10,44.82)       |
| East Asia                    | 2023 | 14.75 (6.43,32.41)      | 1517.97 (1053.46,2096.38) | 56.89 (40.48,78.86)       |
| Eastern Europe               | 1990 | 2.01 (0.84,4.17)        | 206.51 (140.41,296.45)    | 8.56 (6.08,12.05)         |
| Eastern Europe               | 2023 | 2.55 (1.07,5.50)        | 261.81 (182.44,370.11)    | 10.64 (7.58,14.98)        |
| Eastern Sub-Saharan Africa   | 1990 | 4.97 (2.11,10.81)       | 517.00 (356.96,737.78)    | 20.69 (14.76,29.14)       |
| Eastern Sub-Saharan Africa   | 2023 | 6.35 (2.73,14.25)       | 657.28 (454.98,933.48)    | 25.39 (18.11,35.81)       |
| European Union               | 1990 | 26.19 (12.00,55.26)     | 2756.68 (2015.46,3768.24) | 106.36 (75.47,147.54)     |
| European Union               | 2023 | 29.44 (13.31,62.95)     | 3079.36 (2274.12,4249.76) | 121.35 (85.60,169.55)     |
| Global                       | 1990 | 13.11 (5.82,28.69)      | 1369.84 (983.38,1874.47)  | 49.34 (35.92,68.23)       |
| Global                       | 2023 | 16.34 (7.19,35.75)      | 1697.82 (1203.25,2328.52) | 60.34 (43.21,83.04)       |
| High SDI                     | 1990 | 18.78 (8.41,40.95)      | 1972.54 (1434.74,2695.14) | 74.77 (54.28,102.92)      |
| High SDI                     | 2023 | 22.94 (10.27,49.85)     | 2398.08 (1710.94,3278.88) | 95.17 (68.39,131.39)      |
| High-income Asia Pacific     | 1990 | 44.48 (19.60,97.25)     | 4726.94 (3461.55,6507.81) | 191.90<br>(138.05,268.15) |
| High-income Asia Pacific     | 2023 | 48.66<br>(21.68,105.71) | 5178.82 (3693.65,7146.16) | 220.84<br>(155.24,308.65) |
| High-income North America    | 1990 | 28.11 (12.56,61.73)     | 2974.04 (2083.06,4142.18) | 119.20 (83.78,166.46)     |
| High-income North America    | 2023 | 30.02 (13.33,66.16)     | 3152.94 (2205.74,4364.99) | 124.72 (87.90,172.87)     |
| High-middle SDI              | 1990 | 11.84 (5.22,25.44)      | 1235.63 (874.98,1703.84)  | 52.05 (36.61,72.72)       |
| High-middle SDI              | 2023 | 19.08 (8.45,41.24)      | 1982.53 (1404.98,2715.45) | 75.91 (53.88,105.85)      |
| Low SDI                      | 1990 | 4.94 (2.15,10.69)       | 513.32 (358.36,725.72)    | 20.56 (14.80,28.64)       |
| Low SDI                      | 2023 | 7.37 (3.18,16.34)       | 763.04 (529.28,1070.82)   | 28.78 (20.50,40.44)       |
| Low-middle SDI               | 1990 | 6.92 (3.01,14.99)       | 717.31 (500.15,1005.74)   | 28.73 (20.73,40.17)       |
| Low-middle SDI               | 2023 | 11.15 (4.80,24.56)      | 1153.82 (804.31,1601.42)  | 43.05 (30.47,60.40)       |
| Middle SDI                   | 1990 | 11.33 (4.98,24.93)      | 1167.73 (820.08,1617.03)  | 45.76 (32.77,63.90)       |
| Middle SDI                   | 2023 | 19.44 (8.56,42.58)      | 2005.65 (1407.41,2784.80) | 77.32 (54.68,107.78)      |
| North Africa and Middle East | 1990 | 15.05 (6.55,32.75)      | 1548.38 (1066.51,2162.20) | 58.98 (41.36,82.32)       |
| North Africa and Middle East | 2023 | 19.79 (8.65,42.95)      | 2039.65 (1424.64,2869.31) | 75.36 (53.06,105.89)      |
| Oceania                      | 1990 | 12.33 (5.50,26.69)      | 1279.90 (889.74,1778.65)  | 49.58 (34.72,69.93)       |

| location                    | year | DALYs               | Prevalence                | Incidence                 |
|-----------------------------|------|---------------------|---------------------------|---------------------------|
| Oceania                     | 2023 | 16.83 (7.29,37.03)  | 1747.30 (1227.47,2472.29) | 68.08 (47.99,95.62)       |
| South Asia                  | 1990 | 6.19 (2.68,13.62)   | 643.12 (456.18,889.56)    | 25.26 (18.35,35.00)       |
| South Asia                  | 2023 | 10.76 (4.62,23.85)  | 1114.91 (780.71,1548.17)  | 40.21 (28.57,56.25)       |
| Southeast Asia              | 1990 | 14.78 (6.34,32.96)  | 1522.59 (1085.24,2149.42) | 58.95 (42.24,82.46)       |
| Southeast Asia              | 2023 | 27.14 (11.95,59.73) | 2803.20 (1941.99,3904.12) | 107.45 (76.17,148.17)     |
| Southern Latin America      | 1990 | 11.42 (4.89,24.91)  | 1185.88 (834.29,1726.62)  | 46.78 (33.04,67.06)       |
| Southern Latin America      | 2023 | 17.69 (7.57,38.96)  | 1844.34 (1306.55,2622.73) | 72.10 (51.22,102.48)      |
| Southern Sub-Saharan Africa | 1990 | 8.38 (3.55,18.64)   | 870.94 (596.61,1216.09)   | 33.79 (23.78,47.55)       |
| Southern Sub-Saharan Africa | 2023 | 10.42 (4.48,22.79)  | 1087.94 (755.67,1513.97)  | 41.33 (29.28,58.81)       |
| Tropical Latin America      | 1990 | 5.39 (2.30,11.53)   | 558.40 (380.72,807.07)    | 23.30 (16.22,33.60)       |
| Tropical Latin America      | 2023 | 5.73 (2.51,12.12)   | 596.81 (414.72,834.47)    | 24.04 (16.61,34.08)       |
| Western Europe              | 1990 | 33.74 (15.40,71.42) | 3544.90 (2589.57,4874.95) | 143.23<br>(101.50,199.32) |
| Western Europe              | 2023 | 36.98 (16.75,79.26) | 3868.23 (2853.64,5338.69) | 151.46<br>(106.89,210.89) |
| Western Sub-Saharan Africa  | 1990 | 4.81 (2.08,10.35)   | 502.20 (349.43,714.89)    | 20.03 (14.42,28.10)       |
| Western Sub-Saharan Africa  | 2023 | 6.78 (2.88,14.84)   | 704.48 (486.26,986.06)    | 26.80 (19.08,37.80)       |

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45 **Table S7:** Estimated annual percentage change (EAPC) in age-standardized rates by SDI quintile and GBD  
46 region during 1990–2023.

