JAMA Oncology | Original Investigation

Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life Years for 29 Cancer Groups From 2010 to 2019

A Systematic Analysis for the Global Burden of Disease Study 2019

Global Burden of Disease 2019 Cancer Collaboration

IMPORTANCE The Global Burden of Diseases, Injuries, and Risk Factors Study 2019 (GBD 2019) provided systematic estimates of incidence, morbidity, and mortality to inform local and international efforts toward reducing cancer burden.

OBJECTIVE To estimate cancer burden and trends globally for 204 countries and territories and by Sociodemographic Index (SDI) quintiles from 2010 to 2019.

EVIDENCE REVIEW The GBD 2019 estimation methods were used to describe cancer incidence, mortality, years lived with disability, years of life lost, and disability-adjusted life years (DALYs) in 2019 and over the past decade. Estimates are also provided by quintiles of the SDI, a composite measure of educational attainment, income per capita, and total fertility rate for those younger than 25 years. Estimates include 95% uncertainty intervals (UIs).

FINDINGS In 2019, there were an estimated 23.6 million (95% UI, 22.2-24.9 million) new cancer cases (17.2 million when excluding nonmelanoma skin cancer) and 10.0 million (95% UI, 9.36-10.6 million) cancer deaths globally, with an estimated 250 million (235-264 million) DALYs due to cancer. Since 2010, these represented a 26.3% (95% UI, 20.3%-32.3%) increase in new cases, a 20.9% (95% UI, 14.2%-27.6%) increase in deaths, and a 16.0% (95% UI, 9.3%-22.8%) increase in DALYs. Among 22 groups of diseases and injuries in the GBD 2019 study, cancer was second only to cardiovascular diseases for the number of deaths, years of life lost, and DALYs globally in 2019. Cancer burden differed across SDI quintiles. The proportion of years lived with disability that contributed to DALYs increased with SDI, ranging from 1.4% (1.1%-1.8%) in the low SDI quintile to 5.7% (4.2%-7.1%) in the high SDI quintile. While the high SDI quintile had the highest number of new cases in 2019, the middle SDI quintile had the highest number of cancer deaths and DALYs. From 2010 to 2019, the largest percentage increase in the numbers of cases and deaths occurred in the low and low-middle SDI quintiles.

CONCLUSIONS AND RELEVANCE The results of this systematic analysis suggest that the global burden of cancer is substantial and growing, with burden differing by SDI. These results provide comprehensive and comparable estimates that can potentially inform efforts toward equitable cancer control around the world.

Supplemental content

Corresponding Author: Jonathan M. Kocarnik, PhD, MPH, Institute for Health Metrics and Evaluation, Population Health Building/Hans Rosling Center, University of Washington, Box #351615, 3980 15th Ave NE, Seattle, WA 98195 (kocarnik@uw.edu).

JAMA Oncol. doi:10.1001/jamaoncol.2021.6987
Published online December 30, 2021.

Cancers are a major contributor to disease burden worldwide, and projections forecast that global cancer burden will continue to grow for at least the next 2 decades.[1-4] The United Nations (UN) Sustainable Development Goals (SDGs) recognize the need for reducing cancer burden as part of target 3.4, stating "By 2030, reduce by one third premature mortality from noncommunicable diseases [NCDs] through prevention and treatment and promote mental health and well-being."[5] Most countries will need to accelerate their efforts to reduce NCD burden, including cancer, to meet this SDG target.[6,7] Increasing the pace of progress will be particularly critical given the ongoing COVID-19 pandemic, which has led to delays and disruptions in cancer screenings, diagnosis, and treatment around the world.[8-12]

The importance of prevention and control of NCDs, including cancer, was emphasized by the third UN High-Level Meeting on NCDs in 2018[13] and the UN High-Level Meeting on Universal Health Coverage in 2019.[14,15] World Health Organization initiatives that are focused on breast cancer,[16] cervical cancer,[17] and childhood cancer[18] are valuable efforts toward reducing global cancer burden in combination with national-level cancer control planning and implementation. Global and local efforts require comprehensive assessments of cancer burden, information that may be sparse or unavailable in some countries.[19]

The Global Burden of Diseases (GBD), Injuries, and Risk Factors Study 2019 (GBD 2019) framework enables the comparable assessment of cancer burden across locations and time in terms of cancer incidence, mortality, years of life lost (YLLs), years lived with disability (YLDs), and disability-adjusted life years (DALYs).[20] Estimates of YLLs, YLDs, and DALYs complement incidence and mortality estimates by incorporating morbidity and mortality contributions to total cancer burden over the lifetime. Because GBD 2019 estimated disease burden across a mutually exclusive and collectively exhaustive hierarchy of diseases and injuries, cancer burden can also be systematically compared with and ranked against other causes of disease burden. Together, these qualities help GBD 2019 provide a comprehensive picture of variation in cancer burden that can potentially inform cancer control planning.

In this article, we present results for 29 cancer groups from the GBD 2019 study, globally and for 204 countries and territories, from 2010 through 2019. Results are also provided by quintiles of the Sociodemographic Index (SDI), a summary indicator of social and economic development that allows for analyses of disease burden patterns across different resource contexts.[20,21] These estimates update results from the GBD 2017 study[22] and supersede published estimates from previous GBD iterations.[22-25]

Key Points

Question What was the burden of cancer globally and across Sociodemographic Index (SDI) groupings in 2019, and how has incidence, morbidity, and mortality changed since 2010?

Findings In this systematic analysis, there were 23.6 million new global cancer cases in 2019 (17.2 million when excluding those with nonmelanoma skin cancer), 10.0 million cancer deaths, and an estimated 250 million disability-adjusted life years estimated to be due to cancer; since 2010, these represent increases of 26.3%, 20.9%, and 16.0%, respectively. Absolute cancer burden increased in all SDI quintiles since 2010, but the largest percentage increases occurred in the low and low-middle SDI quintiles.

Meanings The study results suggest that increased cancer prevention and control efforts are needed to equitably address the evolving and increasing burden of cancer across the SDI spectrum.

Methods

This section provides an overview of GBD 2019 cancer estimation methods. Additional detail is provided in the GBD 2019 summary publications,[20,21,26] as well as in the eAppendix, eFigures 1 to 15, and eTables 1 to 18 in the Supplement. This study is compliant with the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) statement (eTable 13 in the Supplement).[27] The University of Washington institutional review board committee approved GBD 2019, and informed consent was waived because of the use of deidentified data. This article was produced as part of the GBD Collaborator Network and in accordance with the GBD Protocol (http://www.healthdata.org/gbd/about/protocol).

Study Design

Disease and injuries in GBD 2019 were organized into a comprehensive hierarchy of nested levels, with neoplasms as 1 of 22 level 2 groups.[20] Cancers were classified into 30 level 3 cancer groups (eg, leukemia), 4 of which were further subdivided into level 4 groups (eg, chronic myeloid leukemia). While the GBD study estimates benign and in situ neoplasms as an important component of total health burden from all neoplasms broadly, this level 3 cancer group was not included in the estimates reported in this article to focus on malignant cancers (eAppendix in the Supplement). Similarly, because nonmelanoma skin cancer (NMSC) has relatively high incidence and low mortality compared with other cancers, this article presents estimates with and without NMSC.

There are 5 major ways that this iteration of the GBD study improved on the data and methods used to estimate cancer burden in GBD 2017[22] (eAppendix in the Supplement). First, GBD 2019 incorporated an additional 104 076 new cancer-, location-, and year-specific sources of data compared with GBD 2017 (eTable 1 in the Supplement). Second, data processing methods were improved for several cancers, particularly liver cancer, as described later. Third, the youngest age group estimated was increased or decreased for several cancers to align with cancer registry age patterns. Fourth, modeling parameters were updated to perform additional smoothing of mortality-to-incidence ratio (MIR) estimates across age and time, reducing improbable variation from sparse data. Fifth, cancer survival estimation methods were updated to improve uncertainty estimations and estimate age-specific instead of all-ages survival curves.

Results are presented by SDI, a composite indicator of income per capita, mean years of education, and fertility rate

for those younger than 25 years.[21] The SDI is the geometric mean of these 3 independently estimated and scaled components, with lower values representing lower development. While SDI values may change over time, for consistency of comparison, countries were grouped into quintiles according to their SDI values in 2019 (eTable 2 and eFigure 1 in the Supplement). These quintiles were termed *low*, *low-middle*, *middle*, *high-middle*, and *high*. More details are provided in the eAppendix in the Supplement, including the population and SDI bounds for each quintile.

Data Sources and Processing

Cancer estimation in GBD 2019 used 929 193 cancer-, location-, and year-specific sources of data, of which 767 514 (82.6%) were from vital registration systems, 155 542 (16.7%) from cancer registries, and 6137 (0.7%) from verbal autopsy reports (eTable 1 in the Supplement). The cancers presented in this analysis include *malignant neoplasms* or *cancer* as defined by the *International Statistical Classification of Diseases and Related Health Problems, Ninth Revision* (*ICD-9*) codes 140 to 209,[28] or *Tenth Revision* (*ICD-10*) codes C00 to C96.[29] Incidence and mortality data with these *ICD* codes are mapped to GBD cancer causes[20] (eAppendix and eTables 3-5 in the Supplement). One processing update for GBD 2019 was the remapping of deaths coded to *ICD-10* code C22.9; because this code includes unspecified primary or secondary liver cancer, a subset of these deaths were redistributed to various other cancers that metastasize to the liver.[20,30,31] Kaposi sarcoma was not estimated because deaths were primarily redistributed to be of HIV/AIDS (eAppendix in the Supplement).[20] The GBD NMSC estimates included squamous cell carcinoma and basal cell carcinoma. Because NMSC reporting was incomplete in many cancer registries,[32] GBD 2019 additionally incorporated data from the literature and clinical sources to estimate NMSC burden (eAppendix in the Supplement).

Modeling Process

The GBD cancer mortality and YLL estimation process included 2 primary steps (eFigure 2 in the Supplement), beginning with the estimation of cancer MIRs, which provide an association between mortality and incidence estimation, maximizing data availability. The MIRs were modeled using a space-time Gaussian process regression approach[26] (MIR methods are described in the eAppendix in the Supplement) using matched incidence and mortality data from cancer registries (eTable 6 in the Supplement) and the GBD-estimated health care access and quality index[33] as a covariate. These estimated MIRs were then used to convert cancer registry incidence data into inputs for mortality modeling.

Estimating cancer mortality was the second step. The GBD 2019 study used a Cause of Death Ensemble model (CODEm) approach that combined data from vital registration systems, cancer registries, and verbal autopsy reports to estimate mortality across several submodels.[34] Covariates provided for potential inclusion in the submodels of the ensemble, such as smoking prevalence or alcohol use, can be found in the eAppendix and eTables 7 and 8 in the Supplement. Ensemble model construction and performance was evaluated through out-of-sample predictive validity tests (eTable 9 in the Supplement). For each cancer, sex-specific CODEm models generated mortality estimates across locations, years, and age groups. These cancer mortality estimates were then scaled to align with the total mortality for all causes of death, which was separately estimated in GBD 2019 (eTable 10 in the Supplement).[21] To estimate YLLs, a standard age-specific GBD life expectancy was applied to mortality estimates by age group (eAppendix in the Supplement).[20]

The GBD cancer incidence and YLD estimation process included 2 additional steps (eFigure 3 in the Supplement), starting with estimating incidence. Incidence was estimated by taking mortality estimates from the second step described previously and dividing by MIR estimates from the first step described previously for each cancer type, sex, location, year, and 5-year age group. Additional information can be found in the eAppendix in the Supplement.

Next, YLDs were estimated by combining prevalence estimates with disability weights associated with various phases of cancer survival. To estimate 10-year cancer prevalence, survival curves estimated from MIRs were combined with GBD-estimated background mortality and applied to incidence estimates. Additional information regarding survival and prevalence estimation can be found in the eAppendix and eFigure 3 in the Supplement. These 10-year prevalence estimates were then partitioned into 4 sequelae according to the expected person-time spent in these 4 phases of cancer survival: (1) diagnosis/treatment, (2) remission, (3) metastatic/disseminated, and (4) terminal (eTable 11 in the Supplement). Each sequela prevalence was multiplied by a sequela-specific disability weight that represented the magnitude of health loss (eTable 12 in the Supplement).[20] For 5 cancer types (bladder, breast, colorectal, larynx, and prostate cancer), the total prevalence additionally included lifetime prevalence of procedure-related disability (eg, laryngectomy due to larynx cancer). These procedure-related prevalence estimates were modeled in the Bayesian meta-regression tool DisMod-MR, version 2.1,[20] using medical records data on the proportion of patients with cancer who underwent these procedures and the estimated number of 10-year survivors (eAppendix in the Supplement). These procedure-related prevalence estimates were then multiplied by procedure-specific disability weights (eTable 12 in the Supplement). Total cancer-specific YLDs were estimated by summing across these sequelae. Finally, DALYs were estimated as the sum of YLDs and YLLs.[20]

Reporting Standards

All rates are reported per 100 000 person-years. Annualized rates of change from 2010 to 2019 represent the mean percentage change per year during this period (eAppendix in the Supplement). The GBD world population standard was used to calculate age-standardized rates (eAppendix in the Supplement).[21] For all estimates, 95% uncertainty intervals (UIs) are reported. Uncertainty was propagated through each step of the cancer estimation process, with UIs representing the 2.5th and 97.5th percentiles of the distribution of 1000 draws at each step (eAppendix in the Supplement).[20]

Results are reported for 29 cancer groups, 204 countries and territories, and 5 SDI quintiles from 2010 to 2019. These estimates, as well as extended years (1990-2019), additional cancer groups, national and subnational locations, sex-specific estimates, and additional age groups are available from online resources (https://vizhub.healthdata.org/gbd-compare/ and http://ghdx.healthdata.org/gbd-results-tool).

Data processing and analyses were conducted using Python, version 3.7.0 (Python Software Foundation); Stata, version 15.1 (StataCorp); and R, version 3.4.1 (R Foundation). Code is available at https://ghdx.healthdata.org/gbd-2019/code.

Results

Global Estimates of Total Cancers and Cancer-Specific Burden in 2019

Across 204 countries and territories, there were 23.6 million (95% UI, 22.2-24.9 million) incident cancer cases and 10.0 million (95% UI, 9.36-10.6 million) deaths in 2019 (**Table 1**). Excluding NMSC, there were an estimated 17.2 million (95% UI, 15.9-18.5 million) incident cancer cases and 9.97 million (95% CI, 9.31-10.5 million) deaths (Table 1).

Globally, cancers were estimated to cause 250 million (95% UI, 235-264 million) DALYs in 2019 (eTable 15 in the Supplement). Of the total global DALYs, 96.9% (95% UI, 96.0%-97.7%) came from YLLs, whereas 3.1% (95% UI, 2.3%-4.0%) came from YLDs (eTable 14 and eFigure 4 in the Supplement). Among the 22 groups of diseases and injuries in level 2 of the GBD cause hierarchy (**Figure 1**[22]), total cancer was the second-highest cause of DALYs, deaths, and YLLs behind cardiovascular diseases (**Table 2**; eTable 15 in the Supplement). As such, cancer had greater overall and fatal burden globally in 2019 than other major groups of diseases in the GBD, such as maternal and neonatal disorders, musculoskeletal disorders, and respiratory infections and tuberculosis (Figure 1).

The 5 leading causes of cancer-related DALYs for both sexes combined (**Figure 2**), excluding other malignant neoplasms, were tracheal, bronchus, and lung (TBL) cancer, with 18.3% (95% UI, 17.5%-19.1%) of total cancer-related DALYs; colon and rectum cancer (CRC), with 9.7% (95% UI, 9.4%-10.0%); stomach cancer, with 8.9% (8.6%-9.3%); breast cancer, with 8.2% (7.8%-8.7%); and liver cancer, with 5.0% (4.8%-5.3%).

Tracheal, bronchus, and lung cancer were estimated to cause 45.9 million (95% UI, 42.3-49.3 million) DALYs in 2019; of these, 98.8% (95% UI, 98.5%-99.1%) came from YLLs and just 1.2% (95% UI, 0.9%-1.5%) from YLDs (eTable 14 and eFigure 4 in the Supplement). In 2019, there were 2.04 million (95% UI, 1.88-2.19 million) deaths due to TBL cancer and 2.26 million (95% UI, 2.07-2.45 million) incident TBL cases (Table 1). Tracheal, bronchus, and lung cancer was the leading cause of cancer incidence and mortality in 58 and 119 countries and territories, respectively, for males (eFigures 5 and 6 in the Supplement), and 1 and 27 countries, respectively, for females (eFigures 7 and 8 in the Supplement).

Colon and rectum cancer were estimated to cause 24.3 million (95% UI, 22.6-25.7 million) DALYs in 2019; of these, 95.6% (95% UI, 94.4%-96.8%) came from YLLs and 4.4% (95% UI, 3.2%-5.6%) from YLDs (eTable 14 and eFigure 4 in the Supplement). In 2019, there were 1.09 million (95% UI, 1.00-1.15 million) deaths due to CRC and 2.17 million (95% UI, 2.00-2.34 million) incident CRC cases (Table 1). Colon and rectum cancer was the leading cause of cancer incidence and mortality in 1 country and 9 countries, respectively, for females (eFigures 7 and 8 in the Supplement) and of cancer incidence for 11 countries in males (eFigure 5 in the Supplement).

Stomach cancer was estimated to cause an estimated 22.2 million (95% UI, 20.3-24.1 million) DALYs in 2019; of these, 98.4% (95% UI, 98.0%-98.9%) came from YLLs and 1.6% (95% UI, 1.1%-2.0%) from YLDs (eTable 14 and eFigure 4 in the Supplement). There were also 957 000 (95% UI, 871 000-1 030 000) deaths and 1.27 million (95% UI, 1.15-1.40 million) incident cases of stomach cancer in 2019 (Table 1). Stomach cancer was the leading cause of cancer incidence and mortality in 5 and 11 countries, respectively, for males (eFigures 5 and 6 in the Supplement) and of cancer mortality in 6 countries for females (eFigure 8 in the Supplement).

Breast cancer was the leading cause of cancer-related DALYs, deaths, and YLLs among females globally in 2019. Most of the global breast cancer burden occurred for females, with 20.3 million (95% UI, 18.7-21.9 million) of 20.6 million (95% UI, 19.0-22.2 million) total breast cancer–related DALYs in 2019 occurring in females, of which 93.3% (95% UI, 91.1%-95.2%) came from YLLs and 6.7% (95% UI, 4.8%-8.9%) from YLDs (eTable 14 and eFigure 4 in the Supplement). Likewise, 689 000 (95% UI, 635 000-740 000) of 701 000 (95% UI, 647 000-752 000) breast cancer deaths occurred in females, and 1.98 million (95% UI, 1.81-2.15 million) of 2.00 million (95% UI, 1.83-2.17 million) incident cases of breast cancer (Table 1). For females, breast cancer was the leading cause of cancer incidence in 157 countries and deaths in 119 countries (eFigures 7 and 8 in the Supplement).

Liver cancer was estimated to cause 12.5 million (95% UI, 11.4-13.7 million) DALYs in 2019; of these, 99.0% (95% UI, 98.6%-99.3%) came from YLLs and 1.0% (95% UI, 0.7%-1.4%) from YLDs (eTable 14 and eFigure 4 in the Supplement). There were also 485 000 (95% UI, 444 000-526 000) deaths and 534 000 (95% UI, 487 000-589 000) incident cases of liver cancer in 2019 (Table 1). Liver cancer was the leading cause of cancer incidence and mortality in 6 and 8 countries, respectively, in males (eFigures 5 and 6 in the Supplement) and 1 and 2 countries, respectively, in females (eFigures 7 and 8 in the Supplement).

Sex-specific DALY rankings differed slightly from those previously described because of the higher prominence of several sex-specific cancers. Among males, TBL cancer remained the leading cause of cancer-related DALYs globally, followed by stomach, CRC, liver, and esophageal cancer, with prostate cancer sixth (eFigure 9 in the Supplement). Among females, the leading cause of cancer-related DALYs globally was breast cancer, followed by TBL, CRC, cervical, and stomach cancer, with ovarian cancer sixth (eFigure 10 in the Supplement).

Table 1. Global Incidence and Deaths in 2019 for Total Cancers and 29 Cancer Groups

Cancer type[a]	Deaths, thousands (95% UI)			ASMR per 100 000 (95% UI)			Incident cases, thousands (95% UI)			ASIR per 100 000 (95% UI)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total	10 000 (9360-10 600)	5690 (5250-6100)	4340 (3970-4660)	124.7 (116.4-132.0)	156.1 (143.9-167.2)	99.9 (91.5-107.3)	23 600 (22 200-24 900)	12 900 (12 100-13 800)	10 600 (9920-11 400)	290.5 (274.0-307.1)	348.7 (327.3-370.8)	246.1 (229.8-263.1)
Excluding NMSC	9970 (9310-10 500)	5650 (5220-6 070)	4310 (3950-4 640)	123.9 (115.7-131.2)	155.1 (142.9-166.1)	99.4 (91.0-106.8)	17 200 (15 900-18 500)	9260 (8470-10 000)	7960 (7280-8610)	211.4 (195.4-226.8)	245.9 (225.3-266.5)	185.0 (169.4-200.2)
Tracheal, bronchus, and lung	2040 (1880-2190)	1390 (1260-1510)	657 (590-719)	25.2 (23.2-27.0)	37.4 (34.1-40.7)	15.0 (13.5-16.4)	2260 (2070-2450)	1520 (1370-1680)	737 (658-814)	27.7 (25.3-30.0)	40.4 (36.5-44.4)	16.8 (15.0-18.6)
Colon and rectum	1090 (1000-1150)	594 (551-638)	492 (438-532)	13.7 (12.6-14.5)	16.6 (15.4-17.9)	11.2 (10.0-12.2)	2170 (2000-2 340)	1240 (1130-1360)	926 (832-1 010)	26.7 (24.6-28.9)	33.1 (30.2-36.2)	21.2 (19.0-23.2)
Stomach	957 (871-1030)	612 (544-678)	346 (308-382)	11.9 (10.8-12.8)	16.6 (14.8-18.3)	7.9 (7.1-8.8)	1270 (1150-1400)	847 (748-963)	423 (377-467)	15.6 (14.1-17.2)	22.4 (19.8-25.3)	9.7 (8.7-10.7)
Breast	701 (647-752)	12.1 (10.7-13.3)	689 (635-740)	8.6 (7.9-9.2)	0.3 (0.3-0.4)	15.9 (14.7-17.1)	2000 (1830-2170)	25.1 (22.2-27.8)	1980 (1810-2150)	24.2 (22.1-26.2)	0.7(0.6-0.7)	45.9 (41.9-49.8)
Pancreatic	531 (492-567)	278 (258-299)	253 (226-274)	6.6 (6.1-7.1)	7.5 (7.0-8.1)	5.8 (5.1-6.2)	530 (486-574)	280 (256-303)	250 (224-275)	6.6 (6.0-7.1)	7.5 (6.8-8.1)	5.7 (5.1-6.3)
Esophageal	498 (438-551)	366 (315-415)	133 (110-150)	6.1 (5.4-6.8)	9.7 (8.3-11.0)	3.0 (2.5-3.4)	535 (467-595)	389 (336-444)	146 (120-165)	6.5 (5.7-7.2)	10.1 (8.7-11.6)	3.3 (2.7-3.8)
Prostate	487 (420-594)	487 (420-594)	NA	6.3 (5.4-7.7)	15.3 (13.0-18.6)	NA	1410 (1230-1830)	1410 (1230-1830)	NA	17.4 (15.1-22.5)	38.6 (33.6-49.8)	NA
Liver	485 (444-526)	334 (300-368)	151 (134-167)	5.9 (5.4-6.4)	8.7 (7.9-9.6)	3.5 (3.1-3.8)	534 (487-589)	376 (335-422)	158 (140-176)	6.5 (5.9-7.2)	9.7 (8.7-10.8)	3.6 (3.2-4.0)
Other malignant neoplasms	408 (355-444)	220 (180-249)	188 (169-204)	5.1 (4.5-5.6)	5.9 (4.8-6.7)	4.5 (4.0-4.8)	831 (741-906)	451 (381-504)	381 (347-415)	10.4 (9.3-11.4)	11.9 (10.0-13.3)	9.2 (8.4-10.1)
Leukemia	335 (307-360)	188 (165-208)	146 (132-158)	4.3 (3.9-4.6)	5.2 (4.6-5.7)	3.5 (3.2-3.8)	644 (587-700)	351 (308-390)	293 (263-322)	8.2 (7.5-8.9)	9.4 (8.3-10.5)	7.2 (6.5-8.0)
Cervical	280 (239-314)	NA	280 (239-314)	3.4 (2.9-3.8)	NA	6.5 (5.5-7.3)	566 (482-636)	NA	566 (482-636)	6.8 (5.8-7.7)	NA	13.4 (11.4-15.0)
Non-Hodgkin lymphoma	255 (238-270)	146 (136-155)	109 (98.9-117)	3.2 (3.0-3.4)	4.0 (3.7-4.2)	2.5 (2.3-2.7)	457 (417-499)	266 (241-291)	191 (169-211)	5.7 (5.2-6.3)	7.2 (6.5-7.9)	4.5 (4.0-4.9)
Brain and central nervous system	246 (186-271)	139 (99.6-157)	108 (76.4-122)	3.0 (2.3-3.4)	3.6 (2.6-4.1)	2.6 (1.8-2.9)	348 (262-389)	187 (135-215)	161 (114-184)	4.3 (3.3-4.9)	4.8 (3.5-5.6)	3.9 (2.8-4.5)
Bladder	229 (211-243)	169 (157-181)	59.5 (52.3-64.6)	2.9 (2.7-3.1)	5.1 (4.7-5.4)	1.4 (1.2-1.5)	524 (476-569)	408 (371-444)	116 (104-128)	6.5 (5.9-7.1)	11.3 (10.2-12.3)	2.7 (2.4-2.9)
Lip and oral cavity	199 (182-218)	132 (118-145)	67.8 (60.8-75.7)	2.4 (2.2-2.7)	3.4 (3.1-3.8)	1.6 (1.4-1.7)	373 (341-404)	243 (219-268)	130 (117-143)	4.5 (4.1-4.9)	6.2 (5.6-6.8)	3.0 (2.7-3.3)
Ovarian	198 (175-218)	NA	198 (175-218)	2.4 (2.1-2.7)	NA	4.6 (4.0-5.0)	294 (261-330)	NA	294 (261-330)	3.9 (3.2-4.0)	NA	6.9 (6.1-7.7)
Gallbladder and biliary tract	172 (145-189)	73.0 (59.5-80.4)	99.5 (81.7-114.0)	2.2 (1.8-2.4)	2.1 (1.7-2.3)	2.3 (1.9-2.6)	199 (167-220)	86.4 (69.4-95.9)	113 (91.6-130)	2.5 (2.1-2.7)	2.4 (1.9-2.7)	2.6 (2.1-3.0)
Kidney	166 (155-176)	109 (101-116)	57.7 (52.2-61.9)	2.1 (1.9-2.2)	3.0 (2.8-3.2)	1.3 (1.2-1.4)	372 (345-402)	241 (221-262)	131 (120-142)	4.6 (4.2-4.9)	6.2 (5.7-6.8)	3.1 (2.8-3.3)
Larynx	123 (115-133)	106 (97.8-115)	17.8 (16.2-19.7)	1.5 (1.4-1.6)	2.7 (2.5-3.0)	0.4 (0.4-0.5)	209 (194-225)	181 (166-196)	28.5 (26.1-31.3)	2.5 (2.3-2.7)	4.6 (4.2-5.0)	0.7 (0.6-0.7)
Other pharynx	114 (103-126)	88.0 (78.0-98.7)	26.2 (22.5-30.5)	1.4 (1.2-1.5)	2.2 (2.0-2.5)	0.6 (0.5-0.7)	167 (153-180)	129 (116-142)	37.6 (33.1-42.3)	2.0 (1.8-2.2)	3.2 (2.9-3.5)	0.9 (0.8-1.0)
Multiple myeloma	113 (99.5-122)	60.4 (50.7-67.1)	53.0 (45.1-58.3)	1.4 (1.2-1.5)	1.7 (1.4-1.8)	1.2 (1.0-1.3)	156 (137-173)	84.5 (70.9-94.9)	71.2 (60.3-80.1)	1.9 (1.7-2.1)	2.3 (1.9-2.6)	1.6 (1.4-1.8)

