

	Median (IQR)	Minimum	Maximum	SDG target by 2030*	Proportion of 188 countries achieving the SDG target in 2015
Disaster (Indicator 1.5.1; same as Indicators 11.5.1 and 13.2.1)—age-standardised death rate due to exposure to forces of nature, per 100 000 population	0.0 (0.0-0.1)	0.0	7.5	Undefined	NA
Stunting (Indicator 2.2.1)—prevalence of stunting in children under age 5 years, %	12.5% (4.6-26.5)	0.0%	54.5%	Eliminate	16.5%
Wasting (Indicator 2.2.2a)—prevalence of wasting in children under age 5 years, %	3.6% (1.8-7.1)	0.0%	21.7%	Eliminate	16.5%
Overweight (Indicator 2.2.2b)—prevalence of overweight in children aged 2-4 years, %	23.1% (14.1-32.1)	2.6%	54.5%	Eliminate	0.0%
Maternal mortality ratio (Indicator 3.1.1)—maternal deaths per 100 000 livebirths	49.1 (15.2-239.1)	0.7	1073.9	<70 deaths per 100 000 livebirths	61.2%
Skilled birth attendance (Indicator 3.1.2)—proportion of births attended by skilled health personnel (doctors, nurses, midwives, or country-specific medical staff [eg, clinical officers]), %	98.1% (80.9-99.2)	20.6%	99.6%	100%	0.0%
Under-5 mortality (Indicator 3.2.1)—probability of dying before age 5 years per 1000 livebirths	17.5 (7.1-44.9)	1.9	130.5	At least as low as 25 deaths per 1000 livebirths	60.1%
Neonatal mortality (Indicator 3.2.2)—probability of dying during the first 28 days of life per 1000 livebirths	9.3 (3.5-21.0)	1.0	40.6	At least as low as 12 deaths per 1000 livebirths	57.5%
HIV (Indicator 3.3.1)—age-standardised rate of new HIV infections, per 1000 population	0.1 (0.0-0.4)	0.0	27.4	Eliminate	0.0%
Tuberculosis (Indicator 3.3.2)—age-standardised rate of new and relapsed tuberculosis cases, per 1000 population	0.6 (0.2-1.5)	0.0	26.1	Eliminate	0.0%
Malaria (Indicator 3.3.3)—age-standardised rate of malaria cases, per 1000 population	0.0 (0.0-18.5)	0.0	286.8	Eliminate	52.1%
Hepatitis B (Indicator 3.3.4)—age-standardised rate of hepatitis B incidence, per 100 000 population	1838.6 (1070.4-2098.4)	444.5	2554.1	Undefined	NA
Neglected tropical diseases (Indicator 3.3.5)—age-standardised prevalence of neglected tropical diseases, per 100 000 population	14 474.0 (236.3-46 139.0)	9.8	119 695.4	Eliminate	0.0%
Non-communicable diseases (Indicator 3.4.1)—age-standardised death rate due to cardiovascular disease, cancer, diabetes, and chronic respiratory disease in populations aged 30-70 years, per 100 000 population	422.0 (291.4-552.5)	154.0	1442.5	Reduce by one-third	NA
Suicide (Indicator 3.4.2)—age-standardised death rate due to self-harm, per 100 000 population	10.3 (6.9-14.3)	2.2	34.0	Reduce by one-third	NA
Alcohol (Indicator 3.5.2)—risk-weighted prevalence of alcohol consumption, as measured by the SEV for alcohol use, %	7.8% (4.2-11.1)	0.7%	28.7%	Undefined	NA
Road injuries (Indicator 3.6.1)—age-standardised death rate due to road injuries, per 100 000 population	15.3 (9.7-23.2)	3.0	63.9	Reduce by half	NA
Family planning need met, modern contraception (Indicator 3.7.1)—proportion of women of reproductive age (15-49 years) who have their need for family planning satisfied with modern methods, % women aged 15-49 years	72.4% (46.6-87.0)	15.8%	99.1%	100%	0.0%
Adolescent birth rate (Indicator 3.7.2)—birth rates for women aged 10-14 years and women aged 15-19 years, number of livebirths per 1000 women aged 10-14 years and women aged 15-19 years	22.9 (9.4-37.8)	1.1	102.6	Undefined	NA
Universal health coverage tracer (Indicator 3.8.1)—coverage of universal health coverage tracer interventions for prevention and treatment services, %	79.2% (64.9-88.1)	23.3%	94.6%	100%	0.0%
Air pollution mortality (Indicator 3.9.1)—age-standardised death rate attributable to household air pollution and ambient air pollution, per 100 000 population	74.9 (40.6-170.7)	9.0	427.3	Undefined	NA
WaSH mortality (Indicator 3.9.2)—age-standardised death rate attributable to unsafe WaSH, per 100 000 population	8.4 (2.4-44.2)	0.7	318.0	Undefined	NA
Poisons (Indicator 3.9.3)—age-standardised death rate due to unintentional poisonings, per 100 000 population	0.8 (0.4-2.0)	0.1	7.1	Undefined	NA
Smoking (Indicator 3.a.1)—age-standardised prevalence of daily smoking in populations aged 10 years and older, % population aged 10 years and older	11.0% (6.5-16.3)	0.7%	29.5%	Undefined	NA
Intimate partner violence (Indicator 5.2.1)—age-standardised prevalence of women aged 15 years and older who experienced intimate partner violence, % women aged 15 years and older	19.0% (13.7-25.7)	4.7%	44.6%	Eliminate	0.0%
Water (Indicator 6.1.1)—risk-weighted prevalence of populations using unsafe or unimproved water sources, as measured by the SEV for unsafe water, %	62.7% (21.2-83.0)	0.0%	98.4%	Eliminate	16.0%
Sanitation (Indicator 6.2.1a)—risk-weighted prevalence of populations using unsafe or unimproved sanitation, as measured by the SEV for unsafe sanitation, %	20.6% (3.6-57.5)	0.0%	96.4%	Eliminate	16.0%
Hygiene (Indicator 6.2.1b)—risk-weighted prevalence of populations with unsafe hygiene (no handwashing with soap), as measured by the SEV for unsafe hygiene, %	74.2% (60.5-94.1)	36.0%	99.7%	Eliminate	0.0%

(Table 3 continues on next page)

	Median (IQR)	Minimum	Maximum	SDG target by 2030*	Proportion of 188 countries achieving the SDG target in 2015
(Continued from previous page)					
Household air pollution (Indicator 7.1.2)—risk-weighted prevalence of household air pollution, as measured by the SEV for household air pollution, %	7.1% (0.3–36.0)	0.0%	73.6%	Eliminate	16.5%
Occupational risk burden (Indicator 8.8.1)—age-standardised all-cause DALY rate attributable to occupational risks, per 100 000 population	757.7 (552.7–999.2)	278.7	2148.3	Undefined	NA
Mean PM2.5 (Indicator 11.6.2)—population-weighted mean levels of PM2.5, µg/m ³	21.7 (15.1–37.6)	3.4	107.3	Undefined	NA
Violence (Indicator 16.1.1)—age-standardised death rate due to interpersonal violence, per 100 000 population	3.7 (1.6–8.2)	0.4	58.3	Undefined	NA
War (Indicator 16.1.2)—age-standardised death rate due to collective violence and legal intervention, per 100 000 population	0.0 (0.0–0.0)	0.0	309.9	Undefined	NA
SDG=Sustainable Development Goal. NA=not applicable. SEV=summary exposure value. WaSH=water, sanitation, and hygiene. DALY=disability-adjusted life-year. PM2.5=fine particulate matter smaller than 2.5 µm in diameter. *SDG targets without explicit achievement thresholds, such as "significantly reduce by 2030", or with reduction-based thresholds, such as "reduce by one-third", are reported as undefined. †The target year for achieving indicator 3.6.1 is 2020.					