| location                   | DALYs              | Incidence          | Prevalence         |
|----------------------------|--------------------|--------------------|--------------------|
| Andean Latin America       | 1.11 (1.03,1.19)   | 0.84 (0.74,0.94)   | 1.02 (0.93,1.10)   |
| Australasia                | 0.27 (0.18,0.35)   | 0.27 (0.18,0.35)   | 0.27 (0.18,0.35)   |
| Caribbean                  | 0.71 (0.64,0.78)   | 0.76 (0.68,0.83)   | 0.72 (0.65,0.79)   |
| Central Asia               | 1.12 (1.05,1.20)   | 1.08 (1.00,1.15)   | 1.12 (1.05,1.20)   |
| Central Europe             | 0.61 (0.57,0.66)   | 0.55 (0.49,0.60)   | 0.61 (0.57,0.66)   |
| Central Latin America      | -0.02 (-0.17,0.14) | -0.05 (-0.21,0.11) | -0.03 (-0.18,0.13) |
| Central Sub-Saharan Africa | 1.27 (1.14,1.41)   | 1.18 (1.04,1.32)   | 1.25 (1.11,1.39)   |
| East Asia                  | 1.95 (1.79,2.11)   | 1.88 (1.74,2.03)   | 1.95 (1.79,2.11)   |
| Eastern Europe             | 0.94 (0.88,1.00)   | 0.87 (0.81,0.93)   | 0.93 (0.87,0.99)   |
| Eastern Sub-Saharan Africa | 0.85 (0.82,0.88)   | 0.80 (0.76,0.84)   | 0.85 (0.82,0.88)   |
| European Union             | 0.31 (0.27,0.36)   | 0.54 (0.50,0.57)   | 0.29 (0.25,0.33)   |
| Global                     | 0.74 (0.70,0.78)   | 0.74 (0.70,0.77)   | 0.72 (0.68,0.76)   |
| High SDI                   | 0.56 (0.46,0.66)   | 0.89 (0.82,0.95)   | 0.54 (0.44,0.64)   |
| High-income Asia Pacific   | 0.24 (0.20,0.29)   | 0.41 (0.34,0.48)   | 0.25 (0.20,0.30)   |
| High-income North America  | -0.28 (-0.74,0.19) | -0.38 (-0.85,0.08) | -0.33 (-0.80,0.14) |
| High-middle SDI            | 1.50 (1.43,1.57)   | 1.26 (1.20,1.33)   | 1.49 (1.42,1.56)   |
| Low SDI                    | 1.43 (1.38,1.49)   | 1.27 (1.20,1.33)   | 1.43 (1.37,1.49)   |
| Low-middle SDI             | 1.69 (1.61,1.78)   | 1.50 (1.42,1.58)   | 1.70 (1.62,1.78)   |
| Middle SDI                 | 1.93 (1.85,2.01)   | 1.87 (1.79,1.95)   | 1.93 (1.85,2.01)   |

| location                     | DALYs              | Incidence           | Prevalence         |
|------------------------------|--------------------|---------------------|--------------------|
| North Africa and Middle East | 1.00 (0.91,1.09)   | 0.89 (0.82,0.97)    | 1.01 (0.92,1.10)   |
| Oceania                      | 0.76 (0.61,0.92)   | 0.80 (0.65,0.95)    | 0.77 (0.61,0.93)   |
| South Asia                   | 2.06 (1.94,2.19)   | 1.80 (1.68,1.92)    | 2.07 (1.94,2.20)   |
| Southeast Asia               | 2.19 (2.07,2.32)   | 2.20 (2.07,2.34)    | 2.20 (2.07,2.33)   |
| Southern Latin America       | 1.32 (1.10,1.55)   | 1.32 (1.10,1.55)    | 1.34 (1.11,1.56)   |
| Southern Sub-Saharan Africa  | 0.74 (0.66,0.82)   | 0.68 (0.60,0.77)    | 0.75 (0.67,0.83)   |
| Tropical Latin America       | -0.13 (-0.28,0.02) | -0.21 (-0.37,-0.05) | -0.12 (-0.27,0.03) |
| Western Europe               | 0.21 (0.15,0.27)   | 0.14 (0.10,0.18)    | 0.18 (0.12,0.24)   |
| Western Sub-Saharan Africa   | 0.86 (0.69,1.03)   | 0.75 (0.59,0.92)    | 0.85 (0.68,1.02)   |

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**Table S8:** Raw country-level age-standardized rates and the corresponding SDI, HDI, and UHC index values.

| location    | year | sdi        | hdi   | uhc      | DALYs      | Prevalence | Incidence  |
|-------------|------|------------|-------|----------|------------|------------|------------|
| Romania     | 2000 | 0.65445199 | 0.73  | 68.63213 | 1.62522811 | 167.337998 | 6.66424918 |
| Belgium     | 2000 | 0.79643124 | 0.894 | 76.61296 | 34.7497689 | 3591.21438 | 139.036171 |
| Denmark     | 2000 | 0.8521476  | 0.896 | 71.78837 | 28.7179308 | 3012.27042 | 121.40627  |
| Netherlands | 2000 | 0.84347927 | 0.9   | 75.1118  | 26.7064186 | 2789.58041 | 109.312269 |
| Croatia     | 2000 | 0.68990754 | 0.769 | 70.72003 | 1.70280227 | 176.712392 | 7.01269308 |
| France      | 2000 | 0.78744185 | 0.852 | 79.14757 | 27.251029  | 2804.14836 | 108.256951 |
| Hungary     | 2000 | 0.7108716  | 0.781 | 70.13693 | 1.88065161 | 194.511603 | 7.69856639 |
| Portugal    | 2000 | 0.6858725  | 0.797 | 73.56623 | 29.3630436 | 3054.43526 | 119.751889 |
| Sweden      | 2000 | 0.84604478 | 0.912 | 72.33821 | 20.3701946 | 2099.28643 | 81.1862564 |
| Slovakia    | 2000 | 0.73174275 | 0.774 | 64.85145 | 1.68852067 | 173.724729 | 6.86738719 |
| Luxembourg  | 2000 | 0.81989399 | 0.861 | 73.54443 | 30.847831  | 3209.68391 | 126.935778 |
| Cyprus      | 2000 | 0.75042178 | 0.808 | 50.63619 | 24.5324018 | 2530.42553 | 98.8233255 |
| Bulgaria    | 2000 | 0.67632941 | 0.733 | 56.23362 | 1.78907795 | 185.086943 | 7.32836617 |
| Hungary     | 2005 | 0.73957183 | 0.816 | 71.93488 | 1.97170382 | 203.332198 | 8.01501693 |
| Spain       | 2000 | 0.73124055 | 0.833 | 68.74818 | 29.3976023 | 3104.9763  | 126.331792 |
| Romania     | 2005 | 0.68149508 | 0.765 | 71.76083 | 1.70806629 | 175.458953 | 6.96222091 |
| Finland     | 2000 | 0.80765953 | 0.898 | 74.75711 | 28.1876949 | 2931.18723 | 116.051475 |
| Belgium     | 2005 | 0.81471498 | 0.911 | 80       | 35.1141707 | 3633.4928  | 141.146528 |
| Denmark     | 2005 | 0.86856254 | 0.917 | 74.38334 | 29.8045502 | 3123.79576 | 126.328031 |
| Croatia     | 2005 | 0.71635843 | 0.814 | 73.81461 | 1.87851671 | 193.802671 | 7.67635343 |
| France      | 2005 | 0.80428706 | 0.877 | 80       | 28.1316205 | 2889.52236 | 111.646112 |
| Netherlands | 2005 | 0.86007275 | 0.907 | 77.57281 | 27.5418312 | 2879.03391 | 112.934031 |
| Portugal    | 2005 | 0.71385816 | 0.81  | 80       | 30.9101129 | 3207.75587 | 126.035911 |
| Sweden      | 2005 | 0.8603461  | 0.911 | 75.9309  | 18.9072171 | 1940.8335  | 75.3119043 |
| Estonia     | 2000 | 0.7394406  | 0.793 | 59.60306 | 2.25961026 | 232.047965 | 9.31227522 |
| Slovenia    | 2000 | 0.77069544 | 0.829 | 72.78382 | 1.79772135 | 187.552672 | 7.53030151 |
| Greece      | 2000 | 0.74926858 | 0.828 | 68.94923 | 34.3014975 | 3567.49623 | 140.24684  |
| Czechia     | 2000 | 0.76203695 | 0.817 | 76.89719 | 1.78352389 | 183.822423 | 7.25476422 |

