NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4

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NCD Countdown 2030: Worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4

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Key messages

People in all but about 20 countries have a higher risk of dying prematurely from a non-communicable disease (NCD) than from infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies combined.

The risk of dying from an NCD is highest in low- and middle-income countries, especially in sub-Saharan Africa for both sexes and in central Asia and eastern Europe for men.

Progress towards Sustainable Development Goal (SDG) target 3.4 is markedly different across countries. At current rates of decline in NCD mortality, SDG target 3.4 is expected to be met for women in 35 countries (19% of all countries) and men in 30 countries (16%). Most of these are high-income countries with already-low NCD mortality and countries in central and eastern Europe. A further 50 countries (for women) and 35 countries (for men) would achieve the target with a modest acceleration of decline.

Mortality from the four NCDs included in SDG target 3.4 has stagnated or increased since 2010 among women and men in 15 and 24 countries, respectively. Another 86 countries (for women) and 97 (for men) are progressing too slowly, and need to implement policies that significantly increase the rates of decline, if they are to meet SDG target 3.4.

NCD deaths beyond the age range and causes of death included in SDG target 3.4 cause a larger mortality burden in low- and middle-income countries than in high-income countries. Health policies should address NCDs beyond the causes and age groups covered in SDG target 3.4, so as to “leave no one behind”.

Substantial reduction of NCD mortality requires policies that significantly reduce tobacco and alcohol use and blood pressure levels, and provide access to efficacious and high-quality preventive and curative care for NCDs in the context of UHC.

Summary

The third UN High-Level Meeting on Non-Communicable Diseases (NCDs) in September 2018 will review national and global progress in prevention and control of NCDs and provides an opportunity to renew, reinforce and enhance commitments to reducing their burden. NCD Countdown 2030 is an independent collaboration aiming to monitor and inform progress towards reducing the worldwide burden of NCDs.

In 2016, an estimated 40.5 million (71%) of 56.9 million of worldwide deaths were from NCDs. Of these, 1.7 million occurred before 30 years of age, 15.2 million between 30 and 70 years of age and 23.6 million in people aged 70 years and older. There were 32.2 million deaths from cancers, cardiovascular and chronic respiratory diseases, and diabetes and another 8.3 million from other NCDs. Females in 164 countries (88% of all countries) and males in 165 countries (89%) had a higher probability of dying before 70 years of age from an NCD than from infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies combined.

The lowest levels of NCD mortality in the world in 2016 were seen in high-income countries in the Asia-Pacific, western Europe and Australasia and in Canada. The highest risks of death from NCDs were experienced in low- and middle-income countries, especially in sub-Saharan Africa, and, for men, in central Asia and eastern Europe. Thirty five countries (19% of all countries) are expected to achieve Sustainable Development Goals (SDG) target 3.4 of one-third reduction, relative to their 2015 levels, in the probability of dying between 30 and 70 years of age from cancers, cardiovascular and chronic respiratory diseases, and diabetes by 2030 for women, and 30 (16%) are expected to do so for men, if they maintain or surpass their 2010-2016 rate of decline in mortality. Most of these are high-income countries with already-low NCD mortality and countries in central and eastern Europe. Another 50 (27%) countries for women and 35 (19%) for men are projected to achieve such a reduction in the subsequent decade, and with a modest acceleration of decline could meet the 2030 target.

86 countries (46%) for women and 97 (52%) for men need the implementation of policies that significantly increase the rates of decline. Mortality from the four NCDs included in SDG target 3.4 has stagnated or increased since 2010 among women and men in 15 (8%) and 24 (13%) countries, respectively. NCD causes and age groups other than those included in the SDG target 3.4 are responsible for a higher risk of death in low- and middle-income countries than in high-income countries.

For countries to substantially reduce NCD mortality requires policies that significantly reduce tobacco and alcohol use and blood pressure levels, and provide efficacious and high-quality preventive and curative care for NCDs, including timely diagnosis and treatment of hypertension, diabetes, and treatment-amenable cancers, and treatment pathways that improve the survival of those with acute and chronic NCDs.