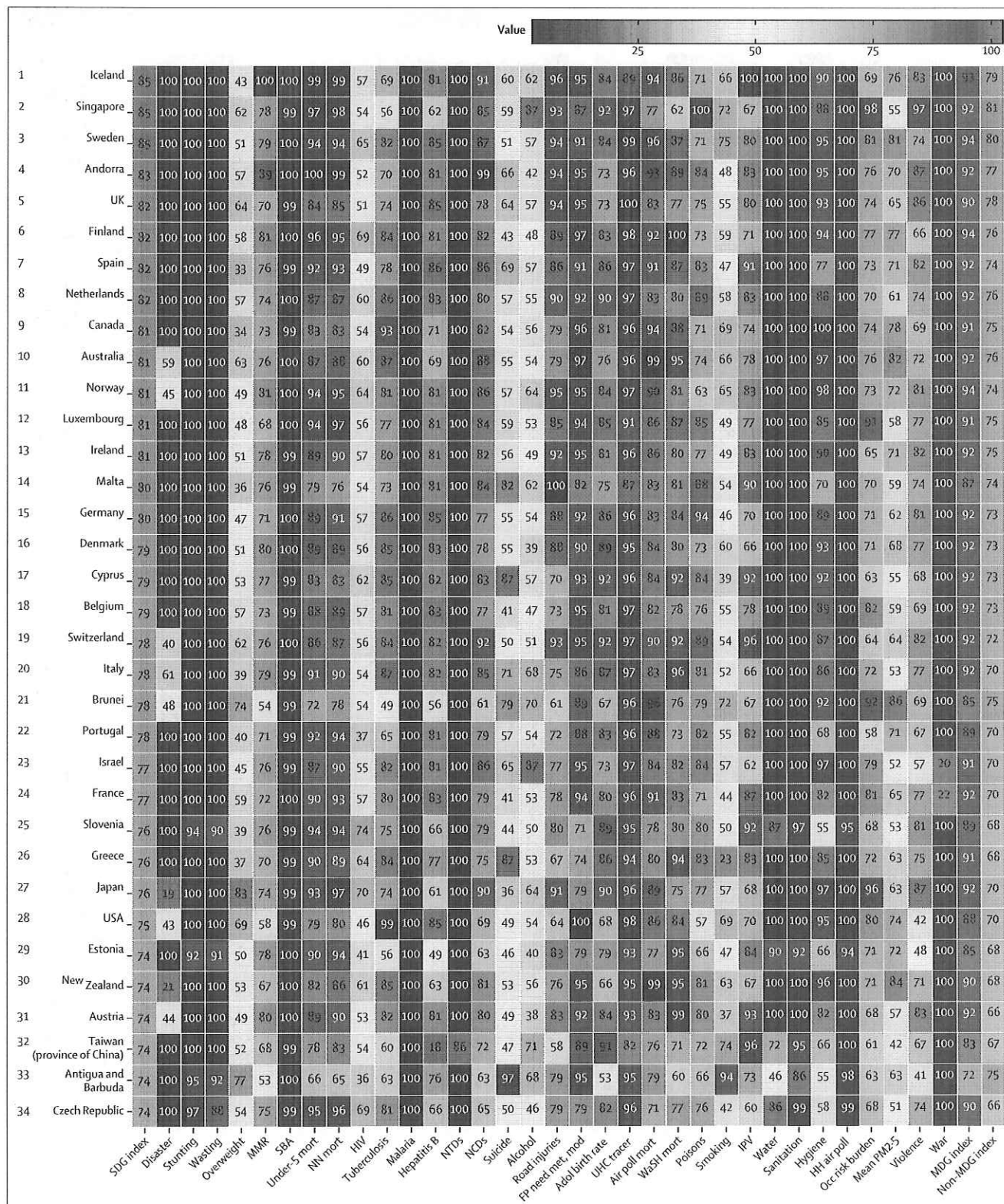
Table 3: Performance of health-related SDG indicators across all countries, 2015

North Africa and the Middle East, and parts of eastern Europe. Countries in western, eastern, and central sub-Saharan Africa, as well as a subset of other countries (eg, Afghanistan, Papua New Guinea, Yemen, and Nepal), dominated the lowest quintile (<37.8) of the health-related SDG index. Although the MDG index was correlated with the non-MDG index, country-level performance on these two indices varied considerably (figure 3). Performing well on the health-related MDG index did not guarantee good performance on the health-related non-MDG index. For example, the health-related MDG index in 2015 was similar for Indonesia (52.3, 49.8–54.6) and South Africa (48.9, 46.0–51.3), but Indonesia had a much higher non-MDG index (64.1, 62.0–66.6) than that of South Africa (42.9, 40.3–45.5). This difference for the non-MDG index was primarily driven by South Africa's lower performance for indicators such as childhood overweight, harmful alcohol use, and mortality due to self-harm and interpersonal violence.

