Five insights from the Global Burden of Disease Study 2019

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Tehran University of Medical Sciences
285 PUBLICATIONS 3,762 CITATIONS

Palash Chandra Banik
Bangladesh University of Health Sciences
138 PUBLICATIONS 284 CITATIONS

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Five insights from the Global Burden of Disease Study 2019

The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019 provides a rules-based synthesis of the available evidence on levels and trends in health outcomes, a diverse set of risk factors, and health system responses. GBD 2019 covered 204 countries and territories, as well as first administrative level disaggregations for 22 countries, from 1990 to 2019. Because GBD is highly standardised and comprehensive, spanning both fatal and non-fatal outcomes, and uses a mutually exclusive and collectively exhaustive list of hierarchical disease and injury causes, the study provides a powerful basis for detailed and broad insights on global health trends and emerging challenges.

SDI is based on fitting spline functions to the relationship between age-specific mortality and SDI, and age-specific years lived with disability per capita and SDI. SDI is a proxy for the status of girls and women in a country as a whole, the average years of schooling among individuals aged older than 25 years, and the total fertility rate among females under the age of 25 years (as a widely available inverse proxy for the status of girls and women in society). SDI ranges from 0 to 100. Since 1950, global SDI has increased monotonically from 35 to 65. The average pace of progress accelerated from 1950 to 1980 and has slowed since then. For the 15% of countries with the fastest rate of increase, SDI has improved on average by 0.9 units per year since 1980, but it has improved by less than a third of this rate (0.3 units per year) for the bottom 15% of countries. Social and economic development can take centuries. Given what was reported from 1950 to 2019, the average country would take about 184 years to progress from an SDI of 0 to an SDI of 100; whereas, countries in the bottom 15% would take 357 years and those in the top 15% would take 110 years. From 1950 to 2000, the pace of improvement in SDI was positively correlated with the level of SDI, whereby high and high-middle SDI countries developed faster than did low and low-middle SDI countries. Since 2000, the correlation has become progressively more negative and is now around -0.5. In other words, since the Millennium Declaration, low and low-middle SDI countries have had larger annual increases in SDI than have high and high-middle SDI countries. The inequality in SDI between countries, measured with the standard deviation of SDI, has been decreasing since 2000, showing catch-up development. Social and economic development, measured with SDI, is highly correlated with health outcomes.

Double down on catch-up development

In the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), a population’s social and economic development status for each location-year is tracked on the basis of the Socio-demographic Index (SDI), which combines information on gross domestic product per capita, average years of schooling among individuals aged older than 25 years, and the total fertility rate among females under the age of 25 years (as a widely available inverse proxy for the status of girls and women in society). SDI ranges from 0 to 100. Since 1950, global SDI has increased monotonically from 35 to 65. The average pace of progress accelerated from 1950 to 1980 and has stayed at around 0.5 units per year since then. For the 15% of countries with the fastest rate of increase, SDI has improved on average by 0.9 units per year since 1980, but it has improved by less than a third of this rate (0.3 units per year) for the bottom 15% of countries. Social and economic development can take centuries. Given what was reported from 1950 to 2019, the average country would take about 184 years to progress from an SDI of 0 to an SDI of 100; whereas, countries in the bottom 15% would take 357 years and those in the top 15% would take 110 years. From 1950 to 2000, the pace of improvement in SDI was positively correlated with the level of SDI, whereby high and high-middle SDI countries developed faster than did low and low-middle SDI countries. Since 2000, the correlation has become progressively more negative and is now around -0.5. In other words, since the Millennium Declaration, low and low-middle SDI countries have had larger annual increases in SDI than have high and high-middle SDI countries. The inequality in SDI between countries, measured with the standard deviation of SDI, has been decreasing since 2000, showing catch-up development. Social and economic development, measured with SDI, is highly correlated with health outcomes.

Figure 1: Change in HALE disaggregated by SDI quintiles. 2000–19
SDI quintiles were assessed in 2019. Expected change in HALE related to change in SDI is based on fitting spline functions to the relationship between age-specific mortality and SDI, and age-specific years lived with disability per capita and SDI. HALE=healthy life expectancy. SDI=Socio-demographic Index.

