Five insights from the Global Burden of Disease Study 2019

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The Global Burden of Diseases, Injuries, and Risk Factors Study for 2019 (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, covering 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 hierarchical disease and injury cause list, it provides a powerful basis for both detailed and broad insights on global health trends and emerging challenges. GBD 2019 incorporates data from 112 493 sources. GBD 2019 provides more than 3.5 billion estimates of health outcome and health system measures of interest for global, national, and sub-national policy dialogue, all of which are publicly available at www.healthdata.org/gbd-compare. All GBD estimates adhere to the Guidelines on Accurate and Transparent Health Estimate Reporting (GATHER).[1] From this massive amount of information, we distill five key insights that are important for health and development strategies. These insights are subject to the many limitations outlined in each of the component GBD capstone papers.[2–6]

1. Double down on catch-up development

In GBD, we track a population's social and economic development status for each location-year based on the Socio-demogrpahic Index (SDI), which combines information on GDP per capita, average years of schooling over age 25, and the total fertility rate under age 25 (as a widely available inverse proxy for the status of girls and women in society).[7] [7] 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 since stayed around 0.5 units per year. For the 15% of countries with the fastest rate of increase, SDI improved, on average, by 0.9 units per year since 1980, but it has improved by less than one third this rate—0.3 units per year—for the bottom 15% of countries. Social and economic development can take centuries; given what we have seen from 1950 to 2019, the average country would take about 184 years to progress from an SDI of 0 to an SDI of 100; countries in the bottom 15% will take 357 and those in the top 15% 110 years. From 1950 to 2000, the pace of improvement in SDI was positively correlated with the level of SDI: higher SDI countries were developing faster. Since 2000, the correlation has become progressively more negative and is currently around -0.5; in other words, since the Millennium Declaration,[8] countries with lower SDI levels have had larger annual increases, Inequality in SDI between countries measured using the standard deviation of SDI has been decreasing since 2000; we are witnessing catch-up development.

Social and economic development, measured using SDI, is very highly correlated with health outcomes.[2] Figure 1 shows the increase in healthy life expectancy (HALE) from 2000 to 2019, divided by what could be expected on the basis of SDI change alone and what is unexplained by SDI, namely some combination of new technologies, prioritisation of societal resources for health, and the emergence of public health challenges such as the HIV epidemic or alcohol consumption in eastern Europe and central Asia. Given

41 the overwhelming impact of SDI on recent health progress, doubling down on policies and strategies
42 that stimulate economic growth, expand access to primary and secondary schooling, and improve the
43 status of women should be our collective priority. The catch-up social and economic development
44 clearly evident since the Millennium Declaration provides some optimism that maintaining focus on the
45 worst-off countries, and worst-off communities within countries, is not only possible but can be
46 expected to have profound health benefits. Further improvements in health can also contribute to
47 economic growth, healthier children can learn more effectively, and reproductive heatlh services can
48 empower women, creating the potential for futher health gains to expand SDI improvement.

2. The Millennium Development Goal health agenda has been working

50 Starting around 2000, the global health community, including donors, focused on reducing mortality of
51 children and mothers, as well as burden from three target conditions--tuberculosis, HIV, and malaria.[8–10]
52 Development Assistance for Health (DAH) increased profoundly until 2010 but has since stagnated.[11]
53 The share of DAH allocated to the Millennium Development Goal (MDG) agenda has remained constant
54 even with the expanded SDG health agenda in place since 2015. This concerted focus on communicable,
55 maternal, neonatal, and nutritional disorders (CMNN) has led to faster progress in combatting these
56 diseases compared to non-communicable diseases (NCDs) and injuries (figure 2). Reductions in age-
57 standardised disability-adjusted life-year (DALY) rates since 1990 have been largest for the CMNN
58 causes and progress has been fastest in the most recent decade, even taking into account the stagnation
59 in DAH since 2010. Despite population growth, particularly in the lowest SDI countries, the absolute
60 number of DALYs from these causes has also declined. In contrast, age-standardised NCD DALY rates
61 have barely declined; population growth and ageing have in fact resulted in a steady increase in the
62 number of DALYs lost due to these causes. Age-standardised injury DALY rates have declined but at rates
63 well below those of CMNN causes.