(continued)

Table 1. Global Incidence and Deaths in 2019 for Total Cancers and 29 Cancer Groups (continued)

Cancer type[a]	Deaths, thousands (95% UI)			ASMR per 100 000 (95% UI)			Incident cases, thousands (95% UI)			ASIR per 100 000 (95% UI)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Uterine	91.6 (82.4-101.5)	NA	91.6 (82.4-101.5)	1.1 (1.0-1.3)	NA	2.1 (1.9-2.3)	435 (397-480)	NA	435 (397-480)	5.2 (4.8-5.7)	NA	10.0 (9.1-11.0)
Nasopharynx	71.6 (65.4-77.6)	51.2 (46.0-57.0)	20.4 (18.2-22.8)	0.9 (0.8-0.9)	1.3 (1.2-1.4)	0.5 (0.4-0.5)	177 (156-200)	127 (108-149)	49.2 (42.6-57.0)	2.1 (1.9-2.4)	3.1 (2.7-3.7)	1.2 (1.0-1.3)
Malignant skin melanoma	62.8 (46.3-71.0)	35.4 (22.0-42.7)	27.4 (19.0-31.9)	0.8 (0.6-0.9)	1.0 (0.6-1.2)	0.6 (0.4-0.7)	290 (214-342)	153 (89.8-193)	137 (92.7-167)	3.6 (2.6-4.2)	4.0 (2.3-5.1)	3.2 (2.2-3.9)
Nonmelanoma skin	56.1 (50.4-59.8)	33.2 (30.3-35.6)	22.8 (19.3-25.2)	0.7 (0.7-0.8)	1.0 (0.9-1.1)	0.5 (0.4-0.6)	6350 (5810-6950)	3680 (3350-4060)	2670 (2430-2910)	79.1 (72.3-86.6)	102.8 (93.9-112.9)	61.1 (55.8-66.7)
Thyroid	45.6 (41.3-48.8)	18.6 (16.8-20.2)	26.9 (23.7-29.3)	0.6 (0.5-0.6)	0.5 (0.5-0.6)	0.6 (0.5-0.7)	234 (212-253)	76.0 (68.2-82.9)	158 (140-173)	2.8 (2.6-3.1)	1.9 (1.7-2.1)	3.7 (3.3-4.1)
Mesothelioma	29.3 (26.7-31.0)	21.2 (20.0-22.5)	8.03 (5.88-8.92)	0.4 (0.3-0.4)	0.6 (0.6-0.6)	0.2 (0.1-0.2)	34.5 (31.2-37.8)	25.2 (22.9-27.6)	9.34 (6.84-10.7)	0.4 (0.4-0.5)	0.7 (0.6-0.8)	0.2 (0.2-0.2)
Hodgkin lymphoma	27.6 (23.7-31.8)	17.2 (13.9-21.0)	10.4 (8.23-12.6)	0.3 (0.3-0.4)	0.4 (0.4-0.5)	0.3 (0.2-0.3)	87.5 (77.9-101.4)	51.3 (43.6-58.7)	36.2 (30.2-46.1)	1.1 (1.0-1.3)	1.3 (1.1-1.5)	0.9 (0.7-1.1)
Testicular	10.8 (9.96-11.9)	10.8 (9.96-11.9)	NA	0.1 (0.1-0.2)	0.3 (0.3-0.3)	NA	109.3 (93.4-129.5)	109.3 (93.4-129.5)	NA	1.4 (1.2-1.7)	2.8 (2.4-3.3)	NA

Abbreviations: ASIR, age-standardized incidence rate; ASMR, age-standardized mortality rate; NA, not applicable; NMSC, nonmelanoma skin cancer; UI, uncertainty interval.

[a] Rows are ordered by decreasing number of total deaths. Cancer groups are defined based on *International Classification of Diseases, Ninth Revision* (*ICD-9*) and *International Classification of Diseases and Related Health Problems, Tenth Revision* (*ICD-10*) codes and include all codes pertaining to malignant neoplasms (*ICD-9* codes 140-208 and *ICD-10* codes C00-C96) except for Kaposi sarcoma (C46; eAppendix in the Supplement). eTables 3 and 4 in the Supplement detail how the original ICD codes were mapped to the Global Burden of Disease cancer cause list. Visual comparisons of cancer-specific incidence and mortality are provided in eFigures 14 and 15 in the Supplement. Detailed results for incidence and mortality by Sociodemographic Index quintile, region, and country can be accessed in eTables 16 and 17 in the Supplement and at https://vizhub.healthdata.org/gbd-compare/.

Global Trends in Cancer Burden From 2010 to 2019

Globally, the number of new cancer cases increased from 18.7 million (95% UI, 18.0-19.3 million) in 2010 to 23.6 million (95% UI, 22.2-24.9 million) in 2019, an increase of 26.3% (95% UI, 20.3%-32.3%). Age-standardized incidence rates remained generally the same during this period, with a difference of −1.1% (95% UI, −5.8% to 3.5%) and an annualized rate of change of −0.1% (95% UI, −0.7% to 0.4%). Excluding NMSC, the number of incident cases increased from 13.8 million (95% UI, 13.3-14.3 million) in 2010 to 17.2 million (95% UI, 15.9-18.5 million) in 2019, a 24.6% (95% UI, 16.8%-32.6%) increase, while the age-standardized incidence rates remained the same during this period, with a difference of −1.6% (95% UI, −7.7% to 4.6%) and an annualized rate of change of −0.2% (95% UI, −0.9% to 0.5%).

Similarly, the number of global total cancer deaths increased by 20.9% (95% UI, 14.2%-27.6%) from 8.29 million (95% UI, 7.89-8.57 million) in 2010 to 10.0 million (95% UI, 9.36-10.6 million) in 2019. Cancer deaths also increased as a proportion of total deaths of all causes, rising from 15.7% (95% UI, 15.0%-16.2%) in 2010 to 17.7% (95% UI, 16.8%-18.4%) in 2019. By contrast, age-standardized mortality rates declined by −5.9% (95% UI, −11.0% to −0.9%) during this 10-year period, with an annualized rate of change of −0.7% (95% UI, −1.3% to −0.1%). During this decade, the absolute number of global cancer-related DALYs increased by 16.0% (95% UI, 9.3%-22.8%) from 216 million (95% UI, 208-223 million) in 2010 to 250 million (95% UI, 235-264 million) in 2019. The proportion of estimated total global DALYs that were due to cancer increased from 8.4% (95% UI, 7.7%-9.0%) of total DALYs from all causes in 2010 to 9.9% (95% UI, 8.9%-10.9%) in 2019. A decline is also evident in the age-standardized rates, as age-standardized cancer-related DALYs rates decreased by −6.6% (95% UI, −11.9% to −1.1%) during this period.

Location-specific annualized rates of change in age-standardized mortality and incidence rates from 2010 to 2019 for total cancers, excluding NMSC, varied by location. During this period, age-standardized mortality rates decreased in 131 of 204 countries and territories (64.2%; **Figure 3**), and age-standardized incidence rates decreased in 75 of 204 countries and territories (36.8%; **Figure 4**).

Trends during the last decade varied by type of cancer, including several shifts in cancer group rankings by absolute DALYs (Figure 2). For example, CRC and liver cancer rose from the third and seventh leading causes of cancer-related DALYs in 2010 to second and fifth in 2019 because of large increases in the number of DALYs and small decreases in age-standardized DALY rates. In contrast, stomach cancer and leukemia dropped from second and fifth to third and seventh during the same period because of large decreases in age-standardized DALY rates and minimal changes in the number of DALYs (Figure 2).

Figure 1. Ranking of Total Cancer Absolute Disability-Adjusted Life Years (DALYs) in 2019 Among the 22 Level 2 Categories of Disease in the Global Burden of Disease (GBD) Study by Quintile of Sociodemographic Index (SDI)

GBD level 2 cause of disease or injury	Absolute DALYs, millions (95% UI)	Global ranking	Low SDI ranking	Low-middle SDI ranking	Middle SDI ranking	High-middle SDI ranking	High SDI ranking
Cardiovascular diseases	393 (368-417)	1	6	1	1	1	2
Total cancers (excluding NMSC)	**249 (234-263)**	**2**	**10**	**4**	**2**	**2**	**1**
Maternal and neonatal disorders	199 (172-232)	3	1	2	7	15	17
Other noncommunicable diseases	153 (124-187)	4	5	5	5	5	6
Respiratory infections and tuberculosis	153 (137-172)	5	2	3	9	14	16
Musculoskeletal disorders	150 (109-198)	6	18	9	3	3	3
Mental disorders	125 (93.0-163.0)	7	11	8	6	4	4
Diabetes and kidney diseases	113 (99.3-128.0)	8	17	11	4	8	7
Unintentional injuries	104 (88.9-120.0)	9	12	10	11	7	8
Chronic respiratory diseases	104 (94.8-112.0)	10	16	7	8	9	9
Neurological disorders	97.7 (55.9-159.0)	11	19	14	10	6	5
Enteric infections	96.8 (79.2-120)	12	3	6	18	20	19
Digestive diseases	89.0 (81.4-97.6)	13	13	12	13	10	11
Transport injuries	77.6 (69.2-85.5)	14	15	13	12	12	15
Self-harm and interpersonal violence	67.9 (63.4-72.9)	15	14	15	15	13	13
Sense organ diseases	66.1 (45.1-93.0)	16	20	19	14	11	12
Neglected tropical diseases and malaria	62.9 (38.6-96.0)	17	4	18	20	22	22
HIV/AIDS and sexually trasmitted infections	56.2 (48.4-67.0)	18	8	17	16	19	20
Other infectious diseases	51.4 (40.7-66.0)	19	7	20	22	21	21
Nutritional deficiencies	49.8 (36.9-65.8)	20	9	16	19	18	18
Skin and subcutaneous diseases	42.9 (28.6-63.4)	21	21	21	17	17	14
Substance use disorders	35.1 (28.2-43.0)	22	22	22	21	16	10

Total cancers excludes nonmelanoma skin cancer. The GBD study organized diseases and injuries into a hierarchy that was mutually exclusive and collectively exhaustive. More details of this hierarchy were previously published.[22] Colors represent the ranking of the cause within a given location group (eg, high SDI quintile) from red (highest ranking) to green (lowest ranking). The other noncommunicable diseases include congenital birth defects; urinary diseases and male infertility; gynecological diseases; hemoglobinopathies and hemolytic anemias; endocrine, metabolic, blood, and immune disorders; oral disorders; and sudden infant death syndrome. The other infectious diseases include meningitis; encephalitis; diphtheria; whooping cough; tetanus; measles; varicella and herpes zoster; acute hepatitis; and other unspecified infectious diseases. NMSC indicates nonmelanoma skin cancer; UI, uncertainty interval.

Cancer Burden by SDI

Cancer burden varied considerably across SDI quintiles in 2019 levels and rankings (Table 2 and Figure 4) and trends during the 2010 to 2019 study period (**Figure 5**; eTables 16 and 17 in the Supplement). The following results exclude NMSC.

In the high SDI quintile in 2019, there were 50.9 million (95% UI, 48.1-52.9 million) DALYs estimated to be caused by cancer, of which 94.5% (95% UI, 93.1%-95.9%) were from YLLs and 5.5% (95% UI, 4.1%-6.9%) from YLDs. The most cases and the highest age-standardized incidence rates were in the high SDI quintile (Table 2; Figure 5). Compared with GBD level 2 groups of diseases and injuries, cancer was the leading cause of YLLs and DALYs in the high SDI quintile and was the leading or second leading cause of deaths by age-standardized rate or absolute number, respectively. In the high-middle SDI quintile, there were 63.5 million (95% UI, 58.6-68.2 million) DALYs estimated to be caused by cancer, of which 96.7% (95% UI, 95.7%-97.6%) were from YLLs and 3.3% (95% UI, 2.4%-4.3%) from YLDs. The high-middle SDI had the highest age-standardized rates of deaths and DALYs of all SDI quintiles and the second highest age-standardized incidence rate (Table 2; Figure 5).

The middle SDI quintile had the highest number of cancer-related DALYs and deaths of any SDI quintile in 2019, with 76.3 million (95% UI, 69.7-83.2 million) DALYs and 2.88 million (95% UI, 2.62-3.15 million) deaths (Table 2, Figure 5). Of the SDI quintiles, the middle SDI quintile had the largest total population (eAppendix in the Supplement). For DALYs, 97.6% (95% UI, 96.8%-98.3%) came from YLLs and 2.4% (95% UI, 1.7%-3.2%) from YLDs. In the low-middle SDI quintile, there were 40.2 million (95% UI, 36.8-43.7 million) DALYs estimated to be caused by cancer in 2019; of these, 98.2% (95% UI, 97.7%-98.7%) were from YLLs and 1.8% (95% UI, 1.3%-2.3%) from YLDs.

In the low SDI quintile, there were 18.0 million (95% UI, 15.9-20.2 million) DALYs estimated to be caused by cancer in 2019; of these, 98.6% (95% UI, 98.1%-98.9%) were from YLLs and 1.4% (95% UI, 1.1%-1.9%) from YLDs. The low SDI quintile had the lowest numbers and age-standardized rates of cancer cases and deaths (Table 2; Figure 5). In contrast to the higher rankings in other quintiles, cancer was the fifth leading cause of death in the low SDI quintile in 2019, ninth for YLLs, and tenth for DALYs.

Alongside these differences, some patterns held across most SDI quintiles. In 2019, TBL cancer had the highest number of cancer deaths and DALYs in both sexes combined in all but the low SDI quintile, in which it was breast cancer (eFigure 11 in the Supplement). Excluding NMSC, the most incident cases occurred for CRC in the high SDI quintile, TBL in the high-middle and middle SDI quintiles, and breast cancer in the low-middle and low SDI quintiles (eFigure 12 in the Supplement).

While in 2019 the largest absolute numbers of cases and deaths occurred in the middle to high SDI quintiles, from 2010 to 2019, the largest increasing annualized rates of change in the absolute numbers of cases and deaths occurred in the low-middle SDI quintile and then the low SDI quintile (Figure 5; eTables 16 and 17 in the Supplement). Changes in age-standardized rates from 2010 to 2019 also varied by SDI quintile. For mortality, age-standardized rates increased from 2010 to 2019 in the low and low-middle SDI quintiles but decreased in the middle to high SDI quintiles. For incidence, age-

Table 2. Global Cancer Estimates in 2019 and Ranking Among 22 Level 2 Categories of Diseases and Injuries in the Global Burden of Disease Study Overall and by Quintile of Sociodemographic Index

Location[a]	DALYs		Deaths		YLLs		Incident cases		YLDs	
	No. millions (95% UI)	Cancer rank	No. millions (95% UI)	Cancer rank	No. millions (95% UI)	Cancer rank	No. millions (95% UI)	Cancer rank	No. millions (95% UI)	Cancer rank
Global	249.0 (233.6-263.2)	2	9.97 (9.31-10.5)	2	241.3 (226.5-255.3)	2	17.2 (15.9-18.5)	21	7.72 (5.68-9.96)	20
SDI										
Low	18.0 (15.9-20.2)	10	0.54 (0.48-0.60)	5	17.7 (15.7-19.8)	9	0.68 (0.60-0.76)	21	0.26 (0.18-0.34)	22
Low-middle	40.2 (36.8-43.7)	4	1.37 (1.26-1.49)	2	39.5 (36.1-43.0)	4	1.81 (1.67-1.96)	21	0.70 (0.52-0.92)	22
Middle	76.3 (69.7-83.2)	2	2.88 (2.62-3.15)	2	74.5 (68.0-81.4)	2	4.47 (4.05-4.89)	21	1.85 (1.36-2.44)	20
High-middle	63.5 (58.6-68.2)	2	2.65 (2.42-2.85)	2	61.4 (56.6-66.0)	2	4.69 (4.29-5.09)	21	2.11 (1.54-2.75)	16
High	50.9 (48.1-52.9)	1	2.53 (2.31-2.64)	2	48.1 (45.5-49.7)	1	5.56 (5.02-6.09)	19	2.79 (2.03-3.61)	12

Abbreviations: DALYs, disability-adjusted life years; SDI, Sociodemographic Index; UI, uncertainty interval; YLDs, years lived with disability; YLLs, years of life lost.

[a] Total numbers and rankings exclude nonmelanoma skin cancer. All estimates refer to estimates in 2019. Rank refers to the relative ranking of the total cancer estimate for a given measure (eg, DALYs) and SDI quintile (eg, high SDI) compared among the 22 level 2 categories of diseases and injuries in the Global Burden of Disease Study 2019. More details on SDI quintiles, including population, are in the eAppendix in the Supplement. A version of this table using age-standardized rates is provided in eTable 18 in the Supplement.

standardized rates increased during this period for the low to middle SDI quintiles but decreased in the high-middle and high SDI quintiles, with the largest decrease in the high SDI quintile. While there was substantial heterogeneity between countries and territories within the same SDI quintile, country-specific estimates showed similar overall trends between SDI and age-standardized incidence and mortality rates (eFigure 13 in the Supplement).

Discussion

The results of this systematic analysis demonstrate the substantial and growing global burden of cancer, with patterns of burden differing by SDI quintile. In 2019, cancer-related DALYs were second only to cardiovascular diseases in their contribution to global disease burden, and in the high SDI quintile, cancer overtook cardiovascular disease to become the leading cause of DALYs. Between 2010 and 2019, the number of new global cancer cases and deaths increased by 26.3% and 20.9%, respectively. However, the largest percentage increases in cancer incidence and mortality during the last decade occurred in the lower SDI quintiles, likely reflecting ongoing epidemiologic transitions, demographic shifts, and disparities in cancer prevention, care, and control. Together, these results provide comprehensive and comparable estimates that can potentially inform efforts for equitably reducing the evolving burden of cancer globally.

While the absolute burden of cancer grew from 2010 to 2019, global age-standardized incidence rates remained similar at −1.1% (95% UI, −5.8% to 3.5%) and mortality rates decreased by −5.9% (95% UI, −11.0% to −0.9%). These age-standardized mortality results suggest cautious optimism that some progress may have been made in early diagnosis and cancer treatment globally during the last decade. However, inequities in the distribution and growth of cancer burden around the world diminish this potential advancement and suggest that an acceleration of efforts to effectively address cancer burden are needed. Of particular concern, recent progress in reducing age-standardized incidence and mortality rates seems concentrated in higher SDI locations, while both rates are still trending upward in lower SDI locations. The increasing age-standardized incidence and mortality rates in lower SDI quintiles may reflect several factors, including shifting population age structures, increasing capacity for diagnosis and registration of cancer cases and deaths, and changes in cancer risk factors, such as metabolic, behavioral, environmental, and occupational exposures. For example, changing patterns of smoking prevalence by SDI quintile may be particularly relevant to cancer burden,[35] with a need for further smoking reduction and tobacco control initiatives in many countries.[36,37] These differences in cancer burden across the SDI spectrum suggest a need to tailor cancer control efforts to specific resource contexts and health system needs, incorporating local cultural and cancer context-specific knowledge.

Low and low-middle SDI locations had a higher rate of growth in the number of cases and deaths than high SDI locations during the last decade. Consistent with this trend, forecasts of cancer incidence[38] and mortality[1] suggest a growing burden in these locations, predicting that by 2040 more than two-thirds of the world's cancers will occur in low-income and middle-income countries.[38] Increasing cancer burden in already overburdened and underresourced settings is concerning given existing disparities in health care access and coverage.[2,3,39] As many in countries within the lower SDI quintiles have insufficient access to cancer prevention services, timely diagnosis, and comprehensive treatment, efforts to strengthen cancer control infrastructure, expand workforce capacity, and increase access to universal health coverage and sufficient financial security will be crucial.[3,40] The grouping of countries by SDI quintile is not

Figure 2. Cancer Group Rankings by Disability-Adjusted Life Years (DALYs) in 2019 and Percentage Change From 2010 to 2019

Rank, 2010	Rank, 2019	Cancer	Absolute DALYs in 2019, millions (95% UI)	Percentage change in absolute DALYs, 2010-2019 (95% UI)	Age-standardized DALY rate in 2019, per 100 000 (95% UI)	Percentage change in age-standardized DALY rate, 2010-2019 (95% UI)
1	1	Tracheal, bronchus, and lung cancer	45.9 (42.3 to 49.3)	18.1 (8.9 to 28.0)	551.6 (509.0 to 593.1)	-7.3 (-14.6 to 0.4)
2	2	Colon and rectum cancer	24.3 (22.6 to 25.7)	23.2 (16.3 to 30.2)	295.5 (275.2 to 313.0)	-2.7 (-8.1 to 2.8)
3	3	Stomach cancer	22.2 (20.3 to 24.1)	-0.5 (-9.3 to 9.2)	268.4 (245.5 to 290.6)	-20.8 (-27.7 to -13.3)
4	4	Breast cancer	20.6 (19.0 to 22.2)	21.3 (13.2 to 29.5)	247.6 (228.7 to 266.1)	-1.3 (-7.8 to 5.4)
5	5	Liver cancer	12.5 (11.4 to 13.7)	20.9 (9.4 to 33.0)	151.1 (137.5 to 164.8)	-2.4 (-11.6 to 7.1)
6	6	Esophageal cancer	11.7 (10.4 to 12.9)	6.1 (-5.7 to 22.2)	139.8 (124.4 to 155.0)	-16.5 (-25.6 to -3.6)
7	7	Leukemia	11.7 (10.5 to 12.7)	0.8 (-7.4 to 9.6)	150.5 (135.7 to 164.1)	-11.9 (-18.9 to -4.3)
8	8	Pancreatic cancer	11.5 (10.8 to 12.3)	32.9 (25.3 to 40.1)	139.6 (130.2 to 149.1)	4.1 (-1.8 to 9.7)
9	9	Cervical cancer	8.96 (7.75 to 9.98)	14.6 (5.0 to 25.0)	107.2 (90.5 to 119.4)	-4.8 (-12.7 to 3.7)
10	10	Brain and central nervous system cancer	8.66 (6.72 to 9.57)	11.6 (-1.3 to 20.8)	109.0 (84.6 to 120.9)	-4.0 (-15.0 to 4.1)
11	11	Prostate cancer	8.64 (7.55 to 10.6)	26.2 (20.4 to 32.8)	107.9 (94.0 to 131.7)	-3.8 (-8.2 to 1.2)
12	12	Non-Hodgkin lymphoma	6.99 (6.57 to 7.45)	18.2 (12.3 to 24.9)	86.5 (81.3 to 92.3)	-2.3 (-7.1 to 3.3)
13	13	Lip and oral cavity cancer	5.51 (5.00 to 6.03)	22.3 (11.9 to 33.6)	66.1 (60.1 to 72.3)	-1.0 (-9.4 to 8.1)
14	14	Ovarian cancer	5.36 (4.69 to 5.95)	27.5 (16.3 to 37.7)	64.3 (56.4 to 71.5)	2.6 (-6.4 to 10.7)
15	15	Bladder cancer	4.39 (4.09 to 4.70)	21.6 (15.0 to 28.9)	54.2 (50.4 to 58.0)	-5.8 (-10.8 to -0.2)
16	16	Kidney cancer	4.05 (3.80 to 4.32)	21.1 (14.8 to 27.8)	49.6 (46.5 to 52.9)	-2.9 (-8.0 to 2.6)
17	17	Gallbladder and biliary tract cancer	3.62 (3.10 to 3.97)	17.4 (9.4 to 26.6)	44.0 (37.6 to 48.2)	-8.2 (-14.4 to -1.0)
18	18	Larynx cancer	3.26 (3.03 to 3.51)	14.3 (6.6 to 22.4)	38.8 (36.1 to 41.8)	-9.3 (-15.3 to -2.9)
19	19	Other pharynx cancer	3.23 (2.90 to 3.57)	26.4 (14.1 to 39.8)	38.4 (34.5 to 42.4)	1.8 (-8.1 to 12.4)
20	20	Multiple myeloma	2.50 (2.19 to 2.72)	26.3 (18.2 to 32.8)	30.3 (26.6 to 32.9)	-1.3 (-7.7 to 3.8)
21	21	Nasopharynx cancer	2.34 (2.14 to 2.54)	12.7 (2.7 to 23.1)	28.0 (25.7 to 30.4)	-6.5 (-14.8 to 2.1)
22	22	Uterine cancer	2.33 (2.09 to 2.56)	11.6 (3.5 to 26.1)	28.0 (25.1 to 30.8)	-11.8 (-18.1 to -1.0)
23	23	Malignant skin melanoma	1.71 (1.30 to 2.00)	12.2 (6.1 to 18.7)	20.8 (15.8 to 24.3)	-8.5 (-13.2 to -2.9)
24	24	Thyroid cancer	1.23 (1.11 to 1.33)	17.8 (10.9 to 24.5)	15.0 (13.6 to 16.1)	-4.3 (-9.8 to 1.3)
25	25	Nonmelanoma skin cancer	1.18 (1.09 to 1.26)	24.3 (17.5 to 31.4)	14.7 (13.4 to 15.7)	-2.6 (-7.8 to 2.8)
26	26	Hodgkin lymphoma	1.15 (0.98 to 1.32)	2.3 (-3.6 to 8.5)	14.4 (12.3 to 16.7)	-9.6 (-14.8 to -3.8)
27	27	Mesothelioma	0.67 (0.61 to 0.72)	14.7 (9.8 to 19.7)	8.1 (7.4 to 8.7)	-8.6 (-12.5 to -4.8)
28	28	Testicular cancer	0.56 (0.51 to 0.63)	14.7 (6.3 to 23.7)	7.1 (6.5 to 8.0)	4.3 (-3.2 to 12.6)