For more on the Guidelines on Accurate and Transparent Health Estimate Reporting see Statement Lancet 2016; 388: e19–23

Correspondence to: Prof Christopher J L Murray, Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA 98195, USA cjlm@uw.edu
For GBD Compare see http://ghdx.healthdata.org/gbd-compare/
For the GBD Results Tool see http://ghdx.healthdata.org/gbd-results-tool
For the GBD Compare see https://vizhub.healthdata.org/
For the GBD Results Tool see https://gbd-results-tool/
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*Collaborators are listed at the end of the paper
improvements in health can also contribute to economic growth; higher educational attainment, because healthy children can learn more effectively; and greater female empowerment, as more women have access to reproductive health services, all of which create the potential for further health gains that expand SDI improvement.

The Millennium Development Goal health agenda has been working

Since around 2000, the global health community, including donors, has focused on reducing mortality of children and mothers, and the burden from three target conditions: tuberculosis, HIV, and malaria. Development Assistance for Health increased profoundly until 2010, but has since stagnated. The share of this assistance allocated to the Millennium Development Goal agenda has remained constant, even with the expanded Sustainable Development Goal health agenda in place since 2015. This concerted focus on communicable, maternal, neonatal, and nutritional (CMNN) diseases has led to faster progress in combating these causes than has been reported for non-communicable diseases (NCDs) and injuries (figure 2). Reductions in rates of age-standardised disability-adjusted life-years (DALYs) since 1990 have been largest for CMNN diseases and progress has been the fastest in the past decade, even considering the stagnation in Development Assistance for Health since 2010. Despite population growth, particularly in countries with the lowest SDI, the absolute number of DALYs from CMNN causes has also decreased. By contrast, age-standardised DALY rates for NCDs have barely reduced; in fact, population growth and ageing have resulted in a steady increase in the number of DALYs due to these causes. Age-standardised DALY rates for injuries have decreased, but at rates well below those of CMNN diseases.

Health systems need to be more agile to adapt to the rapid shift to NCDs and disabilities

Countries in the low-middle and middle SDI quintiles have had rapid transitions from disease burden dominated by CMNN causes to burden dominated by NCDs and injuries. The low-middle quintile increased from 37.8% of total DALYs caused by NCDs and injuries in 1990 to 66.0% in 2019, with a similar pattern in the middle quintile as well. The GBD assessment of universal health coverage (UHC) allows disaggregation of coverage into interventions for CMNN diseases and NCDs (figure 3). Although coverage of CMNN diseases increases almost linearly with higher SDI, coverage of NCD intervention lags behind. Countries with rapid transitions have burden profiles dominated by NCDs, yet their health systems are struggling to deliver effective interventions for these diseases. As countries’ health profiles shift to NCDs, there is a middle-SDI quintile gap that emerges, in which the most important interventions for improving health in these countries have low coverage. Despite this gap, most policy discussion, including WHO engagement with countries, is firmly focused on the agenda for CMNN diseases, ignoring the epidemiological heterogeneity of countries with low and middle SDI. The legacy focus on CMNN causes, and a failure to purposefully anticipate the inevitable shift to NCDs, is evident even in discussions on UHC. For example, the official UN UHC service indicator (3.8.1) does not include the coverage of any intervention targeting NCDs.

A second challenge is emerging at high levels of development, in which most DALYs in high SDI countries...
now arise not from premature mortality, but from loss of functional health. This shift is driven by a combination of ageing populations and stagnant age-specific rates of years lived with disability (YLDs) for the main sources of functional health loss, including musculoskeletal disorders, mental disorders, substance misuse, vision loss, and hearing loss. The proportion of global DALYs due to YLDs increased from 20·7% in 1990 to 33·9% in 2019.24 Over the same period, the number of countries where YLDs exceeded years of life lost increased from one to 29 countries. This shift is mirrored in health expenditures in these high SDI nations. Musculoskeletal disorders were the largest health expenditure in the USA in 2016 at US$380 billion,25 which was greater than expenditure for either cardiovascular diseases or cancers. Health systems appear to be poorly prepared for this shift. Most policy discussion is focused on cardiovascular diseases and cancers.22–24 Similarly, low investment in research into underlying causes and therapeutic innovations for key causes of functional health loss is exacerbating this widespread and unacceptable neglect. For example, the US National Institutes of Health budget for either cardiovascular diseases or cancers. $734 million in 2018.17

Public health is failing to address the increase in crucial global risk factors

The potential to improve health by risk reduction is well reported in GBD 2019.22 All risks quantified in GBD collectively account for 48% of global DALYs. Exposure to many risks highly correlated with SDI has been steadily decreasing as global SDI has increased, including household air pollution; child growth failure; and unsafe water, sanitation, and handwashing. Additionally, there have been notable decreases in exposure to smoking. Figure 4 shows the annualised rate of change in exposure from 2010 to 2019 for select risk factors ordered by global attributable DALYs. Among the 15 leading causes of attributable DALYs shown, high systolic blood pressure, high fasting plasma glucose, high body-mass index (BMI), ambient particulate matter pollution, alcohol use, and drug use stand out because rates of exposure are increasing by more than 0·5% per year.