| location    | year | sdi        | hdi   | uhc      | DALYs      | Prevalence | Incidence  |
|-------------|------|------------|-------|----------|------------|------------|------------|
| Ireland     | 2000 | 0.80704773 | 0.869 | 72.17076 | 30.7863249 | 3184.70465 | 124.980136 |
| Latvia      | 2000 | 0.73547192 | 0.764 | 51.52606 | 2.13439222 | 219.722054 | 8.88452992 |
| Germany     | 2000 | 0.82761345 | 0.897 | 78.7087  | 26.3032412 | 2750.68793 | 109.694713 |
| Poland      | 2000 | 0.71484274 | 0.801 | 65.79383 | 2.57539301 | 265.480671 | 10.532658  |
| Lithuania   | 2000 | 0.71308521 | 0.778 | 50.68051 | 2.02674322 | 208.629697 | 8.42070322 |
| Italy       | 2000 | 0.76938765 | 0.849 | 69.75138 | 82.6994089 | 8831.27954 | 372.851299 |
| Austria     | 2000 | 0.79143035 | 0.879 | 69.85424 | 39.5260732 | 4075.50876 | 157.705816 |
| Malta       | 2000 | 0.72404496 | 0.79  | 74.83934 | 31.116673  | 3231.64251 | 127.237004 |
| Italy       | 2005 | 0.78568427 | 0.876 | 76.41152 | 78.724185  | 8314.3842  | 343.970861 |
| Poland      | 2005 | 0.74961243 | 0.826 | 71.48678 | 2.60294435 | 268.171749 | 10.6412233 |
| Denmark     | 2010 | 0.87887289 | 0.92  | 76.93965 | 30.5458028 | 3210.94246 | 129.990538 |
| Netherlands | 2010 | 0.87381043 | 0.925 | 80       | 28.3072314 | 2970.91277 | 116.696016 |
| Croatia     | 2010 | 0.74061102 | 0.831 | 76.82191 | 1.95757375 | 202.581917 | 8.04156095 |
| Latvia      | 2005 | 0.76588666 | 0.818 | 57.78969 | 2.31153767 | 237.126259 | 9.52791088 |
| France      | 2010 | 0.81856279 | 0.888 | 80       | 29.0051394 | 2980.029   | 115.346474 |
| Portugal    | 2010 | 0.73552608 | 0.836 | 80       | 30.8518859 | 3198.81212 | 126.120415 |
| Hungary     | 2010 | 0.76066762 | 0.838 | 73.16734 | 2.0129544  | 207.608644 | 8.23934047 |
| Sweden      | 2010 | 0.87232405 | 0.918 | 80       | 20.147156  | 2077.37005 | 80.6632279 |
| Belgium     | 2010 | 0.83071062 | 0.921 | 80       | 35.5816116 | 3690.71801 | 143.555787 |
| Romania     | 2010 | 0.71151611 | 0.822 | 73.72845 | 1.86595396 | 192.776199 | 7.63790041 |
| Austria     | 2005 | 0.80685826 | 0.898 | 77.39629 | 38.5536905 | 3991.9054  | 154.939703 |
| Slovakia    | 2005 | 0.75829784 | 0.815 | 73.00352 | 1.73716283 | 179.042897 | 7.1140383  |
| Malta       | 2005 | 0.74995727 | 0.84  | 76.60404 | 32.8206502 | 3414.52697 | 134.762061 |
| Bulgaria    | 2005 | 0.69903467 | 0.775 | 60.81434 | 1.87067775 | 193.503309 | 7.65514909 |
| Greece      | 2005 | 0.77497082 | 0.863 | 72.82025 | 35.1591818 | 3658.35326 | 144.61833  |
| Cyprus      | 2005 | 0.7857946  | 0.844 | 66.68087 | 27.5602506 | 2851.33377 | 112.211224 |
| Luxembourg  | 2005 | 0.83622238 | 0.879 | 75.48934 | 31.7434296 | 3301.44474 | 130.832123 |
| Czechia     | 2005 | 0.78522665 | 0.856 | 77.30387 | 1.8732229  | 191.781324 | 7.54556302 |
| Finland     | 2005 | 0.82838244 | 0.914 | 80       | 29.2153874 | 3037.00738 | 120.772247 |
| Estonia     | 2005 | 0.76877113 | 0.847 | 61.63895 | 2.46982055 | 252.94795  | 10.1137359 |
| Ireland     | 2005 | 0.83912914 | 0.905 | 75.56446 | 31.8740598 | 3306.81185 | 129.985934 |
| Spain       | 2005 | 0.75277272 | 0.857 | 73.6699  | 30.7565905 | 3224.37459 | 128.925248 |
| Lithuania   | 2005 | 0.74802055 | 0.828 | 57.0852  | 2.26850582 | 233.239114 | 9.37974539 |
| Slovenia    | 2005 | 0.79673609 | 0.876 | 73.62452 | 1.93101265 | 200.915634 | 8.01027664 |
| Germany     | 2005 | 0.84011643 | 0.923 | 80       | 27.2896932 | 2854.97997 | 114.351032 |
| Estonia     | 2010 | 0.80052196 | 0.868 | 72.09915 | 2.72254439 | 279.490039 | 11.151538  |
| Spain       | 2010 | 0.77231515 | 0.875 | 77.63302 | 31.1422729 | 3268.83369 | 131.261614 |
| Greece      | 2010 | 0.79650079 | 0.876 | 75.39027 | 35.0283219 | 3653.81327 | 144.492069 |
| Hungary     | 2015 | 0.7674973  | 0.847 | 78.17759 | 2.01026718 | 208.131142 | 8.2390248  |
| Romania     | 2015 | 0.72843259 | 0.823 | 77.64096 | 1.93895683 | 200.675612 | 7.94531739 |
| Belgium     | 2015 | 0.85103035 | 0.933 | 80       | 33.1790971 | 3435.9446  | 133.310572 |

