

# THE LANCET Oncology

## Supplementary appendix

Supplement to: Sullivan R, Lewison G, Torode J, et al. Essay—Cancer research collaboration between the UK and the USA: reflections on the 2021 G20 Summit announcement. *Lancet Oncol* 2022; **23**: 459–61.

## E-Appendix

**e-Table 1. Preference of the UK to partner with other countries/regions on cancer research, N=** total number of joint UK plus Country X papers (2011-20); **%+UK** = percent of UK papers published with Country X where denominator is total UK output with international co-authors; **%-UK** = Country X % of world total minus UK. **Ratio** = UK output minus Country X collaborative output (N) / Total UK output with international co-authors (see worked example below for Ireland).

| Country      | N    | %+UK | %-UK | Ratio | Country      | N             | %+UK      | %-UK        | Ratio       |
|--------------|------|------|------|-------|--------------|---------------|-----------|-------------|-------------|
| Ireland      | 1347 | 3.7  | 0.4  | 10.2  | Italy        | 8190          | 22.7      | 5.6         | 4.06        |
| Belgium      | 3447 | 9.5  | 1.1  | 8.80  | Germany      | 8530          | 23.6      | 5.9         | 4.03        |
| Sweden       | 4248 | 11.8 | 1.4  | 8.64  | Singapore    | 886           | 2.5       | 0.7         | 3.64        |
| Greece       | 2286 | 6.3  | 0.7  | 8.51  | Canada       | 4869          | 13.5      | 3.7         | 3.60        |
| Norway       | 1971 | 5.5  | 0.7  | 8.30  | Russia       | 813           | 2.2       | 0.6         | 3.52        |
| Finland      | 1461 | 4    | 0.5  | 7.91  | Poland       | 1741          | 4.8       | 1.4         | 3.47        |
| Denmark      | 2681 | 7.4  | 1.0  | 7.69  | EU 27        | 26,229        | 65.9      | 28.0        | 2.36        |
| Netherlands  | 6390 | 17.7 | 2.4  | 7.38  | Romania      | 354           | 1         | 0.4         | 2.33        |
| Czech Rep.   | 1232 | 3.4  | 0.5  | 6.27  | Thailand     | 314           | 0.9       | 0.4         | 2.15        |
| Switzerland  | 3232 | 8.9  | 1.5  | 6.16  | Saudi Arabia | 560           | 1.5       | 0.7         | 2.13        |
| Hungary      | 699  | 1.9  | 0.3  | 6.14  | Brazil       | 1237          | 3.4       | 1.8         | 1.92        |
| Spain        | 5679 | 15.7 | 2.6  | 6.09  | Egypt        | 553           | 1.5       | 1.0         | 1.59        |
| New Zealand  | 600  | 1.7  | 0.3  | 5.79  | <b>USA</b>   | <b>15,888</b> | <b>44</b> | <b>28.8</b> | <b>1.53</b> |
| Austria      | 1908 | 5.3  | 1.0  | 5.56  | Mexico       | 256           | 0.7       | 0.5         | 1.31        |
| Australia    | 5198 | 14.4 | 2.6  | 5.44  | Taiwan       | 661           | 1.8       | 2.1         | 0.87        |
| Slovenia     | 322  | 0.9  | 0.2  | 5.41  | Turkey       | 589           | 1.6       | 2.0         | 0.83        |
| France       | 7319 | 20.3 | 4.0  | 5.11  | Japan        | 2068          | 5.7       | 7.5         | 0.76        |
| Portugal     | 981  | 2.7  | 0.6  | 4.58  | Iran         | 421           | 1.2       | 1.6         | 0.73        |
| South Africa | 412  | 1.1  | 0.3  | 4.38  | India        | 941           | 2.6       | 3.7         | 0.71        |
| Malaysia     | 667  | 1.8  | 0.4  | 4.34  | South Korea  | 1101          | 3         | 4.5         | 0.68        |
| Israel       | 1165 | 3.2  | 0.8  | 4.19  | China        | 3339          | 9.2       | 24.0        | 0.39        |

Worked example: In e-Table 1, the Ireland total of 1347 papers is the number of UK-IE papers in the ten years, 2011-20. During this decade, there were 35,047 UK cancer research papers with an international co-author, so 3.7% of them had one from Ireland. But Ireland's cancer research output was only 0.4% (actually 0.36405%) of the world total, less than that of the UK. If

the UK chose its partners strictly in proportion to their cancer research outputs, there would only have been  $0.36405\% \times 36124 = 132$  papers co-authored with Ireland. So, the UK 'preferred' Irish partners by a factor of  $1347/132 = 10.2$ .