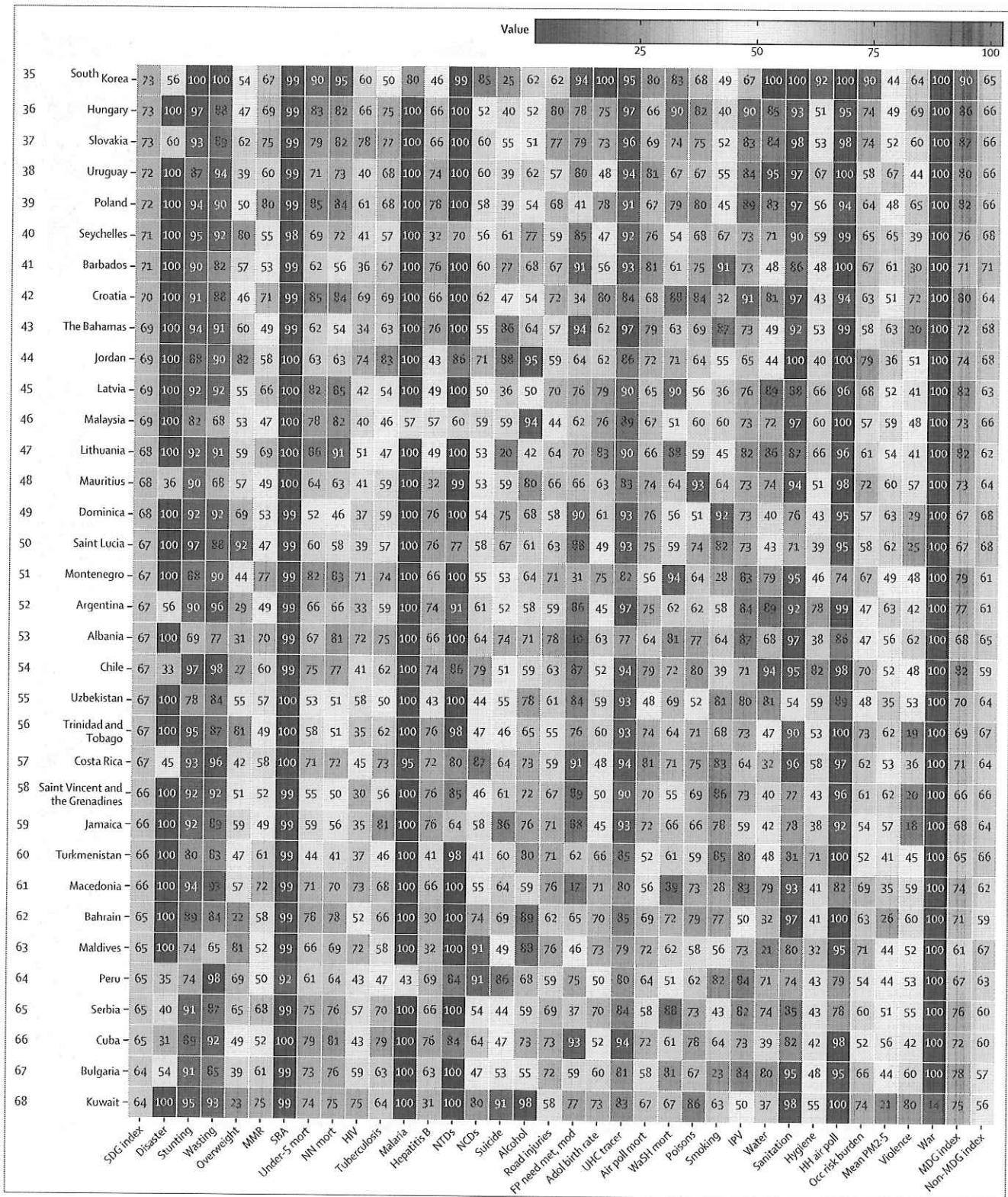
SDI was highly predictive of the overall health-related SDG index ($r^2=0.88$) and MDG index ($r^2=0.92$; figure 4). The non-MDG index was less well predicted by SDI ($r^2=0.79$). This finding is reflective of the variable relations between individual health-related SDG indicators and SDI (results appendix pp 346–47). For instance, SDI was a poor predictor of mortality due to exposure to forces of nature, self-harm, interpersonal violence, and war (collective violence and legal intervention), as well as childhood overweight, intimate partner violence, and ambient particulate matter pollution. By contrast, SDI was highly predictive of maternal mortality ratio, under-5 mortality, and neonatal mortality, as well as mortality attributable to unsafe water, sanitation, and hygiene. Notably, the overall health-related SDG index also had a strong relation with healthy life expectancy ($r^2=0.86$), a summary measure of population health.

By subtracting expected levels for the health-related SDG index, on the basis of SDI alone, from observed levels (figure 5), we could identify potential geographical deviations well above or below expected values on the health-related SDG index. Countries that represent substantial deviations from the average might warrant further investigation to understand how and why they are underperforming or overperforming relative to the average. This deviation might be due, for example, to more or less efficient use of resources to improve health. Many countries in western Europe, Latin America, and parts of east and southeast Asia, as well as other countries such as Australia, recorded health-related SDG index levels that were higher than expected on the basis of SDI alone. Many of the countries with a health-related SDG index below expected levels on the basis of SDI were located in southern and central sub-Saharan Africa, eastern Europe and central Asia (eg, Belarus and Ukraine), North Africa and the Middle East, south Asia, and selected countries such as the USA.

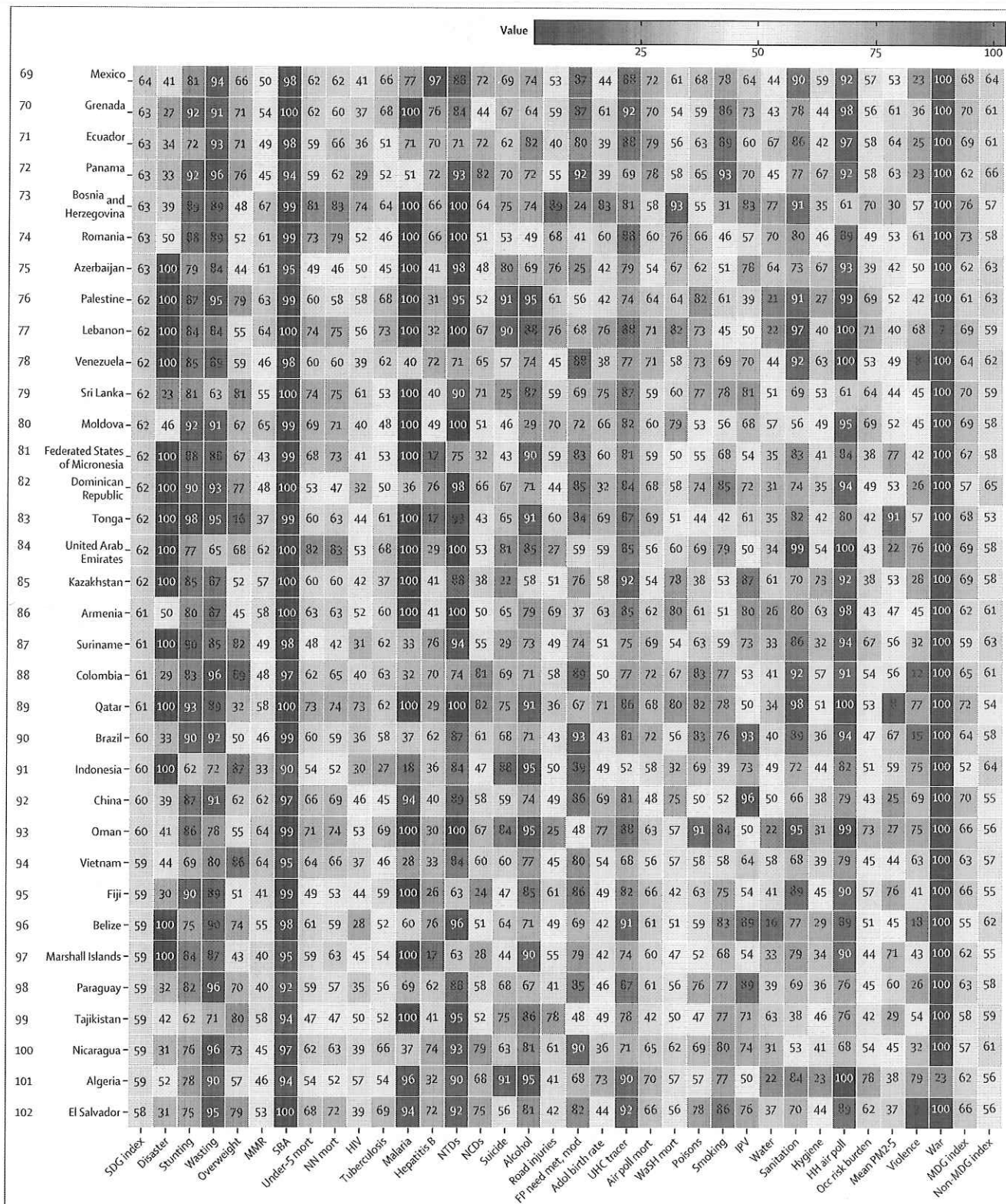
To provide a preliminary indication of potential trajectories in the next 15 years, we assessed absolute changes in the past 15 years for each of the 33 health-related SDG indicators and three summary indices (overall health-related SDG index, health-related MDG index, and non-MDG index). Overall, health-related SDG indicators largely improved since 2000, as summarised by the health-related SDG index; notably, gains in the health-related MDG index generally exceeded improvements in the non-MDG index (figure 6). Across countries, the most pronounced progress occurred for UHC tracer interventions, met need with modern contraception, hygiene, under-5 mortality, and neonatal mortality. Such striking gains for the indicator on UHC tracer interventions reflected the scale-up of antiretroviral therapy and coverage of insecticide-treated nets in malaria-endemic countries since the early 2000s.^{31,44,45} Of note, the relatively small