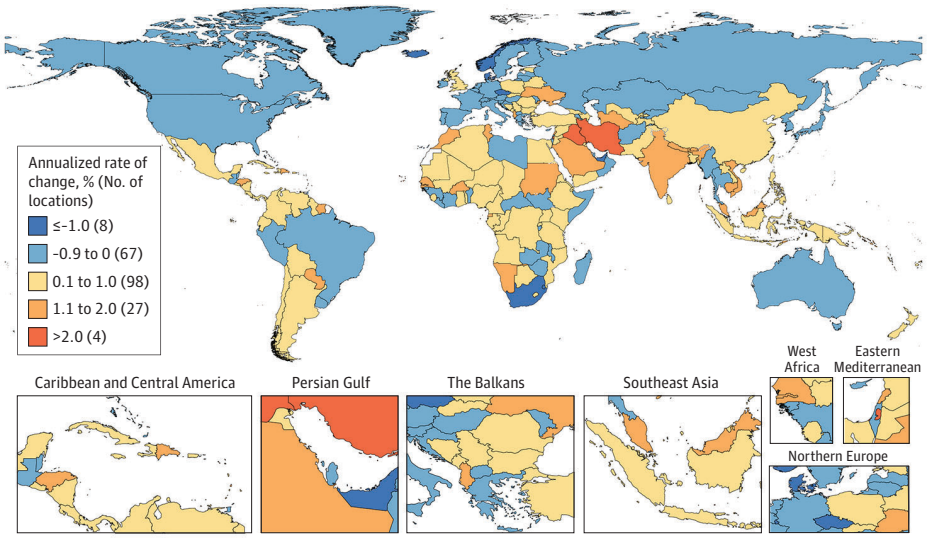
Rankings are by absolute DALYs and exclude the other malignant neoplasms cancer group. Cancers are ordered by rank in 2019, with lines connecting to their rank in 2010. Absolute DALYs and age-standardized DALY rates for 2010 can be found online at https://vizhub.healthdata.org/gbd-compare/. Colors refer to the directional change in cancer rank from 2010 to 2019: red signifies an increase in rank, blue signifies no change in rank, and green signifies a decrease in rank. UI indicates uncertainty interval.

meant to imply that all countries within an SDI quintile have equivalent capacity to prevent, diagnose, or treat cancers; each country has unique strengths and needs that should be considered. Further, the growing absolute number of cases and deaths in all SDI quintiles suggests that even as progress has been made in reducing age-standardized rates in some settings, globally there is an expanding need for health care infrastructure that is capable of supporting the provision of effective diagnoses and treatments for a growing number of patients with cancer.

While the traditional cancer metrics of incidence and mortality are crucial, DALY estimates provide perspective on the healthy years of life lost because of cancer morbidity and mortality globally. The GBD 2019 study found that on a global level, most cancer-related DALYs (96.9%; 95% UI, 96.0%-97.7%) in 2019 came from YLLs, suggesting that the total health loss from cancer was primarily associated with premature death. This finding is a valuable reminder of the lives that prematurely ended because of cancer globally and the importance of working toward improved global survival outcomes. While YLDs contribute less to global DALYs, the percentage of DALYs estimated to be caused by YLDs increased with increasing SDI quintiles, ranging from 1.4% (95% UI, 1.1%-1.8%) in the low SDI quintile to 5.7% (95% UI, 4.2%-7.1%) in the high SDI quintile. This greater comparative contribution of YLDs in higher SDI settings is consistent with likely improved survival,[41] given generally more available access to cancer screening,[42,43] diagnosis,[44,45] and treatment[46,47] as SDI increases. Consequently, the contribution of YLDs to health loss due to cancer would be expected to be increasingly relevant to global health planning as cancer survival improves globally, and the support needs of survivors of cancer should be considered as part of comprehensive cancer control planning efforts.[48,49]

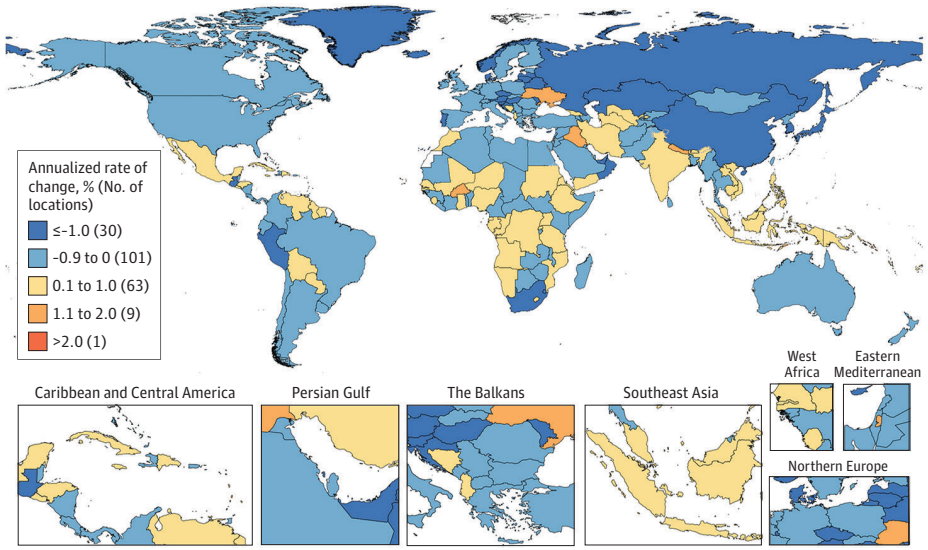
The contribution of cancers to total global DALYs estimated to be caused by disease and injury has increased during the past decade, rising from third place in 2010 to second place in 2019, remaining behind only cardiovascular diseases. However, in high SDI settings, cancer-related DALYs have surpassed cardiovascular disease–related DALYs to become the leading cause of total disease burden in 2019. Other studies have described cancer's emerging prominence as the leading cause of premature death in countries with high income[50] or a high Human Development Index,[4] some of which is attributed to relative decreases in cardiovascular disease deaths.[4,50,51] The GBD 2019 study builds on this evolving global

Figure 3. Annualized Rate of Change in Age-Standardized Total Cancer Incidence Rate From 2010 to 2019 in Both Sexes



Total cancer excludes nonmelanoma skin cancers. Annualized rate of change from 2010 to 2019 represents the average percentage change per year during this period, with negative values indicating decreasing incidence rates and positive values indicating increasing incidence rates. There were several geographic locations where estimates were not available (eg, Western Sahara and French Guiana), as they were not modeled locations in the Global Burden of Disease 2019 Study.

Figure 4. Annualized Rate of Change in Age-Standardized Total Cancer Mortality Rate From 2010 to 2019 in Both Sexes

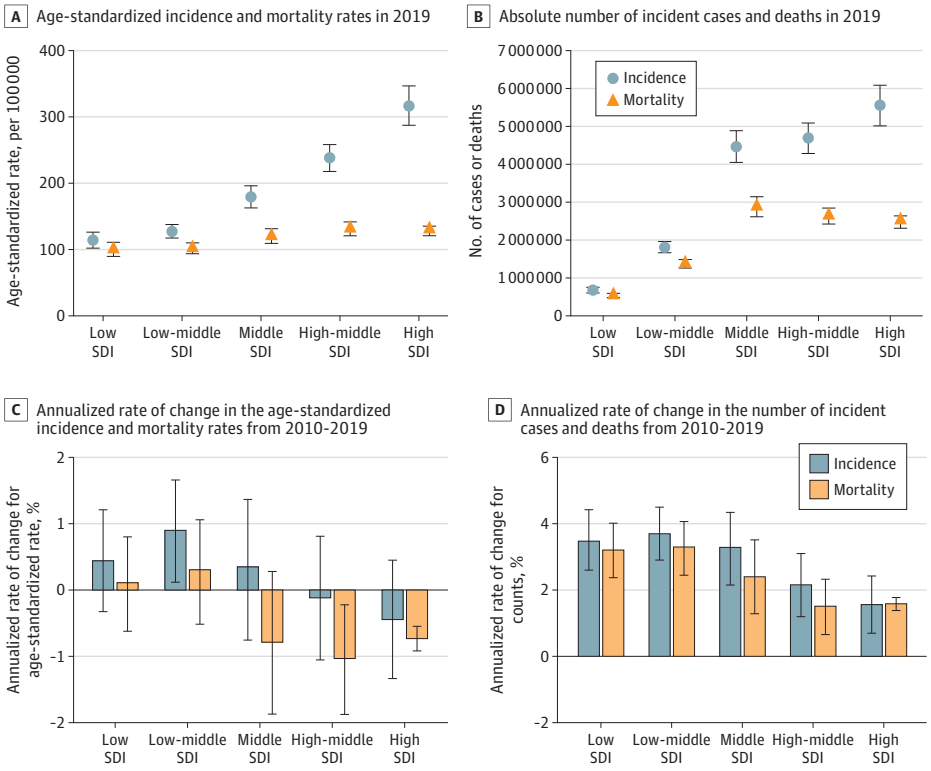


Total cancer excludes nonmelanoma skin cancers. Annualized rate of change from 2010 to 2019 represents the mean percentage change per year during this period, with negative values indicating decreasing mortality rates and positive values indicating increasing mortality rates. There were several geographic locations where estimates were not available (eg, Western Sahara and French Guiana) as they were not modeled locations in the Global Burden of Disease 2019 Study.

landscape of cancer burden by demonstrating the comparative importance of cancer in high SDI settings not just for mortality, but also when comparing the nonfatal burden of cancer and other diseases.

Together, these results suggest the need for increased cancer prevention and control efforts to reduce current burden,[52] as well as the need to accelerate progress in lower SDI locations to reduce the effect of growing burden.[1,2] One important step is bolstering national cancer control plans (NCCPs)[53-56] that identify, plan, and evaluate a framework of cost-effective and feasible interventions, such as the World Health Organization's best buys proposals for cancer prevention, diagnosis, and management.[38] The increasing global uptake of NCCPs has demonstrated the utility of this approach in addressing cancer burden in several settings.[57-59] However, creating and implementing effective NCCPs requires detailed knowledge about the local burden of cancer and associated risk factors, in addition to awareness of sociocultural circumstances and previous cancer control implementation efforts. Lack of information about local cancer epidemiology can be a substantial barrier in some data-sparse, and often resource-limited, locations.[60,61] Cancer burden estimates, such as those in the GBD 2019 study, can potentially be helpful as part of context-specific cancer resource planning and prioritization efforts.

Figure 5. Total Cancer Incidence and Mortality Age-Standardized Rates and Absolute Counts in 2019 and Annualized Rate of Change for Incidence and Mortality in Age-Standardized Rates and Absolute Counts From 2010 to 2019 by Sociodemographic Index (SDI) Quintile



Panels provide global estimates for total cancers, except nonmelanoma skin cancer, stratified by SDI quintile. Annualized rate of change from 2010 to 2019 represents the mean percentage change per year during this period. Black bars represent 95% uncertainty intervals.

Limitations

Several limitations provide opportunities for improvement in future GBD iterations. An ongoing challenge is a lack of high-quality data in many locations. This includes time lags in data availability, nonspecific cause of death data from vital registration systems, and ascertainment limitations of verbal autopsy reports. The GBD addresses these data limitations through data-seeking efforts, data processing corrections, and modeling approaches that incorporate geospatial and temporal smoothing. These approaches allow the estimation of comprehensive results with appropriate uncertainty bounds. However, in years or locations where data were not available, estimates relied on covariates and modeling parameters, which may overestimate or underestimate true cancer burden. As data can be less available or reliable in locations within the lower SDI quintiles,[19] estimates should be interpreted with some caution. These data limitations reinforce the need for enhancing cancer surveillance globally.[61,62]

Similarly, scarcity of age-specific and year-specific survival data requires using MIRs to estimate survival, which may not approximate location-specific survival trends well. Years lived with disability are currently estimated based on 10-year prevalence, which may underestimate the lifelong health loss and disability that some survivors of cancer experience, particularly for survivors of pediatric cancer.[63] While the lifelong disability from treatment-related surgical procedures is currently estimated for 5 cancers, other sources of long-term disability in survivors of cancer have not yet been captured in these analyses. Finally, this study only estimated global cancer burden through 2019, and as such did not incorporate any associations of the COVID-19 pandemic with global cancer morbidity and mortality. Assessing these associations will be critical for future work on cancer burden, as the ongoing pandemic is likely to delay progress in efforts to reduce health loss from cancer globally through delays and reductions in screening, diagnosis, and treatment.[8-12]

Conclusions

This systematic analysis of the GBD 2019 study provides comprehensive and comparable estimates of cancer burden worldwide, which were updated and improved from previous GBD cycles. These estimates varied substantially by SDI quintile, highlighting global inequities in cancer burden. While the high SDI quintile had the highest estimated number of incident cases in 2019, the middle SDI quintile had the highest estimated number of deaths and DALYs. During the last decade, cancer burden has grown the fastest in the low and low-middle SDI quintiles. Such estimates are vital for improving equity in global cancer outcomes and meeting key SDG targets for reducing cancer and other noncommunicable disease burden.

ARTICLE INFORMATION

Accepted for Publication: October 7, 2021.

Published Online: December 30, 2021. doi:10.1001/jamaoncol.2021.6987

The Global Burden of Disease Cancer Collaboration Authors: The following investigators take authorship responsibility for the study results: Jonathan M. Kocarnik, PhD; Kelly Compton, BS; Frances E. Dean, BA; Weijia Fu, MSc; Brian L. Gaw, MLIS; James D. Harvey, BS; Hannah Jacqueline Henrikson, BA; Dan Lu, MEd; Alyssa Pennini, MSc; Rixing Xu, BS; Emad Ababneh, MD; Mohsen Abbasi-Kangevari, MD; Hedayat Abbastabar, PhD; Sherief M. Abd-Elsalam, MD; Amir Abdoli, PhD; Aidin Abedi, MD; Hassan Abidi, PhD; Hassan Abolhassani, PhD; Isaac Akinkunmi Adedeji, PhD; Qorinah Estiningtyas Sakilah Adnani, PhD; Shailesh M. Advani, MD, PhD; Muhammad Sohail Afzal, PhD; Mohammad Aghaali, PhD; Bright Opoku Ahinkorah, MPH; Sajjad Ahmad, PhD; Tauseef Ahmad, MS; Ali Ahmadi, MS; Sepideh Ahmadi, PhD; Tarik Ahmed Rashid, PhD; Yusra Ahmed Salih, PhD; Gizachew Taddesse Akalu, MSc, PhD; Addis Aklilu, MSc; Tayyaba Akram, PhD; Chisom Joyqueenet Akunna, DMD; Hanadi Al Hamad, MD; Fares Alahdab, MSc; Ziyad Al-Aly, MD; Saqib Ali, PhD; Yousef Alimohamadi, PhD; Vahid Alipour, PhD; Syed Mohamed Aljunid, PhD; Motasem Alkhayyat, MD; Amir Almasi-Hashiani, PhD; Nihad A. Almasri, PhD; Sadeq Ali Ali Al-Maweri, PhD; Sami Almustanyir, MD; Nivaldo Alonso, MD; Nelson Alvis-Guzman, PhD; Hubert Amu, PhD; Etsay Woldu Anbesu, MPH; Robert Ancuceanu, PhD; Fereshteh Ansari, PhD; Alireza Ansari-Moghaddam, PhD; Maxwell Hubert Antwi, MPhil; Davood Anvari, PhD; Anayochukwu Edward Anyasodor, PhD; Muhammad Aqeel, PhD; Jalal Arabloo, PhD; Morteza Arab-Zozani, PhD; Olatunde Aremu, PhD; Hany Ariffin, MD; Timur Aripov, PhD; Muhammad Arshad, PhD; Al Artaman, MD, PhD, MHA; Judie Arulappan, DSc; Zatollah Asemi, PhD; Mohammad Asghari Jafarabadi, PhD; Tahira Ashraf, MS; Prince Atorkey, MPhil; Avinash Aujayeb, MBBS; Marcel Ausloos, PhD; Atalel Fentahun Awedew, MD; Beatriz Paulina Ayala Quintanilla, PhD; Temesgen Ayenew, MSc; Mohammed A. Azab, MD; Sina Azadnajafabad, MD, MPH; Amirhossein Azari Jafari, MD; Ghasem Azarian, PhD; Ahmed Y. Azzam, MBBCh; Ashish D. Badiye, PhD, MSc; Saeed Bahadory, PhD; Atif Amin Baig, PhD; Jennifer L. Baker, PhD; Senthilkumar Balakrishnan, PhD; Maciej Banach, PhD; Till Winfried Bärnighausen, MD; Francesco Barone-Adesi, PhD; Fabio Barra, MD; Amadou Barrow, MPH; Masoud Behzadifar, PhD; Uzma Iqbal Belgaumi, MD; Woldesellassie M. Mequanint Bezabhe, BPharm, MSc, PhD; Yihienew Mequanint Bezabih, MD; Devidas S. Bhagat, PhD; Akshaya Srikanth Bhagavathula, PharmD; Nikha Bhardwaj, MD; Pankaj Bhardwaj, MD; Sonu Bhaskar, MD, PhD; Krittika Bhattacharyya, MSc; Vijayalakshmi S. Bhojaraja, MD; Sadia Bibi, PhD; Ali Bijani, PhD; Antonio Biondi, PhD; Catherine Bisignano, MPH; Tone Bjørge, PhD; Archie Bleyer, MD; Oleg Blyuss, PhD; Obasanjo Afolabi Bolarinwa, MSc; Srinivasa Rao Bolla, PhD; Dejana Braithwaite, PhD; Amanpreet Brar, MD; Hermann Brenner, MD; Maria Teresa Bustamante-Teixeira, PhD; Nadeem Shafique Butt, PhD; Zahid A. Butt, PhD; Florentino Luciano Caetano dos Santos, PhD; Yin Cao, DSc; Giulia Carreras, PhD; Ferrán Catalá-López, PhD; Francieli Cembranel, DSc; Ester Cerin, PhD; Achille Cernigliaro, MSc; Raja Chandra Chakinala, MD; Soosanna Kumary Chattu, PhD; Vijay Kumar Chattu, MD; Pankaj Chaturvedi, MD; Odgerel Chimed-Ochir, MD, MPH, PhD; Daniel Youngwhan Cho, MD; Devasahayam J. Christopher, MD; Dinh-Toi Chu, PhD; Michael T. Chung, MD; Joao Conde, PhD; Sanda Cortés, DrPH; Paolo Angelo Cortesi, PhD; Vera Marisa Costa, PhD; Amanda Ramos Cunha, PhD; Omid Dadras, DrPH; Amare Belachew Dagnew, MSc; Saad M. A. Dahlawi, PhD; Xiaochen Dai, PhD; Lalit Dandona, MD, MPH; Rakhi Dandona, PhD; Aso Mohammad Darwesh, PhD; José das Neves, PhD; Fernando Pio De la Hoz, PhD; Asmamaw Bizuneh Demis, MSc; Edgar Denova-Gutiérrez, DSc; Deepak Dhamnetiya, MD; Mandira Lamichhane Dhimal, PhD; Meghnath Dhimal, PhD; Mostafa Dianatinasab, MSc; Daniel Diaz, PhD; Shirin Djalalinia, PhD; Huyen Phuc Do, PhD; Saeid Doaei, PhD; Fariba Dorostkar, PhD; Francisco Winter dos Santos Figueiredo, PhD; Tim Robert Driscoll, PhD; Hedyeh Ebrahimi, MD; Sahar Eftekharzadeh, MD; Maha El Tantawi, PhD; Hassan El-Abid, PhD; Iffat Elbarazi, DrPH; Hala Rashad Elhabashy, MD; Muhammed Elhadi, MD; Shaimaa I. El-Jaafary, MD; Babak Eshrati, PhD; Sharareh Eskandarieh, PhD; Firooz Esmaeilzadeh, PhD; Arash Etemadi, PhD; Sayeh Ezzikouri, PhD; Mohammed Faisaluddin, MD; Emerito Jose A. Faraon, MD; Jawad Fares, MD, MSc; Farshad Farzadfar, DSc; Abdullah Hamid Feroze, MD; Simone Ferrero, PhD; Lorenzo Ferro Desideri, MD; Irina Filip, MD; Florian Fischer, MPH, PhD; James L. Fisher, PhD; Masoud Foroutan, PhD; Takeshi Fukumoto, PhD; Peter Andras Gaal, PhD; Mohamed M. Gad, MD; Muktar A. Gadanya, MD; Silvano Gallus, DSc; Mariana Gaspar Fonseca, PhD; Abera Getachew Obsa, MA; Mansour Ghafourifard, PhD; Ahmad Ghashghaee, BSc; Nermin Ghith, PhD; Maryam Gholamalizadeh, PhD; Syed Amir Gilani, MBBS, PhD; Themba G. Ginindza, PhD; Abraham Tamirat T. Gizaw; James C. Glasbey, MBBCh, BSc, MRCS; Mahaveer Golechha, PhD; Pouya Goleij, MSc; Ricardo Santiago Gomez, PhD; Sameer Vali Gopalani, MPH; Giuseppe Gorini, MD; Houman Goudarzi, PhD; Giuseppe Grosso, PhD; Mohammed Ibrahim Mohialdeen Gubari, PhD; Maximiliano Ribeiro Guerra, PhD; Avirup Guha, MD; D. Sanjeeva Gunasekera, MD; Bhawna Gupta, PhD; Veer Bala Gupta, PhD; Vivek Kumar Gupta, PhD; Reyna Alma Gutiérrez, PhD; Nima Hafezi-Nejad, MD; Mohammad Rifat Haider, PhD, MPS, MHE, MBBS; Arvin Haj-Mirzaian, MD; Rabih Halwani, PhD; Randah R. Hamadeh, DPhil; Sajid Hameed, MPH; Samer Hamidi, DrPH; Asif Hanif, PhD; Shafiul Haque, PhD; Netanja I. Harlianto, BSc; Josep Maria Haro, MD; Ahmed I. Hasaballah, PhD; Soheil Hassanipour, PhD; Roderick J. Hay, MD; Simon I. Hay, DSc; Khezar Hayat, MS; Golnaz Heidari, MD; Mohammad Heidari, PhD; Brenda Yuliana Herrera-Serna, PhD; Claudiu Herteliu, PhD; Kamal Hezam, PhD; Ramesh Holla, MD; Md Mahbub Hossain, MPH; Mohammad Bellal Hossain Hossain, PhD; Mohammad-Salar Hosseini, MD; Mostafa Hosseini, PhD; Mehdi Hosseinzadeh, PhD; Mihaela Hostiuc, PhD; Sorin Hostiuc, PhD; Mowafa Househ, PhD; Mohamed Hsairi, MPH; Junjie Huang, MD; Fernando N. Hugo, PhD; Rabia Hussain, PhD; Nawfal R. Hussein, PhD; Bing-Fang Hwang, PhD; Ivo Iavicoli, PhD; Segun Emmanuel Ibitoye, MPH; Fidelia Ida, PhD; Kevin S. Ikuta, MD; Olayinka Stephen Ilesanmi, PhD; Irena M. Ilic, PhD; Milena D. Ilic, PhD; Lalu Muhammad Irham, PhD; Jessica Y. Islam, PhD; Rakibul M. Islam, PhD; Sheikh Mohammed Shariful Islam, PhD; Nahlah Elkudssiah Ismail, PhD; Gaetano Isola, PhD; Masao Iwagami, MD; Louis Jacob, MD; Vardhmaan Jain, MD; Mihajlo B. Jakovljevic, MD, PhD; Tahereh Javaheri, PhD; Shubha Jayaram, MD; Seyed Behzad Jazayeri, MD; Ravi Prakash Jha, MSc; Jost B. Jonas, MD; Tamas Joo, MSc; Nitin Joseph, MBBS, MD; Farahnaz Joukar, PhD; Mikk Jürisson, PhD; Ali Kabir, MD; Danial Kahrizi, PhD; Leila R. Kalankesh, PhD; Rohollah Kalhor, PhD; Feroze Kaliyadan, MD; Yogeshwar Kalkonde, MD; Ashwin Kamath, MD; Nawzad Kameran Al-Salihi, PhD; Himal Kandel, PhD; Neeti Kapoor, PhD, MSc, BSc; André Karch, MD; Ayele Semachew Kasa, MSc; Srinivasa Vittal Katikireddi, PhD; Joonas H. Kauppila, MD, PhD; Taras Kavetskyy, PhD; Sewnet Adem Kebede, MPH; Pedram Keshavarz, MD; Mohammad Keykhaei, MD; Yousef Saleh Khader, Bsc, Msc, PhD; Rovshan Khalilov, PhD; Gulfaraz Khan, PhD; Maseer Khan, MD; Md Nuruzzaman Khan, PhD; Moien A. B. Khan, MSc; Young-Ho Khang, MD, PhD; Amir M. Khater, MD; Maryam Khayamzadeh, MD; Gyu Ri Kim, PhD; Yun Jin Kim, PhD; Adnan Kisa; Sezer Kisa, PhD; Katarzyna Kissimova-Skarbek, PhD; Jacek A. Kopec, PhD; Rajasekaran Koteeswaran, MD; Parvaiz A. Koul, MD; Sindhura Lakshmi Koulmane Laxminarayana, MD; Ai Koyanagi, MD; Burcu Kucuk Bicer, PhD; Nuworza Kugbey, PhD; G. Anil Kumar, PhD; Narinder Kumar, MS; Nithin Kumar, MD; Om P. Kurmi, PhD; Tezer Kutluk, MD; Carlo La Vecchia, MD; Faris Hasan Lami, PhD; Iván Landires, MD; Paolo Lauriola, MD; Sang-woong Lee, PhD; Shaun Wen Huey Lee, PhD; Wei-Chen Lee, PhD; Yo Han Lee, PhD; James Leigh, MD; Elvynna Leong, PhD; Jiarui Li, MD; Ming-Chieh Li, PhD; Xuefeng Liu, PhD; Joana A. Loureiro, PhD; Raimundas Lunevicius, MD, PhD, DSc; Muhammed Magdy Abd El Razek, MSc; Azeem Majeed, MD; Alaa Makki, PhD; Shilpa Male, DNB; Ahmad Azam Malik, PhD; Mohammad Ali Mansournia, MD, MPH, PhD; Santi Martini, PhD; Seyedeh Zahra Masoumi, PhD; Prashant Mathur, PhD; Martin McKee, DSc; Ravi Mehrotra, DPhil; Walter Mendoza, MD; Ritesh G. Menezes, MD; Endalkachew Worku Mengesha, MPH; Mohamed Kamal Mesregah, MSc; Tomislav Mestrovic, PhD; Junmei Miao Jonasson, PhD; Bartosz Miazgowski, MD; Tomasz Miazgowski, MD; Irmina Maria Michalek, MD, PhD; Ted R. Miller, MS, MCP, PhD; Hamed Mirzaei, PhD; Hamid Reza Mirzaei, PhD; Sanjeev Misra, MCh; Prasanna Mithra, MD; Masoud Moghadaszadeh, PhD; Karzan Abdulmuhsin Mohammad, PhD; Yousef Mohammad, MD; Mokhtar Mohammadi, PhD; Seyyede Momeneh Mohammadi, PhD; Abdollah Mohammadian-Hafshejani, PhD; Shafiu Mohammed, PhD; Nagabhishek Moka, MD; Ali H. Mokdad, PhD; Mariam Molokhia, PhD; Lorenzo Monasta, DSc; Mohammad Ali Moni, PhD; Mohammad Amin Moosavi, PhD; Yousef Moradi, PhD; Paula Moraga, PhD; Joana Morgado-da-Costa, MSc; Shane Douglas Morrison, MD; Abbas Mosapour, PhD; Sumaira Mubarik, MS; Lillian Mwanri, PhD; Ahamarshan Jayaraman Nagarajan, MTech; Shankar Prasad Nagaraju, DM; Chie Nagata, PhD; Mukhammad David Naimzada, MD; Vinay Nangia, MD; Atta Abbas Naqvi, PhD; Sreenivas Narasimha Swamy, MD; Rawlance Ndejjo, MSc;