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

67 Countries in the low-middle and middle SDI quintiles have undergone rapid transitions from burden
68 dominated by CMNN causes to NCDs and injuries. The low-middle quintile increased from 37.8% of total
69 DALYs caused by NCDs and injuries in 1990 to 66.0% in 2019, with a similar pattern in the middle quintile
70 as well. The GBD assessment of universal health coverage (UHC) effective coverage allows
71 disaggregation of coverage into CMNN interventions and NCD interventions, as shown in figure 3. While
72 CMNN coverage rises almost linearly with higher SDI, NCD intervention coverage lags behind. Countries
73 undergoing rapid transitions have burden profiles dominated by NCDs but health systems that are
74 struggling to deliver effective interventions for NCDs. As countries' health profiles shift to NCDs, there is
75 a middle-SDI quintile gap that emerges, where the most important interventions for improving health in
76 that context have low coverage. Despite this gap, most policy discussion, including WHO engagement
77 with countries, remains firmly focused on the CMNN agenda, ignoring the epidemiological
78 heterogeneity of low and middle SDI countries. The legacy focus on CMNN causes, and a failure to more
79 purposefully anticipate the inevitable shift to NCDs, is evident even in UHC discussions; the official UN
80 UHC service indicator (3.8.1) does not include the coverage of any intervention targeting NCDs.[12]

81　A second challenge is emerging at higher levels of development, where the majority of DALYs in high SDI
82　countries now arises not from premature mortality, but from loss of functional health. This shift is driven
83　by a combination of ageing populations and stagnant age-specific rates for the main sources of
84　functional health loss including musculoskeletal disorders, mental disorders, substance abuse, vision
85　loss, and hearing loss. The fraction of global DALYs due to years lived with disability (YLDs) increased
86　from 20.7% in 1990 to 33.9% in 2019. Over the same period, the number of countries where YLDs
87　exceeded years of life lost (YLLs) increased from one to 29 This shift is mirrored in health expenditures in
88　these high SDI nations. Musculoskeletal disorders were the largest health expenditure in the US in 2016
89　at $380 billion,[13] larger than either cardiovascular diseases or cancers. Health systems appear to be ill-
90　prepared for this shift. Most policy discussion remains focused on cardiovascular diseases and
91　cancers.[14–16] The innovation pipeline for the main disabling conditions (musculoskeletal, mental, and
92　neurological disorders) remains poor.[17–19] Comparatively low investment in research on underlying
93　causes and in therapeutic innovations for key causes of functional health loss is exacerbating this
94　widespread and unacceptable neglect: for example, the US National Institutes of Health budget on
95　cardiovascular diseases and cancers is dramatically larger than on musculoskeletal disorders ($8.60
96　billion combined vs $734 million in 2018).[20]

97　4. Public health is failing to stem the increase in critical global risk factors

98　The potential to improve health through risk reduction is well documented in GBD 2019. All risks
99　quantified in GBD collectively account for 48% of global DALYs. Of these risks, exposure to a number of
100　risks highly correlated with SDI have been steadily decreasing as global SDI increases: household air
101　pollution; child growth failure; and unsafe water, sanitation, and handwashing. In addition, there have
102　been notable declines in exposure to smoking. Figure 4 shows the annualised rate of change in exposure
103　from 2010 to 2019 for select risk factors ordered by global attributable. Among the 15 leading causes of
104　attributable DALYs shown, high systolic blood pressure (SBP), high body-mass index (BMI), high fasting
105　plasma glucose (FPG), ambient particulate matter pollution, alcohol use, and durg use stand out because
106　of the rates above 0.5% per year in exposure.

107　If public health action and public policy could stop or reverse the trends up in exposure to these risks
108　and the benefits would be huge. What lessons can we learn from our collective failure to leverage
109　knowledge on the harms associated with these risks to improve health? Simply providing information on
110　the harms does not appear to be sufficient. The one major adult behavioural risk for which a cocktail of
111　interventions, built around strong government policy commitment has had at least partial success is
112　tobacco smoking—down 1.2% per year globally since 2010— suggesting important lessons for strategies
113　to reduce obesity, for example. This progress is likely linked more to taxation and legislation facilitated
114　in part by the Framework Convention on Tobacco Control;[21] and much less to providing information to
115　consumers, particularly in lower SDI countries, about the harms of tobacco.[22,23] The failure to slow or
116　reverse the global rise in body-mass index, to facilitate healthier diets, or to increase levels of physical
117　activity is likely due in part to inadequate policy attention and funding for public health action and
118　behavioural research. The steady rise of these risks is likely to pose a massive threat to future health
119　progress everywhere.[24,25] The rise of key metabolic risks and the slowing or reversals of the long-term
120　declines in cardiovascular diseases seen in some locations suggest that we may be approaching a
121　watershed in terms of life expectancy gains.[26] Governments must invest more in research and action to
122　tackle these stagnating or worsening risk exposures. A core obstacle to accelerating progress on

123 behavioural risks is the notion of individual agency and the need for governments to let individuals make
124 their own choices. This is naïve; individual choices are influenced by context, education, and availability
125 of alternatives. Governments can and should take action to facilitate healthier choices by rich and poor
126 individuals alike. And where there is a major risk to population health, more concerted government
127 action through regulation, taxation, and subsidies, drawing lessons from decades of tobacco control,
128 may be required to protect the public's health.