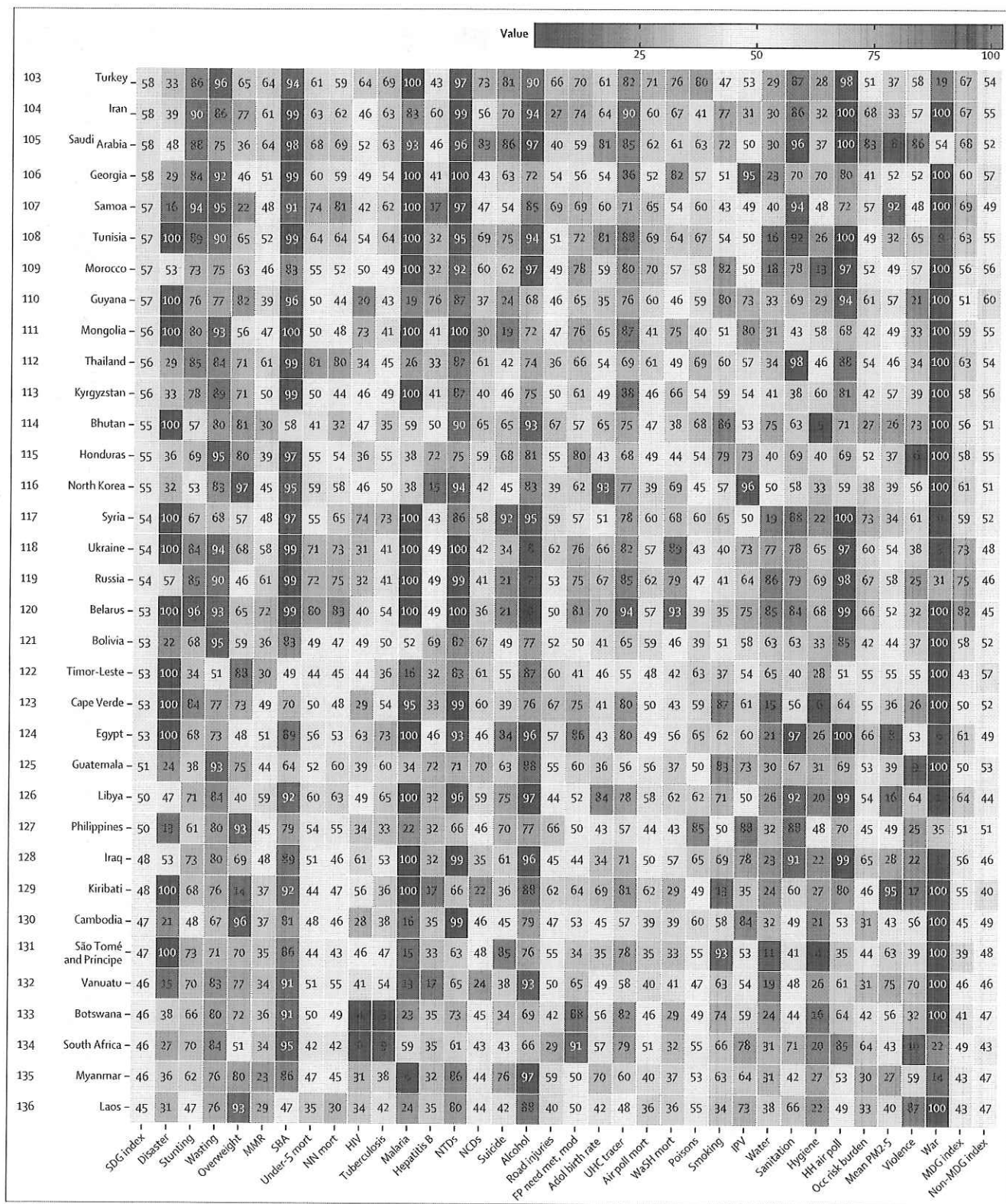
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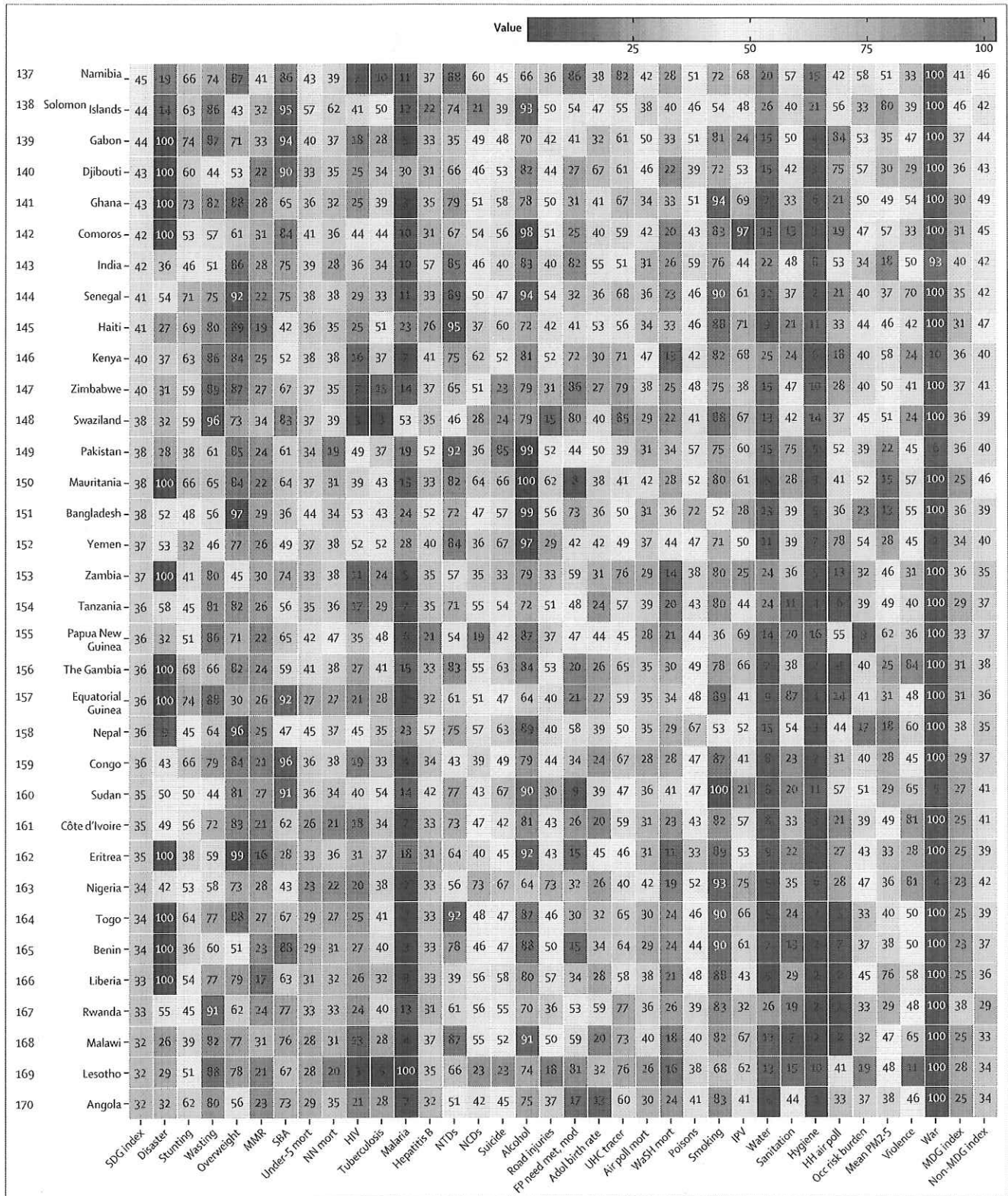
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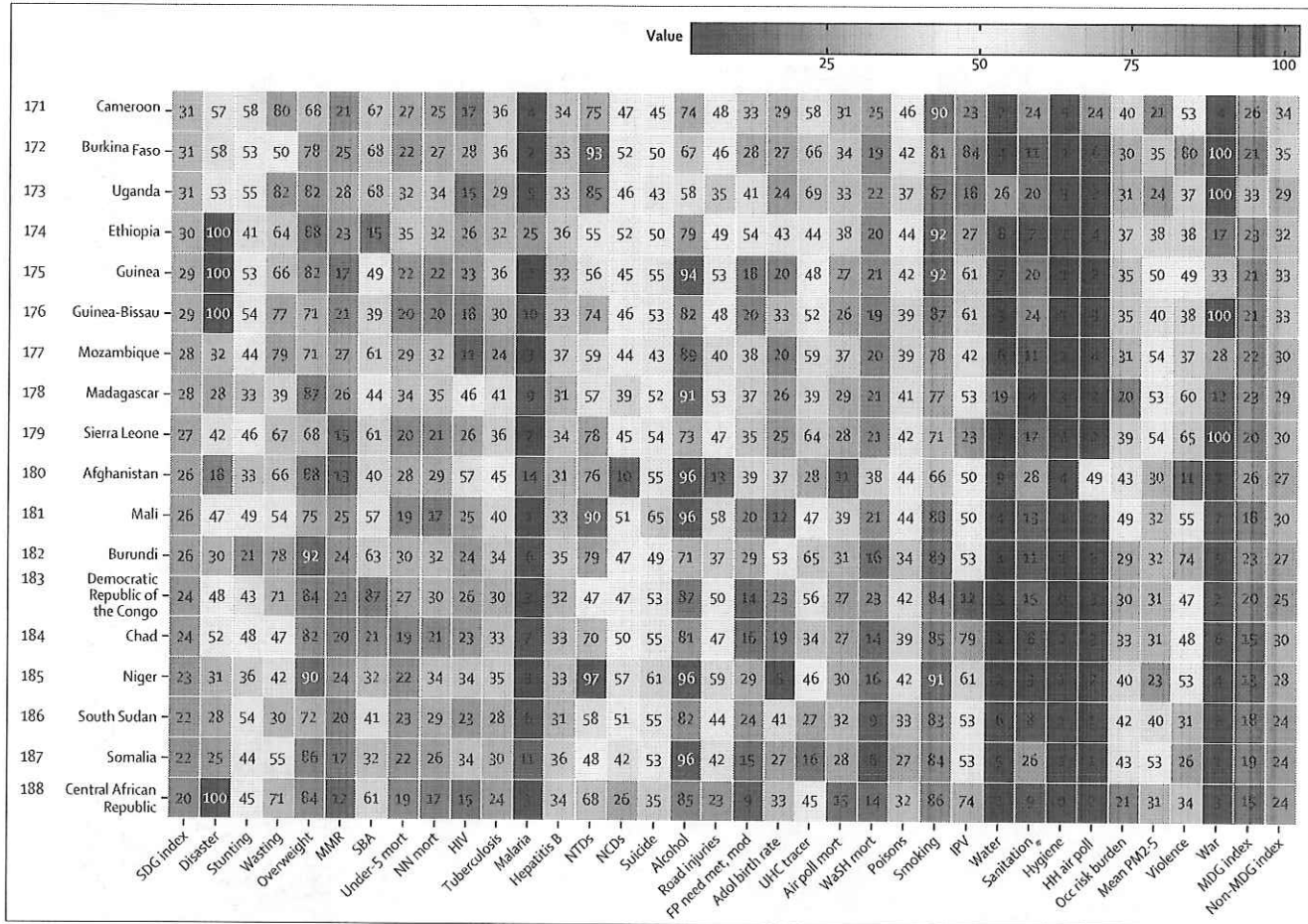