Sabina O. Nduaguba, PhD; Ionut Negoi, PhD; Serban Mircea Negru, MD; Sandhya Neupane Kandel, BSN; Cuong Tat Nguyen, MPH; Huong Lan Thi Nguyen, MPH; Robina Khan Niazi, PhD; Chukwudi A. Nnaji, MBBS, MPH; Nurulamin M. Noor, MPhil; Virginia Nuñez-Samudio, PhD; Chimezie Igwegbe Nzoputam, MPH; Bogdan Oancea, PhD; Chimedsuren Ochir, PhD; Oluwakemi Ololade Odukoya, MSc; Felix Akpojene Ogbo, PhD; Andrew T. Olagunju, MD; Babayemi Oluwaseun Olakunde, PhD; Emad Omar, PhD; Ahmed Omar Bali, PhD; Abidemi E. Emmanuel Omonisi, MBBS; Sokking Ong, MBBS; Obinna E. Onwujekwe, PhD; Hans Orru, PhD; Doris V. Ortega-Altamirano, DrPH; Nikita Otstavnov, BA; Stanislav S. Otstavnov, PhD; Mayowa O. Owolabi, DrM; Mahesh P A, DNB; Jagadish Rao Padubidri, MD, DNB; Keyvan Pakshir, PhD; Adrian Pana, MD, MPH; Demosthenes Panagiotakos, PhD; Songhomitra Panda-Jonas, MD; Shahina Pardhan, PhD; Eun-Cheol Park, PhD; Eun-Kee Park, PhD; Fatemeh Pashazadeh Kan, BSN; Harsh K. Patel, MD; Jenil R. Patel, PhD; Siddhartha Pati, PhD; Sanjay M. Pattanshetty, MD; Uttam Paudel, PhD; David M. Pereira, PhD; Renato B. Pereira, PhD; Arokiasamy Perianayagam, PhD; Julian David Pillay, PhD; Saeed Pirouzpanah, PhD; Farhad Pishgar, MD; Indrashis Podder, MD; Maarten J. Postma, PhD; Hadi Pourjafar, PhD; Akila Prashant, PhD; Liliana Preotescu, PhD; Mohammad Rabiee, PhD; Navid Rabiee, PhD; Amir Radfar, MD; Raghu Anekal Radhakrishnan, PhD; Venkatraman Radhakrishnan, MD; Ata Rafiee, MSc; Fakher Rahim, PhD; Shadi Rahimzadeh, MSc; Mosiur Rahman, DrPH; Muhammad Aziz Rahman, PhD; Amir Masoud Rahmani, PhD; Nazanin Rajai, MD; Aashish Rajesh, MD; Ivo Rakovac, PhD; Pradhum Ram, MD; Kiana Ramezanzadeh, PharmD; Kamal Ranabhat, MPH; Priyanga Ranasinghe, PhD; Chythra R. Rao, MD; Sowmya J. Rao, MDS; Reza Rawassizadeh, PhD; Mohammad Sadegh Razeghinia, MSc; Andre M. N. Renzaho, PhD; Negar Rezaei, PhD; Nima Rezaei, PhD; Aziz Rezapour, PhD; Thomas J. Roberts, MD, MBA; Jefferson Antonio Buendia Rodriguez, PhD; Peter Rohloff, MD; Michele Romoli, MD; Luca Ronfani, PhD; Gholamreza Roshandel, PhD; Godfrey M. Rwegerera, MD; Manjula S, MDS; Siamak Sabour, PhD; Basema Saddik, PhD; Umar Saeed, PhD; Amirhossein Sahebkar, PhD; Harihar Sahoo, PhD; Sana Salehi, MD; Marwa Rashad Salem, MD; Hamideh Salimzadeh, PhD; Mehrnoosh Samaei, MD; Abdallah M. Samy, PhD; Juan Sanabria, MD; Senthilkumar Sankararaman, MD; Milena M. Santric-Milicevic, PhD; Yaeesh Sardiwalla, MD; Arash Sarveazad, PhD; Brijesh Sathian, PhD; Monika Sawhney, PhD; Mete Saylan, MD; Ione Jayce Ceola Schneider, PhD; Mario Sekerija, PhD; Allen Seylani, BS; Omid Shafaat, MD; Zahra Shaghaghi, PhD; Masood Ali Shaikh, MD; Erfan Shamsoddin, DDS; Mohammed Shannawaz, PhD; Rajesh Sharma, PhD; Aziz Sheikh, MD; Sara Sheikhbahaei, MD; Adithi Shetty, MS; Jeevan K. Shetty, MD; Pavanchand H. Shetty, MD; Kenji Shibuya, MD; Reza Shirkoohi, PhD; K. M. Shivakumar, PhD; Velizar Shivarov, PhD; Soraya Siabani, PhD; Sudeep K. Siddappa Malleshappa, MD; Diego Augusto Santos Silva, PhD; Jasvinder A. Singh, MD; Yitagesu Sintayehu, MSc; Valentin Yurievich Skryabin, PhD, MD; Anna Aleksandrovna Skryabina, MD; Matthew J. Soeberg, PhD; Ahmad Sofi-Mahmudi, DDS; Houman Sotoudeh, MD; Paschalis Steiropoulos, MD; Kurt Straif, PhD; Ranjeeta Subedi, MPH; Mu'awiyyah Babale Sufiyan, MSB, MD; Iyad Sultan, MD; Saima Sultana, MPH; Daniel Sur, PhD; Viktória Szerencsés, MA; Miklós Szócska, PhD; Rafael Tabarés-Seisdedos, PhD; Takahiro Tabuchi, MD; Hooman Tadbiri, MD, Msc, MPH; Amir Taherkhani, PhD; Ken Takahashi, PhD; Iman M. Talaat, MD, PhD; Ker-Kan Tan, PhD; Vivian Y. Tat, BS; Bemnet Amare A. Tedla, PhD; Yonas Getaye Tefera, MSc; Arash Tehrani-Banihashemi, PhD; Mohamad-Hani Temsah, MD; Fisaha Haile Tesfay, PhD; Gizachew Assefa Tessema, PhD; Rekha Thapar, MD; Aravind Thavamani, MD; Viveksandeep Thoguluva Chandrasekar, MD; Nihal Thomas, PhD; Hamid Reza Tohidinik, PhD; Mathilde Touvier, PhD; Marcos Roberto Tovani-Palone, PhD; Eugenio Traini, MSc; Bach Xuan Tran, PhD; Khanh Bao Tran, MD; Mai Thi Ngoc Tran, PhD; Jaya Prasad Tripathy, MD; Biruk Shalmeno Tusa, MPH; Irfan Ullah, PhD; Saif Ullah, PhD; Krishna Kishore Umapathi, MD; Bhaskaran Unnikrishnan, MD; Era Upadhyay, PhD; Marco Vacante, PhD; Maryam Vaezi, MD; Sahel Valadan Tahbaz, PhD; Diana Zuleika Velazquez, MSc; Massimiliano Veroux, MD, PhD; Francesco S. Violante, MD; Vasily Vlassov, MD; Bay Vo, PhD; Victor Volovici, MD, PhD; Giang Thu Vu, BA; Yasir Waheed, PhD; Richard G. Wamai, PhD; Paul Ward, PhD; Yi Feng Wen, PhD; Ronny Westerman, DSc; Andrea Sylvia Winkler, PhD; Lalit Yadav, PhD; Seyed Hossein Yahyazadeh Jabbari, MD; Lin Yang, PhD; Sanni Yaya, PhD; Taklo Simeneh Yazie Yazie, MSc; Yigizie Yeshaw, MPH; Naohiro Yonemoto, PhD; Mustafa Z. Younis, PhD; Zabihollah Yousefi, PhD; Chuanhua Yu, PhD; Deniz Yuce, MD; Ismaeel Yunusa, PharmD, PhD; Vesna Zadnik, PhD; Fariba Zare, MSc; Mikhail Sergeevich Zastrozhin, PhD; Anasthasia Zastrozhina, PhD; Jianrong Zhang, MD, MPH; Chenwen Zhong, MD; Linghui Zhou, MD; Cong Zhu, MPH; Arash Ziapour, PhD; Ivan R. Zimmermann, PhD; Christina Fitzmaurice, MD; Christopher J. L. Murray, DPhil; Lisa M. Force, MD, MPH.

Affiliations of The Global Burden of Disease Cancer Collaboration Authors: Institute for Health Metrics and Evaluation, University of Washington, Seattle (Kocarnik, Compton, Dean, Fu, Gaw, Harvey, Lu, Pennini, Xu, Bisignano, Dai, L. Dandona, R. Dandona, S. I. Hay, Ikuta, Mokdad, Fitzmaurice, Murray, Force); Department of Global Health, Boston University, Boston, Massachusetts (Henrikson); Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts (Henrikson); Pathology and Laboratory Medicine Institute, Cleveland Clinic, Cleveland, Ohio (Ababneh); Social Determinants of Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Abbasi-Kangevari); Advanced Diagnostic and Interventional Radiology Research Center, Tehran University of Medical Sciences, Tehran, Iran (Abbastabar); Tropical Medicine Department, Tanta University, Tanta, Egypt (Abd-Elsalam); Zoonoses Research Center, Jahrom University of Medical Sciences, Jahrom, Iran (Abdoli); Department of Orthopaedic Surgery, University of Southern California, Los Angeles (Abedi); Laboratory Technology Sciences Department, Yasouj University, Yasuj, Iran (Abidi); Department of Laboratory Medicine, Karolinska University Hospital, Huddinge, Sweden (Abolhassani); Research Center for Immunodeficiencies, Tehran University of Medical Sciences, Tehran, Iran (Abolhassani, Nima Rezaei); Department of Sociology, Olabisi Onabanjo University, Ago-Iwoye, Nigeria (Adedeji); Department of Midwifery, Karya Husada Institute of Health Sciences, Kediri, Indonesia (Adnani); Department of Midwifery, Auckland University of Technology, Auckland, New Zealand (Adnani); Terasaki Institute for Biomedical Innovation, Los Angeles, California (Advani); School of Medicine, Georgetown University, Washington, DC (Advani); Department of Life Sciences, University of Management and Technology, Lahore, Pakistan (Afzal); Department of Epidemiology and Biostatistics, Qom University of Medical Sciences, Qom, Iran (Aghaali); The Australian Centre for Public and Population Health Research, University of Technology Sydney, Sydney, New South Wales, Australia (Ahinkorah); Foundation University Medical College, Foundation University Islamabad, Islamabad, Pakistan (S. Ahmad, Waheed); Department of Epidemiology and Health Statistics, Southeast University, Nanjing, China (T. Ahmad); Department of Epidemiology and Biostatistics, Shahrekord University of Medical Sciences, Shahrekord, Iran (A. Ahmadi, Mohammadian-Hafshejani); Department of Epidemiology, Shahid Beheshti University of Medical Sciences, Tehran, Iran (A. Ahmadi, Sabour); School of Advanced Technologies in Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran (S. Ahmadi); Department of Computer Science and Engineering, University of Kurdistan Hewler, Erbil, Iraq (Ahmed Rashid); Database Technology Department, Sulaimani Polytechnic University, Sulaymaniyah, Iraq (Ahmed Salih); College of Informatics, Sulaimani Polytechnic University, Sulaymaniyah, Iraq (Ahmed Salih); Microbiology, Immunology and Parasitology Department, St Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia (Akalu); Microbial, Cellular and Molecular Biology, Addis Ababa University, Addis Ababa, Ethiopia (Akalu); Department of Medical Laboratory Sciences, Arba Minch University, Arba Minch, Ethiopia (Aklilu); School of Mathematical Sciences, University of Science Malaysia, Penang, Malaysia (Akram); Department of Public Health, Intercountry Centre for Oral Health for Africa, Jos, Nigeria (Akunna); Department of Public Health, Federal Ministry of Health, Garki, Nigeria (Akunna); Geriatric and Long-Term Care Department, Hamad Medical Corporation, Doha, Qatar (Al Hamad, Sathian); Rumailah Hospital, Hamad Medical Corporation, Doha, Qatar (Al Hamad); Mayo Evidence-Based Practice Center, Mayo Clinic Foundation for Medical Education and Research, Rochester, Minnesota (Alahdab); John T. Milliken Department of Internal Medicine, Washington University in St Louis, St Louis, Missouri (Al-Aly); Clinical Epidemiology Center, Department of Veterans Affairs, St Louis, Missouri (Al-Aly); Department of Information Systems, Sultan Qaboos University, Muscat, Oman (Ali); Pars Hospital, Iran University of Medical Sciences, Tehran, Iran (Alimohamadi); Department of Epidemiology and Biostatistics, Tehran University of Medical Sciences, Tehran, Iran (Alimohamadi, Mostafa Hosseini, Mansournia); Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran (Alipour, Arabloo, Ghashghaee, Rezapour); Department of Health Economics, Iran University of Medical Sciences, Tehran, Iran (Alipour); Department of Health Policy and Management, Kuwait University, Safat, Kuwait (Aljunid); International Centre for Casemix and Clinical Coding, National University of Malaysia, Bandar Tun Razak, Malaysia (Aljunid); Department of Internal Medicine, Cleveland Clinic, Cleveland, Ohio

(Alkhayyat, Jain); Department of Epidemiology, Arak University of Medical Sciences, Arak, Iran (Almasi-Hashiani); Physiotherapy Department, University of Jordan, Amman, Jordan (Almasri); College of Dental Medicine, Qatar University, Doha, Qatar (Al-Maweri); Faculty of Dentistry, Sana'a University, Sana'a, Yemen (Al-Maweri); College of Medicine, Alfaisal University, Riyadh, Saudi Arabia (Almustanyir); Ministry of Health, Riyadh, Saudi Arabia (Almustanyir); Department of Surgery, University of São Paulo, São Paulo, Brazil (Alonso); Research Group in Hospital Management and Health Policies, Universidad de la Costa, Barranquilla, Colombia (Alvis-Guzman); Research Group in Health Economics, University of Cartagena, Cartagena, Colombia (Alvis-Guzman); Department of Population and Behavioural Sciences, University of Health and Allied Sciences, Ho, Ghana (Amu); Department of Public Health, Samara University, Samara, Ethiopia (Anbesu); Pharmacy Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (Ancuceanu); Research Center for Evidence Based Medicine, Tabriz University of Medical Sciences, Tabriz, Iran (Ansari); Razi Vaccine and Serum Research Institute, Agricultural Research, Education, and Extension Organization, Tehran, Iran (Ansari); Department of Epidemiology and Biostatistics, Zahedan University of Medical Sciences, Zahedan, Iran (Ansari-Moghaddam); Clinical Laboratory Department, Ghana Health Service, Kumasi, Ghana (Antwi); Department of Molecular Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana (Antwi); Department of Parasitology, Mazandaran University of Medical Sciences, Sari, Iran (Anvari); Department of Parasitology, Iranshahr University of Medical Sciences, Iranshahr, Iran (Anvari); School of Community Health, Charles Sturt University, Orange, New South Wales, Australia (Anyasodor); Department of Psychology, Foundation University Islamabad, Rawalpandi, Pakistan (Aqeel); Social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran (Arab-Zozani); Department of Public Health, Birmingham City University, Birmingham, England (Aremu); Department of Paediatrics, University of Malaya, Kuala Lumpur, Malaysia (Ariffin); University of Malaya Medical Centre, University of Malaya, Kuala Lumpur, Malaysia (Ariffin); Public Health and Healthcare Management, Tashkent Institute of Postgraduate Medical Education, Tashkent, Uzbekistan (Aripov); Boston Children's Hospital, Boston, Massachusetts (Aripov); Allied Health Sciences, Khyber Medical University, Timergara, Lower Dir, Pakistan (Arshad); Zayed University, Abu Dhabi, United Arab Emirates (Artaman); Department of Maternal and Child Health, Sultan Qaboos University, Muscat, Oman (Arulappan); Research Center for Biochemistry and Nutrition in Metabolic Diseases, Kashan University of Medical Sciences, Kashan, Iran (Asemi, H. Mirzaei); Department of Biostatistics and Epidemiology, Tabriz University of Medical Sciences, Tabriz, Iran (Asghari Jafarabadi); Department of Biostatistics and Epidemiology, Zanjan University of Medical Sciences, Zanjan, Iran (Asghari Jafarabadi); Institute of Radiological Sciences and Medical Imaging Technology, University of Lahore, Lahore, Pakistan (Ashraf); School of Medicine and Public Health, University of Newcastle, Newcastle, New South Wales, Australia (Atorkey); Hunter New England Population Health, Wallsend, New South Wales, Australia (Atorkey); Northumbria HealthCare National Health Service (NHS) Foundation Trust, NHS England, Newcastle upon Tyne, England (Aujayeb); School of Business, University of Leicester, Leicester, England (Ausloos); Department of Statistics and Econometrics, Bucharest University of Economic Studies, Bucharest, Romania (Ausloos, Herteliu, Pana); Department of Surgery, Addis Ababa University, Addis Ababa, Ethiopia (Awedew); The Judith Lumley Centre, La Trobe University, Melbourne, Victoria, Australia (Ayala Quintanilla); San Martin de Porres University, Lima, Peru (Ayala Quintanilla); Department of Nursing, Debre Markos University, Debre Markos, Ethiopia (Ayenew); Department of Neurosurgery, Cairo University, Cairo, Egypt (Azab); Noncommunicable Diseases Research Center, Tehran, Iran (Azadnajafabad); School of Medicine, Shahroud University of Medical Sciences, Shahroud, Iran (Azari Jafari); Department of Environmental Health Engineering, Hamadan University of Medical Sciences, Hamadan, Iran (Azarian); Faculty of Medicine, October 6 University, 6th of October City, Egypt (Azzam); Department of Forensic Science, Government Institute of Forensic Science, Nagpur, India (Badiye, Kapoor); Department of Parasitology, Tarbiat Modares University, Tehran, Iran (Bahadory); Department of Parasitology, Alborz University of Medical Sciences, Karaj, Iran (Bahadory); Unit of Biochemistry, Universiti Sultan Zainal Abidin, Kuala Terengganu, Malaysia (Baig); Center for Clinical Research and Prevention, Bispebjerg University Hospital, Frederiksberg, Denmark (Baker); Department of Medical Microbiology, Haramaya University, Harar, Ethiopia (Balakrishnan); Department of Hypertension, Medical University of Lodz, Lodz, Poland (Banach); Polish Mothers' Memorial Hospital Research Institute, Lodz, Poland (Banach); Heidelberg Institute of Global Health, Heidelberg University, Heidelberg, Germany (Bärnighausen); T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts (Bärnighausen); Department of Translational Medicine, University of Eastern Piedmont, Novara, Italy (Barone-Adesi); Academic Unit of Obstetrics and Gynecology, University of Genoa, Genoa, Italy (Barra); Department of Public and Environmental Health, University of the Gambia, Brikama, The Gambia (Barrow); Epidemiology and Disease Control Unit, Ministry of Health, Kotu, The Gambia (Barrow); Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran (Behzadifar); Department of Oral Pathology and Microbiology, Krishna Institute of Medical Sciences, Karad, India (Belgaumi); University of Tasmania, Tasmania, Victoria, Australia (Bezabhe); Bahir Dar University, Bahir Dar, Ethiopia (Bezabhe); Department of Internal Medicine, Bahir Dar University, Bahir Dar, Ethiopia (Bezabih); One Health, University of Nantes, Nantes, France (Bezabih); Department of Forensic Chemistry, Government Institute of Forensic Science, Aurangabad, India (Bhagat); Department of Social and Clinical Pharmacy, Charles University, Hradec Kralova, Czech Republic (Bhagavathula); Institute of Public Health, United Arab Emirates University, Al Ain, United Arab Emirates (Bhagavathula, Elbarazi); Department of Anatomy, Government Medical College Pali, Pali, India (N. Bhardwaj); Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur, India (P. Bhardwaj); School of Public Health, All India Institute of Medical Sciences, Jodhpur, India (P. Bhardwaj); Neurovascular Imaging Laboratory, New South Wales Brain Clot Bank, Sydney, New South Wales, Australia (Bhaskar); Department of Neurology and Neurophysiology, South West Sydney Local Heath District and Liverpool Hospital, Sydney, New South Wales, Australia (Bhaskar); Department of Statistical and Computational Genomics, National Institute of Biomedical Genomics, Kalyani, India (Bhattacharyya); Department of Statistics, University of Calcutta, Kolkata, India (Bhattacharyya); Department of Anatomy, Manipal University College Melaka, Melaka, Malaysia (Bhojaraja); Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad, Faisalabad, Pakistan (Bibi, S. Ullah); Social Determinants of Health Research Center, Babol University of Medical Sciences, Babol, Iran (Bijani); Department of General Surgery and Medical-Surgical Specialties, University of Catania, Catania, Italy (Biondi, Vacante); Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway (Bjørge); Cancer Registry of Norway, Oslo, Norway (Bjørge); Department of Radiation Medicine, Oregon Health and Science University, Portland (Bleyer); McGovern Medical School, University of Texas, Houston (Bleyer); School of Physics, Engineering and Computer Science, University of Hertfordshire, Hatfield, England (Blyuss); Institute for Women's Health, University College London, London, England (Blyuss); Department of Public Health Medicine, University of KwaZulu-Natal, Durban, South Africa (Bolarinwa); Department of Biomedical Sciences, Nazarbayev University, Nur-Sultan City, Kazakhstan (Bolla); Department of Epidemiology, University of Florida, Gainesville (Braithwaite); Cancer Population Sciences Program, University of Florida Health Cancer Center, Gainesville (Braithwaite); Department of Surgery, University of Toronto, Toronto, Ontario, Canada (Brar); Division of Clinical Epidemiology and Aging Research, German Cancer Research Center, Heidelberg, Germany (Brenner); Department of Public Health, Federal University of Juiz de Fora, Juiz de Fora, Brazil (Bustamante-Teixeira, Guerra); Department of Family and Community Medicine, King Abdulaziz University, Jeddah, Saudi Arabia (N. S. Butt); School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada (Z. A. Butt); Al Shifa School of Public Health, Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan (Z. A. Butt); Institute of Microengineering, Federal Polytechnic School of Lausanne, Lausanne, Switzerland (Caetano dos Santos); Department of Surgery, Washington University in St Louis, St Louis, Missouri (Cao); Institute for Cancer Research, Prevention and Clinical Network, Florence, Italy (Carreras); National School of Public Health, Institute of Health Carlos III, Madrid, Spain (Catalá-López); Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada (Catalá-López); Department of Nutrition, Federal University of Santa Catarina, Florianópolis, Brazil (Cembranel); Mary MacKillop Institute for Health Research, Australian Catholic University, Melbourne, Victoria, Australia (Cerin); School of Public Health, University of Hong Kong, Hong Kong, China (Cerin); Regional Epidemiological Observatory Department, Sicilian Regional Health Authority, Palermo, Italy (Cernigliaro); Hospitalist Department, Geisinger Health System, Danville, Pennsylvania (Chakinala);