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Introduction

Non-communicable diseases (NCDs) are the leading causes of ill health in the world and account for seven out of ten worldwide deaths.[1, 2] NCD death rates are higher in low- and middle-income countries and, at least in high-income countries, in people with lower socioeconomic status,[3-5] making NCDs an important obstacle to reducing global and national health inequalities.[6]

Following the first United Nations (UN) High-Level Meeting on the prevention and control of NCDs in 2011, the World Health Organization (WHO) member states committed to reduce mortality between 30 and 70 years of age from four NCDs (cancers, cardiovascular and chronic respiratory diseases, and diabetes; referred to as NCD4 hereafter) by 25% relative to their 2010 levels by 2025 (referred to as the 25×25 target). NCDs have also been included in the Sustainable Development Goals (SDGs), with a target to "by 2030 reduce by one-third pre-mature mortality from non-communicable diseases (NCDs) through prevention and treatment, and promote mental health and wellbeing" (SDG target 3.4). The indicator used to measure progress in reducing premature NCD mortality is the same as the 25×25 target, and suicide is used as a tracer indicator for mental health.

2018 is an important year for action on NCDs,[7] with the third UN High-Level Meeting on NCDs in September 2018 reviewing global and national progress and renewing and enhancing political commitment towards reducing NCD mortality. Supporting these political deliberations and informing actions to reduce the health burden of NCDs requires data on how NCD mortality is changing in different countries, and on interventions and policies that can reduce them. NCD Countdown 2030 is an independent collaboration aiming to monitor progress towards reducing the worldwide burden of NCDs, and to inform policies that aim to accelerate progress (Panel 1). This first report from NCD Countdown 2030 evaluates the current worldwide status of mortality from NCDs and how likely it is, based on recent trends, to achieve significant reductions in mortality as agreed for SDG target 3.4. We also evaluate

the importance of outcomes and age groups beyond those included in this target and its indicators, and discuss the implications for NCD policies.

NCDs as a global health challenge

We used data on deaths from NCDs – including cancers; cardiovascular diseases; diabetes; endocrine, blood, and immune disorders; non-infectious respiratory, digestive (including liver), and genitourinary diseases; neurological conditions; mental and substance use disorders; congenital anomalies; and sense organ, skin, musculoskeletal and oral/dental conditions – by sex, age group and country from the World Health Organization (WHO) Global Health Estimates 2016.[1] The data sources and methods are described in detail in a methodology document,[11] and summarised in the Appendix.

According to these estimates, NCDs accounted for an estimated 40.5 million (71%) of 56.9 million of worldwide deaths in 2016, and for an estimated 17.0 million (57%) of 29.8 million deaths before 70 years of age, the age commonly used to define premature death.[12] NCDs were an important cause of death in all ages except the very youngest: they accounted for at least 25% of all deaths in every age group after 10 years of age, and for more than one half in age groups beyond 40 years (Figure 1). Females in 164 countries (88% of all countries) and males in 165 (89%) countries were estimated to have a higher probability of dying prematurely before 70 years of age from an NCD than from infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies combined (Figure 2).

Current status of NCD mortality and progress towards SDG target 3.4

Figure 3A maps the level in 2016 of the indicator used to measure progress towards SDG target 3.4, the probability of dying from NCD4 between exact age 30 years and exact age 70 years, in the absence of competing causes of death. SDG target 3.4 is calculated in the absence of competing causes of death so that it measures only the risk of dying from the

causes of interest, namely NCD4.[13] In addition, SDG target 3.4 uses deaths from suicides as a tracer for mental health (Panel 2).

For women, the probability of dying from NCD4 between 30 and 70 years of age was below six percent in South Korea and Japan, and was also low in some high-income countries in western Europe (e.g., Spain and Switzerland), Singapore and Australia. The highest probabilities for women were seen in parts of sub-Saharan Africa, and in Guyana, Yemen, Afghanistan and Papua New Guinea, where 30-year-old women had a one in three to one in four risk of dying from NCD4 before reaching their 70th birthday, about three to seven times more likely than in the above-mentioned high-income countries. For men, the probabilities of dying from NCD4 were highest in central Asia, eastern Europe, parts of Oceania, North Korea and Yemen with 30-year old men having a more than one in three risk of dying from one of these four diseases before their 70th birthday. The lowest probabilities, ranging from ten to twelve percent, were those in some high-income countries in western Europe, Bahrain, South Korea, Australia, Japan, Canada, New Zealand, and Singapore.

Progress towards SDG target 3.4 is shown in Figure 4A, while Figures 5A shows the year when a one-third reduction, relative to 2015 levels, is expected to be achieved if the rate of decline from 2010 to 2016 continues (note that because the target is formulated as relative to 2015 levels, countries with higher mortality in 2015, would need a larger absolute reduction to achieve the same relative reduction). Women in 35 countries (19% of all countries) and men in 30 countries (16%) are expected to achieve SDG target 3.4 of one-third reduction, relative to their 2015 levels, in probability of dying between 30 and 70 years of age from NCD4 by 2030 if they maintain or surpass their 2010-2016 rate of decline. Another 50 countries (27%) for women and 35 for men (19%) are projected to achieve such a reduction in the subsequent decade, i.e. by 2040, and with modest acceleration of their rate of decline could meet the 2030 target. 86 countries (46%) for women and 97 countries (52%) for men require policies that significantly increase the rates of decline. The probability

of dying from NCD4 between 30 and 70 years of age has stagnated or increased since 2010 among women in 15 countries (8%) and men in 24 countries (13%).