Figure 1: Performance of the health-related SDG index, MDG index, and non-MDG index, and 33 individual health-related indicators, by country, 2015
 Countries are ranked by their health-related SDG index from highest to lowest. Indicators have been scaled from 0 to 100. Definitions of health-related SDG indicators are shown in table 1.
 SDG=Sustainable Development Goal. MDG=Millennium Development Goal. MMR=maternal mortality ratio. SBA=skilled birth attendance. Mort=mortality. NN mort=neonatal mortality. NTDs=neglected tropical diseases. NCDs=non-communicable diseases. FP need met, mod=family planning need met, modern contraception. Adol=adolescent. UHC=universal health coverage.
 Air poll mort=mortality attributable to air pollution. WASH=water, sanitation, and hygiene. IPV=intimate partner violence. HH air poll=household air pollution. Occ risk burden=burden attributable to occupational risks. PM2.5=fine particulate matter smaller than 2.5 µm.

improvement for the indicator on malaria incidence represents the large number of malaria-free countries in both 2000 and 2015.⁴⁶ Health-related indicators covered by Target 3.3—which aims to end the epidemics of HIV, tuberculosis, malaria, and neglected tropical diseases, and to “combat hepatitis” by 2030—generally saw moderate progress (median absolute change of 2.7 [IQR -0.2 to 4.6] for HIV incidence and 3.9 [IQR 1.7 to 5.7] for tuberculosis incidence), although minimal changes occurred for hepatitis B incidence (-0.2 [-0.4 to -0.05]). In combination, these trends highlight the need for accelerated progress in order to meet Target 3.3. Substantial improvements occurred for childhood stunting (8.2 [3.5 to 14.2]) and, to a more modest extent, wasting (2.7 [0.0 to 6.0]), yet childhood overweight considerably worsened in the past 15 years (-4.5 [-9.2 to -0.7]). This trend occurred across SDI

quintiles, emphasising the need for concerted policy attention to reverse this trend. Alcohol consumption worsened slightly in the past 15 years as well (-0.4 [-2.3 to 0.7]).