Department of Public Health, Texila American University, Georgetown, Guyana (S. K. Chattu); Department of Medicine, University of Toronto, Toronto, Ontario, Canada (V. K. Chattu); Saveetha Medical College, Saveetha University, Chennai, India (V. K. Chattu); Center for Cancer Epidemiology, Tata Memorial Hospital, Navi Mumbai, India (Chaturvedi); Department of Head Neck Surgery, Tata Memorial Hospital, Mumbai, India (Chaturvedi); Department of Public Health and Health Policy, Hiroshima University, Hiroshima, Japan (Chimed-Ochir); Division of Plastic Surgery, University of Washington, Seattle (Cho); Department of Pulmonary Medicine, Christian Medical College and Hospital, Vellore, India (Christopher); Center for Biomedicine and Community Health, VNU International School, Hanoi, Vietnam (Chu); Department of Otolaryngology, Wayne State University, Detroit, Michigan (Chung); Nova Medical School, Nova University of Lisbon, Lisbon, Portugal (Conde); Department of Public Health, Pontifical Catholic University of Chile, Santiago, Chile (Cortés); Research Line in Environmental Exposures and Health Effects at Population Level, Centro de Desarrollo Urbano Sustentable, Santiago, Chile (Cortés); School of Medicine and Surgery, University of Milan Bicocca, Monza, Italy (Cortesi); Research Unit on Applied Molecular Biosciences, University of Porto, Porto, Portugal (Costa); Faculty of Dentistry, Federal University of Rio Grande do Sul, Porto Alegre, Brazil (Cunha); School of Public Health, Walailak University, Nakhon Si Thammarat, Thailand (Dadras); Graduate School of Medicine, Kyoto University, Kyoto, Japan (Dadras); Department of Nursing, Bahir Dar University, Bahir Dar, Ethiopia (Dagnew); Environmental Health Department, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia (Dahlawi); Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle (Dai, R. Dandona, S. I. Hay, Mokdad, Murray, Force); Public Health Foundation of India, Gurugram, India (L. Dandona, R. Dandona, G. A. Kumar); Indian Council of Medical Research, New Delhi, India (L. Dandona); Department of Information Technology, University of Human Development, Sulaymaniyah, Iraq (Darwesh); Institute for Research and Innovation in Health, University of Porto, Porto, Portugal (das Neves); Institute of Biomedical Engineering, University of Porto, Porto, Portugal (das Neves); Department of Public Health, National University of Colombia, Bogota, Colombia (De la Hoz); Department of Nursing, Woldia University, Woldia, Ethiopia (Demis); School of Nursing, Jimma University, Jimma, Ethiopia (Demis); Center for Nutrition and Health Research, National Institute of Public Health, Cuernavaca, Mexico (Denova-Gutiérrez); Department of Community Medicine, Dr Baba Saheb Ambedkar Medical College and Hospital, Delhi, India (Dhamnetiya, Jha); Policy Research Institute, Kathmandu, Nepal (M. L. Dhimal); Global Institute for Interdisciplinary Studies, Kathmandu, Nepal (M. L. Dhimal); Health Research Section, Nepal Health Research Council, Kathmandu, Nepal (M. Dhimal); Department of Epidemiology and Biostatistics, Shahroud University of Medical Sciences, Shahroud, Iran (Dianatinasab); Department of Epidemiology, Shiraz University of Medical Sciences, Shiraz, Iran (Dianatinasab); Center of Complexity Sciences, National Autonomous University of Mexico, Mexico City, Mexico (Diaz); Faculty of Veterinary Medicine and Zootechnics, Autonomous University of Sinaloa, Culiacán Rosales, Mexico (Diaz, Velazquez); Development of Research and Technology Center, Ministry of Health and Medical Education, Tehran, Iran (Djalalinia); Center of Excellence in Behavioral Medicine, Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam (Do, Vu); School of Health, Guilan University of Medical Sciences, Rasht, Iran (Doaei); Department of Community Nutrition, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Doaei); Department of Medical Laboratory Sciences, Iran University of Medical Sciences, Tehran, Iran (Dorostkar); Epidemiology and Data Analysis Laboratory, University Center Faculdade de Medicina do ABC, Santo André, Brazil (dos Santos Figueiredo); Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia (Driscoll); Noncommunicable Diseases Research Center, Tehran University of Medical Sciences, Tehran, Iran (Ebrahimi, Farzadfar, Keykhaei, Pishgar, Negar Rezaei); Liver and Pancreaticobilliary Disease Research Center, Tehran University of Medical Sciences, Tehran, Iran (Ebrahimi); Division of Urology, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania (Eftekharzadeh); Pediatric Dentistry and Dental Public Health Department, Alexandria University, Alexandria, Egypt (El Tantawi); Direction de L'épidémiologie et la Lutte Contre les Maladies, Ministry of Health, Rabat, Morocco (El-Abid); Neurophysiology Department, Cairo University, Cairo, Egypt (Elhabashy); Faculty of Medicine, University of Tripoli, Tripoli, Libya (Elhadi); Department of Neurology, Cairo University, Cairo, Egypt (El-Jaafary); Preventive Medicine and Public Health Research Center, Iran University of Medical Sciences, Tehran, Iran (Eshrati, Tehrani-Banihashemi); Multiple Sclerosis Research Center, Tehran University of Medical Sciences, Tehran, Iran (Eskandarieh); Department of Public Health, Maragheh University of Medical Sciences, Maragheh, Iran (Esmaeilzadeh); Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, Maryland (Etemadi); Department of Virology, Pasteur Institute of Morocco, Casablanca, Morocco (Ezzikouri); Department of Internal Medicine, Rochester General Hospital, Rochester, New York (Faisaluddin); Department of Health Policy and Administration, University of the Philippines Manila, Manila, Philippines (Faraon); Department of Neurological Surgery, Northwestern University, Chicago, Illinois (Fares); Department of Neurological Surgery, University of Washington, Seattle (Feroze); Human Biology Division, Fred Hutchinson Cancer Research Center, Seattle, Washington (Feroze); Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health, University of Genoa, Genoa, Italy (Ferrero); University Eye Clinic, University of Genoa, Genoa, Italy (Ferro Desideri); Psychiatry Department, Kaiser Permanente, Fontana, California (Filip); School of Health Sciences, A.T. Still University, Mesa, Arizona (Filip); Institute of Gerontological Health Services and Nursing Research, Ravensburg-Weingarten University of Applied Sciences, Weingarten, Germany (Fischer); James Cancer Hospital, Ohio State University, Columbus (Fisher); Department of Medical Parasitology, Abadan University of Medical Sciences, Abadan, Iran (Foroutan); Faculty of Medicine, Abadan University of Medical Sciences, Abadan, Iran (Foroutan); Department of Dermatology, Kobe University, Kobe, Japan (Fukumoto); Health Services Management Training Centre, Semmelweis University, Budapest, Hungary (Gaal, Joo, Szerencsés); Department of Applied Social Sciences, Sapientia Hungarian University of Transylvania, Târgu-Mureş, Romania (Gaal); Department of Cardiovascular Medicine, Cleveland Clinic, Cleveland, Ohio (Gad); Gillings School of Global Public Health, University of North Carolina Chapel Hill, Chapel Hill (Gad); Community Medicine Department, Bayero University, Kano, Kano, Nigeria (Gadanya); Department of Community Medicine, Aminu Kano Teaching Hospital, Kano, Nigeria (Gadanya); Department of Environmental Health Sciences, Mario Negri Institute for Pharmacological Research, Milan, Italy (Gallus); National Health Service, London, England (Gaspar Fonseca); School of Psychology, Addis Ababa University, Addis Ababa, Ethiopia (Getachew Obsa); Department of Medical Surgical Nursing, Tabriz University of Medical Sciences, Tabriz, Iran (Ghafourifard); Student Research Committee, Iran University of Medical Sciences, Tehran, Iran (Ghashghaee); Research Group for Genomic Epidemiology, Technical University of Denmark, Copenhagen, Denmark (Ghith); Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Gholamalizadeh); Faculty of Allied Health Sciences, University of Lahore, Lahore, Pakistan (Gilani); Afro-Asian Institute, Lahore, Pakistan (Gilani); Discipline of Public Health Medicine, University of KwaZulu-Natal, Durban, South Africa (Ginindza); Health, Behavior and Society, Jimma University, Jimma, Ethiopia (Gizaw); National Institute for Health Research Global Health Research Unit on Global Surgery, University of Birmingham, Birmingham, England (Glasbey); Health Systems and Policy Research, Indian Institute of Public Health, Gandhinagar, India (Golechha); Department of Genetics, Sana Institute of Higher Education, Sari, Iran (Goleij); Department of Oral Surgery and Pathology, Federal University of Minas Gerais, Belo Horizonte, Brazil (Gomez); Hudson College of Public Health, University of Oklahoma Health Sciences Center, Oklahoma City (Gopalani); Department of Health and Social Affairs, Government of the Federated States of Micronesia, Palikir, Federated States of Micronesia (Gopalani); Oncological Network, Prevention and Research Institute, Institute for Cancer Research, Prevention and Clinical Network, Florence, Italy (Gorini); Department of Respiratory Medicine, Hokkaido University, Sapporo, Japan (Goudarzi); Center for Environmental and Health Sciences, Hokkaido University, Sapporo, Japan (Goudarzi); Department of Biomedical and Biotechnological Sciences, University of Catania, Catania, Italy (Grosso); Department of Family and Community Medicine, University of Sulaimani, Sulaimani, Iraq (Gubari); Harrington Heart and Vascular Institute, Case Western Reserve University, Cleveland, Ohio (Guha); Division of Cardiovascular Medicine, Ohio State University, Columbus (Guha); Department of Paediatrics, National Cancer Institute, Maharagama, Sri Lanka (Gunasekera); Department of Public Health, Torrens University, Melbourne, Victoria, Australia (B. Gupta); School of Medicine, Deakin University, Geelong, Victoria, Australia (V. B. Gupta); Department of Clinical Medicine, Macquarie University, Sydney, New South Wales, Australia (V. K. Gupta); Department of Epidemiology and Psychosocial Research, Ramón de la Fuente Muñiz

National Institute of Psychiatry, Mexico City, Mexico (Gutiérrez); Department of Radiology and Radiological Science, Johns Hopkins University, Baltimore, Maryland (Hafezi-Nejad, Shafaat, Sheikhbahaei); School of Medicine, Tehran University of Medical Sciences, Tehran, Iran (Hafezi-Nejad); Department of Social and Public Health, Ohio University, Athens (Haider); Department of Pharmacology, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Haj-Mirzaian, Ramezanzadeh); Obesity Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Haj-Mirzaian); Clinical Sciences Department, University of Sharjah, Sharjah, United Arab Emirates (Halwani, Talaat); College of Medicine, University of Sharjah, Sharjah, United Arab Emirates (Halwani); Department of Family and Community Medicine, Arabian Gulf University, Manama, Bahrain (Hamadeh); University Institute of Public Health, University of Lahore, Lahore, Pakistan (Hameed, Hanif, Malik); School of Health and Environmental Studies, Hamdan Bin Mohammed Smart University, Dubai, United Arab Emirates (Hamidi); Research & Scientific Studies Unit, Jazan University, Jazan, Saudi Arabia (Haque); Faculty of Medicine, Utrecht University, Utrecht, Netherlands (Harlianto); Department of Radiology, University Medical Center Utrecht, Utrecht, Netherlands (Harlianto); Research Unit, University of Barcelona, Barcelona, Spain (Haro); Biomedical Research Networking Center for Mental Health Network, Barcelona, Spain (Haro); Department of Zoology and Entomology, Al Azhar University, Cairo, Egypt (Hasaballah); Gastrointestinal and Liver Diseases Research Center, Guilan University of Medical Sciences, Rasht, Iran (Hassanipour, Joukar); Caspian Digestive Disease Research Center, Guilan University of Medical Sciences, Rasht, Iran (Hassanipour, Joukar); International Foundation for Dermatology, London, England (R. J. Hay); St John's Institute of Dermatology, King's College London, London, England (R. J. Hay); Institute of Pharmaceutical Sciences, University of Veterinary and Animal Sciences, Lahore, Pakistan (Hayat); Department of Pharmacy Administration and Clinical Pharmacy, Xian Jiaotong University, Xian, China (Hayat); Independent Consultant, Santa Clara, California (G. Heidari); Community-Oriented Nursing Midwifery Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran (M. Heidari); Departamento de Salud Oral, Universidad Autónoma de Manizales, Manizales, Colombia (Herrera-Serna); School of Business, London South Bank University, London, England (Herteliu); Department of Applied Microbiology, Taiz University, Taiz, Yemen (Hezam); Department of Microbiology, Nankai University, Tianjin, China (Hezam); Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India (Holla, Kamath, Padubidri); Social and Environmental Health Research, Nature Study Society of Bangladesh, Khulna, Bangladesh (M. M. Hossain); Department of Health Promotion and Community Health Sciences, Texas A&M University, College Station (M. M. Hossain); Department of Population Sciences, University of Dhaka, Dhaka, Bangladesh (M. B. H. Hossain); Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran (Mohammad-Salar Hosseini); Pediatric Chronic Kidney Disease Research Center, Tehran University of Medical Sciences, Tehran, Iran (Mostafa Hosseini); Institute of Research and Development, Duy Tan University, Da Nang, Vietnam (Hosseinzadeh); Department of Computer Science, University of Human Development, Sulaymaniyah, Iraq (Hosseinzadeh); Internal Medicine Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (M. Hostiuc); Department of Legal Medicine and Bioethics, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (S. Hostiuc); Clinical Legal Medicine Department, National Institute of Legal Medicine Mina Minovici, Bucharest, Romania (S. Hostiuc); College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar (Househ); Faculty of Medicine of Tunis, University Tunis El Manar, Tunis, Tunisia (Hsairi); Jockey Club School of Public Health and Primary Care, Chinese University of Hong Kong, Hong Kong, China (Huang, Zhong); Department of Preventive and Social Dentistry, Federal University of Rio Grande do Sul, Porto Alegre, Brazil (Hugo); School of Pharmaceutical Sciences, University of Science Malaysia, Penang, Malaysia (Hussain); Department of Biomolecular Sciences, University of Zakho, Zakho, Iraq (Hussein); Department of Occupational Safety and Health, China Medical University, Taichung, Taiwan (Hwang); Department of Public Health, University of Naples Federico II, Naples, Italy (Iavicoli); Department of Health Promotion and Education, University of Ibadan, Ibadan, Nigeria (Ibitoye); Pharmacoepidemiology Department, Sanofi, Cambridge, Massachusetts (Ida); Division of Allergy and Infectious Diseases, University of Washington, Seattle (Ikuta); Department of Community Medicine, University of Ibadan, Ibadan, Nigeria (Ilesanmi); Department of Community Medicine, University College Hospital, Ibadan, Ibadan, Nigeria (Ilesanmi); Faculty of Medicine, University of Belgrade, Belgrade, Serbia (I. M. Ilic, Santric-Milicevic); Department of Epidemiology, University of Kragujevac, Kragujevac, Serbia (M. D. Ilic); School of Pharmacy, Taipei Medical University, Taipei, Taiwan (Irham); Faculty of Pharmacy, Ahmad Dahlan University, Yogyakarta, Indonesia (Irham); H. Lee Moffitt Cancer Center and Research Institute, Tampa, Florida (J. Y. Islam); Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Victoria, Australia (R. M. Islam); Institute for Physical Activity and Nutrition, Deakin University, Burwood, Victoria, Australia (S. M. S. Islam); Sydney Medical School, University of Sydney, Sydney, New South Wales, Australia (S. M. S. Islam); Department of Clinical Pharmacy, MAHSA University, Bandar Saujana Putra, Malaysia (Ismail); Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania, Italy (Isola); Department of Health Services Research, University of Tsukuba, Tsukuba, Japan (Iwagami); Department of Non-Communicable Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, England (Iwagami); Research and Development Unit, Biomedical Research Networking Center for Mental Health Network, Sant Boi de Llobregat, Spain (Jacob); Faculty of Medicine, University of Versailles Saint-Quentin-en-Yvelines, Montigny-le-Bretonneux, France (Jacob); Institute of Comparative Economic Studies, Hosei University, Tokyo, Japan (Jakovljevic); Department of Global Health, Economics and Policy, University of Kragujevac, Kragujevac, Serbia (Jakovljevic); Health Informatic Lab, Boston University, Boston, Massachusetts (Javaheri); Department of Biochemistry, Government Medical College, Mysuru, India (Jayaram); Urology Department, University of Florida, Jacksonville (Jazayeri); Department of Community Medicine, Banaras Hindu University, Varanasi, India (Jha); Department of Ophthalmology, Heidelberg University, Heidelberg, Germany (Jonas, Panda-Jonas); Beijing Institute of Ophthalmology, Beijing Tongren Hospital, Beijing, China (Jonas); Department of Community Medicine, Manipal Academy of Higher Education, Mangalore, India (Joseph, Nithin Kumar, Mithra, Thapar); Institute of Family Medicine and Public Health, University of Tartu, Tartu, Estonia (Jürisson, Orru); Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, Iran (Kabir); Department of Genetics, Kermanshah University of Medical Sciences, Kermanshah, Iran (Kahrizi); School of Management and Medical Informatics, Tabriz University of Medical Sciences, Tabriz, Iran (Kalankesh); Institute for Prevention of Non-communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran (Kalhor); Health Services Management Department, Qazvin University of Medical Sciences, Qazvin, Iran (Kalhor); Dermatology Department, King Faisal University, Hofuf, Saudi Arabia (Kaliyadan); Public Health Division, Society for Education, Action and Research in Community Health, Gadchiroli, India (Kalkonde); Manipal Academy of Higher Education, Manipal, India (Kamath); Department of Computer Science and Engineering, University of Kurdistan Hewler, Hewler, Iraq (Kameran Al-Salihi); Save Sight Institute, University of Sydney, Sydney, New South Wales, Australia (Kandel); Sydney Eye Hospital, South Eastern Sydney Local Health District, Sydney, New South Wales, Australia (Kandel); Institute for Epidemiology and Social Medicine, University of Münster, Münster, Germany (Karch); Department of Adult Health Nursing, Bahir Dar University, Bahir Dar, Ethiopia (Kasa); Medical Research Council/Chief Scientist Office Social and Public Health Sciences Unit, University of Glasgow, Glasgow, Scotland (Katikireddi); Surgery Research Unit, University of Oulu, Oulu, Finland (Kauppila); Department of Molecular Medicine and Surgery, Karolinska Institute, Stockholm, Sweden (Kauppila); Department of Surface Engineering, John Paul II Catholic University of Lublin, Lublin, Poland (Kavetskyy); Drohobych Ivan Franko State Pedagogical University, Drohobych, Ukraine (Kavetskyy); Department of Epidemiology and Biostatistics, University of Gondar, Gondar, Faroe Islands (Kebede); School of Science and Technology, University of Georgia, Tbilisi, Georgia (Keshavarz); Department of Diagnostic and Interventional Radiology, New Hospitals LTD, Tbilisi, Georgia (Keshavarz); Students Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran (Keykhaei); Department of Public Health, Jordan University of Science and Technology, Irbid, Jordan (Khader); Department of Biophysics and Biochemistry, Baku State University, Baku, Azerbaijan (Khalilov); Russian Institute for Advanced Study, Moscow State Pedagogical University, Moscow, Russia (Khalilov); Department of Medical Microbiology and Immunology, United Arab Emirates University, Al Ain, United Arab Emirates (G. Khan); Epidemiology Department, Jazan University, Jazan, Saudi Arabia (M. Khan); Department of Population Science, Jatiya Kabi Kazi Nazrul Islam University, Mymensingh, Bangladesh (M. N. Khan); Family Medicine Department, United Arab Emirates University, Al Ain, United Arab Emirates (M. A. B. Khan); Primary Care Department,

NHS North West London, London, England (M. A. B. Khan); Department of Health Policy and Management, Seoul National University, Seoul, South Korea (Khang); Institute of Health Policy and Management, Seoul National University, Seoul, South Korea (Khang); National Hepatology and Tropical Medicine Research Institute, Cairo University, Cairo, Egypt (Khater); Shahid Beheshti University of Medical Sciences, Tehran, Iran (Khayamzadeh); The Iranian Academy of Medical Sciences, Tehran, Iran (Khayamzadeh); Department of Preventive Medicine, Yonsei University, Seoul, South Korea (G. R. Kim, Eun-Cheol Park); School of Traditional Chinese Medicine, Xiamen University Malaysia, Sepang, Malaysia (Y. J. Kim); School of Health Sciences, Kristiania University College, Oslo, Norway (A. Kisa); Department of Global Community Health and Behavioral Sciences, Tulane University, New Orleans, Louisiana (A. Kisa); Department of Nursing and Health Promotion, Oslo Metropolitan University, Oslo, Norway (S. Kisa); Department of Health Economics and Social Security, Jagiellonian University Medical College, Krakow, Poland (Kissimova-Skarbek); School of Population and Public Health, University of British Columbia, Vancouver, British Columbia, Canada (Kopec); Arthritis Research Canada, Richmond, British Columbia, Canada (Kopec); Microbiology & Molecular Cell Biology Department, Eastern Virginia Medical School, Norfolk (Koteeswaran); Department of Internal and Pulmonary Medicine, Sheri Kashmir Institute of Medical Sciences, Srinagar, India (Koul); Kasturba Medical College, Udupi, India (Koulmane Laxminarayana); Biomedical Research Networking Center for Mental Health Network, San Juan de Dios Sanitary Park, Sant Boi de Llobregat, Spain (Koyanagi); Catalan Institution for Research and Advanced Studies, Barcelona, Spain (Koyanagi); Faculty of Medicine, Gazi University, Ankara, Turkey (Kucuk Bicer); University of Environment and Sustainable Development, Somanya, Ghana (Kugbey); Department of Orthopaedics, Medanta Hospital, Lucknow, India (Narinder Kumar); Faculty of Health and Life Sciences, Coventry University, Coventry, England (Kurmi); Department of Medicine, McMaster University, Hamilton, Ontario, Canada (Kurmi); Department of Pediatric Oncology, Hacettepe University, Ankara, Turkey (Kutluk); Department of Clinical Sciences and Community Health, University of Milan, Milan, Italy (La Vecchia); Department of Community and Family Medicine, University of Baghdad, Baghdad, Iraq (Lami); Unit of Genetics and Public Health, Institute of Medical Sciences, Las Tablas, Panama (Landires); Ministry of Health, Herrera, Panama (Landires); Institute of Clinical Physiology, National Research Council, Pisa, Italy (Lauriola); Pattern Recognition and Machine Learning Lab, Gachon University, Seongnam, South Korea (S. Lee); School of Pharmacy, Monash University, Bandar Sunway, Malaysia (S. W. H. Lee); School of Pharmacy, Taylor's University Lakeside Campus, Subang Jaya, Malaysia (S. W. H. Lee); Office of Health Policy & Legislative Affairs, University of Texas, Galveston (W. Lee); Graduate School of Public Health, Ajou University, Suwon-si, South Korea (Y. H. Lee); Asbestos Diseases Research Institute, University of Sydney, Sydney, New South Wales, Australia (Leigh); Faculty of Science, Universiti Brunei Darussalam, Bandar Seri Begawan, Brunei (Leong); Department of Medical Oncology, Peking Union Medical College, Beijing, China (J. Li); Department of Health Promotion and Health Education, National Taiwan Normal University, Taipei, Taiwan (M. Li); Lerner Research Institute, Cleveland Clinic, Cleveland, Ohio (Liu); Department of Quantitative Health Science, Case Western Reserve University, Cleveland, Ohio (Liu); Laboratory for Process Engineering, Environment, Biotechnology and Energy, University of Porto, Porto, Portugal (Loureiro); School of Health, Polytechnic Institute of Porto, Portugal (Loureiro); Department of General Surgery, Liverpool University Hospitals NHS Foundation Trust, Liverpool, England (Lunevicius); Department of Surgery, University of Liverpool, Liverpool, England (Lunevicius); Ophthalmology Department, Ministry of Health and Population, Aswan, Egypt (Magdy Abd El Razek); Department of Primary Care and Public Health, Imperial College London, London, England (Majeed); Mass Communication Department, University of Sharjah, Sharjah, United Arab Emirates (Makki); Department of Ophthalmology, M M Joshi Eye Institute, Hubli, India (Male); Rabigh Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia (Malik); Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia (Martini); Indonesian Public Health Association, Surabaya, Indonesia (Martini); Department of Midwifery, Hamadan University of Medical Sciences, Hamadan, Iran (Masoumi); National Centre for Disease Informatics and Research, Indian Council of Medical Research, Bengaluru, India (Mathur); Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, London, England (McKee); India Cancer Research Consortium, Indian Council of Medical Research, New Delhi, India (Mehrotra); Peru Country Office, United Nations Population Fund, Lima, Peru (Mendoza); Forensic Medicine Division, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia (Menezes); Department of Reproductive Health and Population Studies, Bahir Dar University, Bahir Dar, Ethiopia (Mengesha); Department of Orthopaedic Surgery, Menoufia University Faculty of Medicine, Shebin El-Kom, Egypt (Mesregah); Clinical Microbiology and Parasitology Unit, Polyclinic "Dr. Zora Profozic", Zagreb, Croatia (Mestrovic); University Centre Varazdin, University North, Varazdin, Croatia (Mestrovic); School of Public Health and Community Medicine, University of Gothenburg, Gothenburg, Sweden (Miao Jonasson); Center for Innovation in Medical Education, Pomeranian Medical University, Szczecin, Poland (B. Miazgowski); Pomeranian Medical University, Szczecin, Poland (B. Miazgowski); Department of Propedeutics of Internal Diseases and Arterial Hypertension, Pomeranian Medical University, Szczecin, Poland (T. Miazgowski); Woman-Mother-Child Department, Lausanne University Hospital, Lausanne, Switzerland (Michalek); Pacific Institute for Research and Evaluation, Calverton, Maryland (Miller); School of Public Health, Curtin University, Perth, Western Australia, Australia (Miller, Tessema); Department of Medical Immunology, Tehran University of Medical Sciences, Tehran, Iran (H. R. Mirzaei); Department of Surgical Oncology, All India Institute of Medical Sciences, Jodhpur, India (Misra); Biotechnology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran (Moghadaszadeh); Molecular Medicine Research Center, Tabriz University of Medical Sciences, Tabriz, Iran (Moghadaszadeh); Department of Biology, Salahaddin University-Erbil, Erbil, Iraq (K. A. Mohammad); Internal Medicine Department, King Saud University, Riyadh, Saudi Arabia (Y. Mohammad); Department of Information Technology, Lebanese French University, Erbil, Iraq (M. Mohammadi); Department of Anatomical Sciences, Zanjan University of Medical Sciences, Zanjan, Iran (S. M. Mohammadi); Health Systems and Policy Research Unit, Ahmadu Bello University, Zaria, Nigeria (Mohammed); Department of Health Care Management, Technical University of Berlin, Berlin, Germany (Mohammed); Oncology Department, Appalachian Regional Healthcare, Hazard, Kentucky (Moka); Internal Medicine, University of Kentucky, Lexington (Moka); Faculty of Life Sciences and Medicine, King's College London, London, England (Molokhia); Clinical Epidemiology and Public Health Research Unit, Burlo Garofolo Institute for Maternal and Child Health, Trieste, Italy (Monasta, Ronfani, Traini); Department of Computer Science and Engineering, Pabna University of Science and Technology, Pabna, Bangladesh (Moni); Department of Molecular Medicine, National Institute of Genetic Engineering and Biotechnology, Tehran, Iran (Moosavi); Social Determinants of Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran (Moradi); Computer, Electrical, and Mathematical Sciences and Engineering Division, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (Moraga); University Hospital Center of Porto, University of Porto, Porto, Portugal (Morgado-da-Costa); Section of Plastic Surgery, University of Michigan School of Medicine, Ann Arbor (Morrison); Department of Clinical Biochemistry, Babol University of Medical Sciences, Babol, Iran (Mosapour); Department of Clinical Biochemistry, Tarbiat Modares University, Tehran, Iran (Mosapour); Department of Epidemiology and Biostatistics, Wuhan University, Wuhan, China (Mubarik, Yu); College of Medicine and Public Health, Flinders University, Adeaide, South Australia, Australia (Mwanri); Research and Analytics Department, Initiative for Financing Health and Human Development, Chennai, India (Nagarajan); Department of Research and Analytics, Bioinsilico Technologies, Chennai, India (Nagarajan); Department of Nephrology, Manipal Academy of Higher Education, Manipal, India (Nagaraju); Department of Education for Clinical Research, National Center for Child Health and Development, Tokyo, Japan (Nagata); Laboratory of Public Health Indicators Analysis and Health Digitalization, Moscow Institute of Physics and Technology, Dolgoprudny, Russia (Naimzada, N. Otstavnov, S. S. Otstavnov); Experimental Surgery and Oncology Laboratory, Kursk State Medical University, Kursk, Russia (Naimzada); Suraj Eye Institute, Nagpur, India (Nangia); Department of Pharmacy Practice, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia (Naqvi); Discipline of Social and Administrative Pharmacy, University of Science, Malaysia, Penang, Malaysia (Naqvi); Mysore Medical College and Research Institute, Government Medical College, Mysore, India (Narasimha Swamy); Department of Disease Control and Environmental Health, Makerere University, Kampala, Uganda (Ndejjo); Pharmaceutical Outcomes and Policy Department, University of Florida, Gainesville (Nduaguba); Department of General Surgery, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (Negoi); Department of General Surgery, Emergency Hospital of Bucharest, Bucharest,