With the exception of the USA (women), Iceland (women) and Cyprus (men), mortality from NCD4 is declining in high-income regions of Asia-Pacific, Australasia, north America and western Europe, with some countries in these regions progressing sufficiently fast to achieve SDG target 3.4. In Denmark, Luxembourg, New Zealand, Norway, Singapore and South Korea both sexes are on track for such a reduction (Figure 4A and Figure 5A); men in another nine high-income Asia-Pacific or western countries are also on track. Deaths from NCD4 are also declining rapidly in central and eastern Europe, from very high levels for men, with many countries in this region on track to achieve a one third reduction, relative to 2015 levels, by 2030.

In other regions, women and men in Bahrain, Brazil, Iran, Kazakhstan, Maldives and Timor-Leste are experiencing a sufficiently rapid decline in NCD4 mortality to achieve a one third reduction, relative to 2015 levels, by 2030. Women in Armenia, Azerbaijan, Congo, Costa Rica, Grenada, Kuwait, Oman, Qatar, Samoa, Thailand, Zambia and men in Argentina are also on track. Some other countries, mainly in Latin America and southern Africa, are also making progress in reducing premature NCD deaths but will miss the target by up to 10 years. However, progress has been slow throughout Asia and Oceania, and in other parts of sub-Saharan Africa and Latin America and the Caribbean. In a number of countries in these regions, mortality from the four NCDs included in SDG target 3.4 has increased since 2010. NCD4 mortality has declined in China and India, the two most populous countries in the world, but the rate of decline is not sufficient to meet the SDG target 3.4.

The countries where mortality from NCD4 has stagnated or even increased (15 for women and 24 for men) were a heterogeneous group in different regions including three high-income western countries (women in Iceland and the USA, and men in Cyprus). In the USA,

cancer mortality has continued to decline while the decline from other causes has slowed down or reversed, especially in poorer rural communities, leading to a stagnation or rise in death rates depending on age.[21-23] Other large countries (sex-specific population of 10 million or larger in 2016) in this group were Bangladesh (men), Egypt (women), Ghana (both sexes), Ivory Coast (both sexes), Kenya (both sexes), Mexico (men), Sri Lanka (women), Tanzania (men), all of which experienced stagnation or small increases. Low- and middle-income countries with substantial worsening of NCD mortality included Haiti, Papua New Guinea and the sparsely populated islands of Antigua and Barbuda, and Saint Vincent and the Grenadines. The reasons for lack of progress in these countries are not known and may be because major NCD risk factors, e.g., blood pressure, diabetes, obesity, and alcohol and tobacco use, either failed to improve or worsened[24-28] and/or because their health systems are not able to prevent, treat and manage NCDs.

NCD mortality beyond SDG target 3.4

The WHO 25x25 target and SDG target 3.4 both refer to deaths from NCD4 between exact age 30 years and exact age 70 years. In 2016, there were 12.5 million deaths from these four causes between 30 and 70 years of age. The indicator used for these targets excludes:

- An estimated 1.7 million NCD deaths in people younger than 30 years of age (4% of all NCD deaths; 18% of all deaths in these ages). Of these, 0.6 million were estimated to be from NCD4 and 1.2 million from all other NCDs. The largest NCD causes of death in these ages in 2016 were congenital heart anomalies (2.5% of all deaths and 13.3% of NCD deaths in these ages), sickle cell disorders (0.8% of all deaths and 4.1% of NCD deaths in these ages), ischaemic heart disease (0.7% of all deaths and 3.9% of NCD deaths in these ages), stroke (0.7% of all deaths and 3.7% of NCD deaths in these ages), kidney diseases (0.7% of all deaths and 3.6% of NCD deaths in these ages), and leukaemia (0.6% of all deaths and 3.4% of NCD deaths in these ages).
- An estimated 2.8 million deaths from NCDs other than NCD4 between 30 and 70 years of age. These 2.8 million deaths account for 7% of all NCD deaths (18% of NCD deaths

in these ages). The most significant of these causes are liver cirrhosis and kidney diseases.