Between 2000 and 2015, distinct patterns for absolute changes in health-related SDG indicators surfaced across SDI quintiles (figure 6). While the indicator for UHC tracer interventions improved across all SDI quintiles, the most pronounced gains occurred in low-SDI and low-middle-SDI countries. Childhood stunting and wasting also improved at a faster pace for the low-SDI quintile than for other quintiles. Notably, mortality measures from the MDG agenda—maternal mortality ratio, under-5 mortality, and neonatal mortality—progressed at a similar pace across SDI quintiles. By contrast, mortality due to road injuries, non-communicable diseases (NCDs), and interpersonal

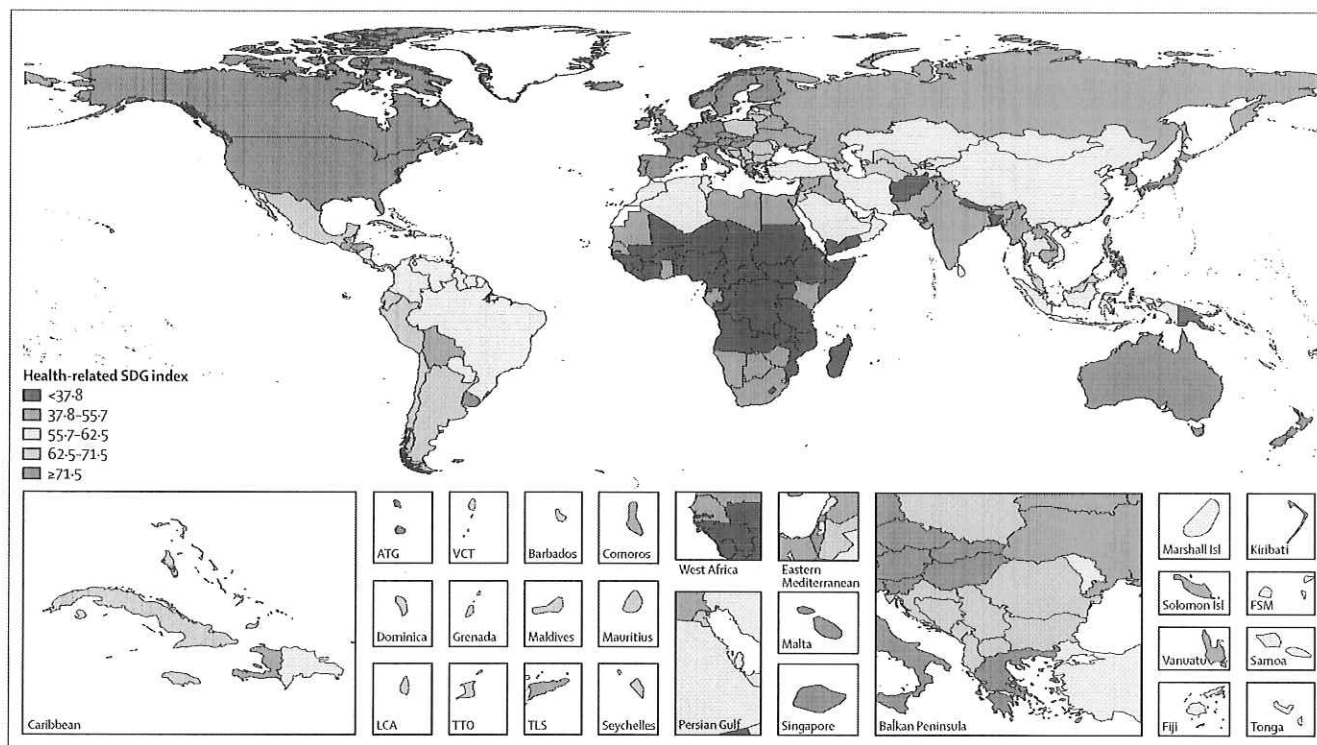


Figure 2: Map of health-related SDG index, by quintile, 2015

SDG=Sustainable Development Goal. ATG=Antigua and Barbuda. VCT=Saint Vincent and the Grenadines. LCA=Saint Lucia. TTO=Trinidad and Tobago. TLS=Timor-Leste. FSM=Federated States of Micronesia.

violence declined faster in the higher-SDI quintiles than in the lower-SDI quintiles. Prevalence of smoking also had the largest reductions in countries in the high-SDI quintile.

Between 2000 and 2015, progress on the health-related SDG index (figure 7), as well as on individual health-related SDG indicators and on the MDG and non-MDG indices (results appendix p 6), was highly heterogeneous across geographies. Since 2000, the largest absolute improvements in the health-related SDG index occurred in Timor-Leste (18.5, 95% UI 16.2–20.8), Bhutan (16.2, 13.6–18.7), and Colombia (15.6, 14.1–16.8), whereas three countries—Libya, Syria, and Chile—experienced significant declines. Declines for the next two countries (Brunei and South Sudan) were between 0 and –0.5 and rounded to 0 in figure 7. Countries with the most pronounced gains for the health-related SDG index were found mainly in east, southeast, and central Asia, as well as parts of Latin America (eg, Venezuela and Honduras). Several countries in sub-Saharan Africa also recorded considerable gains in the health-related SDG index, including Rwanda, Ethiopia, Ghana, Namibia, and Angola.

To demonstrate the usefulness of these estimates for informing progress towards the SDGs, we also identified

the geographies with the largest improvement in overall health-related SDG index between 2000 and 2015, stratified by SDI quintile classification in 2000. The five geographies were: Timor-Leste in the low-SDI quintile, Tajikistan in the low-middle-SDI quintile, Colombia in the middle-SDI quintile, Taiwan (province of China) in the middle-high-SDI quintile, and Iceland in the high-SDI quintile. Based on their gains for the health-related SDG index, these geographies could serve as case studies for understanding potential drivers of progress on the SDGs.

In Timor-Leste, changes in the health-related SDG index were largely driven by improvements in UHC tracer interventions, skilled birth attendance, met need with modern contraception, under-5 and neonatal mortality, childhood stunting, risk exposure to unsafe water and sanitation, and mortality from war or conflict. This overall improvement was despite worsening measures for childhood overweight, smoking prevalence, and alcohol use since 2000. Tajikistan recorded sizeable improvements across various health-related SDG indicators. Among indicators related to the MDGs, these included both measures of child mortality, childhood stunting, coverage of UHC tracer interventions, malaria incidence, and exposure to household air pollution. Improvements were also noted