If public health action and public policy could stop or reverse the trends in exposure to these risks, the benefits would be huge. What lessons can be learned to improve health from humanity’s collective failure to leverage knowledge on the harms associated with these risks? Simply providing information on the harms does not appear to be sufficient. The one major behavioural risk for adults is tobacco smoking, for which a cocktail of interventions built around strong commitment to government policy has had at least partial success. Smoking is down 1·2% per year globally since 2010, suggesting important lessons for strategies to reduce obesity, for example. This progress is more likely to be linked to taxation and legislation facilitated in part by the Framework Convention on Tobacco Control rather than to providing information to consumers about the harms of tobacco, particularly in low and low-middle SDI countries.20–23 The failure to slow or reverse the global rise in BMI, to facilitate healthier diets, or to increase amounts of physical activity is probably partly due to inadequate policy attention and funding for public health action and behavioural research. The steady rise of these risks is likely to pose a massive threat to future health progress everywhere.22–24 The increase in exposure to key metabolic risks and the slowing or reversals of long-term reductions in cardiovascular diseases seen in some locations suggest that the world might be approaching a turning point in terms of life expectancy gains.25 Governments should invest more funding in research and action to tackle these stagnating or worsening risk exposures. A core obstacle to accelerating progress on behavioural risks is the notion of individual agency and the need for governments to let individuals make their own choices. This concept is naive, given that individual choices are influenced by context, education, and availability of alternatives.

Figure 4: Global ARC in exposure for select risks, 2010–19
Risk factors are ordered by global attributable DALYs. Values are shaded by change in exposure, from dark blue (largest decrease) to dark red (largest increase). Exposure is measured as the age-standardised summary exposure value. Summary exposure value is an integrated measure of risk exposure that allows comparison across continuous, polytomous, and dichotomous risk factors. ARC=annualised rate of change. DALYs=disability-adjusted life-years. SBP=systolic blood pressure.
The natural rate of increase is negative when the crude death rate exceeds the crude birth rate. When there is a major risk to population health, concerted government action through regulation, taxation, and subsidies, drawing lessons from decades of tobacco control, might be required to protect the public’s health.

Social, fiscal, and geopolitical challenges of inverted population pyramids

As an extension of GBD, Vollset and colleagues have developed population scenarios for 195 countries and territories to 2100. In 2019, 34 countries had negative natural rates of increase; in other words, the crude death rate was greater than the crude birth rate. When the natural rate of increase is negative, in the absence of net immigration, populations will decrease. Two variables, female educational attainment and met contraceptive need, explain 80-5% of the variation in the completed fertility for a cohort of women. When met contraceptive need reaches 95% and average educational attainment reaches 16 years of age, the global total fertility rate will decrease to 1.41. Globally, educational attainment is rising, as is contraceptive met need. The effect of these trends will be a rapid increase in the number of countries with a negative natural rate of increase (figure S). Over time, negative rates of natural increase progressively lead to inverted age pyramids, in which older 5-year age groups (eg, aged 40–44 years) are more populous than younger 5-year age groups (eg, aged 5–9 years). In 2050, China is projected to have 79.6 million people aged 70–74 years, but only 46.0 million children aged younger than 5 years. Negative natural rates of increase will lead to an intensified national debate on immigration. The profound social, fiscal, economic, and geopolitical challenges of an inverted age pyramid might best be addressed through liberal immigration policies. Countries such as Canada, Australia, New Zealand, and the USA have already used such a strategy to maintain or increase their working age populations in the face of decreasing fertility rates. Some countries will try to increase fertility rates rather than accept migrants into their societies. Russia has identified increasing the birth rate as their number one health priority. In such cases, it is imperative that any policy initiatives protect women’s sexual and reproductive rights. Yet, attempts to increase fertility rates through economic incentives and paid maternal and paternal leave in countries like Sweden, Singapore, South Korea, Japan, and Taiwan (province of China) have had a minimal effect on fertility rates.