- An estimated 23.6 million NCD deaths in people aged 70 years and older (58% of all NCD deaths). Of these, 10.3 million were estimated to be in those aged 70-79 years, and 13.3 million in people aged 80 years and older. 11.4 million (48.4%) of these 23.6 million deaths were estimated to be from CVDs and another 7.8 million (33.0%) from cancers, chronic respiratory diseases, and diabetes (Figure 1).

Many of the causes of death excluded from SDG target 3.4 have shared risk factors and interventions with NCD4. For example, high blood pressure and alcohol use are risk factors for deaths from NCD4 as well as from kidney disease, liver cirrhosis and dementia.[29-33] Exclusion of these diseases from the global target could therefore lead to policy and intervention choices that are less effective in terms of improving population health. In terms of age, with the key exception of some genetically-determined and congenital conditions, NCD deaths prior to 30 years of age can be avoided through prevention and treatment, as evidenced by very-low death rates in these ages in high-income countries. Finally, some of the NCD deaths in people aged 70 years and older can be postponed through primary or secondary prevention and treatment, and lower mortality in these ages has contributed to rising life expectancy in high-income and some middle-income countries.[34-36] A target excluding these age groups is not consistent with the SDG principle of “leaving no one behind”.

Figure 6 shows the difference between the probability of dying from all NCDs between birth and 80 years of age and the indicator used for SDG target 3.4 (i.e. the probability of dying from NCD4 between 30 and 70 years of age), by country in 2016. We limited the age range to 80 years because probability of death in the absence of competing causes reaches 100% when the entire life course is considered (i.e., while death can be postponed, they cannot be avoided) which makes it impossible to distinguish among countries. Further, above 80 years

of age, NCD death rates have larger error than in younger ages for two reasons. First, age in censuses or at the time of death may be misreported (i.e., overstated or understated) with larger error than in younger ages, which leads to incorrect estimates of age-specific population and deaths, and hence death rates.[37, 38] Second, the assignment of cause of death in older ages is more difficult, often because people have multiple conditions.[39] As a result, a larger share of deaths are assigned to improbable or ill-defined causes of death in the oldest age groups.[40, 41]

The difference between the comprehensive indicator and the SDG 3.4 indicator was largest in low- and middle-income countries with high NCD burden, mainly those in sub-Saharan Africa and some countries in Central Asia, Middle East and North Africa (e.g., Egypt), especially for men. It was smallest in high-income countries, followed by those in Latin America and Caribbean and central and eastern Europe. This finding means that NCD deaths beyond the age range and causes of death included in SDG target 3.4 cause a larger mortality burden in low- and middle-income countries than in high-income countries, which can only be revealed by taking a more comprehensive approach to NCDs and including all NCD deaths between birth and 80 years of age. By leaving out a larger burden in low- and middle-income countries, the SDG 3.4 indicator also underestimates global inequalities in NCDs. To take a more epidemiologically coherent and inclusive approach, NCD Countdown 2030 will also report on all NCD deaths below 80 years of age alongside monitoring progress towards SDG target 3.4.

The probability of dying between birth and 80 years of age from all NCDs is shown in Figure 3B. This probability is highest in low- and middle-income countries in sub-Saharan Africa and south and southeast Asia, parts of Middle East and North Africa, Oceania, and, for men, in central Asia and Eastern Europe, contrasting with low mortality in high-income countries and some countries in southern Latin America. Males had a higher probability of dying from NCDs than females in all but a few countries in 2016 (Figure 7A), with the largest male

disadvantage being those in central Asia and central and eastern Europe. In most countries, the probability of dying between birth and 80 years of age from NCDs declined at a higher rate among women than among men (Figure 7B). The notable exception was some high-income western countries where trends in men were more favourable than in women, including Iceland, Netherlands, Norway, Finland, Sweden, Switzerland, Australia, France, Italy and Belgium.

Average yearly change from 2010 to 2016 in the SDG target 3.4 indicator and the comprehensive NCD outcome, both as a percent of 2015 level, were correlated (correlation coefficient = 0.80 for females and 0.88 for males). However, the rate of reduction was smaller for the comprehensive NCD outcome (Appendix Figure 1), indicating that measuring progress based on the SDG target 3.4 indicator gives a more optimistic picture of progress than warranted based on the total NCD mortality burden experienced by many populations. In particular, if progress were measured based on all NCDs and all ages under-80 years of age, only 17 countries (9%) for women and 5 countries (3%) for men would be on track to reduce the probability of death by one third, relative to 2015 levels, by 2030, because progress is slower for causes and age groups that are not a part of SDG target 3.4.

Which NCDs are driving the mortality declines?