| location    | year | sdi        | hdi   | uhc      | DALYs      | Prevalence | Incidence  |
|-------------|------|------------|-------|----------|------------|------------|------------|
| Croatia     | 2015 | 0.75504377 | 0.852 | 77.54351 | 1.98429012 | 205.414165 | 8.13568224 |
| Denmark     | 2015 | 0.88983461 | 0.943 | 80       | 30.6555666 | 3221.39321 | 130.393556 |
| France      | 2015 | 0.83605302 | 0.901 | 80       | 30.0286689 | 3094.31394 | 119.811256 |
| Netherlands | 2015 | 0.88751948 | 0.94  | 80       | 29.1430655 | 3044.41844 | 119.554679 |
| Portugal    | 2015 | 0.75635734 | 0.857 | 80       | 30.7622314 | 3191.09121 | 125.515266 |
| Czechia     | 2010 | 0.80209216 | 0.88  | 80       | 1.91648809 | 198.319443 | 7.82754176 |
| Ireland     | 2010 | 0.85578834 | 0.915 | 77.2882  | 31.8998518 | 3314.03988 | 130.354181 |
| Sweden      | 2015 | 0.88673595 | 0.945 | 80       | 21.7256891 | 2239.18664 | 87.1287262 |
| Lithuania   | 2010 | 0.78709966 | 0.854 | 62.62812 | 2.41978128 | 248.08441  | 9.95352646 |
| Italy       | 2010 | 0.79826437 | 0.887 | 80       | 72.7308014 | 7661.16709 | 312.804293 |
| Bulgaria    | 2010 | 0.7277182  | 0.799 | 65.17148 | 1.9915284  | 205.508466 | 8.12378705 |
| Slovenia    | 2010 | 0.81288369 | 0.896 | 77.43741 | 2.05913141 | 214.428043 | 8.53245221 |
| Slovakia    | 2010 | 0.78221372 | 0.851 | 75.63513 | 1.87041385 | 194.061658 | 7.69886396 |
| Austria     | 2010 | 0.82167187 | 0.912 | 80       | 38.1142958 | 3944.79891 | 152.976131 |
| Cyprus      | 2010 | 0.81773455 | 0.869 | 70.17817 | 31.7874641 | 3301.43944 | 130.398841 |
| Germany     | 2010 | 0.85363334 | 0.936 | 80       | 27.1996971 | 2853.66424 | 114.134356 |
| Poland      | 2010 | 0.77821584 | 0.852 | 75.49274 | 2.55074468 | 262.430343 | 10.3245855 |
| Malta       | 2010 | 0.77086994 | 0.867 | 79.12861 | 33.3287464 | 3457.05646 | 136.326864 |
| Latvia      | 2010 | 0.80203707 | 0.833 | 65.14338 | 2.51207934 | 257.465476 | 10.3079956 |
| Finland     | 2010 | 0.84580489 | 0.92  | 80       | 30.0995817 | 3135.21181 | 124.701119 |
| Romania     | 2017 | 0.73375081 | 0.828 | 78.08285 | 1.96501987 | 203.42302  | 8.05437323 |
| Belgium     | 2017 | 0.85852859 | 0.94  | 80       | 33.5491674 | 3470.00659 | 134.314173 |
| Croatia     | 2017 | 0.76100002 | 0.862 | 78.57928 | 2.00969048 | 207.110709 | 8.19521873 |
| Denmark     | 2017 | 0.89506427 | 0.951 | 80       | 30.724096  | 3228.48962 | 130.494851 |
| Hungary     | 2017 | 0.77273259 | 0.853 | 78.82822 | 2.03177304 | 211.298874 | 8.36350173 |
| France      | 2017 | 0.84314219 | 0.908 | 80       | 30.1559925 | 3101.11271 | 119.941358 |
| Netherlands | 2017 | 0.8927917  | 0.945 | 80       | 29.4459661 | 3071.34747 | 120.51672  |
| Portugal    | 2017 | 0.76294938 | 0.864 | 80       | 30.8666788 | 3201.02012 | 125.780737 |
| Sweden      | 2017 | 0.89184713 | 0.949 | 80       | 23.2380198 | 2397.31955 | 93.2777343 |
| Luxembourg  | 2010 | 0.85447118 | 0.909 | 77.37735 | 33.1895316 | 3452.19069 | 136.485365 |
| Romania     | 2019 | 0.74729378 | 0.838 | 78.57488 | 1.9999451  | 206.862632 | 8.19170395 |
| Croatia     | 2019 | 0.76743383 | 0.872 | 80       | 2.02717931 | 209.591242 | 8.28897168 |
| Belgium     | 2019 | 0.86512763 | 0.945 | 80       | 34.0085288 | 3516.81751 | 135.730537 |
| Netherlands | 2019 | 0.89854849 | 0.95  | 80       | 29.7316054 | 3096.08323 | 121.325968 |
| Hungary     | 2019 | 0.77867835 | 0.861 | 78.55894 | 2.08770428 | 215.295634 | 8.51231111 |
| Portugal    | 2019 | 0.77139024 | 0.872 | 80       | 31.0733422 | 3217.83873 | 126.174067 |
| Denmark     | 2019 | 0.90296328 | 0.953 | 80       | 30.809578  | 3237.95721 | 130.615684 |
| Sweden      | 2019 | 0.89833092 | 0.955 | 80       | 24.6256758 | 2543.51512 | 98.767649  |
| France      | 2019 | 0.84955934 | 0.914 | 80       | 30.2586964 | 3107.64883 | 119.945134 |
| Slovakia    | 2015 | 0.79657933 | 0.861 | 80       | 1.92747409 | 200.523961 | 7.94320097 |
| Bulgaria    | 2015 | 0.74525604 | 0.824 | 70.32406 | 2.05584152 | 213.000471 | 8.41024947 |

| location    | year | sdi        | hdi   | uhc      | DALYs      | Prevalence | Incidence  |
|-------------|------|------------|-------|----------|------------|------------|------------|
| Malta       | 2015 | 0.7948311  | 0.892 | 80       | 33.8253332 | 3516.47107 | 139.027997 |
| Cyprus      | 2015 | 0.83242523 | 0.882 | 78.24181 | 31.8793605 | 3308.9604  | 130.915573 |
| Greece      | 2015 | 0.80692195 | 0.888 | 77.90915 | 34.3214399 | 3586.85804 | 141.885838 |
| Estonia     | 2015 | 0.8230347  | 0.888 | 76.83005 | 2.85725755 | 293.747051 | 11.6588105 |
| Spain       | 2015 | 0.7862878  | 0.895 | 80       | 31.1749476 | 3275.12212 | 131.35151  |
| Finland     | 2015 | 0.86334107 | 0.938 | 80       | 30.9455604 | 3226.72465 | 128.024803 |
| Luxembourg  | 2015 | 0.87280496 | 0.913 | 80       | 34.269883  | 3572.79243 | 141.360812 |
| Ireland     | 2015 | 0.87629157 | 0.931 | 80       | 32.497479  | 3376.09765 | 133.31389  |
| Czechia     | 2015 | 0.80982991 | 0.9   | 80       | 1.96485069 | 202.482061 | 7.97210932 |
| Lithuania   | 2015 | 0.81158089 | 0.869 | 70.22359 | 2.52765922 | 260.24144  | 10.3922286 |
| Romania     | 2021 | 0.75724032 | 0.829 | 78.39335 | 2.00762504 | 207.953429 | 8.20512325 |
| Belgium     | 2021 | 0.87084237 | 0.948 | 80       | 34.2465116 | 3545.33662 | 137.029048 |
| Italy       | 2015 | 0.81049148 | 0.889 | 80       | 73.8590727 | 7779.32185 | 315.008981 |
| Denmark     | 2021 | 0.90975569 | 0.958 | 80       | 31.15434   | 3274.33285 | 132.2751   |
| Croatia     | 2021 | 0.77382    | 0.876 | 80       | 2.03674636 | 211.945022 | 8.36907572 |
| Netherlands | 2021 | 0.90328808 | 0.951 | 80       | 30.1754299 | 3147.44541 | 123.52091  |
| France      | 2021 | 0.85560891 | 0.915 | 80       | 30.8274547 | 3174.7749  | 122.947271 |
| Hungary     | 2021 | 0.78545747 | 0.852 | 79.45746 | 2.08580758 | 215.292296 | 8.50023113 |
| Portugal    | 2021 | 0.77917855 | 0.876 | 80       | 31.4232331 | 3267.97051 | 128.214906 |
| Slovakia    | 2017 | 0.79811169 | 0.865 | 80       | 1.98759015 | 204.681196 | 8.10164677 |
| Sweden      | 2021 | 0.90493485 | 0.958 | 80       | 25.2209658 | 2607.0693  | 101.180184 |
| Poland      | 2015 | 0.80590046 | 0.879 | 80       | 2.48064258 | 254.733429 | 9.93520456 |
| Germany     | 2015 | 0.86208335 | 0.948 | 80       | 28.3159427 | 2974.42855 | 119.183852 |
| Austria     | 2015 | 0.83394985 | 0.919 | 80       | 38.5428497 | 3996.65206 | 154.959187 |
| Slovenia    | 2015 | 0.82251833 | 0.909 | 80       | 2.0742818  | 216.465039 | 8.62850234 |
| Bulgaria    | 2017 | 0.75055465 | 0.829 | 72.439   | 2.07851325 | 215.334703 | 8.5086982  |
| Estonia     | 2017 | 0.83104145 | 0.894 | 77.81068 | 2.89228327 | 297.116302 | 11.8072656 |
| Cyprus      | 2017 | 0.83697057 | 0.897 | 80       | 31.8208451 | 3300.40699 | 130.057089 |
| Finland     | 2017 | 0.87174978 | 0.942 | 80       | 31.1316676 | 3239.63062 | 128.253566 |
| Greece      | 2017 | 0.80968498 | 0.887 | 78.92592 | 34.3107351 | 3581.50729 | 141.540407 |
| Latvia      | 2015 | 0.81185683 | 0.859 | 70.49352 | 2.60474559 | 268.245085 | 10.7125059 |
| Czechia     | 2017 | 0.8127148  | 0.904 | 80       | 1.9866009  | 205.218042 | 8.07966183 |
| Spain       | 2017 | 0.79228903 | 0.902 | 80       | 31.1665825 | 3271.31153 | 131.188452 |
| Ireland     | 2017 | 0.88734707 | 0.941 | 80       | 32.8163412 | 3409.34823 | 134.427711 |
| Luxembourg  | 2017 | 0.87982802 | 0.913 | 80       | 34.5736185 | 3595.46155 | 142.031076 |
| Italy       | 2017 | 0.81607106 | 0.897 | 80       | 75.3780881 | 7939.39502 | 320.728624 |
| Slovenia    | 2017 | 0.82599034 | 0.918 | 80       | 2.1164517  | 218.795284 | 8.7234975  |
| Lithuania   | 2017 | 0.82401944 | 0.885 | 71.81193 | 2.56552978 | 264.70597  | 10.574628  |
| Poland      | 2017 | 0.81408674 | 0.882 | 80       | 2.49770312 | 256.679285 | 10.0177839 |
| Latvia      | 2017 | 0.82203695 | 0.87  | 75.48441 | 2.67258371 | 273.958361 | 10.9418053 |
| Bulgaria    | 2019 | 0.75680937 | 0.835 | 75.77181 | 2.10024236 | 217.816689 | 8.59994228 |