5.Social, fiscal, and geopolitical challenges of inverted population pyramids

131 As an extension of GBD, Vollset and colleagues[6] have developed population scenarios for each country
132 and territory to 2100. In 2019, 34 countries had negative natural rates of increase; in other words, the
133 crude death rate was greater than the crude birth rate. When the natural rate of increase is negative in
134 the absence of net in-migration, populations will decline. Two variables, female educational attainment
135 and met contraceptive need, explain 80.5% of the variation in the completed fertility for a cohort of
136 women. When met contraceptive need reaches 95% and average educational attainment reaches 16
137 years, the total fertility rate, on average, will decline to 1.4. Globally, educational attainment is rising, as
138 is contraceptive met need.[27,28] The effect of these trends will be to rapidly increase the number of
139 countries with a negative natural rate of increase (figure 5).[6] Negative rates of natural increase lead
140 progressively over time to inverted population pyramids, where older 5-year age groups have more
141 individuals in them than younger 5-year age groups. In 2050, China will have 79.6 million 70–74 year
142 olds but only 46.0 million 0–4 year olds. Negative natural rates of increase will lead inexorably to an
143 intensified national debate on immigration. The profound social, fiscal, economic, and geopolitical
144 challenges of an inverted age pyramid can be addressed through liberal immigration policies. Countries
145 such as Canada, Australia, New Zealand, and the US have already used such a strategy to maintain or
146 increase the working age population. Some countries will try to increase fertility rates rather than accept
147 migrants into their societies. Russia has identified raising the birth rate as their number one health
148 priority.[29] In such cases, it is imperative that any policy initiatives protect women's sexual and
149 reproductive rights. Yet, attempts to increase fertility rates through economic incentives and paid
150 maternal and paternal leave in countries like Sweden,[30] Singapore,[31] South Korea,[32] Japan,[33] and Taiwan
151 (Province of China)[34] have had a minimal effect on fertility rates.[6]

Conclusion

153 Success in reducing burden from CMNN causes through global collective action to fund key programmes
154 should be celebrated. Catch-up social and economic development is fuelling more rapid health progress
155 in the lower SDI quintiles. But there is reason to believe that while the last 70 years have largely been a
156 story of sustained improvements in health, rising critical risks including high BMI, high FPG, and ambient
157 air pollution and stagnantation for many other behavioural risks including diet quality and physical
158 activity may well attenuate progress. Most alarmingly, the half century of mortality declines in
159 cardiovascular diseases have slowed significantly, or reversed, in some high SDI nations. New challenges
160 such as rising temperature and the associated increases in poverty need to be urgently addressed. Low
161 fertility in many nations will likely emerge as a profound social and economic issue. Tracking progress
162 across this myriad of global health challenges, and with health development goals more broadly,

163   reinforces the policy value of global comparative assessments in the health sector such as the ongoing
164   Global Burden of Disease Study.

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255 ## Figures
256 Figure 1. Change in healthy life expectancy (HALE) from 2000 to 2019 disaggregated by Socio-
257 demographic Index quintiles as assessed in 2019. Expected change in HALE related to change in SDI is
258 based on fitting spline functions to the relationship between age-specific mortality and SDI and age-
259 specific years lived with disability per capita and SDI.

260 Figure 2. Global annualised rates of change for age-standardised DALY rates and DALY counts for two
261 periods, 1990–2010 and 2010–2019. Results are shown for three broad cause groups: communicable,
262 maternal, neonatal, and nutritional disorders (CMNN); non-communicable diseases (NCDs); and injuries.

263   Figure 3. Relationships of UHC effective coverage in 204 countries and territories in 2019 for
264   interventions targeting communicable, maternal, neonatal, and nutritional diseases (CMMN) and non-
265   communicable diseases (NCDs) versus Socio-demographic Index (SDI).

266   Figure 4. Global annualised rates of change 2010–2019 in exposure measured using the Summary
267   exposure value (SEV) for select risks. Risk factors are ordered by global attributable DALYs. Summary
268   exposure value is an integrated measure of risk exposure that allows comparison across continuous,
269   polytomous, and dichotomous risk factors.

270   Figure 5. Number of countries and territories with negative natural rate of population increase observed
271   1950–2019 and in the reference forecast scenario for 2020–2100. The nature rate of increase is negative
272   when the crude death rate exceeds the crude birth rate.