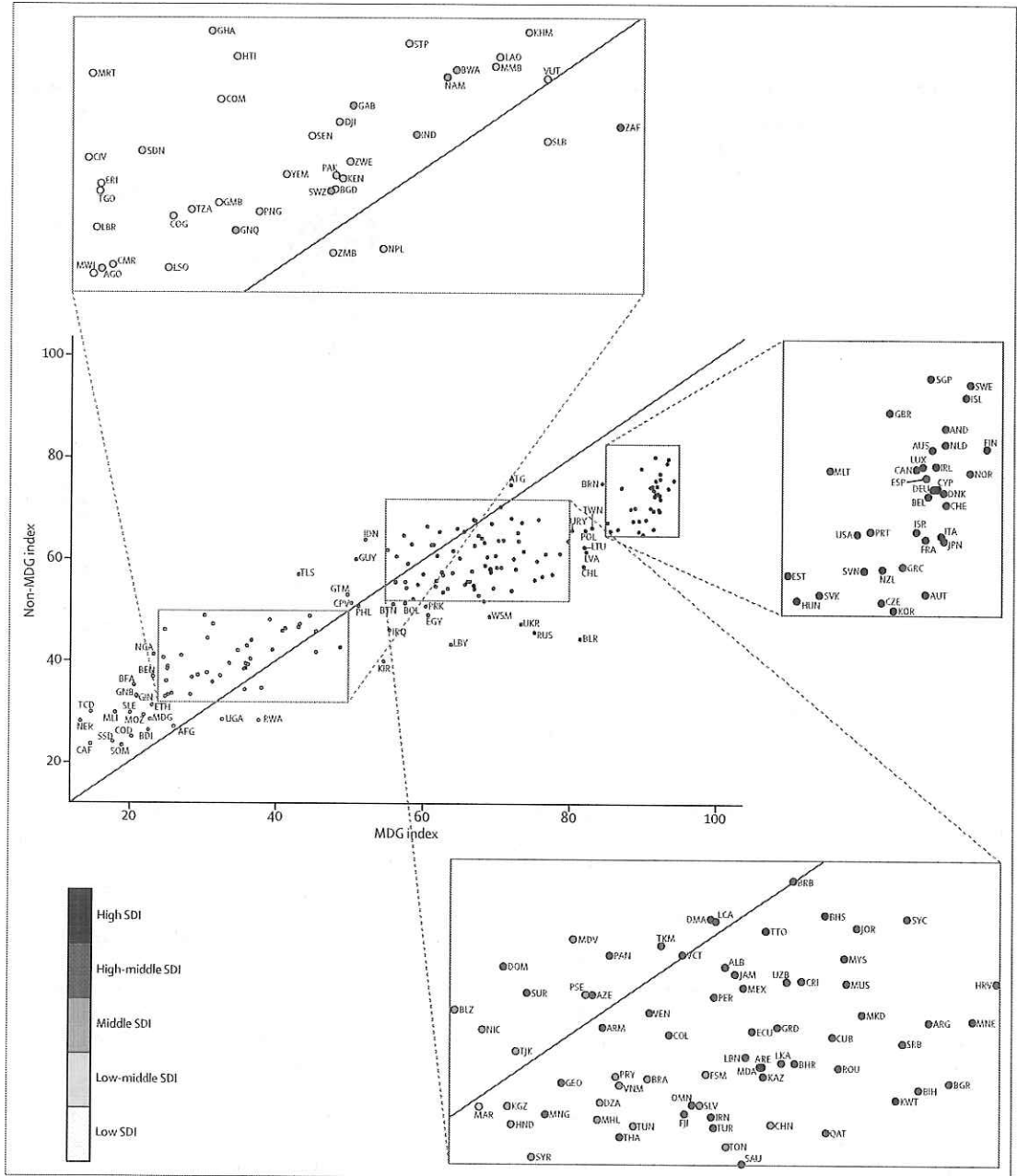


Figure 3: Non-MDG index versus MDG index, by country, 2015
 The dark blue line shows the equivalence line, such that values that fall on this line are equivalent for both the MDG index and non-MDG index. Countries are abbreviated according to the ISO3 code. MDG=Millennium Development Goal. SDI=Socio-demographic Index.

in mortality due to NCDs, interpersonal violence, and war or conflict, as well as mortality attributable to unsafe water, sanitation, and hygiene and to air pollution. However, several indicators either had minimal progress or worsened in Tajikistan, particularly childhood overweight and intimate partner violence. Colombia's most pronounced improvements since 2000 occurred

for many of the non-MDG indicators, which included smoking prevalence and mortality rates due to NCDs, road injuries, interpersonal violence, and war. Sizeable improvements were also recorded for a subset of health-related MDG indicators—namely, coverage of UHC tracer interventions, adolescent birth rates, met need with modern contraception, and unsafe sanitation.

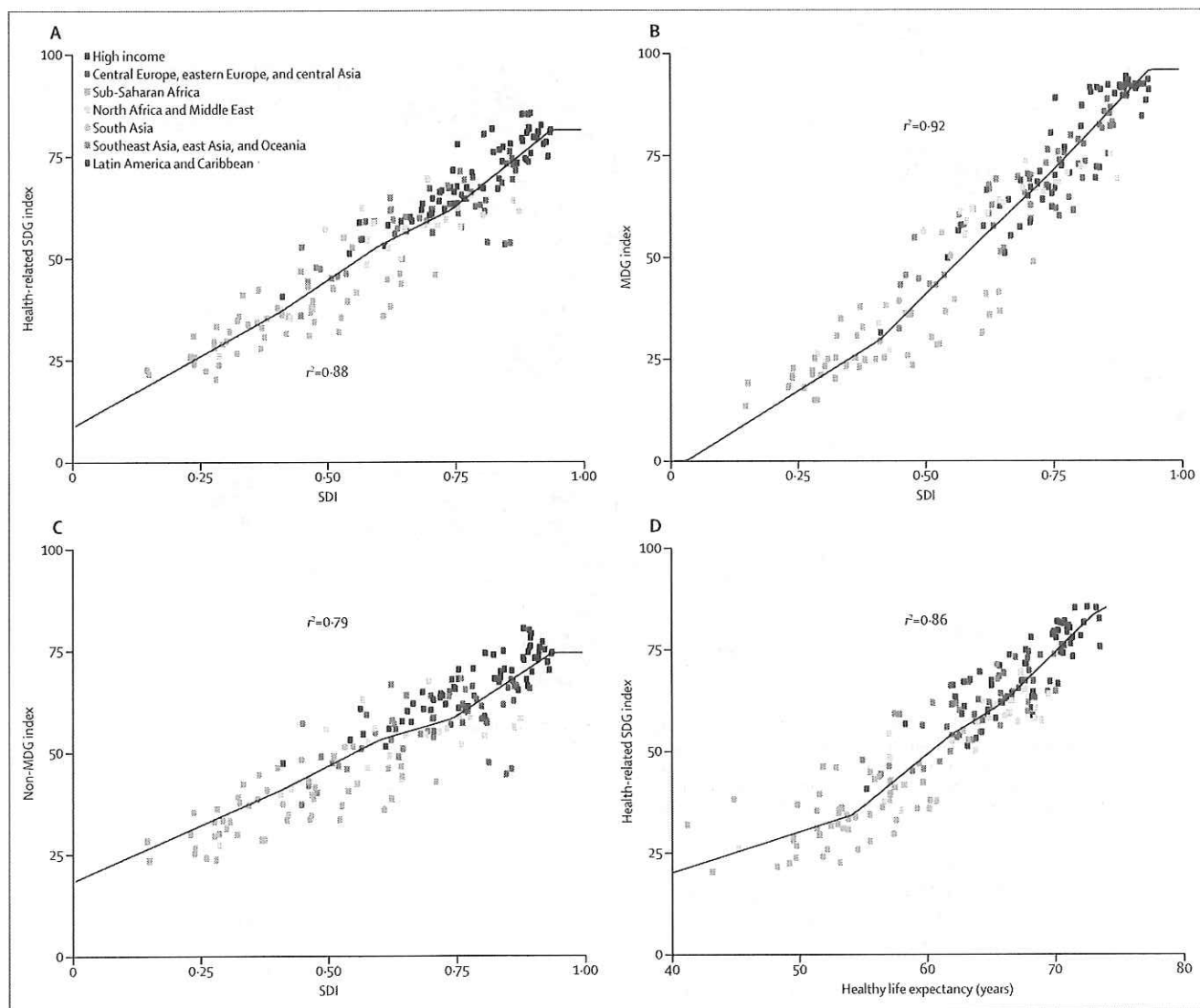


Figure 4: Relations (A) between the SDI and the health-related SDG index, (B) between the SDI and the MDG index, (C) between the SDI and the non-MDG index, and (D) between healthy life expectancy and the health-related SDG index, by country representing each of the seven GBD super regions, 2015

Each point represents a country and is colour coded according to the seven GBD super regions. The black lines were generated by spline regression. SDG=Sustainable Development Goal. SDI=Socio-demographic Index. MDG=Millennium Development Goal. GBD=Global Burden of Disease.