Romania (Negoi); Department of Oncology, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania (Negru); Estia Health Blakehurst, Estia Health, Sydney, New South Wales, Australia (Neupane Kandel); Institute for Global Health Innovations, Duy Tan University, Hanoi, Vietnam (C. T. Nguyen, H. L. T. Nguyen); International Islamic University Islamabad, Islamabad, Pakistan (Niazi); South African Medical Research Council, Cape Town, South Africa (Nnaji); School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa (Nnaji); Medical Research Council Clinical Trials Unit, University College London, London, England (Noor); Department of Gastroenterology, Cambridge University Hospitals, Cambridge, England (Noor); Unit of Microbiology and Public Health, Institute of Medical Sciences, Las Tablas, Panama (Nuñez-Samudio); Department of Public Health, Ministry of Health, Herrera, Panama (Nuñez-Samudio); Center of Excellence in Reproductive Health Innovation, University of Benin, Benin City, Nigeria (Nzoputam); Administrative and Economic Sciences Department, University of Bucharest, Bucharest, Romania (Oancea); Department of International Cyber Education, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia (Ochir); Advisory Board, Ministry of Health, Ulaanbaatar, Mongolia (Ochir); Department of Community Health and Primary Care, University of Lagos, Idi Araba, Nigeria (Odukoya); Department of Family and Preventive Medicine, University of Utah, Salt Lake City (Odukoya); Translational Health Research Institute, Western Sydney University, Sydney, New South Wales, Australia (Ogbo); Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, Ontario, Canada (Olagunju); Department of Psychiatry, University of Lagos, Lagos, Nigeria (Olagunju); Community Prevention and Care Services, National AIDS Control Committee, Abuja, Nigeria (Olakunde); Mass Communication Department, Ajman University, Dubai, United Arab Emirates (Omar); Diplomacy and Public Relations Department, University of Human Development, Sulaymaniyah, Iraq (Omar Bali); Department of Anatomic Pathology, Ekiti State University, Ado-Ekiti, Nigeria (Omonisi); Department of Anatomic Pathology, Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria (Omonisi); Noncommunicable Disease Prevention Unit, Ministry of Health, Bandar Seri Begawan, Brunei (Ong); Early Detection and Cancer Prevention Services, Pantai Jerudong Specialist Centre, Bandar Seri Begawan, Brunei (Ong); Department of Pharmacology and Therapeutics, University of Nigeria Nsukka, Enugu, Nigeria (Onwujekwe); Section of Sustainable Health, Umeå University, Umea, Sweden (Orru); Health Systems Research Center, National Institute of Public Health, Cuernavaca, Mexico (Ortega-Altamirano); Department of Project Management, National Research University Higher School of Economics, Moscow, Russia (S. S. Otstavnov); Department of Medicine, University of Ibadan, Ibadan, Nigeria (Owolabi); Department of Medicine, University College Hospital, Ibadan, Ibadan, Nigeria (Owolabi); Department of Respiratory Medicine, Jagadguru Sri Shivarathreeswara Academy of Health Education and Research, Mysore, India (P A); Department of Medical Mycology and Parasitology, Shiraz University of Medical Sciences, Shiraz, Iran (Pakshir); Department of Health Metrics, Center for Health Outcomes and Evaluation, Bucharest, Romania (Pana); Department of Nutrition and Dietetics, Harokopio University, Athens, Greece (Panagiotakos); Vision and Eye Research Institute, Anglia Ruskin University, Cambridge, England (Pardhan); Institute of Health Services Research, Yonsei University, Seoul, South Korea (Eun-Cheol Park); Department of Medical Humanities and Social Medicine, Kosin University, Busan, South Korea (Eun-Kee Park); Iran University of Medical Sciences, Tehran, Iran (Pashazadeh Kan); Department of Internal Medicine, Ochsner Medical Center, New Orleans, Louisiana (H. K. Patel); Department of Epidemiology, Human Genetics and Environmental Sciences, The University of Texas Health Science Center at Houston School of Public Health, Dallas (J. R. Patel); Department of Epidemiology, University of Arkansas for Medical Sciences, Little Rock (J. R. Patel); Centre of Excellence, Khallikote University, Berhampur, India (Pati); Research Division, Association for Biodiversity Conservation and Research, Balasore, India (Pati); Department of Health Policy, Manipal Academy of Higher Education, Manipal, India (Pattanshetty); Research Section, Nepal Health Research Council, Kathmandu, Nepal (Paudel); Faculty of Humanities and Social Sciences, Tribhuvan University, Kathmandu, Nepal (Paudel); Associated Laboratory for Green Chemistry, University of Porto, Porto, Portugal (D. M. Pereira); Department of Chemistry, University of Porto, Porto, Portugal (R. B. Pereira); Department of Development Studies, International Institute for Population Sciences, Mumbai, India (Perianayagam, Sahoo); Basic Medical Sciences Department, Durban University of Technology, Durban, South Africa (Pillay); Department of Biochemistry and Dietetics, Tabriz University of Medical Sciences, Tabriz, Iran (Pirouzpanah); Urooncology Research Center, Tehran University of Medical Sciences, Tehran, Iran (Pishgar); Department of Dermatology, College of Medicine and Sagore Dutta Hospital, Kolkata, India (Podder); University Medical Center Groningen, University of Groningen, Groningen, Netherlands (Postma); School of Economics and Business, University of Groningen, Groningen, Netherlands (Postma); Department of Nutrition and Food Sciences, Maragheh University of Medical Sciences, Maragheh, Iran (Pourjafar); Dietary Supplements and Probiotic Research Center, Alborz University of Medical Sciences, Karaj, Iran (Pourjafar); Department of Biochemistry, Jagadguru Sri Shivarathreeswara University, Mysuru, India (Prashant); National Institute of Infectious Diseases, Bucuresti, Romania (Preotescu); Department of Infectious Diseases, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (Preotescu); Biomedical Engineering Department, Amirkabir University of Technology, Tehran, Iran (M. Rabiee); Department of Physics, Sharif University of Technology, Tehran, Iran (N. Rabiee); College of Medicine, University of Central Florida, Orlando (Radfar); Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, India (R. A. Radhakrishnan); Department of Medical Oncology, Cancer Institute, Chennai, India (V. Radhakrishnan); Department of Medicine, University of Alberta, Edmonton, Alberta, Canada (Rafiee); Metabolomics and Genomics Research Center, Tehran University of Medical Sciences, Tehran, Iran (Rahim); Department of Natural Science, Middlesex University, London, England (Rahimzadeh); Department of Population Science and Human Resource Development, University of Rajshahi, Rajshahi, Bangladesh (M. Rahman); School of Nursing and Healthcare Professions, Federation University Australia, Berwick, Victoria, Australia (M. A. Rahman); School of Nursing and Midwifery, La Trobe University, Melbourne, Victoria, Australia (M. A. Rahman); Future Technology Research Center, National Yunlin University of Science and Technology, Yunlin, Taiwan (Rahmani); Department of Internal Medicine, Harvard University, Boston, Massachusetts (Rajai); Department of Surgery, University of Texas Health Science Center at San Antonio, San Antonio (Rajesh); European Office for the Prevention and Control of Noncommunicable Diseases, World Health Organization, Moscow, Russia (Rakovac); Department of Cardiology, Emory University, Atlanta, Georgia (Ram); Health Emergency Operation Center, Ministry of Health and Population, Kathmandu, Nepal (Ranabhat); Central Department of Public Health, Institute of Medicine, Kathmandu, Nepal (Ranabhat); Department of Pharmacology, University of Colombo, Colombo, Sri Lanka (Ranasinghe); Department of Community Medicine, Manipal Academy of Higher Education, Manipal, India (C. R. Rao); Department of Oral Pathology, Srinivas Institute of Dental Sciences, Mangalore, India (S. J. Rao); Department of Computer Science, Boston University, Boston, Massachusetts (Rawassizadeh); Department of Immunology and Laboratory Sciences, Sirjan School of Medical Sciences, Sirjan, Iran (Razeghinia); Department of Immunology, Kerman University of Medical Sciences, Kerman, Iran (Razeghinia); School of Medicine, Western Sydney University, Campbelltown, New South Wales, Australia (Renzaho); Translational Health Research Institute, Western Sydney University, Campbelltown, New South Wales, Australia (Renzaho); Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran (Negar Rezaei); Network of Immunity in Infection, Malignancy and Autoimmunity, Universal Scientific Education and Research Network, Tehran, Iran (Nima Rezaei); Dana-Farber Cancer Institute, Boston, Massachusetts (Roberts); Deparment of Pharmacology and Toxicology, University of Antioquia, Medellin, Colombia (Rodriguez); Department of Global Health and Population, Harvard University, Boston, Massachusetts (Rohloff); Center for Indigenous Health Research, Wuqu' Kawoq Maya Health Alliance, Tecpan, Guatemala (Rohloff); Maurizio Bufalini Hospital, Cesena, Italy (Romoli); Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan, Iran (Roshandel); Department of Internal Medicine, University of Botswana, Gaborone, Botswana (Rwegerera); Oral and Maxillofacial Surgery, Jagadguru Sri Shivarathreeswara University, Mysore, India (S); Sharjah Institute for Medical Research, University of Sharjah, Sharjah, United Arab Emirates (Saddik); Research and Development, Islamabad Diagnostic Center Pakistan, Islamabad, Pakistan (Saeed); Biological Production Development, National Institute of Health, Islamabad, Pakistan (Saeed); Applied Biomedical Research Center, Mashhad University of Medical Sciences, Mashhad, Iran (Sahebkar); Biotechnology Research Center, Mashhad University of Medical Sciences, Mashhad, Iran (Sahebkar); Department of Radiology, University of

Southern California, Los Angeles (Salehi); Public Health and Community Medicine Department, Cairo University, Giza, Egypt (Salem); Digestive Diseases Research Institute, Tehran University of Medical Sciences, Tehran, Iran (Salimzadeh); Emergency Department, Brown University, Providence, Rhode Island (Samaei); Department of Entomology, Ain Shams University, Cairo, Egypt (Samy); Department of Surgery, Marshall University, Huntington, West Virginia (Sanabria); Department of Nutrition and Preventive Medicine, Case Western Reserve University, Cleveland, Ohio (Sanabria); Department of Pediatrics, University Hospitals Rainbow Babies & Children's Hospital, Cleveland, Ohio (Sankararaman, Thavamani); Department of Pediatrics, Case Western Reserve University, Cleveland, Ohio (Sankararaman); School of Public Health and Health Management, University of Belgrade, Belgrade, Serbia (Santric-Milicevic); Division of Plastic and Reconstructive Surgery, McMaster University, Hamilton, Ontario, Canada (Sardiwalla); Colorectal Research Center, Iran University of Medical Sciences, Tehran, Iran (Sarveazad); Faculty of Health & Social Sciences, Bournemouth University, Bournemouth, England (Sathian); Department of Public Health Sciences, University of North Carolina at Charlotte, Charlotte (Sawhney); Market Access, Bayer, Istanbul, Turkey (Saylan); Department of Health Sciences, Federal University of Santa Catarina, Araranguá, Brazil (Schneider); Department of Medical Statistics, Epidemiology and Medical Informatics, University of Zagreb, Zagreb, Croatia (Sekerija); Department of Epidemiology and Prevention of Chronic Noncommunicable Diseases, Croatian Institute of Public Health, Zagreb, Croatia (Sekerija); National Heart, Lung, and Blood Institute, National Institutes of Health, Rockville, Maryland (Seylani); Department of Radiology and Interventional Neuroradiology, Isfahan University of Medical Sciences, Isfahan, Iran (Shafaat); Clinical Research Development Unit of Farshchian Heart Center, Hamedan University of Medical Sciences, Hamadan, Iran (Shaghaghi); Independent Consultant, Karachi, Pakistan (Shaikh); Department of Oral Health, Non-Communicable Diseases Research Center, Tehran, Iran (Shamsoddin, Sofi-Mahmudi); Noncommunicable Diseases Committee, National Institute for Medical Research Developmen, Tehran, Iran (Shamsoddin); Symbiosis Medical College for Women, Symbiosis International University, Pune, India (Shannawaz); University School of Management and Entrepreneurship, Delhi Technological University, Delhi, India (Sharma); Centre for Medical Informatics, University of Edinburgh, Edinburgh, Scotland (Sheikh); Division of General Internal Medicine, Harvard University, Boston, Massachusetts (Sheikh); Department of Obstetrics and Gynaecology, Manipal Academy of Higher Education, Mangalore, India (A. Shetty); Department of Biochemistry, Manipal University College Melaka, Melaka, Malaysia (J. K. Shetty); Department of Forensic Medicine, Manipal Academy of Higher Education, Mangalore, India (P. H. Shetty); University of Tokyo, Tokyo, Japan (Shibuya); Cancer Research Center, Tehran University of Medical Sciences, Tehran, Iran (Shirkoohi); Cancer Biology Research Center, Tehran University of Medical Sciences, Tehran, Iran (Shirkoohi); Public Health Dentistry Department, Krishna Institute of Medical Sciences, Karad, India (Shivakumar); Clinical Immunology and Hematology, Sofiamed University Hospital, Sofia, Bulgaria (Shivarov); Department of Genetics, Sofia University St. Kliment Ohridiski, Sofia, Bulgaria (Shivarov); Department of Health Education and Health Promotion, Kermanshah University of Medical Sciences, Kermanshah, Iran (Siabani, Ziapour); School of Health, University of Technology Sydney, Sydney, New South Wales, Australia (Siabani); Department of Hematology-Oncology, Baystate Medical Center, Springfield, Massachusetts (Siddappa Malleshappa); Department of Physical Education, Federal University of Santa Catarina, Florianópolis, Brazil (Silva); School of Medicine, University of Alabama at Birmingham, Birmingham (Singh); Medicine Service Department of Veterans Affairs, Birmingham, Alabama (Singh); Department of Midwifery, Haramaya University, Harar, Ethiopia (Sintayehu); Department No. 16, Moscow Research and Practical Centre on Addictions, Moscow, Russia (Skryabin); Therapeutic Department, Balashiha Central Hospital, Balashikha, Russia (Skryabina); Asbestos Diseases Research Institute, Sydney, New South Wales, Australia (Soeberg, Takahashi); Cochrane Iran Associate Centre, National Institute for Medical Research Development, Iranian Ministry of Health and Medical Education, Tehran, Iran (Sofi-Mahmudi); Department of Radiology, University of Alabama at Birmingham, Birmingham (Sotoudeh); Department of Medicine, Democritus University of Thrace, Alexandroupolis, Greece (Steiropoulos); Schiller Institute, Boston College, Boston, Massachusetts (Straif); Barcelona Institute for Global Health, Barcelona, Spain (Straif); Nepal Health Research Council, Kathmandu, Nepal (Subedi); Department of Community Medicine, Ahmadu Bello University, Zaria, Nigeria (Sufiyan); Pediatric Services, King Hussein Cancer Center, Amman, Jordan (Sultan); Pediatrics, University of Jordan, Amman, Jordan (Sultan); Maternal and Child Health, Projahnmo Research Foundation, Dhaka, Bangladesh (Sultana); Department of Medical Oncology, The Oncology Institute "Prof Dr Ion Chiricuță" Cluj-Napoca, Cluj-Napoca, Romania (Sur); Department of Medical Oncology, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania (Sur); Faculty of Health and Public Administration, Semmelweis University, Budapest, Hungary (Szócska); Department of Medicine, University of Valencia, Valencia, Spain (Tabarés-Seisdedos); Carlos III Health Institute, Biomedical Research Networking Center for Mental Health Network, Madrid, Spain (Tabarés-Seisdedos); Cancer Control Center, Osaka International Cancer Institute, Osaka, Japan (Tabuchi); Johns Hopkins University, Baltimore, Maryland (Tadbiri); Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran (Taherkhani); Pathology Department, Alexandria University, Alexandria, Egypt (Talaat); Department of Surgery, National University of Singapore, Singapore, Singapore (Tan); Department of Pathology, University of Texas, Galveston (Tat); College of Public Health, Medical and Veterinary Sciences, James Cook University, Cairns, Queensland, Australia (Tedla); University of Gondar, Gondar, Ethiopia (Tedla); Department of Clinical Pharmacy, University of Gondar, Gondar, Ethiopia (Tefera); Department of Community and Family Medicine, Iran University of Medical Sciences, Tehran, Iran (Tehrani-Banihashemi); Pediatric Intensive Care Unit, King Saud University, Riyadh, Saudi Arabia (Temsah); School of Public Health, Mekelle University, Mekelle, Ethiopia (Tesfay); Southgate Institute for Health and Society, Flinders University, Adelaide, South Australia, Australia (Tesfay); School of Public Health, University of Adelaide, Adelaide, South Australia, Australia (Tessema); Division of Pediatric Gastroenterology, Case Western Reserve University, Cleveland, Ohio (Thavamani); Department of Gastroenterology and Hepatology, Mayo Clinic, Scottsdale, Arizona (Thoguluva Chandrasekar); Department of Endocrinology, Diabetes and Metabolism, Christian Medical College and Hospital, Vellore, India (Thomas); HIV/STI Surveillance Research Center and World Health Organization Collaborating Center for HIV Surveillance, Kerman University of Medical Sciences, Kerman, Iran (Tohidinik); Nutritional Epidemiology Research Team, National Institute for Health and Medical Research Institut national de la santé et de la recherche médicale, Paris, France (Touvier); Department of Health, Medicine and Human Biology, Sorbonne Paris Nord University, Bobigny, France (Touvier); Department of Pathology and Legal Medicine, University of São Paulo, Ribeirão Preto, Brazil (Tovani-Palone); Modestum LTD, London, England (Tovani-Palone); Institute for Risk Assessment Sciences, Utrecht University, Utrecht, Netherlands (Traini); Department of Health Economics, Hanoi Medical University, Hanoi, Vietnam (B. X. Tran); Department of Molecular Medicine and Pathology, University of Auckland, Auckland, New Zealand (K. B. Tran); Clinical Hematology and Toxicology, Maurice Wilkins Centre, Auckland, New Zealand (K. B. Tran); School of Public Health and Social Work, Queensland University of Technology, Brisbane, Queensland, Australia (M. T. N. Tran); Health Informatics Department, Nursing and Midwifery Faculty, Hanoi Medical University, Ha Noi, Vietnam (M. T. N. Tran); Department of Community Medicine, All India Institute of Medical Sciences, Nagpur, India (Tripathy); Department of Epidemiology and Biostatistics, Haramaya University, Haramaya, Ethiopia (Tusa); Department of Allied Health Sciences, Iqra National University, Peshawar, Pakistan (I. Ullah); Pakistan Council for Science and Technology, Ministry of Science and Technology, Islamabad, Pakistan (I. Ullah); Department of Pediatric Cardiology, Rush University, Chicago, Illinois (Umapathi); Kasturba Medical College, Manipal Academy of Higher Education, Mangalore, India (Unnikrishnan); Amity Institute of Biotechnology, Amity University Rajasthan, Jaipur, India (Upadhyay); Alzahra Teaching Hospital, Tabriz University of Medical Sciences, Tabriz, Iran (Vaezi); Women's Reproductive Health Research Center, Tabriz University of Medical Sciences, Tabriz, Iran (Vaezi); Clinical Cancer Research Center, Milad General Hospital, Tehran, Iran (Valadan Tahbaz, Yahyazadeh Jabbari); Department of Microbiology, Islamic Azad University, Tehran, Iran (Valadan Tahbaz); Department of Medical and Surgical Sciences and Advanced Technologies, University of Catania, Catania, Italy (Veroux); Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy (Violante); Occupational Health Unit, Sant'Orsola Malpighi Hospital, Bologna, Italy (Violante); Department of Health Care Administration and Economics, National Research University Higher School of Economics, Moscow, Russia (Vlassov); Faculty of Information

Technology, Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam (Vo); Department of Neurosurgery, Erasmus University Medical Center, Rotterdam, Netherlands (Volovici); Center for Experimental Microsurgery, Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania (Volovici); Cultures, Societies and Global Studies, Integrated Initiative for Global Health, Northeastern University, Boston, Massachusetts (Wamai); School of Public Health, University of Nairobi, Nairobi, Kenya (Wamai); College of Medicine and Public Health, Flinders University, Adelaide, South Australia, Australia (Ward); Key Laboratory of Shaanxi Province for Craniofacial Precision Medicine Research, Stomatological Hospital (College) of Xi'an Jiaotong University, Xi'an, China (Wen); Competence Center of Mortality-Follow-Up of the German National Cohort, Federal Institute for Population Research, Wiesbaden, Germany (Westerman); Institute of Health and Society, University of Oslo, Oslo, Norway (Winkler); Department of Neurology, Technical University of Munich, Munich, Germany (Winkler); Adelaide Medical School, University of Adelaide, Adelaide, South Australia, Australia (Yadav); Research and Development Division, The George Institute for Global Health, New Delhi, India (Yadav); Cancer Epidemiology and Prevention Research, Alberta Health Services, Calgary, British Columbia, Canada (Yang); Department of Oncology, University of Calgary, Calgary, Alberta, Canada (Yang); School of International Development and Global Studies, University of Ottawa, Ottawa, Ontario, Canada (Yaya); George Institute for Global Health, University of Oxford, Oxford, England (Yaya); Department of Pharmacy, Debre Tabor University, Debre Tabor, Ethiopia (Yazie); Department of Epidemiology and Biostatistics, University of Gondar, Gondar, Ethiopia (Yeshaw); Department of Neuropsychopharmacology, National Center of Neurology and Psychiatry, Kodaira, Japan (Yonemoto); Department of Public Health, Juntendo University, Tokyo, Japan (Yonemoto); Department of Health Policy and Management, Jackson State University, Jackson, Mississippi (Younis); School of Medicine, Tsinghua University, Beijing, China (Younis); Department of Environmental Health, Mazandaran University of Medical Sciences, Sari, Iran (Yousefi); Cancer Institute, Hacettepe University, Ankara, Turkey (Yuce); Department of Clinical Pharmacy and Outcomes Sciences, University of South Carolina, Columbia (Yunusa); Epidemiology and Cancer Registry Sector, Institute of Oncology Ljubljana, Ljubljana, Slovenia (Zadnik); Shahroud University of Medical Sciences, Shahroud, Iran (Zare); Laboratory of Genetics and Genomics, Moscow Research and Practical Centre on Addictions, Moscow, Russia (Zastrozhin); Addictology Department, Russian Medical Academy of Continuous Professional Education, Moscow, Russia (Zastrozhin); Pediatrics Department, Russian Medical Academy of Continuous Professional Education, Moscow, Russia (Zastrozhina); Department of General Practice, University of Melbourne, Melbourne, Victoria, Australia (Zhang); Victorian Comprehensive Cancer Centre, Melbourne, Victoria, Australia (Zhang); Bone Marrow Transplantation Center, Zhejiang University, Hangzhou, China (Zhou); Department of Epidemiology, Human Genetics, and Environmental Sciences, University of Texas Health Science Center at Houston, Houston (Zhu); Departamento de Saúde Coletiva, Brasília University, Brasilia, Brazil (Zimmermann); Division of Hematology, University of Washington, Seattle (Fitzmaurice); Division of Pediatric Hematology-Oncology, University of Washington, Seattle (Force).