Conclusion

Success in reducing the disease burden from causes of CMNN diseases by global collective action to fund key programmes should be celebrated. Catch-up social and economic development is fuelling more rapid health progress in the lower SDI quintiles. But there is reason to believe that, although the past 70 years have largely been a story of sustained improvements in health, rising exposure to crucial risks, such as high BMI, high fasting plasma glucose, and ambient particulate matter pollution, as well as stagnant exposure to many other behavioural risks, including diet quality and physical activity, might attenuate progress. Most alarmingly, the mortality decreases in cardiovascular diseases of the past half a century have slowed substantially, or even reversed, in some nations with high SDI. New challenges, such as rising temperature and the associated increases in poverty, need to be urgently addressed. Low fertility in many nations is likely to emerge as a profound social and economic challenge. Tracking progress across this myriad of global health challenges, and with health development goals more broadly, reinforces the policy value of global comparative assessments in the health sector, such as the ongoing GBD.

See Online for appendix
both the data analysis as well as the policy uptake and proliferation of GBD and affiliated projects. Below, we list the individual collaborators who are authors on the publications listed in this issue.

First and senior authors

Five insights from the Global Burden of Disease Study 2019: Christopher J L Murray (first author) and Alan D Lopez, Theo Vos, and Stephen S Lim (senior authors). Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates for 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019: Hazozd Wang (first author) and Christopher J Murray (senior author). Mortality and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Theo Vos and Stephen S Lim (first authors) and Mohsen Naghavi and Christopher J Murray (senior authors).