**e-Table 2. Preference of the USA to partner with other countries/regions on cancer research, N=** total number of joint USA plus Country X papers (2011-20); **%+US** = percent of USA papers published with Country X where denominator is total USA output with international co-authors; **%-US** = Country X % of world total minus USA. **Ratio** = USA output minus Country X collaborative output (N) / Total USA output with international co-authors.

| Country     | Papers       | %+US        | %-US       | Ratio       | Country   | Papers | %+US | %-US | Ratio |
|-------------|--------------|-------------|------------|-------------|-----------|--------|------|------|-------|
| Canada      | 15670        | 13.3        | 3.6        | 3.70        | Russia    | 1727   | 1.5  | 0.7  | 2.01  |
| Israel      | 3208         | 2.7         | 0.8        | 3.58        | Thailand  | 996    | 0.8  | 0.4  | 1.89  |
| Lebanon     | 503          | 0.4         | 0.1        | 3.06        | Germany   | 15113  | 12.8 | 6.9  | 1.86  |
| Chile       | 772          | 0.7         | 0.2        | 2.92        | France    | 10544  | 9    | 4.8  | 1.85  |
| Singapore   | 2377         | 2           | 0.7        | 2.88        | Italy     | 13879  | 11.8 | 6.7  | 1.77  |
| Switzerland | 5403         | 4.6         | 1.6        | 2.79        | Mexico    | 1231   | 1    | 0.6  | 1.77  |
| Finland     | 1959         | 1.7         | 0.6        | 2.72        | S. Africa | 647    | 0.5  | 0.3  | 1.75  |
| Colombia    | 543          | 0.5         | 0.2        | 2.71        | Brazil    | 3639   | 3.1  | 2.1  | 1.51  |
| Belgium     | 4118         | 3.5         | 1.3        | 2.60        | Taiwan    | 3949   | 3.4  | 2.4  | 1.41  |
| Norway      | 2371         | 2           | 0.8        | 2.47        | Portugal  | 1230   | 1    | 0.8  | 1.39  |
| Sweden      | 4936         | 4.2         | 1.7        | 2.45        | S. Arabia | 1366   | 1.2  | 0.9  | 1.35  |
| Argentina   | 877          | 0.7         | 0.3        | 2.40        | Poland    | 2631   | 2.2  | 1.7  | 1.30  |
| Austria     | 3108         | 2.6         | 1.1        | 2.39        | Romania   | 703    | 0.6  | 0.5  | 1.17  |
| Denmark     | 3348         | 2.8         | 1.2        | 2.39        | Egypt     | 1557   | 1.3  | 1.1  | 1.16  |
| Spain       | 8243         | 7           | 3.1        | 2.27        | S. Korea  | 6872   | 5.8  | 5.2  | 1.12  |
| Hungary     | 1008         | 0.9         | 0.4        | 2.27        | Pakistan  | 555    | 0.5  | 0.5  | 0.94  |
| Netherlands | 7866         | 6.7         | 3          | 2.25        | Malaysia  | 613    | 0.5  | 0.6  | 0.92  |
| <b>UK</b>   | <b>15888</b> | <b>13.5</b> | <b>6.1</b> | <b>2.23</b> | China     | 30235  | 25.7 | 28.3 | 0.91  |
| Ireland     | 1274         | 1.1         | 0.5        | 2.21        | Japan     | 8754   | 7.4  | 9.1  | 0.82  |
| Australia   | 8005         | 6.8         | 3.1        | 2.17        | India     | 3601   | 3.1  | 4.5  | 0.67  |
| New Zealand | 861          | 0.7         | 0.3        | 2.12        | Turkey    | 1600   | 1.4  | 2.5  | 0.55  |
| Greece      | 2373         | 2           | 1          | 2.08        | Iran      | 1254   | 1.1  | 2    | 0.53  |

|            |      |     |     |      |  |  |  |  |
|------------|------|-----|-----|------|--|--|--|--|
| Czech Rep. | 1610 | 1.4 | 0.7 | 2.04 |  |  |  |  |
|------------|------|-----|-----|------|--|--|--|--|

**e-Table 3. Research funders acknowledged on UK cancer research outputs (2011-20)**

|             |                      |  |             |               |  |             |                  |
|-------------|----------------------|--|-------------|---------------|--|-------------|------------------|
| <i>Code</i> | <i>Sector</i>        |  | <i>Code</i> | <i>Sector</i> |  | <i>Code</i> | <i>Sector</i>    |
| C           | collecting charity   |  | G           | government    |  | N           | other non-profit |
| E           | European             |  | H           | hospital      |  | P           | pharma company   |
| F           | foundation (endowed) |  | I           | international |  | U           | university       |