Author Contributions: Drs Kocarnik and Force had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Drs Murray and Force are co–senior authors.
Concept and design: Kocarnik, Compton, Ababneh, Abbastabar, Abedi, Abidi, Adedeji, Almasi-Hashiani, Ansari-Moghaddam, Anvari, Anyasodor, Arab-Zozani, Azari Jafari, Azzam, Bärnighausen, Behzadifar, Bhaskar, Bisignano, Bleyer, Cembranel, Darwesh, M. L. Dhimal, Dianatinasab, Do, Faisaluddin, Fares, Gadanya, Gallus, Getachew Obsa, Ghashghaee, Golechha, Gutiérrez, Hafezi-Nejad, Hameed, S. Hay, Hezam, Househ, Isola, Jain, Javaheri, Jayaram, Kalhor, Kasa, M. A. Khan, Y. Kim, A. Kisa, S. Kisa, Kissimova-Skarbek, S. Lee, Leigh, Liu, Magdy Abd El Razek, Mansournia, Masoumi, Menezes, Mestrovic, M. Mohammadi, Mohammed, Moka, Mokdad, Naqvi, Narasimha Swamy, C. Nguyen, H. Nguyen, Niazi, Olagunju, Padubidri, Panagiotakos, Eun-Kee Park, Pashazadeh Kan, Podder, M. Rabiee, N. Rabiee, Rahmani, Ram, S. Rao, Rawassizadeh, Saeed, Samy, Sanabria, Sardiwalla, Sarveazad, Seylani, Shivakumar, Taherkhani, Touvier, B. Tran, Umapathi, Valadan Tahbaz, Volovici, Vu, Westerman, Yahyazadeh Jabbari, Yonemoto, Zare, Zastrozhin, Force.
Acquisition, analysis, or interpretation of data: Kocarnik, Dean, Fu, Gaw, Harvey, Henrikson, Lu, Pennini, Xu, Abbasi-Kangevari, Abd-Elsalam, Abdoli, Abedi, Abidi, Abolhassani, Adedeji, Adnani, Advani, Afzal, Aghaali, Ahinkorah, S. Ahmad, T. Ahmad, A. Ahmadi, S. Ahmadi, Ahmed Rashid, Ahmed Salih, Akalu, Aklilu, Akram, Akunna, Al Hamad, Alahdab, Al-Aly, Ali, Alimohamadi, Alipour, Aljunid, Alkhayyat, Almasi-Hashiani, Almasri, Al-Maweri, Almustanyir, Alonso, Alvis-Guzman, Amu, Anbesu, Ancuceanu, Ansari, Ansari-Moghaddam, Antwi, Anvari, Aqeel, Arabloo, Aremu, Ariffin, Aripov, Arshad, Artaman, Arulappan, Asemi, Asghari Jafarabadi, Ashraf, Atorkey, Aujayeb, Ausloos, Awedew, Ayala Quintanilla, Ayenew, Azab, Azadnajafabad, Azari Jafari, Azarian, Azzam, Badiye, Bahadory, Baig, Baker, Balakrishnan, Banach, Barone-Adesi, Barra, Barrow, Belgaumi, Bezabhe, Bezabih, Bhagat, Bhagavathula, N. Bhardwaj, P. Bhardwaj, Bhaskar, Bhattacharyya, Bhojaraja, Bibi, Bijani, Biondi, Bjørge, Bleyer, Blyuss, Bolarinwa, Bolla, Braithwaite, Brar, Brenner, Bustamante-Teixeira, N. Butt, Z. Butt, Caetano dos Santos, Cao, Carreras, Catalá-López, Cembranel, Cerin, Cernigliaro, Chakinala, S. Chattu, V. Chattu, Chaturvedi, Chimed-Ochir, Cho, Christopher, Chu, Chung, Conde, Cortés, Cortesi, Costa, Cunha, Dadras, Belachew, Dahlwai, Dai, L. Dandona, R. Dandona, das Neves, De la Hoz, Bizuneh, Denova-Gutiérrez, Dhamnetiya, M. L. Dhimal, M. Dhimal, Dianatinasab, Diaz, Djalalinia, Do, Doaei, Dorostkar, dos Santos Figueiredo, Driscoll, Ebrahimi, Eftekharzadeh, El Tantawi, El-Abid, Elbarazi, Elhabashy, Elhadi, El-Jaafary, Eshrati, Eskandarieh, Esmaeilzadeh, Etemadi, Ezzikouri, Faisaluddin, Faraon, Fares, Farzadfar, Feroze, Ferrero, Ferro Desideri, Filip, Fischer, Fisher, Foroutan, Fukumoto, Gaal, Gad, Gadanya, Gaspar Fonseca, Ghafourifard, Ghith, Gholamalizadeh, Gilani, Ginindza, Gizaw, Glasbey, Golechha, Goleij, Gomez, Gopalani, Gorini, Goudarzi, Grosso, Gubari, Ribeiro Guerra, Guha, Gunasekera, B. Gupta, V. Gupta, V. K. Gupta, Hafezi-Nejad, Haider, Haj-Mirzaian, Halwani, Hamadeh, Hamidi, Hanif, Haque, Harlianto, Haro, Hasaballah, Hassanipour, R. Hay, Hayat, G. Heidari, M. Heidari, Herrera-Serna, Herteliu, Hezam, Holla, M. Hossain, M. B. Hossain, Mohammad-Salar Hosseini, Mostafa Hosseini, Hosseinzadeh, M. Hostiuc, S. Hostiuc, Househ, Hsairi, Huang, Hugo, Hussain, Hussein, Hwang, Iavicoli, Ibitoye, Ida, Ikuta, Ilesanmi, I. Ilic, M. Ilic, Irham, J. Islam, R. Islam, S. Islam, Ismail, Iwagami, Jacob, Jain, Jakovljevic, Jazayeri, Jha, Jonas, Joo, Joseph, Joukar, Jürisson, Kabir, Kahrizi, Kalankesh, Kaliyadan, Kalkonde, Kamath, Kameran Al-Salihi, Kandel, Kapoor, Karch, Katikireddi, Kauppila, Kavetskyy, Kebede, Keshavarz, Keykhaei, Khader, Khalilov, G. Khan, Maseer Khan, Md Nuruzzaman Khan, Khang, Khater, Khayamzadeh, G. Kim, A. Kisa, S. Kisa, Kissimova-Skarbek, Kopec, Koteeswaran, Koul, Koulmane Laxminarayana, Koyanagi, Kucuk Bicer, Kugbey, G. Kumar, Narinder Kumar, Nithin Kumar, Kurmi, Kutluk, La Vecchia, Lami, Landires, Lauriola, S. Lee, S. W. Lee, W. Lee, Y. Lee, Leigh, Leong, J. Li, M. Li, Loureiro, Lunevicius, Magdy Abd El Razek, Majeed, Makki, Male, Malik, Mansournia, Martini, Mathur, McKee, Mehrotra, Mendoza, Mengesha, Mesregah, Miao Jonasson, B. Miazgowski, T. Miazgowski, Michalek, Miller, Hamed Mirzaei, Hamid Reza Mirzaei, Misra, Mithra, Moghadaszadeh, K. Mohammad, Y. Mohammad, S. Mohammadi, Mohammadian-Hafshejani, Mohammed, Moka, Molokhia, Monasta, Moni, Moosavi, Moradi, Moraga, Morgado-da-Costa, Morrison, Mosapour, Mubarik, Mwanri, Nagarajan, Nagaraju, Nagata, Naimzada, Nangia, Ndejjo, Nduaguba, Negoi, Negru, Neupane Kandel, C. Nguyen, H. Nguyen, Niazi, Nnaji, Noor, Nuñez-Samudio, Nzoputam, Oancea, Ochir, Odukoya, Ogbo, Olagunju, Olakunde, Omar, Omar Bali, Omonisi, Ong, Onwujekwe, Orru, Ortega-Altamirano, N. Otstavnov, S. Otstavnov, Owolabi, P A, Padubidri, Pakshir, Pana, Panda-Jonas, Pardhan, Eun-Cheol Park, Pashazadeh Kan, H. Patel, J. Patel, Pati, Pattanshetty, Paudel, D. Pereira, R. Pereira, Perianayagam, Pillay, Pirouzpanah, Pishgar, Postma, Pourjafar, Prashant, Preotescu, M. Rabiee, N. Rabiee, Radfar, R. Radhakrishnan, V. Radhakrishnan, Rafiee, Rahim, Rahimzadeh, Mosiur Rahman, Muhammad Aziz Rahman, Rahmani, Rajai, Rajesh, Rakovac, Ram, Ramezanzadeh, Ranabhat, Ranasinghe, C. Rao, S. Rao, Rawassizadeh, Razeghinia, Renzaho, Negar Rezaei, Nima Rezaei, Rezapour, Roberts, Rodriguez, Rohloff, Romoli, Ronfani, Roshandel, Rwegerera, S, Sabour, Saddik, Saeed, Sahebkar, Sahoo, Salehi, Salem, Salimzadeh, Samaei, Samy, Sankararaman, Santric Milicevic, Sathian, Sawhney, Saylan, Schneider, Sekerija, Seylani, Shafaat, Shaghaghi, Shaikh, Shamsoddin, Shannawaz, Sharma, Sheikh, Sheikhbahaei, A. Shetty, J. Shetty, P. Shetty, Shibuya, Shirkoohi, Shivakumar, Shivarov, Siabani, Siddappa Malleshappa, Silva, Singh, Sintayehu, Skryabin, Skryabina, Soeberg, Sofi-Mahmudi, Sotoudeh, Steiropoulos, Straif, Subedi, Sufiyan, Sultan, Sultana, Sur, Szerencsés, Szócska, Tabares-Seisdedos, Tabuchi, Tadbiri, Takahashi, Talaat, Tan, Tat, Tedla, Tefera, Tehrani-Banihashemi, Temsah, Tesfay, Tessema, Thapar, Thavamani, Thoguluva Chandrasekar, Thomas, Tohidinik, Touvier, Tovani-Palone, Traini, B. Tran, K. Tran, M. Tran, Tripathy, Tusa, I. Ullah, S. Ullah, Umapathi,

Unnikrishnan, Upadhyay, Vacante, Vaezi, Valadan Tahbaz, Velazquez, Veroux, Violante, Vlassov, Vo, Volovici, Vu, Waheed, Wamai, Ward, Wen, Westerman, Winkler, Yadav, Yahyazadeh Jabbari, Yang, Yaya, Yazie, Yeshaw, Yonemoto, Younis, Yousefi, Yu, Yuce, Yunusa, Zadnik, Zastrozhin, Zastrozhina, Zhang, Zhong, Zhou, Zhu, Ziapour, Zimmermann, Fitzmaurice, Murray, Force.
Drafting of the manuscript: Kocarnik, Compton, Lu, Pennini, Xu, Abedi, Adedeji, S. Ahmadi, Ahmed Rashid, Almasi-Hashiani, Ansari, Anvari, Aripov, Aujayeb, Azab, Azzam, Bleyer, Cembranel, Chakinala, V. Chattu, Cortés, Denova-Gutiérrez, M. Dhimal, Dianatinasab, Do, Elhadi, Faisaluddin, Fares, Gad, Gadanya, Ghashghaee, Glasbey, Hafezi-Nejad, S. Hay, G. Heidari, Househ, Huang, Hussein, J. Islam, Isola, Jain, Kasa, Kavetskyy, Keshavarz, Khalilov, Khater, A. Kisa, S. Kisa, Magdy Abd El Razek, Malik, Mansournia, Masoumi, Moghadaszadeh, K. Mohammad, Mohammed, Moka, Mokdad, H. Nguyen, N. Otstavnov, Pashazadeh Kan, Pati, Pourjafar, Preotescu, M. Rabiee, Rahim, Rahmani, Rajai, Ram, S. Rao, Rodriguez, Samy, Sanabria, Seylani, Shamsoddin, Sharma, Taherkhani, Vaezi, Valadan Tahbaz, Vo, Vu, Westerman, Yahyazadeh Jabbari, Zastrozhin, Zastrozhina, Force.
Critical revision of the manuscript for important intellectual content: Kocarnik, Dean, Fu, Gaw, Harvey, Henrikson, Ababneh, Abbasi-Kangevari, Abbastabar, Abd-Elsalam, Abdoli, Abedi, Abidi, Abolhassani, Adedeji, Adnani, Advani, Afzal, Aghaali, Ahinkorah, S. Ahmad, T. Ahmad, A. Ahmadi, Ahmed Salih, Akalu, Aklilu, Akram, Akunna, Al Hamad, Alahdab, Al-Aly, Ali, Alimohamadi, Alipour, Aljunid, Alkhayyat, Almasi-Hashiani, Almasri, Al-Maweri, Almustanyir, Alonso, Alvis-Guzman, Amu, Anbesu, Ancuceanu, Ansari-Moghaddam, Antwi, Anvari, Anyasodor, Aqeel, Arabloo, Arab-Zozani, Aremu, Ariffin, Aripov, Arshad, Artaman, Arulappan, Asemi, Asghari Jafarabadi, Ashraf, Atorkey, Aujayeb, Ausloos, Awedew, Ayala Quintanilla, Ayenew, Azadnajafabad, Azari Jafari, Azarian, Azzam, Badiye, Bahadory, Baig, Baker, Balakrishnan, Banach, Bärnighausen, Barone-Adesi, Barra, Barrow, Behzadifar, Belachew, Belgaumi, Bezabhe, Bezabih, Bhagat, Bhagavathula, N. Bhardwaj, P. Bhardwaj, Bhaskar, Bhattacharyya, Bhojaraja, Bibi, Bijani, Biondi, Bisignano, Bjørge, Bleyer, Blyuss, Bolarinwa, Bolla, Braithwaite, Brar, Brenner, Bustamante-Teixeira, N. Butt, Z. Butt, Caetano dos Santos, Cao, Carreras, Catalá-López, Cembranel, Cerin, Cernigliaro, Chakinala, S. Chattu, V. Chattu, Chaturvedi, Chimed-Ochir, Cho, Christopher, Chu, Chung, Conde, Cortesi, Costa, Cunha, Dadras, Belachew, Dahlwai, Dai, L. Dandona, R. Dandona, Darwesh, das Neves, De la Hoz, Bizuneh, Denova-Gutiérrez, Dhamnetiya, M. L. Dhimal, M. Dhimal, Dianatinasab, Diaz, Djalalinia, Do, Doaei, Dorostkar, dos Santos Figueiredo, Driscoll, Ebrahimi, Eftekharzadeh, El Tantawi, El-Abid, Elbarazi, Elhabashy, Elhadi, El-Jaafary, Eshrati, Eskandarieh, Esmaeilzadeh, Etemadi, Ezzikouri, Faisaluddin, Faraon, Fares, Farzadfar, Feroze, Ferrero, Ferro Desideri, Filip, Fischer, Fisher, Foroutan, Fukumoto, Gaal, Gadanya, Gallus, Gaspar Fonseca, Getachew Obsa, Ghafourifard, Ghith, Gholamalizadeh, Gilani, Ginindza, Gizaw, Glasbey, Golechha, Goleij, Gomez, Gopalani, Gorini, Goudarzi, Grosso, Gubari, Ribeiro Guerra, Guha, Gunasekera, B. Gupta, V. Gupta, V. K. Gupta, Gutiérrez, Hafezi-Nejad, Haider, Haj-Mirzaian, Halwani, Hamadeh, Hameed, Hamidi, Hanif, Haque, Harlianto, Haro, Hasaballah, Hassanipour, R. Hay, S. Hay, Hayat, G. Heidari, M. Heidari, Herrera-Serna, Herteliu, Hezam, Holla, M. Hossain, M. B. Hossain, Mohammad-Salar Hosseini, Mostafa Hosseini, Hosseinzadeh, M. Hostiuc, S. Hostiuc, Hsairi, Hugo, Hussain, Hussein, Hwang, Iavicoli, Ibitoye, Ida, Ikuta, Ilesanmi, I. Ilic, M. Ilic, Irham, J. Islam, R. Islam, S. Islam, Ismail, Isola, Iwagami, Jacob, Jain, Jakovljevic, Javaheri, Jayaram, Jazayeri, Jha, Jonas, Joo, Joseph, Joukar, Jürisson, Kabir, Kahrizi, Kalankesh, Kalhor, Kaliyadan, Kalkonde, Kamath, Kameran Al-Salihi, Kandel, Kapoor, Karch, Kasa, Katikireddi, Kauppila, Kavetskyy, Kebede, Keshavarz, Keykhaei, Khader, Khalilov, G. Khan, Maseer Khan, Md Nuruzzaman Khan, M. A. Khan, Khang, Khater, Khayamzadeh, G. Kim, Y. Kim, A. Kisa, S. Kisa, Kissimova-Skarbek, Kopec, Koteeswaran, Koul, Koulmane Laxminarayana, Koyanagi, Kucuk Bicer, Kugbey, G. Kumar, Narinder Kumar, Nithin Kumar, Kurmi, Kutluk, La Vecchia, Lami, Landires, Lauriola, S. Lee, S. W. Lee, W. Lee, Y. Lee, Leigh, Leong, J. Li, M. Li, Liu, Loureiro, Lunevicius, Magdy Abd El Razek, Majeed, Makki, Male, Malik, Martini, Mathur, McKee, Mehrotra, Mendoza, Menezes, Mengesha, Mesregah, Mestrovic, Miao Jonasson, B. Miazgowski, T. Miazgowski, Michalek, Miller, Hamed Mirzaei, Hamid Reza Mirzaei, Misra, Mithra, Y. Mohammad, M. Mohammadi, S. Mohammadi, Mohammadian-Hafshejani, Mohammed, Moka, Mokdad, Molokhia, Monasta, Moni, Moosavi, Moradi, Moraga, Morgado-da-Costa, Morrison, Mosapour, Mubarik, Mwanri, Nagarajan, Nagaraju, Nagata, Naimzada, Nangia, Naqvi, Narasimha Swamy, Ndejjo, Nduaguba, Negoi, Negru, Neupane Kandel, C. Nguyen, H. Nguyen, Niazi, Nnaji, Noor, Nuñez-Samudio, Nzoputam, Oancea, Ochir, Odukoya, Ogbo, Olagunju, Olakunde, Omar, Omar Bali, Omonisi, Ong, Onwujekwe, Orru, Ortega-Altamirano, N. Otstavnov, S. Otstavnov, Owolabi, P A, Padubidri, Pakshir, Pana, Panagiotakos, Panda-Jonas, Pardhan, Eun-Cheol Park, Eun-Kee Park, H. Patel, J. Patel, Pattanshetty, Paudel, D. Pereira, R. Pereira, Perianayagam, Pillay, Pirouzpanah, Pishgar, Podder, Postma, Prashant, M. Rabiee, N. Rabiee, Radfar, R. Radhakrishnan, V. Radhakrishnan, Rafiee, Rahim, Rahimzadeh, Mosiur Rahman, Muhammad Aziz Rahman, Rahmani, Rajai, Rajesh, Rakovac, Ram, Ramezanzadeh, Ranabhat, Ranasinghe, C. Rao, S. Rao, Rawassizadeh, Razeghinia, Renzaho, Negar Rezaei, Nima Rezaei, Rezapour, Roberts, Rodriguez, Rohloff, Romoli, Ronfani, Roshandel, Rwegerera, S, Sabour, Saddik, Saeed, Sahebkar, Sahoo, Salehi, Salem, Salimzadeh, Samaei, Samy, Sanabria, Sankararaman, Santric Milicevic, Sardiwalla, Sarveazad, Sathian, Sawhney, Saylan, Schneider, Sekerija, Seylani, Shafaat, Shaghaghi, Shaikh, Shamsoddin, Shannawaz, Sharma, Sheikh, Sheikhbahaei, A. Shetty, J. Shetty, P. Shetty, Shibuya, Shirkoohi, Shivakumar, Shivarov, Siabani, Siddappa Malleshappa, Silva, Singh, Sintayehu, Skryabin, Skryabina, Soeberg, Sofi-Mahmudi, Sotoudeh, Steiropoulos, Straif, Subedi, Sufiyan, Sultan, Sultana, Sur, Szerencsés, Szócska, Tabares-Seisdedos, Tabuchi, Tadbiri, Takahashi, Talaat, Tan, Tat, Tedla, Tefera, Tehrani-Banihashemi, Temsah, Tesfay, Tessema, Thapar, Thavamani, Thoguluva Chandrasekar, Thomas, Tohidinik, Touvier, Tovani-Palone, Traini, B. Tran, K. Tran, M. Tran, Tripathy, Tusa, I. Ullah, S. Ullah, Umapathi, Unnikrishnan, Upadhyay, Vacante, Valadan Tahbaz, Velazquez, Veroux, Violante, Vlassov, Vo, Volovici, Vu, Waheed, Wamai, Ward, Wen, Westerman, Winkler, Yadav, Yahyazadeh Jabbari, Yang, Yaya, Yazie, Yeshaw, Yonemoto, Younis, Yousefi, Yu, Yuce, Yunusa, Zadnik, Zare, Zastrozhin, Zastrozhina, Z. Butt, Zhang, Zhong, Zhou, Zhu, Ziapour, Zimmermann, Fitzmaurice, Murray, Force.
Statistical analysis: Kocarnik, Dean, Fu, Harvey, Henrikson, Lu, Pennini, Xu, Advani, Ahmed Rashid, Ahmed Salih, Aklilu, Akram, Al Hamad, Ali, Aljunid, Almasi-Hashiani, Almustanyir, Ansari-Moghaddam, Anvari, Aremu, Asghari Jafarabadi, Ashraf, Ausloos, Azzam, Bärnighausen, Bezabhe, Bezabih, Bleyer, Blyuss, Bolarinwa, Braithwaite, Brar, N. Butt, Cernigliaro, Chakinala, S. Chattu, V. Chattu, Dai, Darwesh, Bizuneh, Dianatinasab, Diaz, Do, Ebrahimi, Etemadi, Gad, Gadanya, Gilani, Glasbey, Gopalani, Goudarzi, B. Gupta, Haj-Mirzaian, Halwani, Herteliu, Hezam, M. B. Hossain, Househ, Hussain, Ikuta, Ismail, Javaheri, Joseph, Kalhor, Kameran Al-Salihi, Kandel, Karch, Keshavarz, Koyanagi, Kugbey, S. Lee, Leong, Liu, Magdy Abd El Razek, Makki, Mansournia, M. Mohammadi, Mohammed, Mokdad, Moradi, Mubarik, Naimzada, Negoi, Neupane Kandel, C. Nguyen, H. Nguyen, Niazi, Olagunju, Omar, Pashazadeh Kan, Paudel, D. Pereira, Postma, Preotescu, Rahmani, Rajai, Ramezanzadeh, S. Rao, Rawassizadeh, Salehi, Samaei, Samy, Sathian, Sur, Tadbiri, M. Tran, Valadan Tahbaz, Velazquez, Vlassov, Vo, Volovici, Vu, Yeshaw, Younis, Yu, Zare, Zastrozhin, Ziapour, Fitzmaurice, Murray, Force.
Obtained funding: Mokdad, Pashazadeh Kan, Samy, Force.
Administrative, technical, or material support: Kocarnik, Compton, Gaw, Pennini, Abolhassani, Adedeji, Adnani, Aghaali, A. Ahmadi, Akunna, Alipour, Aljunid, Almasi-Hashiani, Amu, Arabloo, Arab-Zozani, Aujayeb, Ayala Quintanilla, Azab, Baig, Barrow, Behzadifar, Bhagat, Bibi, Caetano dos Santos, Catalá-López, V. Chattu, Chaturvedi, Chu, Dadras, L. Dandona, R. Dandona, M. Dhimal, Dianatinasab, Djalalinia, Doaei, Eshrati, Eskandarieh, Ezzikouri, Faisaluddin, Farzadfar, Foroutan, Fukumoto, Gadanya, Ghafourifard, Ghashghaee, Golechha, Hamidi, Hanif, Hasaballah, R. Hay, S. Hay, Hayat, M. Hossain, Hosseinzadeh, Hugo, Hussein, Ibitoye, R. Islam, Jayaram, Jonas, Kahrizi, Kalankesh, Kasa, Kavetskyy, Khader, Khalilov, M. A. Khan, A. Kisa, S. Kisa, G. Kumar, S. W. Lee, Leigh, M. Li, Magdy Abd El Razek, Male, Mansournia, Mehrotra, Menezes, Mengesha, Michalek, Mohammadian-Hafshejani, Mohammed, Moka, Mokdad, Narasimha Swamy, Nnaji, Nzoputam, Ogbo, Olagunju, Omonisi, Ong, P A, Panda-Jonas, Pardhan, J. Patel, D. Pereira, Perianayagam, Pirouzpanah, Preotescu, M. Rabiee, N. Rabiee, Rahim, Rajesh, Nima Rezaei, Rezapour, Sabour, Saddik, Saeed, Sahoo, Salem, Samy, Sanabria, Sawhney, Shafaat, Shaghaghi, Shannawaz, Shibuya, Shivakumar, Silva, Soeberg, Tabares-Seisdedos, Tabuchi, Tan, Tat, Tedla, Tessema, Thavamani, B. Tran, I. Ullah, S. Ullah, Unnikrishnan, Valadan Tahbaz, Vlassov, Waheed, Yaya, Yunusa, Zhou, Murray, Force.
Supervision: Kocarnik, Compton, Abbastabar, Abd-Elsalam, Abedi, Adnani, Akalu, Amu, Azab, Azzam, Banach, Bärnighausen, Barra, Bleyer, Caetano dos Santos, Cernigliaro, Djalalinia, dos Santos Figueiredo, Ferrero, Ferro Desideri, Fukumoto, Gaal, Gallus, Ghashghaee, S. Hay, M. Hostiuc, Irham, Isola, Jakovljevic, Joo, Kavetskyy, Keshavarz, Keykhaei, Khalilov, Maseer

Khan, Y. Kim, Kutluk, W. Lee, Y. Lee, Magdy Abd El Razek, Majeed, Malik, Mansournia, T. Miazgowski, Michalek, S. Mohammadi, Mokdad, Omonisi, Panagiotakos, M. Rabiee, N. Rabiee, Nima Rezaei, Rodriguez, Saeed, Sahoo, Samy, Sardiwalla, Schneider, P. Shetty, Silva, Skryabin, Skryabina, Sur, Szerencsés, Szócska, Tan, Tripathy, I. Ullah, Valadan Tahbaz, Veroux, Westerman, Yahyazadeh Jabbari, Yang, Zastrozhin, Zastrozhina, Murray, Force.