Viewpoint

Global Burden of Disease 2019 Collaborators

Cristiana Abaffy§, Kaja M Abbas‡¶, Mohammad Abbasi-Kangevari*†‡§, Global Burden of Disease 2019 Collaborators (ordered authors), and Christopher J Murray (senior author). 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. Rafael Lozano (first author), Nancy Fullman, John Everett Mumford, Megan Knight, and Celine Barthelemy (ordered authors) and Christopher J Murray (senior author). Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2040: a forecasting analysis for the Global Burden of Disease Study 2019. Stein Emil Vollset (first author), Emily Goren, Chun-Wei Yuan, John Everett Mumford, Megan Knight, and Celine Barthelemy (ordered authors) and Christopher J Murray (senior author). The future of fertility decline: a superforecast for the Global Burden of Disease Study 2019. John Everett Mumford, Megan Knight, and Celine Barthelemy (ordered authors) and Christopher J Murray (senior author). Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2040: a forecasting analysis for the Global Burden of Disease Study 2019. Stein Emil Vollset (first author), Emily Goren, Chun-Wei Yuan, John Everett Mumford, Megan Knight, and Celine Barthelemy (ordered authors) and Christopher J Murray (senior author).
L Kemmer PhD, P J Kendall BS, M Knight BS, J Mc Owen PhD, K J Krohn MPH, H H Kyu PhD, Prof H J Larson PhD, S L Larson BS, K M Lau BS, J R Ledesma BA, A T LeClergh MD, H Lescinsky BA, C Lin BS, H Liu MS, Z Liu BA, J Lo BA, Prof A D Lopez PhD, Prof R Lozano MD, A Lu MSc, J Ma MS, E R Maddison BS, H Manguerra BS, A Marka MS, I Martopulu MPH, C I Mastroyiannos GM, A May BIE, A T Mignanaw PhD, Prof A H Mokdad PhD, M D Mooney BS, J F Mossor MD, E C Mullany BA, J Mumford BA, S B Munro PhD, Prof M Najafvi MD, V Nandakumar MS, J Nguyen BS, M Nguyen BA, E Nichols BA, M R Nixon PhD, C M Odell MMP, K L Ong PhD, A U Orji BA, S S Ostrow PhD, M Pasovac MA, K R Paulson BS, S A Pease BS, A Pennini MSc, M Pierse BS, D M Pigott PhD, T M Pilze BA, M Fletcher BS, P C Rao MPH, C Razo PhD, S B Redford MPH, R C Reiner Jr PhD, N Reingn BS, B M Reitserma BS, P Rhinehart BA, T Rohalik BSc, S Roberts MSc, N L S Roberts BS, S Rolfe BA, G A Roth MD, A N Schara MPH, L E Schaeffer MS, K A Scalfordell BA, J Shadid BSc, F Sharara MS, D H Shaw BA, B S Sheena BS, K E Simpson BS, A Smith MPA, R J D Sorensen MPH, C N Spencer EE, E Spurlock JP, J D Stanaway PhD, B A Stark MA, C Steiner MPH, K M Steuben MS, D O Sylte BA, M Tang MS, H J Taylor BA, S Terrason MA, A M Thomas BM, A E Torre BS, R Travillian PhD, C E Treogreer MPH, Prof S Vollset DrPH, A Vrangrath BA, Prof A G Warrington PhD, C C Wang MPH, H Wang MP, P Zheng PhD, P S R Zimansa MS, B S Zlavelv BS, Prof S S Lim PhD, Prof C J L Murray PhD, University of Washington, Seattle, WA, USA (A Y Chang DS, Prof E Oren PhD); Department of Epidemiology and Preventive Medicine (Prof R Bhuchinder PhD, K L Chin PhD, Prof Y Guo PhD), Department of Medicine (Prof K R Palkinsonhe PhD, Prof A G Thrift PhD), School of Pharmacy (S J T Zhang BA), School of Public Health and Preventive Medicine (J A Ackerman PhD, Prof F M Cicinatti PhD, S Li PhD), The School of Clinical Sciences at Monash Health (S Zaman MPH), Monash University, Melbourne, VIC, Australia; Department of Agriculture and Food Systems (H Suleria PhD), Department of General Practice (J Zhong MD), Department of Medicine (Prof B C Cowie PhD), Department of Neurology (Prof T Wieratne JD), Department of Paediatrics (Prof G C Patton MD, Prof S M Sawyer MD), Melbourne Medical School (K L Chin PhD), Melbourne School of Population and Global Health (T Adair PhD, Prof A D Lopez PhD), School of Health Sciences (A Meretoja MD), University of Melbourne, Melbourne, VIC, Australia; Centre of Excellence for Epidemiological Modelling and Analysis (O O Adetokunboh PhD), Department of Global Health (A A Adamu PhD, O O Adetokunboh PhD, C J Iwu PhD), Department of Psychiatry (Prof C D H Parry PhD, Prof S Sreedat PhD), Stellenbosch University, Cape Town, South Africa; Alcohol, Tobacco & Other Drug Research Unit (Prof C D H Parry PhD), Cochrane South Africa (A A Adamu PhD, D E Nwandoz PhD), Grants, Innovation and Product Development Unit (P W Mabaha PhD), Risk and Resilience in Mental Disorders Research Unit (Prof D J Stein MD), South African Medical Research Council, Cape Town, South Africa (J C Iwu PhD, C A Nnaji MPH, E Z Samhala PhD, Prof C S Wiyonge MD); College of Medicine (O M Adebayo MD), Department of Community Medicine (O S Ilesanmi PhD), Department of Medicine (Prof M O Owohali DrM), School of Laboratory Medicine and Science (A M Ayeo MD), University Hospital College, Ibadan, Ibadan, Nigeria; Department of Sociology (A A Adejede PhD), Obafemi Awolowo University, Age-Iwoye, Nigeria; School of Medicine (V Adekambi PhD), Cardinal University, Ibadan, Nigeria; Department of Community Medicine (H Zandian PhD), Department of Environmental Health Engineering (M Fazlizadeh PhD), School of Health (D Ardham PhD), Social Determinants of Health Research Center (A B S Alavi PhD, Prof A T Zahariah Moghadam PhD, H Zandian PhD), Ardabil University of Medical Science, Ardabil, Iran; Social Behavioral Research Branch (S M Advani PhD), National Eye Institute (W L Teague BA), National Institute of Health, Bethesda, MD, USA; Department of Oncology (S M Advani PhD), Division of Hematology and Oncology (D Braithwaite PhD), Georgetown University, Washington DC, DC, USA; Department of Cardiovascular Medicine (P Kagelhi MD, S Saadatagh V), Department of Dermatology (M A friesheid MD), Mayo Clinic, Rochester, MN, USA; Department of Community Medicine (M Afsheh MD), Zabol University of Medical Sciences, Zabol, Iran; Department of Global Public Health (E E Agaerd PhD, Prof P Allebeck MD, A Danielsson PhD, K Deuba