| <i>Funder</i>  | <i>Sector</i> | <i>Papers</i> | <i>%</i> |
|--|---------------|---------------|----------|
| Cancer Research UK                                   | C             | 11574         | 17.9     |
| Medical Research Council                             | G             | 9120          | 14.1     |
| National Institute for Health Research               | G             | 8225          | 12.7     |
| European Commission                                  | E             | 5054          | 7.82     |
| Wellcome Trust                                       | F             | 3451          | 5.34     |
| Engineering & Physical Sciences Research Council     | G             | 1685          | 2.61     |
| AstraZeneca plc                                      | P             | 1446          | 2.24     |
| Biotechnology & Biological Sciences Research Council | G             | 1339          | 2.07     |
| International Agency for Research on Cancer/WHO      | I             | 1217          | 1.88     |
| Roche Holding  | P             | 874           | 1.35     |
| Novartis s.a.  | P             | 780           | 1.21     |
| Pfizer Inc.  | P             | 726           | 1.12     |
| Breast Cancer Now                                    | C             | 684           | 1.06     |
| GlaxoSmithKline plc                                  | P             | 652           | 1.01     |
| British Heart Foundation                             | C             | 637           | 0.99     |
| The Francis Crick Institute                          | U             | 637           | 0.99     |
| Breakthrough Breast Cancer                           | C             | 622           | 0.96     |
| Yorkshire Cancer Research                            | C             | 569           | 0.88     |
| University College London                            | U             | 548           | 0.85     |
| World Cancer Research Fund International             | C             | 546           | 0.84     |
| Royal Society of London                              | N             | 540           | 0.84     |
| Prostate Cancer UK                                   | C             | 518           | 0.80     |
| Merck Inc.   | P             | 516           | 0.80     |
| Leukaemia & Lymphoma Research                        | C             | 506           | 0.78     |

|   |   |     |      |
|---|---|-----|------|
| European Molecular Biology Organization         | E | 499 | 0.77 |
| Amgen Inc.                                      | P | 485 | 0.75 |
| Bloodwise                                       | C | 476 | 0.74 |
| Johnson & Johnson Inc. / Janssen s.a.           | P | 440 | 0.68 |
| Chief Scientist Office, Scotland                | G | 430 | 0.67 |
| Bristol Myers Squibb Inc.                       | P | 398 | 0.62 |
| Rosetrees Trust                                 | F | 395 | 0.61 |
| Academy of Medical Sciences                     | N | 394 | 0.61 |
| Worldwide Cancer Research                       | C | 392 | 0.61 |
| Breast Cancer Campaign                          | C | 386 | 0.60 |
| Prostate Cancer Foundation                      | C | 351 | 0.54 |
| Versus Arthritis/Arthritis UK/Arthritis Care    | C | 345 | 0.53 |
| Bayer AG  | P | 323 | 0.50 |
| Kay Kendall Leukaemia Fund                      | F | 319 | 0.49 |
| Public Health Agency (Northern Ireland)         | G | 318 | 0.49 |
| Great Ormond Street Hospital Children's Charity | H | 274 | 0.42 |

**e-Table 4. Research funders acknowledged on USA cancer research outputs, (2011-20)**

| <i>Funder</i>  | <i>Sector</i> | <i>Papers</i> | <i>%</i> |
|--|---------------|---------------|----------|
| National Cancer Institute                                  | G             | 114089        | 35.5     |
| National Institutes of Health (other than the NCI)         | G             | 59425         | 18.5     |
| Department of Veterans Affairs                             | G             | 13955         | 4.34     |
| National Institute of General Medical Sciences             | G             | 12783         | 3.97     |
| United States Department of Defense                        | G             | 10451         | 3.25     |
| National Center for Advancing Translational Sciences       | G             | 9959          | 3.10     |
| American Cancer Society                                    | C             | 9293          | 2.89     |
| National Institute of Diabetes Digestive & Kidney Diseases | G             | 8527          | 2.65     |
| National Heart Lung & Blood Institute                      | G             | 8085          | 2.51     |
| National Science Foundation                                | G             | 7097          | 2.21     |
| National Center for Research Resources                     | G             | 6774          | 2.11     |
| National Institute of Allergy Infectious Diseases          | G             | 5920          | 1.84     |
| National Institute of Environmental Health Sciences        | G             | 4916          | 1.53     |
| National Institute of Neurological Disorders & Stroke      | G             | 4596          | 1.43     |