Figure 8 shows the contribution of changes in major disease clusters to the overall decline in the probability of dying from NCDs between birth and 80 years of age. In high-income countries, cancers have emerged as an important contributor to the overall decline in NCD mortality alongside CVDs, which have declined for decades,[42-44] and diabetes, whose deaths have declined more recently.[45] In central and eastern Europe, where CVD mortality is high, the decline in CVDs was the largest driver of the impressive decline in NCD mortality since 2010, accounting for more than two thirds of the decline. CVDs were also the largest contributor to the overall change in premature NCD mortality in most other low- and middle-income countries, although cancers, chronic respiratory diseases, and other NCDs together

accounted for as much as or more than CVDs in some countries. In particular, in China, India, and a few other low- and middle-income countries, chronic respiratory diseases accounted for a significant part of the decline in premature NCD mortality, and for the majority of it in the case of Indian men.

The decline in mortality from cancers amenable to healthcare[46] (colon and rectal cancer, breast cancer, cervix cancer, uterine cancer, testicular cancer, bladder cancer, thyroid cancer, melanoma and non-melanoma skin cancers, Hodgkin lymphoma, and, for those aged 45 years and younger, leukaemia) were moderately correlated to the decline in mortality from other cancers (correlation coefficient = 0.38 for females and 0.59 for males) (Appendix Figure 2). Most high-income countries experienced a larger decline in cancers amenable to healthcare than other cancers, as did some middle-income countries. Similarly, the declines in cancers related to smoking (mouth and oropharynx cancer, oesophagus cancer, stomach cancer, colon and rectum cancer, liver cancer, pancreas cancer, trachea, bronchus, and lung cancer, cervix uteri cancer, bladder cancer and kidney cancer) and those unrelated to smoking were moderately correlated (correlation coefficient = 0.57 for females and 0.65 for males) (Appendix Figure 3). In particular, smoking-related cancers declined more slowly than those unrelated to smoking among women in many high-income western countries and in some countries in central and eastern Europe and Latin America and the Caribbean.

Measurement and monitoring gaps

High-quality data on the numbers and causes of death, risk factors, coverage of preventive and curative interventions, and health systems infrastructure, utilisation and quality are essential for monitoring progress towards NCD targets, and their determinants and interventions.[47] In particular, death registration with medical certification and ICD coding of the causes of death is the preferred source of information for monitoring mortality. If too few deaths are registered, or the quality of cause-of-death information is poor, death registration

data cannot be used to reliably monitor mortality by cause. However, there are major gaps in the completeness of death registration and persisting issues with the quality of information on causes of death recorded by death registration systems. WHO rates whether death registration systems can be reliably used to track mortality by cause, taking into account the completeness of the death registration, the quality of the cause-of-death information, and the timeliness of publication of data (Appendix and Figures 4 and 8). Fifty (27%) countries and territories represented in this analysis currently have high-quality death registration, with the share being 86% of high-income countries compared to 16% of low- and middle-income countries. In other countries, demographic and epidemiological data and methods, described in the Appendix, are used to estimate all-cause and cause-specific death rates, leading to additional uncertainty.[47] Therefore, a priority area for strengthening accountability towards NCDs should be expanding and strengthening death registration, including medical certification of cause of death.[48] In countries with limited resources and inadequate medical workforce, the first step may be implementing sample registration of deaths with medical diagnosis and verbal autopsy.[49, 50]

Actions to accelerate reductions in NCD mortality

Our independent evaluation shows that NCD mortality is declining in most countries but the pace of decline varies substantially, even among countries in the same region. Some countries in high-income regions of Asia-Pacific, Australasia, north America and western Europe and in central and eastern European countries, and some other low- and middle-income countries are on track for achieving SDG target 3.4. Many more could achieve the target if they implement policies that accelerate the decline by a modest amount. About the same number are making slow progress and need policies that significantly increase the rates of decline if they are to achieve the SDG target 3.4. Of particular concern, NCD mortality is stagnant or deteriorating in a few countries, including in the USA.

The decline in total NCD mortality in high-income countries, where CVD mortality has declined for decades,[42-44] is now driven by reductions in cancer, CVD and diabetes deaths. The main driver of the NCD decline in most low- and middle-income countries is still reductions in CVD deaths, albeit from high levels relative to high-income countries. For NCD mortality to decline faster in these countries, the decline in CVD mortality must accelerate, and there should be moderate to large reductions in mortality from diabetes, cancers, chronic respiratory diseases and other NCDs.