| location   | year | sdi        | hdi   | uhc      | DALYs      | Prevalence | Incidence  |
|------------|------|------------|-------|----------|------------|------------|------------|
| Austria    | 2017 | 0.83914931 | 0.922 | 80       | 38.0472739 | 3937.64959 | 152.414016 |
| Malta      | 2017 | 0.80492308 | 0.901 | 80       | 34.1269728 | 3542.79363 | 139.747939 |
| Estonia    | 2019 | 0.83960465 | 0.901 | 78.77091 | 2.91860911 | 300.775508 | 11.959909  |
| Greece     | 2019 | 0.8150367  | 0.896 | 79.45765 | 34.4166136 | 3581.74846 | 141.37563  |
| Ireland    | 2019 | 0.89740216 | 0.947 | 80       | 33.0731433 | 3440.18416 | 135.336603 |
| Germany    | 2017 | 0.86643518 | 0.951 | 80       | 28.664349  | 3007.02876 | 120.383846 |
| Finland    | 2019 | 0.87905179 | 0.947 | 80       | 31.283214  | 3254.35938 | 128.40628  |
| Spain      | 2019 | 0.79940175 | 0.91  | 80       | 31.2323332 | 3269.65961 | 131.114164 |
| Czechia    | 2019 | 0.81946846 | 0.903 | 80       | 2.01882875 | 208.524339 | 8.20927662 |
| Italy      | 2019 | 0.82254461 | 0.906 | 80       | 76.8559621 | 8093.15233 | 326.175519 |
| Luxembourg | 2019 | 0.88485132 | 0.916 | 80       | 34.8095277 | 3614.52391 | 142.552859 |
| Lithuania  | 2019 | 0.83660458 | 0.894 | 74.69107 | 2.60420156 | 268.140198 | 10.7350009 |
| Poland     | 2019 | 0.82581958 | 0.887 | 80       | 2.52304725 | 259.263509 | 10.106664  |
| Slovenia   | 2019 | 0.83194861 | 0.923 | 80       | 2.13212778 | 222.023328 | 8.84031746 |
| Slovakia   | 2019 | 0.80215382 | 0.871 | 80       | 2.01823453 | 208.730044 | 8.25251087 |
| Estonia    | 2021 | 0.84881392 | 0.899 | 79.31091 | 2.95183107 | 301.922058 | 11.9824412 |
| Greece     | 2021 | 0.82219215 | 0.897 | 77.18728 | 34.6734959 | 3616.51114 | 142.843812 |
| Austria    | 2019 | 0.84553151 | 0.928 | 80       | 37.4818454 | 3879.43022 | 149.88344  |
| Bulgaria   | 2021 | 0.7634706  | 0.817 | 73.4856  | 2.11731147 | 218.825309 | 8.65200461 |
| Latvia     | 2019 | 0.83192794 | 0.88  | 75.91148 | 2.71091886 | 278.204515 | 11.1393066 |
| Ireland    | 2021 | 0.9023461  | 0.946 | 80       | 33.2815918 | 3456.7124  | 135.907779 |
| Malta      | 2019 | 0.81494122 | 0.91  | 80       | 34.3911349 | 3573.06771 | 140.511666 |
| Finland    | 2021 | 0.88512075 | 0.949 | 80       | 31.9173496 | 3328.95007 | 131.656606 |
| Cyprus     | 2019 | 0.84234938 | 0.907 | 80       | 31.8193599 | 3292.48242 | 129.181127 |
| Germany    | 2019 | 0.87150987 | 0.957 | 80       | 29.029901  | 3035.63862 | 121.29844  |
| Spain      | 2021 | 0.80541049 | 0.912 | 80       | 31.3494042 | 3306.93334 | 132.948546 |
| Italy      | 2021 | 0.82808045 | 0.908 | 80       | 76.9503376 | 8115.22334 | 326.664046 |
| Luxembourg | 2021 | 0.88984107 | 0.918 | 80       | 34.6965914 | 3617.07469 | 142.788201 |
| Czechia    | 2021 | 0.82610626 | 0.901 | 80       | 2.00586372 | 207.66763  | 8.17268275 |
| Lithuania  | 2021 | 0.8483526  | 0.887 | 75.31574 | 2.60415168 | 267.407153 | 10.6831763 |
| Slovakia   | 2021 | 0.80635185 | 0.859 | 80       | 2.03705815 | 209.915152 | 8.29405089 |
| Malta      | 2021 | 0.82216918 | 0.914 | 80       | 34.5839933 | 3599.86448 | 141.389187 |
| Slovenia   | 2021 | 0.83841419 | 0.924 | 80       | 2.15246779 | 223.822691 | 8.88587121 |
| Poland     | 2021 | 0.83764641 | 0.884 | 80       | 2.61626344 | 269.76213  | 10.5336505 |
| Germany    | 2021 | 0.87521828 | 0.958 | 80       | 29.5070836 | 3088.25543 | 123.417422 |
| Austria    | 2021 | 0.84966608 | 0.93  | 80       | 38.0677337 | 3942.70011 | 152.322286 |
| Latvia     | 2021 | 0.84227114 | 0.871 | 74.62745 | 2.69407243 | 277.572534 | 11.0488093 |
| Cyprus     | 2021 | 0.847888   | 0.907 | 80       | 31.9445715 | 3316.22251 | 130.16722  |

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**Table S9:** Expert-informed list of excluded SEV indicators and the corresponding reasons for exclusion.