Nonetheless, similar to other countries, Colombia had minimal progress in or worsened levels of alcohol consumption and hepatitis B incidence. In Taiwan, marked gains occurred for a subset of health-related SDG indicators previously associated with the MDG agenda (eg, adolescent birth rates and coverage of UHC tracer interventions); in parallel, Taiwan had considerable improvements for many non-MDG indicators, such as smoking prevalence and mortality due to NCDs, interpersonal violence, and road injuries. However, HIV and hepatitis B incidence worsened in Taiwan since 2000, and minimal progress occurred for

ambient particulate matter pollution and several maternal and child health indicators. For Iceland, its progress on the health-related SDG health index was primarily driven by improvements in mortality due to NCDs and road injuries, smoking prevalence, adolescent birth rates, and both measures of child mortality. Similar to other countries, particularly those in the high-middle-SDI and high-SDI quintiles, Iceland had little progress in childhood overweight and worsening levels of alcohol consumption.

Further results are provided in the results appendix, and dynamic visualisations are available online.

For dynamic visualisations of results see <https://vizhub.healthdata.org/sdg>

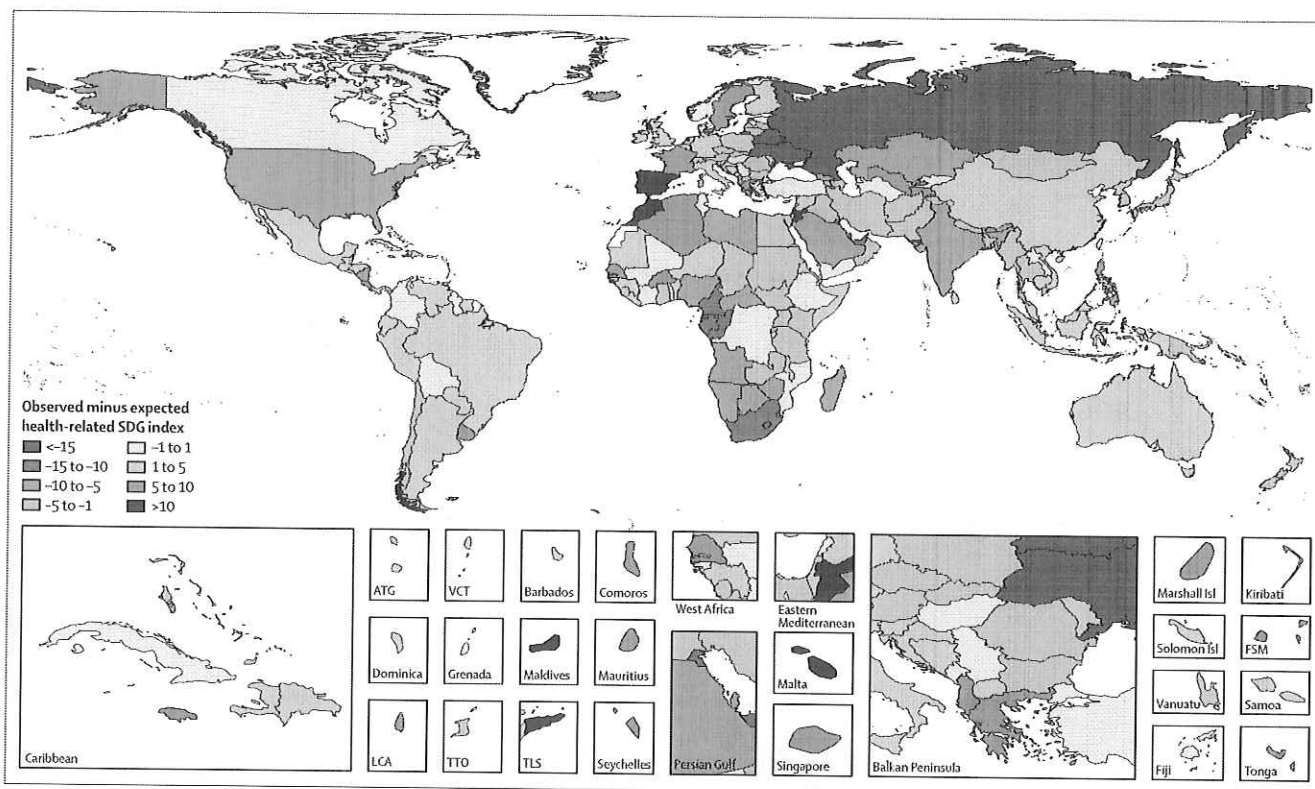


Figure 5: Map of observed health-related SDG index minus expected health-related SDG index, on the basis of SDI alone, 2015
 The difference between the observed health-related SDG index and expected index (on the basis of SDI) reflects whether a country has a health-related SDG index above or below the expected level. Values for this difference are colour coded such that dark red reflects an observed health-related SDG index that is much lower than expected on the basis of SDI, and dark blue indicates that observed levels are much higher than expected on the basis of SDI. SDG=Sustainable Development Goal. SDI=Socio-demographic Index. ATG=Antigua and Barbuda. VCT=Saint Vincent and the Grenadines. LCA=Saint Lucia. TTO=Trinidad and Tobago. TLS=Timor-Leste. FSM=Federated States of Micronesia.

Discussion

Summary of findings and implications

The ambitious SDG agenda is accompanied by numerous goals, targets, and indicators for tracking progress. Leading up to and following the UN SDG resolution¹ in September, 2015, considerable debate surrounded the selection of indicators, including scepticism about the feasibility of their measurement.^{5,6} In this study, we produced independent, highly standardised, and comparable estimates of 33 of the 47 health-related SDG indicators across 188 countries. To facilitate overall tracking, we also distilled these 33 health-related indicators into a health-related SDG index. Our findings show the wide range in this health-related SDG index in 2015, from 20.4 in Central African Republic to 85.5 in Iceland. Our historical analysis of these indicators also shows that progress can be achieved. Notable improvements were recorded for several health-related SDG indicators, particularly those that were also MDG indicators, such as under-5 mortality, met need with modern contraception, and childhood stunting. An index of the 14 MDG indicators that were included in the health-related SDG indicators

had a median absolute change of 10.0 from 2000 to 2015, and larger reductions were generally found for countries at the lower end of the development spectrum. Our analysis also highlights the challenges associated with the expanded scope of the SDGs, with several of the non-MDG indicators having minimal improvements (eg, hepatitis B incidence) or worsening (eg, childhood overweight) between 2000 and 2015. This finding is further supported by the highly variable relation between the health-related MDG index and the health-related non-MDG index—good performance on the MDG index did not guarantee good performance on the non-MDG index. The overall health-related SDG index was well predicted by SDI; however, SDI was a variable predictor of the performance of individual health-related SDG indicators, particularly indicators that were not in the MDG agenda. Drawing from GBD, these findings provide a strong, comparable basis for monitoring the SDGs; furthermore, the independent nature of these results can enable accountability mechanisms for the multiple national and international, governmental, and non-governmental actors that must achieve progress on the SDGs.