The decline in CVD mortality in high-income countries over the past half a century has benefited from reductions in blood pressure and, especially for men, smoking.[42, 51, 52] Blood pressure, together with diabetes, is also an important risk factor for chronic kidney disease which is a leading NCD cause of death beyond NCD4, and smoking is the most important global risk factor for cancers and for chronic respiratory diseases.[53] While blood pressure has declined sharply in high-income countries, and has begun to do so in better-off middle-income countries, especially in Latin America and the Caribbean, it is increasing in sub-Saharan Africa, south and east Asia, and Oceania.[24, 54] Tobacco use has also shifted from high-income to low- and middle-income countries, fuelled by the tobacco industry's aggressive tactics.[55] Heavy and hazardous alcohol consumption is an important cause of deaths from CVDs, other NCDs and suicides in young- and middle-aged adults, especially men, in central and eastern Europe and central Asia.[27, 56-63] Decline in alcohol use has been an important driver of the recent declines in deaths from CVDs and other NCDs in central and eastern Europe,[62, 64-66] where many countries are projected to meet SDG target 3.4. Alongside population-based prevention, the experience of high-income and increasingly middle-income countries shows that significant reductions in CVD mortality also require high-quality health care, particularly primary and secondary prevention in high-risk individuals through multi-drug treatment, management of co-morbidities, and treatment of acute cases.[42, 67-71]

Alongside CVDs, reducing cancer deaths is essential to meeting the SDG target 3.4. Cancers are a heterogeneous group of diseases whose causes include infections, health behaviours such as tobacco and alcohol use, environmental exposures and hormonal and metabolic traits.[53, 72-74] HPV and Hepatitis B vaccination are highly effective cancer prevention measures for cervical and liver cancers, whose burden is largest in low- and middle-income countries,[4, 75] and should be used in all countries through school and community-based vaccination (including birth dose for HBV to prevent mother-to-child transmission).[76] However the impacts of immunization on mortality will materialise decades beyond the current targets. With nearly 20% of global cancer deaths due to tobacco use,[53] effective tobacco control is essential for reducing cancer mortality.[76-78] While the overall cancer burden of alcohol use is smaller than that of smoking, ~5% of all cancer deaths,[53] it affects some cancers with large mortality burden (e.g., breast, colorectal and liver cancers)[79, 80] as well as other NCDs that are not affected by smoking (e.g., liver cirrhosis). Finally, many cancers are amenable to treatment, especially if precancerous or early stages are diagnosed and treated.[46, 76] Closing the substantial global cancer diagnosis and survival gap,[81] through screening and treatment, is essential for reducing NCD mortality in low- and middle-income countries.

Therefore, based on the analysis of causes of death and their risk factors,[77, 78, 82] policies and interventions that reduce tobacco and alcohol use and blood pressure are essential for accelerating reductions in NCDs, alongside primary and specialist healthcare which we discuss below. Reducing tobacco and alcohol use requires implementing fiscal and regulatory measures including taxes, warning labels, restricting availability and sales, and banning marketing, advertising, and public smoking.[83-87] Remarkable progress has been made in tobacco control in the last decade. In 2008, MPOWER was introduced as a tool to help implement the WHO Framework Convention on Tobacco Control (FCTC) and to promote best practice implementation of key demand reduction measures in the Convention at their highest level. From 2007 to 2014, for 116 WHO FCTC parties, there was a significant

increase in the best practice level in all five policy measures recommended by MPOWER; by contrast, there was no significant increase in any of the key measures in the ten non-parties.[88] Nonetheless, there are still many countries where implementation has fallen short of the standards set by WHO FCTC.[28] Importantly, only 32 countries tax tobacco as recommended, wherein total taxes should account for at least 75% of the retail price of the most sold brand of cigarettes.[28] This leaves a major implementation gap, because tobacco taxation is the most cost-effective measure to reduce tobacco consumption. Implementation of effective alcohol policies - taxation, reduction of availability and a ban of marketing – has been slow. Although most countries impose excise taxes on alcohol, the level is much lower compared to tobacco, in most cases less than 25% of the price.[27] The situation regarding the reduction of availability is even worse, and alcohol seems to have become more available since 2010.[89] Finally, complete bans of marketing are rare, occurring in about ten percent of the 159 countries (mainly in Middle East and north Africa where Islam is the main religion) that provided information to the WHO about the status of their alcohol marketing policies in 2012.[27, 89, 90]