| Risk factor (excluded REI)                                | Reason for exclusion                                                                                                                                                                          |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drug use                                                  | No consistent biological mechanism linking drug use to PCOS; evidence is mainly related to mental health or social factors rather than reproductive endocrinology.                            |
| Low bone mineral density                                  | Primarily an age-related or postmenopausal metabolic issue and not a typical feature or established risk factor for PCOS.                                                                     |
| Occupational asthmagens                                   | Workplace asthma-related exposures are not directly related to reproductive endocrine function.                                                                                               |
| Occupational particulate matter, gases, and fumes         | Mainly affect the respiratory system; no direct evidence of effects on ovarian function relevant to PCOS.                                                                                     |
| Occupational noise                                        | An occupational health exposure without a recognized endocrine pathway implicated in PCOS.                                                                                                    |
| Occupational ergonomic factors                            | Musculoskeletal/ergonomic exposures are not part of the metabolic or endocrine pathways of PCOS.                                                                                              |
| Non-exclusive breastfeeding                               | Breastfeeding practices have weak or no established relevance to PCOS onset or risk.                                                                                                          |
| Discontinued breastfeeding                                | Breastfeeding discontinuation is not an established etiologic or risk factor for PCOS.                                                                                                        |
| Occupational exposure to asbestos                         | Asbestos is primarily carcinogenic and not linked to PCOS-related endocrine dysregulation. Evidence mainly relates to hepatic/dermal toxicity; no robust evidence for PCOS-specific pathways. |
| Occupational exposure to arsenic                          |                                                                                                                                                                                               |
| Occupational exposure to benzene                          | Primarily hematotoxic and carcinogenic; no established mechanism for PCOS.                                                                                                                    |
| Occupational exposure to beryllium                        | A respiratory sensitizer/toxicant without direct links to the reproductive axis implicated in PCOS.                                                                                           |
| Occupational exposure to cadmium                          | May affect renal function; not a PCOS-specific risk factor with consistent evidence.                                                                                                          |
| Occupational exposure to chromium                         | A toxicologic occupational exposure without confirmed interference with ovarian function relevant to PCOS.                                                                                    |
| Occupational exposure to diesel engine exhaust            | Commonly linked to respiratory outcomes; direct evidence for PCOS risk is insufficient.                                                                                                       |
| Occupational exposure to formaldehyde                     | Primarily a carcinogen/irritant; not supported as a PCOS-related endocrine exposure. Mainly associated with respiratory/dermatologic outcomes; not an established PCOS risk factor.           |
| Occupational exposure to nickel                           |                                                                                                                                                                                               |
| Occupational exposure to polycyclic aromatic hydrocarbons | PAHs are mainly linked to cancer and cardiometabolic risks; evidence for PCOS-specific effects is limited.                                                                                    |
| Occupational exposure to silica                           | Causes pneumoconiosis and other lung disease; unrelated to ovarian function in PCOS.                                                                                                          |
| Occupational exposure to sulfuric acid                    | Acid mists primarily pose respiratory hazards; no established endocrine pathway for PCOS.                                                                                                     |
| Occupational exposure to trichloroethylene                | A solvent with carcinogenic/toxic effects; no strong evidence for PCOS-specific causation.                                                                                                    |



| Risk factor (excluded REI)        | Reason for exclusion                                                                                                                                                                          |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No access to handwashing facility | Reflects hygiene/infectious risk conditions rather than a causal risk factor for PCOS.<br>Primarily relates to infectious and gastrointestinal disease risk; not implicated in PCOS etiology. |
| Unsafe water source               |                                                                                                                                                                                               |
| Unsafe sanitation                 | Associated with infection/diarrheal disease burden; not a PCOS risk factor.                                                                                                                   |
| Residential radon                 | A major lung cancer risk factor; not linked to PCOS.                                                                                                                                          |
| High temperature                  | Ambient temperature variation has no clear or established mechanistic link to PCOS.                                                                                                           |
| Low temperature                   | Ambient cold exposure is not a recognized risk factor for PCOS.<br>An acute pediatric undernutrition condition; not relevant to PCOS in reproductive-age women.                               |
| Child wasting                     |                                                                                                                                                                                               |
| Child stunting                    | A chronic pediatric undernutrition indicator; not aligned with established PCOS mechanisms.                                                                                                   |
| Child underweight                 | Pediatric undernutrition is not a typical PCOS etiologic background.<br>More often a comorbidity or consequence of other conditions, not an upstream risk factor for PCOS.                    |
| Kidney dysfunction                |                                                                                                                                                                                               |
| Bullying victimization            | Psychosocial stress may affect hormones, but evidence is insufficient to support a specific association with PCOS.                                                                            |
| Iron deficiency                   | Commonly reflects anemia and may relate to heavy menstrual bleeding; not an established risk factor for PCOS.                                                                                 |
| Vitamin A deficiency              | Primarily affects immunity/vision; no clear evidence of relevance to PCOS pathophysiology.<br>Related to general metabolism/immune function; not supported as a PCOS-specific risk factor.    |
| Zinc deficiency                   |                                                                                                                                                                                               |

**Table S10:** Full Pearson correlation results between SEVs and PCOS burden for incidence, prevalence, and DALYs, including both significant and non-significant associations with Benjamini–Hochberg adjusted p values.

| measure | rei                                      | sd_sev     | sd_val     | r          | p          | p_adj      |
|---------|------------------------------------------|------------|------------|------------|------------|------------|
| DALYs   | Diet low in fruits                       | 7.87008993 | 18.3842837 | -0.7117052 | 3.1449E-05 | 0.00103783 |
| DALYs   | Household air pollution from solid fuels | 0.38666753 | 18.3842837 | -0.5786861 | 0.00156566 | 0.02399535 |
| DALYs   | Diet low in nuts and seeds               | 12.9032191 | 18.3842837 | -0.5640494 | 0.0021814  | 0.02399535 |
| DALYs   | Childhood sexual abuse                   | 4.78934475 | 18.3842837 | 0.52374089 | 0.00505064 | 0.03206208 |
| DALYs   | Nitrogen dioxide pollution               | 5.14783665 | 18.3842837 | 0.51722181 | 0.00573136 | 0.03206208 |
| DALYs   | Diet high in sodium                      | 15.2366088 | 18.3842837 | -0.516337  | 0.00582947 | 0.03206208 |
| DALYs   | Secondhand smoke                         | 7.30152607 | 18.3842837 | -0.4859864 | 0.01016729 | 0.04444937 |
| DALYs   | Chewing tobacco                          | 0.11241736 | 18.3842837 | -0.4826553 | 0.01077561 | 0.04444937 |
| DALYs   | Diet low in seafood omega-3 fatty acids  | 13.4890619 | 18.3842837 | -0.4748269 | 0.01232546 | 0.04519334 |
| DALYs   | Diet high in red meat                    | 5.98586957 | 18.3842837 | 0.45806503 | 0.01627207 | 0.05167996 |
| DALYs   | Diet low in legumes                      | 12.4573422 | 18.3842837 | -0.4545237 | 0.01722665 | 0.05167996 |
| DALYs   | Low physical activity                    | 4.89186581 | 18.3842837 | 0.4473852  | 0.01929111 | 0.05305055 |
| DALYs   | High systolic blood pressure             | 6.80300297 | 18.3842837 | -0.4240447 | 0.02750016 | 0.06980809 |
| DALYs   | Ambient ozone pollution                  | 8.66724332 | 18.3842837 | 0.31451963 | 0.1100848  | 0.25948561 |