Conflict of Interest Disclosures: Dr Kocarnik reported grants from the Bill and Melinda Gates Foundation and American Lebanese Syrian Associated Charities as well as nonfinancial support from the Institute for Health Metrics and Evaluation during the conduct of the study. Drs Lu, Xu, Bisignano, Compton, Dean, Fu, Mohammed, and Henrikson reported grants from the Bill and Melinda Gates Foundation during the conduct of the study. Dr Ancuceanu reported personal fees and nonfinancial support from AbbVie; personal fees from Sandoz and B. Braun; and consulting/speaking fees from UCB, Sandoz, AbbVie, Zentiva, Teva, Laropharm, CEGEDIM, Angelini, B. Braun, Biessen Pharma, Hofigal, AstraZeneca, and Stada. Dr Atorkey received research support from Hunter Medical Research Research Institute. Dr Bhaskar reported grants from the NSW Ministry of Health NSW Brain Clot Bank outside the submitted work and serving on the board of directors for the Rotary Club of Sydney and International Rotary Fellowship of Healthcare Professionals. Dr Conde reported being a cofounder of and shareholder in TargTex S.A. Dr Dai reported grants from the Bill & Melinda Gates Foundation and Bloomberg Philanthropies. Dr Filip reported financial support from Avicenna Medical and Clinical Research Institute. Dr Ghith reported grants from NovoNordisk Foundation outside the submitted work. Dr Haro reported research support from Eli Lilly and Co. Dr J. Islam reported grants from the American Society of Clinical Oncology outside the submitted work. Dr S. Islam reported grants from NHMRC Emerging Leadership Fellowship and the National Heart Foundation of Australia Fellowship and Vanguard Grant outside the submitted work. Dr Ismail reported being a council member of the Malaysian Academy of Pharmacy. Dr Katikireddi reported grants from the Medical Research Council and the Scottish government Chief Scientist Office during the conduct of the study as well as being a member of the steering group for Obesity Action Scotland. Dr Kauppila reported grants from the Finnish Cancer Foundation, Sigrid Juselius Foundation, and Päivikki and Sakari Sohlberg Foundation outside the submitted work. Dr Loureiro reported grants from FCT Scientific and Norte Portugal Regional Operational Programme through the European Regional Development Fund outside the submitted work. Dr Moni reported grants from the University of Queensland during the conduct of the study. Dr Radfar reported financial support from Avicenna Medical and the Clinical Research Institute. Dr Rakovac reported grants from the World Health Organization during the conduct of the study. Dr Saylan reported being an employee of Bayer. Dr Sekerija reported personal fees from Roche and Johnson & Johnson outside the submitted work. Dr Sheikh reported grants from Health Data Research UK outside the submitted work. Dr Singh reported consulting fees from Crealta/Horizon, Navigant, Spherix, MedIQ, Jupiter Life Science, UBM LLC, Trio Health, Medscape, WebMD, Practice Point, National Institutes of Health, American College of Rheumatology, Medisys, Fidia, PK Med, Adept Field Solutions, Two Labs Inc, Clinical Care Options, Clearview Healthcare Partners, Putnam Associates, and Focus Forward; stock options in TPT Global Tech, Vaxart, Atyu, Adaptimmune Therapeutics, GeoVax Labs, Pieris Pharmaceuticals, and Charlotte's Web Holdings, Inc; nonfinancial support from Outcomes Measures in Rheumatology; service on the US Food and Drug Administration arthritis advisory committee, American College of Rheumatology's annual meeting planning committee and quality of care committees and as chair of the Veterans Affairs Rheumatology Field Advisory Committee and American College of Rheumatology Meet-the-Professor, Workshop and Study Group subcommittee and Criteria and Response Criteria subcommittee (cochair); and being the editor and director of the University of Alabama at Birmingham Cochrane Musculoskeletal Group Satellite Center on Network Meta-analysis. Dr Zhu reported grants from the UTHealth Innovation for Cancer Prevention Research Training Program Predoctoral Fellowship. Dr Force reported grants from the Bill and Melinda Gates Foundation and St. Baldrick's Foundation, financial support from the National Institutes of Health Loan Repayment Award, and research support from the American Lebanese Syrian Associated Charities. Dr Aujayeb reports grants, honoraria, and personal fees from Rocket Medical PLC outside the submitted work. Dr Ausloos reports grants from the Romanian National Authority for Scientific Research and Innovation outside the submitted work. Dr Bärnighausen reports grants from the European Union, German Research Foundation, National Institutes of Health, German Ministry of Education and Research, Alexander von Humboldt Foundation, Else-Kröner-Fresenius-Foundation, Wellcome Trust, Bill and Melinda Gates Foundation, KfW, UNAIDS, and World Health Organization; consulting fees from KfW; board participation in the National Institutes of Health's Healthy Options study, German National Committee, EDCTP Evaluation, Global Health Hub Germany, and University of Pennsylvania Population Aging Research Center; and service as a member of the UNAIDS Evaluation Expert Advisory Committee, National Institutes of Health Study Section on Population and Public Health Approaches to HIV/AIDS, and the US National Academies of Sciences, Engineering, and Medicine Committee for the Evaluation of Human Resources for Health in the Republic of Rwanda under the President's Emergency Plan for AIDS Relief outside the submitted work. Dr Bhagat reports personal fees from Elsevier and Springer outside the submitted work. Dr Bleyer reports royalties or licenses from Springer Publishing, Germany; consulting fees from Slack Publishing, and expert testimony with Bradley Drendel & Jeanney outside the submitted work. Dr Braithwaite reports research support from the National Institutes of Health/National Cancer Institute. Dr Catalá-López reports board service with the International Agency for Research on Cancer outside the submitted work. Dr Chaturvedi reports grants from the National Institutes of Health and government of India outside the submitted work. Dr Cortés reports research support from the Advanced Center for Chronic Diseases and Centro de Desarrollo Urbano Sustentable (Agencia Nacional de Investigación y Desarrollo Chile. Dr Driscoll reports expert testimony in 2019 and board membership with the Expert Advisory Group of the Australian Mesothelioma Registry outside the submitted work. Dr El-Jaafary reports service on the steering committee of the Movement Disorder Society Young Members group. Dr Grosso reports research support from the University of Catania Osservatorio Epidemiologico Regionale and University of Catania and grants from the Italian Ministry of Health outside the submitted work. Dr Guha reports grants from the the American Heart Association. Dr Gunasekera reports service as an assistant secretary for Sri Lanka College of Oncology outside the submitted work. Dr Gupta reports grants from the National Health and Medical Research Council, Australia outside the submitted work. Dr Haider reports research support from Ohio University and board service for the American Public Health Association outside the submitted work. Dr Herteliu reports grants from the Romanian National Authority for Scientific Research and Innovation and Ministry of Labour and Social Justice, Romania outside the submitted work. Dr Hugo reports research support from CAPES Higher Education Improvement Coordination Brazil. Dr Kahrizi reports research support, grants, royalties/licenses, consulting fees, honoraria, expert testimony, patents (planned, issued, or pending), board service, and stock and stock options from Razi University outside the submitted work. Dr G. Khan reports membership with the UAE Ministry of Health National Immunization Task Advisory Group. Dr Koul reports research support from Sheri Kashmir Institute of Medical Sciences. Dr La Vecchia reports grants or contracts from Associazione Italiana per la Ricerca sul Cancro outside the submitted work. Dr Miller reports grants from AB InBev Foundation outside the submitted work. Dr Odukoya reports grants from the National Institutes of Health. Dr Pana reports grants from the Romanian National Authority for Scientific Research and Innovation outside the submitted word. Dr Panagiotakos reports research support from the Hellenic Cardiology Society and Hellenic Atherosclerosis Society. Dr Sanabria reports research support from the Bill and Melinda Gates Foundation, patents with their institution and board service for the Department and Surgical Services Lines outside the submitted work. Dr Silva reports research support from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior–Brasil and CNPq. Dr Straif reports board service with the Collegium Ramazzini and ISEE Europe Chapter as an elected member and nonfinancial support from the International Agency for Research on Cancer outside the submitted work. Dr Volovici reports personal fees from *JAMA Network Open*. Dr Yazie reports research support from the Bill and Melinda Gates Foundation, American Lebanese Syrian Associated Charities, and St. Baldrick's Foundation. Dr Younis reports research support from Jackson State University. No other disclosures were reported.

Funding/Support: The Institute for Health Metrics and Evaluation received funding from the Bill & Melinda Gates Foundation and the American Lebanese Syrian Associated Charities. Dr Aljunid acknowledges the Department of Health Policy and Management of Kuwait University and the International Centre for Casemix and Clinical Coding, National University of Malaysia for the approval and support to participate in this research project. Dr Bhaskar acknowledges institutional

support from the NSW Ministry of Health and NSW Health Pathology. Dr Bärnighausen was supported by the Alexander von Humboldt Foundation through the Alexander von Humboldt Professor award, which is funded by the German Federal Ministry of Education and Research. Dr Braithwaite acknowledges funding from the National Institutes of Health/ National Cancer Institute. Dr Conde acknowledges financial support from the European Research Council ERC Starting Grant agreement No 848325. Dr Costa acknowledges her grant (SFRH/BHD/110001/2015), received by Portuguese national funds through Fundação para a Ciência e Tecnologia, IP under the Norma Transitória grant DL57/2016/CP1334/CT0006. Dr Ghith acknowledges support from a grant from Novo Nordisk Foundation (NNF16OC0021856). Dr Glasbey is supported by a National Institute of Health Research Doctoral Research Fellowship. Dr Vivek Kumar Gupta acknowledges funding support from National Health and Medical Research Council Australia. Dr Haque thanks Jazan University, Saudi Arabia for providing access to the Saudi Digital Library for this research study. Drs Herteliu, Pana, and Ausloos are partially supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNDS-UEFISCDI, project number PN-III-P4-ID-PCCF-2016-0084. Dr Hugo received support from the Higher Education Improvement Coordination of the Brazilian Ministry of Education for a sabbatical period at the Institute for Health Metrics and Evaluation, between September 2019 and August 2020. Dr Sheikh Mohammed Shariful Islam acknowledges funding by a National Heart Foundation of Australia Fellowship and National Health and Medical Research Council Emerging Leadership Fellowship. Dr Jakovljevic acknowledges support through grant OI 175014 of the Ministry of Education Science and Technological Development of the Republic of Serbia. Dr Katikireddi acknowledges funding from a NHS Research Scotland Senior Clinical Fellowship (SCAF/15/02), the Medical Research Council (MC_UU_00022/2), and the Scottish Government Chief Scientist Office (SPHSU17). Dr Md Nuruzzaman Khan acknowledges the support of Jatiya Kabi Kazi Nazrul Islam University, Bangladesh. Dr Yun Jin Kim was supported by the Research Management Centre, Xiamen University Malaysia (XMUMRF/2020-C6/ITCM/0004). Dr Koulmane Laxminarayana acknowledges institutional support from Manipal Academy of Higher Education. Dr Landires is a member of the Sistema Nacional de Investigación, which is supported by Panama's Secretaría Nacional de Ciencia, Tecnología e Innovación. Dr Loureiro was supported by national funds through Fundação para a Ciência e Tecnologia under the Scientific Employment Stimulus–Institutional Call (CEECINST/00049/2018). Dr Molokhia is supported by the National Institute for Health Research Biomedical Research Center at Guy's and St Thomas' National Health Service Foundation Trust and King's College London. Dr Moosavi appreciates NIGEB's support. Dr Pati acknowledges support from the SIAN Institute, Association for Biodiversity Conservation & Research. Dr Rakovac acknowledges a grant from the government of the Russian Federation in the context of World Health Organization Noncommunicable Diseases Office. Dr Samy was supported by a fellowship from the Egyptian Fulbright Mission Program. Dr Sheikh acknowledges support from Health Data Research UK. Drs Adithi Shetty and Unnikrishnan acknowledge support given by Kasturba Medical College, Mangalore, Manipal Academy of Higher Education. Dr Pavanchand H. Shetty acknowledges Manipal Academy of Higher Education for their research support. Dr Diego Augusto Santos Silva was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil Finance Code 001 and is supported in part by CNPq (302028/2018-8). Dr Zhu acknowledges the Cancer Prevention and Research Institute of Texas grant RP210042.

Role of the Funder/Sponsor: The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the Cancer Prevention and Research Institute of Texas.

Additional Contributions: We thank the many cancer registries around the world that worked to generate data on cancer burden.

Additional Information: Information about individual author contributions to the research is detailed in the eAppendix in the Supplement.

REFERENCES

1. Foreman KJ, Marquez N, Dolgert A, et al. Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016-40 for 195 countries and territories. *Lancet*. 2018;392(10159):2052-2090. doi:10.1016/S0140-6736(18)31694-5

2. Bray F, Jemal A, Grey N, Ferlay J, Forman D. Global cancer transitions according to the Human Development Index (2008-2030): a population-based study. *Lancet Oncol*. 2012;13(8):790-801. doi:10.1016/S1470-2045(12)70211-5

3. International Agency for Research on Cancer. World cancer report: cancer research for cancer prevention. Accessed March 1, 2021. https://publications.iarc.fr/Non-Series-Publications/World-Cancer-Reports/World-Cancer-Report-Cancer-Research-For-Cancer-Prevention-2020

4. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 71(3):209-249. doi:10.3322/caac.21660

5. United Nations. Sustainable development goals. Accessed March 3, 2021. https://sdgs.un.org

6. NCD Countdown 2030 Collaborators. NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards sustainable development goal target 3.4. *Lancet*. 2018;392(10152):1072-1088. doi:10.1016/S0140-6736(18)31992-5

7. NCD Countdown 2030 Collaborators. NCD Countdown 2030: pathways to achieving sustainable development goal target 3.4. *Lancet*. 2020;396(10255):918-934. doi:10.1016/S0140-6736(20)31761-X

8. Kuderer NM, Choueiri TK, Shah DP, et al; COVID-19 and Cancer Consortium. Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study. *Lancet*. 2020;395(10241):1907-1918. doi:10.1016/S0140-6736(20)31187-9

9. Maringe C, Spicer J, Morris M, et al. The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study. *Lancet Oncol*. 2020;21(8):1023-1034. doi:10.1016/S1470-2045(20)30388-0

10. Sharpless NE. COVID-19 and cancer. *Science*. 2020;368(6497):1290. doi:10.1126/science.abd3377

11. Addai BW, Ngwa W. COVID-19 and cancer in Africa. *Science*. 2021;371(6524):25-27. doi:10.1126/science.abd1016

12. Sato Y, Fujiwara Y, Fukuda N, et al; COVID-19 Working Group of The Cancer Institute Hospital of Japanese Foundation for Cancer Research. Changes in treatment behavior during the COVID-19 pandemic among patients at a cancer hospital. *Cancer Cell*. 2021;39(2):130-131. doi:10.1016/j.ccell.2021.01.002

13. General Assembly of the United Nations. Prevention and control of non-communicable diseases. Accessed July 1, 2021. https://www.un.org/pga/72/event-latest/prevention-of-non-communicable-diseases/

14. United Nations. Resolution adopted by the General Assembly on 10 October 2019. Accessed March 3, 2021. https://undocs.org/en/A/RES/74/2

15. United Nations. The UN high-level meeting on universal health coverage. Accessed March 3, 2021. https://www.uhc2030.org/un-hlm-2019/

16. Anderson BO, Ilbawi AM, Fidarova E, et al. The Global Breast Cancer Initiative: a strategic collaboration to strengthen health care for non-communicable diseases. *Lancet Oncol*. 2021;22(5):578-581. doi:10.1016/S1470-2045(21)00071-1

17. World Health Organization. Global strategy to accelerate the elimination of cervical cancer as a public health problem. Accessed February 16, 2021. https://www.who.int/publications-detail-redirect/9789240014107

18. World Health Organization. Global initiative for childhood cancer. Accessed July 1, 2021. https://www.who.int/publications/m/item/global-initiative-for-childhood-cancer

19. Bray F, Colombet M, Mery L, et al. Cancer incidence in five continents. vol XI (electronic version). Accessed March 1, 2021. https://ci5.iarc.fr

20. Vos T, Lim SS, Abbafati C, et al; GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204-1222. doi:10.1016/S0140-6736(20)30925-9

21. Wang H, Abbas KM, Abbasifard M, et al; GBD 2019 Demographics Collaborators. Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950-2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1160-1203. doi:10.1016/S0140-6736(20)30977-6

22. Fitzmaurice C, Abate D, Abbasi N, et al; Global Burden of Disease Cancer Collaboration. Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 29 cancer groups, 1990 to 2017: a systematic analysis for the Global Burden of Disease Study. *JAMA Oncol*. 2019;5(12):1749-1768. doi:10.1001/jamaoncol.2019.2996

23. Fitzmaurice C, Akinyemiju TF, Al Lami FH, et al; Global Burden of Disease Cancer Collaboration. Global, regional, and national cancer incidence,

mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 29 cancer groups, 1990 to 2016: a systematic analysis for the Global Burden of Disease Study. *JAMA Oncol*. 2018;4(11):1553-1568. doi:10.1001/jamaoncol.2018.2706

24. Fitzmaurice C, Allen C, Barber RM, et al; Global Burden of Disease Cancer Collaboration. Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 32 cancer groups, 1990 to 2015: a systematic analysis for the Global Burden of Disease Study. *JAMA Oncology*. 2017;3(4):524-548. doi:10.1001/jamaoncol.2016.5688

25. Fitzmaurice C, Dicker D, Pain A, et al; Global Burden of Disease Cancer Collaboration. The global burden of cancer 2013. *JAMA Oncol*. 2015;1(4):505-527. doi:10.1001/jamaoncol.2015.0735

26. Murray CJL, Aravkin AY, Zheng P, et al; GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1223-1249. doi:10.1016/S0140-6736(20)30752-2

27. Stevens GA, Alkema L, Black RE, et al; GATHER Working Group. Guidelines for accurate and transparent health estimates reporting: the GATHER statement. *Lancet*. 2016;388(10062):e19-e23. doi:10.1016/S0140-6736(16)30388-9

28. World Health Organization. *International Classification of Diseases: Ninth Revision*, basic tabulation list with alphabetic index. Accessed March 1, 2021. https://apps.who.int/iris/handle/10665/39473

29. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, 10th revision, 2nd edition*. Accessed March 1, 2021. https://apps.who.int/iris/handle/10665/42980

30. Naghavi M, Makela S, Foreman K, O'Brien J, Pourmalek F, Lozano R. Algorithms for enhancing public health utility of national causes-of-death data. *Popul Health Metr*. 2010;8(1):9. doi:10.1186/1478-7954-8-9

31. Percy C, Ries LG, Van Holten VD. The accuracy of liver cancer as the underlying cause of death on death certificates. *Public Health Rep*. 1990;105(4):361-367.

32. Lomas A, Leonardi-Bee J, Bath-Hextall F. A systematic review of worldwide incidence of nonmelanoma skin cancer. *Br J Dermatol*. 2012;166(5):1069-1080. doi:10.1111/j.1365-2133.2012.10830.x

33. Barber RM, Fullman N, Sorensen RJD, et al; GBD 2015 Healthcare Access and Quality Collaborators. Healthcare Access and Quality Index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990-2015: a novel analysis from the Global Burden of Disease Study 2015. *Lancet*. 2017;390(10091):231-266. doi:10.1016/S0140-6736(17)30818-8

34. Foreman KJ, Lozano R, Lopez AD, Murray CJ. Modeling causes of death: an integrated approach using CODEm. *Popul Health Metr*. 2012;10:1. doi:10.1186/1478-7954-10-1

35. Reitsma MB, Fullman N, Ng M, et al; GBD 2015 Tobacco Collaborators. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. *Lancet*. 2017;389(10082):1885-1906. doi:10.1016/S0140-6736(17)30819-X

36. Reitsma MB, Kendrick PJ, Ababneh E, et al; GBD 2019 Tobacco Collaborators. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. *Lancet*. 2021;397(10292):2337-2360. doi:10.1016/S0140-6736(21)01169-7

37. Flor LS, Reitsma MB, Gupta V, Ng M, Gakidou E. The effects of tobacco control policies on global smoking prevalence. *Nat Med*. 2021;27(2):239-243. doi:10.1038/s41591-020-01210-8

38. World Health Organization. WHO report on cancer: setting priorities, investing wisely and providing care for all. Accessed February 18, 2021. https://www.who.int/publications-detail-redirect/who-report-on-cancer-setting-priorities-investing-wisely-and-providing-care-for-all

39. GBD 2019 Universal Health Coverage Collaborators. Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1250-1284. doi:10.1016/S0140-6736(20)30750-9

40. Cavalli F. Tackling cancer: time for a global response. *Lancet*. 2016;387(10018):e13-e14. doi:10.1016/S0140-6736(16)00233-6

41. Allemani C, Matsuda T, Di Carlo V, et al; CONCORD Working Group. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet*. 2018;391(10125):1023-1075. doi:10.1016/S0140-6736(17)33326-3

42. Sankaranarayanan R. Screening for cancer in low- and middle-income countries. *Ann Glob Health*. 2014;80(5):412-417. doi:10.1016/j.aogh.2014.09.014

43. Shah SC, Kayamba V, Peek RM Jr, Heimburger D. Cancer control in low- and middle-income countries: is it time to consider screening? *J Glob Oncol*. 2019;5:1-8. doi:10.1200/JGO.18.00200

44. Brand NR, Qu LG, Chao A, Ilbawi AM. Delays and barriers to cancer care in low- and middle-income countries: a systematic review. *Oncologist*. 2019;24(12):e1371-e1380. doi:10.1634/theoncologist.2019-0057

45. Hricak H, Abdel-Wahab M, Atun R, et al. Medical imaging and nuclear medicine: a *Lancet Oncology* commission. *Lancet Oncol*. 2021;22(4):e136-e172. doi:10.1016/S1470-2045(20)30751-8

46. Cortes J, Perez-García JM, Llombart-Cussac A, et al. Enhancing global access to cancer medicines. *CA Cancer J Clin*. 2020;70(2):105-124. doi:10.3322/caac.21597

47. Martei YM, Iwamoto K, Barr RD, Wiernkowski JT, Robertson J. Shortages and price variability of essential cytotoxic medicines for treating children with cancers. *BMJ Glob Health*. 2020;5(11):e003282. doi:10.1136/bmjgh-2020-003282

48. Miller KD, Nogueira L, Mariotto AB, et al. Cancer treatment and survivorship statistics, 2019. *CA Cancer J Clin*. 2019;69(5):363-385. doi:10.3322/caac.21565

49. Mollica MA, Falisi AL, Geiger AM, et al. Survivorship objectives in comprehensive cancer control plans: a systematic review. *J Cancer Surviv*. 2020;14(2):235-243. doi:10.1007/s11764-019-00832-3

50. Dagenais GR, Leong DP, Rangarajan S, et al. Variations in common diseases, hospital admissions, and deaths in middle-aged adults in 21 countries from five continents (PURE): a prospective cohort study. *Lancet*. 2020;395(10226):785-794. doi:10.1016/S0140-6736(19)32007-0

51. Roth GA, Mensah GA, Johnson CO, et al; GBD-NHLBI-JACC Global Burden of Cardiovascular Diseases Writing Group. Global burden of cardiovascular diseases and risk factors, 1990-2019: update from the GBD 2019 Study. *J Am Coll Cardiol*. 2020;76(25):2982-3021. doi:10.1016/j.jacc.2020.11.010

52. Franceschi S, Wild CP. Meeting the global demands of epidemiologic transition—the indispensable role of cancer prevention. *Mol Oncol*. 2013;7(1):1-13. doi:10.1016/j.molonc.2012.10.010

53. World Health Organization. Cancer control: a global snapshot in 2015: summary of results from the 2015 WHO NCD Country Capacity Survey. Accessed July 1, 2021. https://apps.who.int/iris/handle/10665/326369

54. International Cancer Control Partnership. Developing a NCCP. Accessed July 1, 2021. https://www.iccp-portal.org/developing-nccp

55. World Health Organization. National cancer control programmes: policies and managerial guidelines. Accessed July 1, 2021. https://www.who.int/publications/i/item/national-cancer-control-programmes

56. Oar A, Moraes FY, Romero Y, Ilbawi A, Yap ML. Core elements of national cancer control plans: a tool to support plan development and review. *Lancet Oncol*. 2019;20(11):e645-e652. doi:10.1016/S1470-2045(19)30404-8

57. Romero Y, Trapani D, Johnson S, et al. National cancer control plans: a global analysis. *Lancet Oncol*. 2018;19(10):e546-e555. doi:10.1016/S1470-2045(18)30681-8

58. Stulac S, Binagwaho A, Tapela NM, et al. Capacity building for oncology programmes in sub-Saharan Africa: the Rwanda experience. *Lancet Oncol*. 2015;16(8):e405-e413. doi:10.1016/S1470-2045(15)00161-8

59. Strasser-Weippl K, Chavarri-Guerra Y, Villarreal-Garza C, et al. Progress and remaining challenges for cancer control in Latin America and the Caribbean. *Lancet Oncol*. 2015;16(14):1405-1438. doi:10.1016/S1470-2045(15)00218-1

60. Znaor A, Eser S, Anton-Culver H, et al. Cancer surveillance in northern Africa, and central and western Asia: challenges and strategies in support of developing cancer registries. *Lancet Oncol*. 2018;19(2):e85-e92. doi:10.1016/S1470-2045(18)30019-6

61. WHO International Agency for Research on Cancer. The global initiative for cancer registry development. Accessed February 16, 2021. https://gicr.iarc.fr/about-the-gicr/

62. Piñeros M, Znaor A, Mery L, Bray F. A global cancer surveillance framework within noncommunicable disease surveillance: making the case for population-based cancer registries. *Epidemiol Rev*. 2017;39(1):161-169. doi:10.1093/epirev/mxx003

63. Suh E, Stratton KL, Leisenring WM, et al. Late mortality and chronic health conditions in long-term survivors of early-adolescent and young adult cancers: a retrospective cohort analysis from the Childhood Cancer Survivor Study. *Lancet Oncol*. 2020;21(3):421-435. doi:10.1016/S1470-2045(19)30800-9