Where blood pressure has declined, the decline has been largely achieved through a shift in the entire population distribution, although reductions in the high-blood-pressure tail of the distribution have also contributed.[54] The drivers of distributional shift however are largely unknown, and may include improvements in foetal and early life nutrition and health,[91, 92] higher intake of fruits and vegetables, facilitated by more regular availability, and lower salt intake, and improvements in the living environment.[54, 93-96] These factors change, often improving, as countries become more affluent and their housing, food and healthcare improves, but there are few examples of active policy interventions that have changed them in entire populations, especially in low- and middle-income countries.[4, 82, 97-99] Therefore, based on current experiences, diagnosis and use of off-patent medicines to treat hypertension at primary care level[100-102] is the most effective approach to reducing blood-pressure-related NCD deaths as has been done in high-income countries with effective

hypertension programmes and some middle-income countries.[93, 103-108] The Resolve to Save Lives initiative[109] aims to reduce salt intake and treat hypertension based on a simplified protocol at the primary care level in a number of low- and middle-income countries. The initiative is in its initial phases and therefore has not yet been evaluated; if successful, this project can inform the design of future national programmes. In addition to population-based prevention, reducing mortality from NCD4 and other NCDs requires high-quality health care for prevention, early diagnosis, and treatment of acute and chronic NCDs. Achieving access to high-quality care for the entire population is the subject of SDG target 3.8 on achieving universal health coverage (UHC).[110, 111]

Financing, priority setting and implementation

It is widely acknowledged that there is a significant financing gap for implementing NCD programmes in low-income and some middle-income countries,[112] especially for implementing high-quality NCD care in the context of UHC. The WHO Independent High-Level Commission on NCDs recently recommended that a higher percentage of national budgets are allocated to health, and within health, a higher percentage to NCDs and mental health, financed partly through higher taxes on tobacco and alcohol.[10] The Commission also recommends that the international community should increase financing and lending for the prevention and management of NCDs through bilateral and multilateral channels, and a multi-donor fund and other innovative financing mechanisms as done for HIV/AIDS.[10] While essential, additional fiscal resources can only lead to better NCD outcomes if national health systems are able to use them to deliver effective interventions for a diverse set of NCDs, which itself requires accessible and high-quality primary and specialist care,[4, 110] and designing a benefits package through priority setting based on local NCD epidemiology and effectiveness and cost of interventions.[113, 114] NCD prevention, management and treatment also need effective referral pathways from primary to specialist care and the ability to maintain patients in long-term care, both of which are challenges in resource-constrained health systems that do not commonly deal with chronic conditions.[101, 115-117] Therefore,

provision and quality of care for NCDs, which present a new and complex disease mix, cannot be assumed but must be achieved through enhancements and improvements in infrastructure, workforce, guidelines, and procurement and health information systems.[118-120]

The third UN High-Level Meeting on Non-Communicable Diseases (NCDs) in September 2018 provides an opportunity to renew, reinforce and enhance commitment to reducing the health burden of NCDs and reducing global health inequalities.[7] Data-driven monitoring and reporting by NCD Countdown 2030 is an independent accountability mechanism for monitoring progress towards the SDG target for reducing NCD mortality, while also presenting a more comprehensive perspective on NCDs in terms of diseases and age groups. Ongoing monitoring and reporting by NCD Countdown 2030 of NCD outcomes, and their key risk factors and interventions, is essential for creating accountability towards reducing the burden of NCDs. However, significant progress can only be made through national and multi-lateral political and financial commitments and strong health systems.

NCD Countdown 2030 Collaborators

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Declaration of interests

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Panel 1. NCD Countdown 2030

The SDGs have broadened the global development and health agenda, to include NCDs and universal health coverage. Turning the SDG political commitments into impact on NCDs requires implementing effective interventions in the health, economic and social sectors, and reliable information on whether strategies are being implemented and succeeding in reducing NCD outcomes. An independent system of accountability has been in place for maternal and child health since the era of Millennium Development Goals, now expanded to women's, children's and adolescents' health to monitor progress towards corresponding SDGs.[8, 9] The WHO Independent High-Level Commission on NCDs has also recommended an independent accountability system for NCDs.[10]

NCD Countdown 2030 is an independent collaboration aiming to monitor progress towards reducing the worldwide burden of NCDs, and to inform policies that aim to accelerate progress. A key output of NCD Countdown 2030 will be regular reporting of progress towards SDG target 3.4 on NCD mortality. Beyond the global target, NCD Countdown 2030 will comprehensively monitor and report NCD mortality to address important outcomes and age groups beyond what is included in this target, in the spirit of "leaving no one behind". Over time, NCD Countdown 2030 will analyse and report on a small number of NCD risk factors, relevant health system interventions and multi-sectoral policies, and financial commitments by governments and donors. NCD Countdown 2030 will also emphasise the need to enhance the availability and quality of data and methodology for monitoring.