|   |   |      |      |
|---|---|------|------|
| University of Texas MD Anderson Cancer Center                   | U | 3475 | 1.08 |
| Susan G Komen Breast Cancer Foundation                          | C | 3438 | 1.07 |
| National Institute of Child Health & Human Development          | G | 3166 | 0.98 |
| National Institute of Biomedical Imaging Bioengineering         | G | 3104 | 0.96 |
| National Institute on Aging                                     | G | 3011 | 0.94 |
| Novartis s.a.   | P | 3005 | 0.93 |
| Breast Cancer Research Foundation                               | C | 2954 | 0.92 |
| Roche Holding s.a.  | P | 2734 | 0.85 |
| Genentech Inc.  | P | 2680 | 0.83 |
| Pfizer Inc.   | P | 2592 | 0.81 |
| Cancer Prevention and Research Institute of Texas               | C | 2551 | 0.79 |
| Leukemia and Lymphoma Society                                   | C | 2509 | 0.78 |
| National Institute of Dental & Craniofacial Research            | G | 2463 | 0.77 |
| National Institute of Arthritis Musculoskeletal & Skin Diseases | G | 2317 | 0.72 |
| Merck Inc.  | P | 2196 | 0.68 |
| Prostate Cancer Foundation                                      | C | 2158 | 0.67 |
| Centers for Disease Control & Prevention                        | G | 2048 | 0.64 |
| Bristol Myers Squibb Inc.                                       | P | 1977 | 0.61 |
| Memorial Sloan Kettering/Sidney Kimmel Center                   | H | 1754 | 0.55 |
| AstraZeneca plc   | P | 1744 | 0.54 |
| American Lebanese Syrian Associated Charities                   | C | 1551 | 0.48 |
| Amgen Inc.  | P | 1495 | 0.46 |
| GlaxoSmithKline plc   | P | 1387 | 0.43 |
| Howard Hughes Medical Institute                                 | F | 1377 | 0.43 |
| Eli Lilly Inc.  | P | 1334 | 0.41 |

**e-Table 5. Research funders acknowledged on joint UK-USA cancer research outputs, (2011-20, absolute numbers)**

| <i>Name</i>                           | <i>ISO2</i> | <i>Sector</i> | <i>Papers</i> | <i>Name</i>                | <i>ISO2</i> | <i>Sector</i> | <i>Papers</i> |
|---------------------------------------|-------------|---------------|---------------|----------------------------|-------------|---------------|---------------|
| US National Cancer Institute          | US          | G             | 3575          | Breast Cancer Now          | UK          | C             | 557           |
| Cancer Research UK                    | UK          | C             | 2952          | Roche/Genentech            | CH          | P             | 516           |
| NIH institutes other than NCI         | US          | G             | 2504          | Pfizer                     | US          | P             | 379           |
| European Union                        | EU          | I             | 2326          | Novartis                   | CH          | P             | 365           |
| Medical Research Council              | UK          | G             | 1860          | GlaxoSmithKline            | UK          | P             | 319           |
| National Inst. Health Res.            | UK          | G             | 1768          | World Cancer Research Fund | UK          | C             | 313           |
| Wellcome Trust                        | UK          | F             | 1369          | Blood Cancer UK            | UK          | C             | 280           |
| American Cancer Society               | US          | C             | 632           | Susan G Komen foundation   | US          | C             | 278           |
| AstraZeneca plc                       | UK          | P             | 627           | Merck (not KGaA)           | US          | P             | 274           |
| US Department of Defense              | US          | G             | 560           | Bristol Myers Squibb       | US          | P             | 231           |
| Canadian Institute of Health Research | CA          | G             | 558           | Eli Lilly                  | US          | P             | 212           |

## Glossary

|       |                                       |
|-------|---------------------------------------|
| AAPG  | Annual Average Percentage Growth      |
| ASCO  | American Society of Clinical Oncology |
| COVID | COrona Virus Disease                  |
| EU    | European Union                        |
| NCD   | Non-Communicable Disease              |
| NCI   | (US) National Cancer Institute        |
| NIH   | (US) National Institutes of Health    |
| SDG   | Sustainable Development Goals         |
| UK    | United Kingdom                        |
| USA   | United States of America              |

| Cancer anatomical sites: |             | Research domains |                         |
|--------------------------|-------------|------------------|-------------------------|
| BLA                      | bladder     | BIOM             | biomarkers              |
| BLO                      | blood       | DIAG             | diagnostics             |
| CER                      | cervical    | EPID             | epidemiology            |
| CNS                      | brain       | GENE             | basic biology, genomics |
| COL                      | colorectal  | HESR             | health services         |
| KID                      | kidney      | PALL             | palliative care         |
| LIV                      | liver       | PATH             | pathology               |
| LUN                      | lung        | QUAL             | quality of life         |
| MAM                      | breast      | RADI             | radiotherapy            |
| MOU                      | head & neck | SCRE             | screening               |
| OES                      | oesophageal | SURG             | surgery                 |
| OVA                      | ovary       | SYST             | systemic therapy.       |
| PAN                      | pancreatic  |                  |                         |
| PRO                      | prostate    |                  |                         |
| SKI                      | skin        |                  |                         |
| STO                      | stomach     |                  |                         |
| UTE                      | uterine     |                  |                         |