| measure   | rei                                      | sd_sev     | sd_val     | r          | p          | p_adj      |
|-----------|------------------------------------------|------------|------------|------------|------------|------------|
| DALYs     | Diet high in trans fatty acids           | 8.00805    | 18.3842837 | -0.3046813 | 0.12228303 | 0.26902267 |
| DALYs     | High fasting plasma glucose              | 3.79135718 | 18.3842837 | -0.2889715 | 0.14377194 | 0.29652962 |
| DALYs     | Ambient particulate matter pollution     | 7.85571359 | 18.3842837 | -0.2826319 | 0.15317065 | 0.29733127 |
| DALYs     | Low birth weight                         | 6.16529426 | 18.3842837 | 0.22809301 | 0.25250458 | 0.43982936 |
| DALYs     | Alcohol use                              | 4.93015135 | 18.3842837 | 0.22606346 | 0.2568653  | 0.43982936 |
| DALYs     | Diet low in calcium                      | 3.50581537 | 18.3842837 | -0.2216289 | 0.26656325 | 0.43982936 |
| DALYs     | Diet low in polyunsaturated fatty acids  | 15.3692772 | 18.3842837 | -0.1770681 | 0.37694077 | 0.58358131 |
| DALYs     | Intimate partner violence                | 2.99615787 | 18.3842837 | -0.1698408 | 0.3970302  | 0.58358131 |
| DALYs     | Lead exposure                            | 7.30535421 | 18.3842837 | -0.1664226 | 0.40673849 | 0.58358131 |
| DALYs     | Diet low in fiber                        | 8.72659885 | 18.3842837 | -0.1548881 | 0.4404629  | 0.60563649 |
| DALYs     | Short gestation                          | 16.4594826 | 18.3842837 | 0.14444031 | 0.47226268 | 0.62338674 |
| DALYs     | High LDL cholesterol                     | 3.35705593 | 18.3842837 | -0.127284  | 0.52694751 | 0.65700689 |
| DALYs     | Diet low in whole grains                 | 7.04452804 | 18.3842837 | 0.12405997 | 0.53755109 | 0.65700689 |
| DALYs     | High body-mass index                     | 2.75878837 | 18.3842837 | -0.1056317 | 0.60001634 | 0.70716212 |
| DALYs     | Diet high in processed meat              | 14.8531314 | 18.3842837 | -0.0993543 | 0.62197429 | 0.70776385 |
| DALYs     | Diet low in milk                         | 16.0066152 | 18.3842837 | -0.0816538 | 0.6855611  | 0.73142698 |
| DALYs     | Diet low in vegetables                   | 5.68917335 | 18.3842837 | -0.0812337 | 0.68709807 | 0.73142698 |
| DALYs     | Smoking                                  | 4.18609518 | 18.3842837 | 0.05642233 | 0.77983906 | 0.80420903 |
| DALYs     | Diet high in sugar-sweetened beverages   | 9.89039172 | 18.3842837 | -0.0421958 | 0.83446875 | 0.83446875 |
| Incidence | Diet low in fruits                       | 7.87008993 | 76.2143482 | -0.7125561 | 3.0466E-05 | 0.00100537 |
| Incidence | Household air pollution from solid fuels | 0.38666753 | 76.2143482 | -0.5719575 | 0.00182699 | 0.02665807 |
| Incidence | Diet low in nuts and seeds               | 12.9032191 | 76.2143482 | -0.5592616 | 0.00242346 | 0.02665807 |
| Incidence | Childhood sexual abuse                   | 4.78934475 | 76.2143482 | 0.51882625 | 0.00555702 | 0.03755775 |
| Incidence | Nitrogen dioxide pollution               | 5.14783665 | 76.2143482 | 0.50835044 | 0.00678106 | 0.03755775 |
| Incidence | Diet high in sodium                      | 15.2366088 | 76.2143482 | -0.5079762 | 0.00682868 | 0.03755775 |
| Incidence | Secondhand smoke                         | 7.30152607 | 76.2143482 | -0.4824449 | 0.01081502 | 0.04830746 |
| Incidence | Chewing tobacco                          | 0.11241736 | 76.2143482 | -0.4778273 | 0.0117109  | 0.04830746 |
| Incidence | Diet low in seafood omega-3 fatty acids  | 13.4890619 | 76.2143482 | -0.4655393 | 0.01439997 | 0.05279989 |
| Incidence | Diet low in legumes                      | 12.4573422 | 76.2143482 | -0.4533542 | 0.01755183 | 0.05478115 |
| Incidence | Diet high in red meat                    | 5.98586957 | 76.2143482 | 0.45073882 | 0.01829733 | 0.05478115 |
| Incidence | Low physical activity                    | 4.89186581 | 76.2143482 | 0.44533409 | 0.01992042 | 0.05478115 |
| Incidence | High systolic blood pressure             | 6.80300297 | 76.2143482 | -0.4173927 | 0.03029702 | 0.07690781 |
| Incidence | Ambient ozone pollution                  | 8.66724332 | 76.2143482 | 0.31991676 | 0.10378894 | 0.24464536 |
| Incidence | Diet high in trans fatty acids           | 8.00805    | 76.2143482 | -0.3012241 | 0.12679629 | 0.27895185 |
| Incidence | High fasting plasma glucose              | 3.79135718 | 76.2143482 | -0.2839232 | 0.15122151 | 0.31189437 |
| Incidence | Ambient particulate matter pollution     | 7.85571359 | 76.2143482 | -0.2716994 | 0.17039388 | 0.3307646  |
| Incidence | Low birth weight                         | 6.16529426 | 76.2143482 | 0.22595418 | 0.25710148 | 0.45491005 |
| Incidence | Alcohol use                              | 4.93015135 | 76.2143482 | 0.22201315 | 0.26571366 | 0.45491005 |
| Incidence | Diet low in calcium                      | 3.50581537 | 76.2143482 | -0.2175439 | 0.27570306 | 0.45491005 |
| Incidence | Diet low in polyunsaturated fatty acids  | 15.3692772 | 76.2143482 | -0.1778307 | 0.37485599 | 0.58905942 |
| Incidence | Lead exposure                            | 7.30535421 | 76.2143482 | -0.1663447 | 0.40696133 | 0.60466413 |