DrPH), Department of Medical Epidemiology and Biostatistics (Prof J J Carrero PhD), Department of Medicine (D K Mohammad PhD), Department of Neurobiology (S Fesrhotshnejad PhD), Department of Neurobiology, Care Sciences and Society (Prof J Amliv PhD, C Nowak PhD), Department of Physiology and Pharmacology (C B Cederroth PhD), Department of Public Health (A Ahmadi MD), Department of Global Public Health-Systems and Policy (HSP): Medicines Focusing Antiotics (Prof A Pathak PhD), Karolinska Institutet, Stockholm, Sweden; Department of Health Research Methods, Evidence and Impact (E J Mills PND), Department of Medicine (M K Kurni PhD), Department of Psychiatry and Behavioural Neurosciences (A T Oluague MD), Department of Family Medicine (Prof G Agrawal PhD), Population Health Research Institute (T Sathi PhD), McMaster University, Hamilton, ON, Canada; Department of Epidemiology and Biostatistics (M Aghasii PhD, A Mohammadbeigi PhD), Neurosciences Research Center (A Mohammadbeigi PhD), Qum University of Medical Sciences, Qum, Iran; Institute of Genomics and Integrative Biology (Prof A Agrawal PhD), Council of Scientific & Industrial Research, Delhi, India; Internal Medicine (Prof A Agrawal PhD), Baylor College of Medicine, Houston, TX, USA; Department of Epidemiology and Health Statistics (T Ahmad MS), Southeast University, Nanjing, China; Lincoln Medical School (K Ahmadi PhD), Universities of Nottingham & Lincoln, Lincoln, UK; Clinical Research Development Center (S Moleki MSc, M Naderi PhD), Department of Anatomical Sciences (M R Salahihoosh PhD), Department of Anesthesiology (A Ahmadi MD), Department of Emergency Medicine (R Pourmirza Kalhori PhD), Department of Environmental Health Engineering (Prof A Almassi PhD), Department of Biostatistics and Biometry (Y Salimi PhD), Department of Health Education and Health Promotion (S Siabani PhD, A Zajpour PhD), Department of Occupational Health Engineering (A Bazegar PhD), Department of Psychiatry (Prof H Khazaei MD), Department of Public Health (N Kaniourz MA), Department of Radiology and Nuclear Medicine (F Amiri MSc, S Salehi Zahabi PhD), Department of Rehabilitation and Sports Medicine (M Mirzaei MSc, M Shamisi PhD), Epidemiology and Biostatistics Department (Prof F Najafi PhD), Health Institute (A Jalali PhD), Infectious Disease Research Center (Prof K Ghadiri MD), Medical Biology Research Center (F Heydarpoor PhD), Pediatric Department (Prof K Gladir MD), Research Center for Environmental Determinators of Health (N Fatbahi PhD, Prof B Karamzin Mar PhD, A Kazemi Karyani PhD, M Monazi PhD, Prof F Najafi PhD, Prof M Parshals PhD, F Rajai PhD, Prof E Sadeghi PhD, Y Safari PhD, K Shafii PhD, S Soltan PhD, Y Vaseghian PhD); Social Development and Health Promotion Research Center (Z Atafar PhD, F Jalili PhD, M Mirzaei-Alavijeh PhD, S Saeedi MSc, Y Salimi PhD, M Soofi PhD, A Zangeneh MSc), Substance Abuse Prevention Research Center (A Jalali PhD, B Manourir PhD), Kermansah Medical Sciences, Kermansah, Iran (H Janjani PhD), Environmental Health Engineering (A Ahmadi PhD), Environmental Technologies Research Center (A M Khafiz PhD), Thalassemia and Hemoglobinopathy Research Center (F Rahimi PhD), Alzah Jundishapour University of Medical Sciences, Alzah, Iran; Aging Research Institute (S Safari PhD), Biotechnology Research Center (M Moghadasezdah PhD), Department of Biostatistics and Epidemiology (Prof M Aghari Jafarabadi PhD), Department of Community Medicine (S Safari PhD), Department of Health Policy and Management (L Dushmgar PhD), Department of...
Department of Neurology (S Vidale MD), Infermi Hospital, Rimini, Italy; Department of Neurology & Stroke Unit (S Vidale MD), Sant’Anna Hospital, Como, Italy; Occupational Health Unit (Prof F S Violante MD), Sant’Orsola Malpighi Hospital, Bologna, Italy; Department of Pediatric Endocrinology (R Vukovic PhD), Mother and Child Healthcare Institute of Serbia “Dr Vukan Cupic”, Belgrade, Serbia; Foundation University Medical College (Prof Y Wahred PhD), Foundation University Islamabad, Islamabad, Pakistan; Department of Epidemiology and Biostatistics (J Wei PhD), Department of Neurology (MT Wallin MD), George Washington University, Washington, DC, USA; School of Health Sciences (F Wang MA, X G Zhao PhD), Department of Epidemiology and Biostatistics (Y Wang BSA, Prof C Yu PhD), Global Health Institute (Prof C Yu PhD), School of Medicine (Z Zhang PhD), Wuhan University, Wuhan, China; Division of Social Science (H Wang DipScSc), Hong Kong University of Science and Technology, Hong Kong, China; Cardiology Department (Prof R G Weintraub MB), Royal Children’s Hospital, Melbourne, VIC, Australia; Leonard Davis Institute of Health Economics (J Weiss MA), Population Studies Center (J Weiss MA), University of Pennsylvania, Philadelphia, PA, USA; Department of Physical Therapy (T Wiangkham PhD), Naesrun University, Phitsanulok, Thailand; Department of Community Medicine (N D Wickramasinghe MD), Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka; Department of Medicine (Prof P T Wijeratne MD), University of Rajarata, Saliyapura, Anuradhapura, Sri Lanka; NIH Biomedical Research Centre (Prof C D A Wolfe MD), Guy’s and St.Thomas’ Hospital and Kings College London, London, UK; Department of Orthopaedics (Prof A Wu MD), Wenzhou Medical University, Wenzhou, China; Department of Behaviour and Operation Management (Y Xie MD), Beijing Advanced Innovation Center for Big Data-based Precision Medicine, Beijing, China; School of Medicine (Prof G Xu MD), Nanjing University, Nanjing, China; Clinical Cancer Research Center (S Yahyazedeh Jabbari MD), Milad General Hospital, Tehran, Iran; Research and Development Center for Health Services (Prof M S Zastrozhin PhD), Russian Medical Academy of Science Center at Houston, Houston, TX, USA.