The work of NCD Countdown 2030 will be essential for evidence-based policies and programmes for reducing the health burden of NCDs and its global and national inequalities, and for raising public awareness about NCDs. NCD Countdown 2030 is a collaboration between the World Health Organization, *The Lancet*, NCD Alliance, the WHO Collaborating Centre on NCD Surveillance and Epidemiology at Imperial College London, and researchers and practitioners from all regions.

Panel 2. The global status of suicide deaths

SDG target 3.4 uses deaths from suicides as a tracer for mental health (according to the International Classification of Disease system suicides are classified under injuries, and not NCDs). In addition to data gaps and limitations for NCD causes of death described in the paper, data on suicide deaths are affected by stigma and medico-legal factors that generally lead to an underestimation of deaths due to suicides.[14, 15]

Suicides accounted for an estimated 793,000 deaths in 2016. Suicides were the second leading cause of death among people aged 15-29 years globally. The specific SDG target 3.4 indicator is crude death rates from suicides, and is shown in Figure 9 for 2016. For females, the suicide death rate was highest in some countries in sub-Saharan Africa, south and southeast Asia, and Latin America, and in South Korea. For males, it was highest in Eastern Europe, parts of sub-Saharan Africa and Latin America, Japan and South Korea. Males had higher suicide death rates than females in most countries.

Many mental health conditions, including depression, psychoses and substance use disorders, increase the risk of suicides.[16] Therefore, pharmacological and psychosocial interventions are not only important for reducing the significant morbidity burden of mental health conditions, but also reduce deaths from suicides.[17] Other effective interventions for reducing suicides include restricting access to lethal means (e.g. firearms[18] and pesticides) and selective prevention in high-risk groups who have experienced conflict, physical or sexual abuse, displacement and significant livelihood losses.[17, 19, 20]

Figure 1. Number of deaths from NCDs, injuries, and the cluster of infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies in 2016.

Figure 2. Comparison of the probability of dying prematurely (i.e., between birth and 70 years of age) from an NCD with that of dying from infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies. All probabilities are calculated in the absence of competing causes of death as described in the Appendix. Each point shows one country. In countries lying above the dashed line, there is a higher probability of dying prematurely from an NCD than from infectious and parasitic diseases, maternal and perinatal conditions, and nutritional deficiencies, and vice versa.

Figure 3. Probability of dying (reported as percentage points) in 2016 (A) from NCD4 (cancers, diabetes and cardiovascular and chronic respiratory diseases) between 30 and 70 years of age and (B) from any NCD between birth and 80 years of age. See Appendix Table 2 for numerical values.

Figure 4. Progress in reducing premature mortality from non-communicable diseases (NCDs) by country for (A) NCD4 (cancers, diabetes and cardiovascular and chronic respiratory diseases) between 30 and 70 years of age and (B) all NCDs between birth and 80 years of age.

The line for each country starts from the probability of premature mortality in 2015 and ends at the level in 2018 estimated based on using the trend from fitting to data from 2010 to 2016 to predict change from 2015 to 2018. The green zone depicts the 2015-2018 declines that, by 2030, would achieve a one-third reduction in probability of death relative to 2015 levels. The number in parentheses following each country's name indicates the quality of its vital registration system: 1=high, 2=medium, 3=low, and 4=very low. See Appendix for definition of each category.

Figure 5. The year expected to achieve a one-third reduction in probability of dying from (A) NCD4 (cancers, diabetes and cardiovascular and chronic respiratory diseases) between 30 and 70 years of age and (B) any NCD between birth and 80 years of age, relative to 2015 levels if trends from 2010 to 2016 continue.

Figure 6. Additional probability of dying from all non-communicable diseases (NCDs) between birth and 80 years of age compared to dying from NCD4 (cancers, diabetes and cardiovascular and chronic respiratory diseases) between 30 and 70 years of age. Each point shows one country and countries are coloured by region. See Appendix Table 1 for the list of countries in each region.

Figure 7. Comparison in females and males of (A) the probability of dying in 2016 from any non-communicable disease (NCD) between birth and 80 years of age and (B) annual average change in the probability of dying from any NCD between birth and 80 years of age, as percent of the probability in 2015.

Figure 8. Contributions of different non-communicable diseases (NCDs) to the overall change in the probability of dying prematurely from NCDs by country. The black dot shows the overall annual average change in the probability of dying from any NCD between birth and 80 years of age, as percent of the probability in 2015. The coloured segments show change due to constituent disease components, calculated as described in the Appendix so that their net effect equals the overall annual average change. The number in parentheses following each country's name indicates the quality of its vital registration system: 1=high, 2=medium, 3=low, and 4=very low. See Appendix for definition of each category.

Figure 9. Crude death rates from suicide per 100,000 people in 2016.

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