| measure    | rei                                      | sd_sev     | sd_val     | r          | p          | p_adj      |
|------------|------------------------------------------|------------|------------|------------|------------|------------|
| Incidence  | Intimate partner violence                | 2.99615787 | 76.2143482 | -0.1613346 | 0.42143257 | 0.60466413 |
| Incidence  | Diet low in fiber                        | 8.72659885 | 76.2143482 | -0.1530108 | 0.44609015 | 0.61337395 |
| Incidence  | Short gestation                          | 16.4594826 | 76.2143482 | 0.14294258 | 0.47691643 | 0.62952968 |
| Incidence  | High LDL cholesterol                     | 3.35705593 | 76.2143482 | -0.1265895 | 0.52922322 | 0.64823684 |
| Incidence  | Diet low in whole grains                 | 7.04452804 | 76.2143482 | 0.12623832 | 0.5303756  | 0.64823684 |
| Incidence  | High body-mass index                     | 2.75878837 | 76.2143482 | -0.1056546 | 0.59993682 | 0.70706839 |
| Incidence  | Diet high in processed meat              | 14.8531314 | 76.2143482 | -0.0973695 | 0.62898429 | 0.71574075 |
| Incidence  | Diet low in milk                         | 16.0066152 | 76.2143482 | -0.0825621 | 0.68224217 | 0.74030681 |
| Incidence  | Diet low in vegetables                   | 5.68917335 | 76.2143482 | -0.0789595 | 0.69543973 | 0.74030681 |
| Incidence  | Smoking                                  | 4.18609518 | 76.2143482 | 0.05005119 | 0.80419443 | 0.82932551 |
| Incidence  | Diet high in sugar-sweetened beverages   | 9.89039172 | 76.2143482 | -0.0423228 | 0.8339774  | 0.8339774  |
| Prevalence | Diet low in fruits                       | 7.87008993 | 1926.66691 | -0.712497  | 3.0533E-05 | 0.00100759 |
| Prevalence | Household air pollution from solid fuels | 0.38666753 | 1926.66691 | -0.5761247 | 0.00166106 | 0.02492774 |
| Prevalence | Diet low in nuts and seeds               | 12.9032191 | 1926.66691 | -0.5623232 | 0.00226616 | 0.02492774 |
| Prevalence | Childhood sexual abuse                   | 4.78934475 | 1926.66691 | 0.5215917  | 0.00526705 | 0.03425599 |
| Prevalence | Nitrogen dioxide pollution               | 5.14783665 | 1926.66691 | 0.5140309  | 0.00609186 | 0.03425599 |
| Prevalence | Diet high in sodium                      | 15.2366088 | 1926.66691 | -0.5128642 | 0.00622836 | 0.03425599 |
| Prevalence | Secondhand smoke                         | 7.30152607 | 1926.66691 | -0.4841396 | 0.01050091 | 0.04574502 |
| Prevalence | Chewing tobacco                          | 0.11241736 | 1926.66691 | -0.4809963 | 0.0110897  | 0.04574502 |
| Prevalence | Diet low in seafood omega-3 fatty acids  | 13.4890619 | 1926.66691 | -0.4712478 | 0.01309335 | 0.04800897 |
| Prevalence | Diet high in red meat                    | 5.98586957 | 1926.66691 | 0.45557644 | 0.01693819 | 0.05132738 |
| Prevalence | Diet low in legumes                      | 12.4573422 | 1926.66691 | -0.4549508 | 0.01710913 | 0.05132738 |
| Prevalence | Low physical activity                    | 4.89186581 | 1926.66691 | 0.44693768 | 0.019427   | 0.05342426 |
| Prevalence | High systolic blood pressure             | 6.80300297 | 1926.66691 | -0.4216761 | 0.02847101 | 0.07227256 |
| Prevalence | Ambient ozone pollution                  | 8.66724332 | 1926.66691 | 0.31709406 | 0.10704729 | 0.25232575 |
| Prevalence | Diet high in trans fatty acids           | 8.00805    | 1926.66691 | -0.3033267 | 0.12403711 | 0.27288164 |
| Prevalence | High fasting plasma glucose              | 3.79135718 | 1926.66691 | -0.2873085 | 0.14619619 | 0.30152965 |
| Prevalence | Ambient particulate matter pollution     | 7.85571359 | 1926.66691 | -0.2781889 | 0.1600135  | 0.31061444 |
| Prevalence | Low birth weight                         | 6.16529426 | 1926.66691 | 0.22705553 | 0.25472762 | 0.44685109 |
| Prevalence | Alcohol use                              | 4.93015135 | 1926.66691 | 0.2240324  | 0.26127808 | 0.44685109 |
| Prevalence | Diet low in calcium                      | 3.50581537 | 1926.66691 | -0.2197159 | 0.27081884 | 0.44685109 |
| Prevalence | Diet low in polyunsaturated fatty acids  | 15.3692772 | 1926.66691 | -0.1780458 | 0.37426903 | 0.58530848 |
| Prevalence | Intimate partner violence                | 2.99615787 | 1926.66691 | -0.1677423 | 0.4029746  | 0.58530848 |
| Prevalence | Lead exposure                            | 7.30535421 | 1926.66691 | -0.166002  | 0.40794228 | 0.58530848 |
| Prevalence | Diet low in fiber                        | 8.72659885 | 1926.66691 | -0.1542632 | 0.44233184 | 0.60820627 |
| Prevalence | Short gestation                          | 16.4594826 | 1926.66691 | 0.14327563 | 0.47587953 | 0.62816098 |
| Prevalence | High LDL cholesterol                     | 3.35705593 | 1926.66691 | -0.1267678 | 0.52863835 | 0.65383564 |
| Prevalence | Diet low in whole grains                 | 7.04452804 | 1926.66691 | 0.12484606 | 0.53495643 | 0.65383564 |
| Prevalence | High body-mass index                     | 2.75878837 | 1926.66691 | -0.1057429 | 0.59963019 | 0.70670701 |
| Prevalence | Diet high in processed meat              | 14.8531314 | 1926.66691 | -0.0992388 | 0.62238145 | 0.70822717 |
| Prevalence | Diet low in milk                         | 16.0066152 | 1926.66691 | -0.0812125 | 0.68717566 | 0.7341829  |

| measure    | rei                                    | sd_sev     | sd_val     | r          | p          | p_adj      |
|------------|----------------------------------------|------------|------------|------------|------------|------------|
| Prevalence | Diet low in vegetables                 | 5.68917335 | 1926.66691 | -0.0805269 | 0.68968697 | 0.7341829  |
| Prevalence | Smoking                                | 4.18609518 | 1926.66691 | 0.05439744 | 0.78755893 | 0.81217015 |
| Prevalence | Diet high in sugar-sweetened beverages | 9.89039172 | 1926.66691 | -0.0420956 | 0.83485674 | 0.83485674 |

**Table S11:** Mendelian randomization estimates for the effect of NO2 on PCOS risk using five MR methods.

| id.exposure | id.outcome         | method                    | pval       | or         | or_lci95   | or_uci95   |
|-------------|--------------------|---------------------------|------------|------------|------------|------------|
| ukb-b-2618  | ebi-a-GCST90044902 | MR Egger                  | 0.29028886 | 0.02738671 | 4.6702E-05 | 16.0600406 |
| ukb-b-2618  | ebi-a-GCST90044902 | Weighted median           | 0.01808137 | 7.56692754 | 1.41315043 | 40.5182572 |
| ukb-b-2618  | ebi-a-GCST90044902 | Inverse variance weighted | 0.00364994 | 6.60333094 | 1.84942745 | 23.5770154 |
| ukb-b-2618  | ebi-a-GCST90044902 | Simple mode               | 0.11534683 | 17.0673654 | 0.63240015 | 460.618107 |
| ukb-b-2618  | ebi-a-GCST90044902 | Weighted mode             | 0.11380096 | 13.6754893 | 0.66484238 | 281.298267 |

**Table S12:** Heterogeneity tests for the NO2–PCOS Mendelian randomization analysis.

| id.exposure | id.outcome         | method                    | Q          | Q_df | Q_pval     |
|-------------|--------------------|---------------------------|------------|------|------------|
| ukb-b-2618  | ebi-a-GCST90044902 | MR Egger                  | 12.0271169 | 12   | 0.44350431 |
| ukb-b-2618  | ebi-a-GCST90044902 | Inverse variance weighted | 14.9809528 | 13   | 0.30854336 |

**Table S13:** Horizontal pleiotropy assessment for the NO2–PCOS Mendelian randomization analysis.

| id.exposure | id.outcome         | egger_intercept | se         | pval       |
|-------------|--------------------|-----------------|------------|------------|
| ukb-b-2618  | ebi-a-GCST90044902 | 0.07689223      | 0.04478983 | 0.11170317 |

**Table S14:** MR-PRESSO results for the NO2–PCOS Mendelian randomization analysis.

| RSSobs    | Pvalue |
|-----------|--------|
| 17.506115 | 0.333  |

**Table S15:** Steiger directionality test for the NO2–PCOS Mendelian randomization analysis.

| id.exposure | id.outcome         | snp_r2.exposure | snp_r2.outcome | steiger_pval |
|-------------|--------------------|-----------------|----------------|--------------|
| ukb-b-2618  | ebi-a-GCST90044902 | 0.00110933      | 0.00017487     | 4.0727E-11   |