Department of Health Economics (N Yonemoto MPH), National Center of Neurology and Psychiatry, Kodaira, Japan; Department of Public Health (N Yonemoto MPH), Nippon University, Tokyo, Japan; Department of Health Policy and Management (Prof M Z Younis PhD), Jackson State University, Jackson, MS, USA; School of Medicine (Prof M Z Younis PhD), Tsinghua University, Beijing, China; Department of Immunology (T P Younker BS), University of Pittsburgh, Pittsburgh, PA, USA; School of Public Health and Management (Y Yu MS), Hubei University of Medicine, Shiyuan, China; Department of Pharmaceutics (S Zaidi PhD), Dow University of Health Sciences, Karachi, Pakistan; Addictionology Department (Prof M S Zastrozthin PhD), Russian Medical Academy of Continuous Professional Education, Moscow, Russia; Victorian Comprehensive Cancer Centre, Melbourne, VIC, Australia (J Zhang MD); Hubei Province Key Laboratory of Occupational Hazard Identification and Control (Y Zhang PhD), School of Public Health (Y Zhang PhD), Wuhan University of Science and Technology, Wuhan, China; School of Biology and Pharmaceutical Engineering (X G Zhao PhD), Wuhan Polytechnic University, Wuhan, China; Global Strategy and Advocacy Unit (B Zheleva MBA), Children’s HeartLink, Minneapolis, MN, USA; Department of Epidemiology, Human Genetics, and Environmental Sciences (C Zhu MPH), University of Texas Health Science Center at Houston, Houston, TX, USA.

Declaration of interests
R Anseauene reports receiving consultancy and speakers’ fees from various pharmaceutical companies. E Beghi reports grants from Italian Ministry of Health and Swedish Orphan Biovitrum; and personal fees from Arvelle Therapeutics, outside the submitted work. M Bell reports grants from US Environmental Protection Agency, National Institutes of Health (NIH), and Wellcome Trust Foundation, during the conduct of this work; and Honorarium and travel reimbursement from the NIH (for review of grant proposals), American Journal of Public Health (participation as editor), Global Research Laboratory and Seoul National
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