REVISED: November 13, 2017

Disease Control Priorities in Developing Countries, 3rd Edition
Working Paper #21

Title: Reducing Mortality within Universal Health Coverage: The *DCP3* Model

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Introduction

For countries seeking to move towards universal health coverage (UHC), a fundamental challenge is identifying which health interventions should receive priority for public finance.(1) This issue is especially important in highly resource-constrained low-income (LI) and lower middle-income (LMI) countries where coverage of potentially cost-effective interventions is often low, and the investments needed to achieve UHC very large. *Disease Control Priorities, Third Edition* (DCP3) has proposed a concrete notion of UHC that could be affordable and feasible in LI and LMI countries. Volume 9, Chapter 3, of DCP3, entitled "Universal Health Coverage and Essential Packages of Care," draws on the content of 21 packages of essential health interventions contained in DCP3 and synthesizes them into a model health benefits package, termed "essential UHC" (EUHC).(2, 3) A subset of these interventions have been distilled into a "highest-priority UHC package" (HPP) that is designed to address the specific health needs of – and be feasible to implement in – LI countries by the end of the Sustainable Development Goal (SDG) period in 2030.(4)

Although the HPP and EUHC packages are based interventions that provide good value for money and are likely to be feasible in low-resource settings, these packages would likely still face political hurdles and require a significant increase in domestic and external resources in most countries.(5) A practical question that health ministers might face from their governments, external donors, and other stakeholders is whether a UHC package based on DCP3's EUHC or HPP model packages would, on the whole, provide good value for money and facilitate the country meeting one or more SDG 3 targets. To address this question, we seek to quantify the potential mortality impact of EUHC and the HPP in LI and LMI countries. We frame our

analysis within the context of the SDG 3 supplementary target proposed by Norheim and colleagues, “Avoid in each country 40% of premature (under-70) deaths that would be seen in the 2030 population at 2010 death rates.”(6)

Methods and Data Sources

Analytic Framework

A variety of analytic approaches can be used to estimate the potential health impact of interventions. For analyses that focus on a single health topic, fairly complex outcomes models have been developed, particularly for infectious diseases.(7) For analyses of closely related health topics, such as causes of under-five mortality, a handful of models have been developed that employ consistent assumptions and strive to avoid double-counting costs or benefits of multiple simultaneous interventions.(8) The WHO’s OneHealth Tool represents one of the more advanced and widely-used such tools.(9)

DCP3 has strived to be comprehensive in addressing health conditions and identifying interventions. This comprehensiveness prohibits the use of existing, off-the-shelf outcomes models, even OneHealth Tool. Hence for the present analysis, we use a simplified approach that assesses mortality impacts over a limited time period, 2015-2030, using assumptions and inputs that are consistent with *DCP3*’s related work on the cost of UHC.(10)

Our methods draw on the “comparative statics” approach that is commonly used in economic analysis.(11) In the case of mortality estimation, this approach would treat population coverage of a specified set of interventions as an exogenous parameter and hold constant all

other variables – e.g., population size and structure, cause-specific mortality rates, intervention effectiveness, and other disease modifiers not addressed by the specified interventions. The resulting estimate of deaths averted, then, would be interpreted as a counterfactual estimate of deaths that could be averted from an instantaneous shift in the exogenous parameter (in this case, coverage of selected interventions) at a given point in time.

Methods and data sources

Our analysis has three steps. First, we project hypothetical mortality patterns by cause in 2030 in LI and LMI countries assuming current (2015) death rates are unchanged. Second, we identify the reduction in mortality that would be possible with a subset of very high-impact EUHC and HPP interventions. Third, we calculate incremental (counterfactual) reductions in mortality by age group and cause of death that would be expected following an increase in coverage from current levels.

Step 1. Projection of mortality patterns by cause in 2030

We obtained United Nations Population Division (UNPD; 2017 revision) medium projections of population size and structure in LI and LMI countries in 2030.(12) We also obtained estimates of cause-specific mortality rates by age, sex, and income group in the year 2015 from the most recent WHO Global Health Estimates (GHE).(13) These rates were applied to the UNPD dataset to obtain projected cause-specific death counts by age, sex, and income

group in 2030. (NB: the use of 2015 mortality rates differs slightly from the original "40x30" analysis, which specified 2010 death rates.)

Unlike GHE, UNPD does not disaggregate population size 0-4 years into neonatal (0-28 days) and post-neonatal (1-59 months) groups. We thus assumed that the distribution of the 2030 population into the neonatal and post-neonatal groups would be the same in 2030 as it was in 2015. (GHE estimates that the neonatal population comprised about 2% of the total under-five population in 2015 but about 38% and 48% of the under-five deaths in LI and LMI countries, respectively.)

The 40x30 reduction target includes a 40% reduction in deaths 0-69 overall, a two-thirds reduction in under-five deaths and adult deaths from tuberculosis, HIV/AIDS, malaria, and maternal conditions, and a one-third reduction in deaths from major noncommunicable diseases. We set our quantitative targets for mortality from major causes – under-five mortality (all causes), HIV/AIDS, tuberculosis, malaria, maternal conditions, cardiovascular diseases, neoplasms, and road injuries – to reflect these goals. However, because EUHC contains interventions against lesser, but still important causes of death (e.g., adult febrile illness, epilepsy, and sickle-cell disease), we calculated targets for "residual" categories in light of the targets for the major causes of death so that the total number of target deaths 5-69 is sufficient to meet the 40x30 target. (Tables 1 and 2 clarify, by comparison with each other, which specific causes were included parent categories, and which causes were subsumed in the residual categories.)

We then corrected the total population size for the number of projected live births in 2030, which was necessary to calculate under-five death rates. These figures were calculated as

the average yearly number of projected live births over the period 2025-2035. We estimated the number of projected live births in 2030 to be 33 million and 61 million in LI and LMI countries, respectively. We multiplied by five to arrive at estimates of total under-five population size. Population total estimates were distributed to the neonatal and postneonatal groups proportionally according to GHE 2015 estimates of relative population sizes.

We should make one final note on the composition of the LI and LMI country groups. *DCP3* defines LI and LMI countries according to their 2014 World Bank income group classification. This results in a common set of statistics across the *DCP3* volumes, which span across 2015 to 2018; however, it should be noted that the composition of the four country income groups has changed since 2014. For instance, two populous countries, Kenya and Bangladesh, were classified as LI in 2014 but graduated to LMI status after that time. Hence current estimates of deaths by cause (GHE) and population (UN) for the LI and LMI groups will differ somewhat from what is presented in this paper. For this analysis, we re-aggregated individual country data for 2015 and 2030 from those two data sources, based on the *DCP3*/World Bank 2014 country classifications.

Step 2. Identification of EUHC and HPP effects on cause-specific mortality

As discussed previously, *DCP3*'s work on UHC benefits packages identified 218 unique health sector interventions that were been deemed to (1) provide good value for money, (2) be feasible in low- and middle-income countries, and (3) address a significant disease burden. These interventions together are referred to as EUHC.

A subset of these interventions, referred to as the HPP, was identified as appropriate for LI countries during the SDG period. These interventions were judged by the DCP3 author group

to (1) provide the very best value for money (i.e., at usual levels of willingness to pay in LI countries), (2) give preference to the worst off (i.e., focusing on causes that lead to the least lifetime health among those affected in the absence of intervention), and (3) provide significant financial risk protection. The methods used to develop the EUHC and HPP are described elsewhere.(14) The full list of interventions can be found online at www.dcp-3.org.

We took a hybrid approach to estimating the mortality reduction due to EUHC and HPP interventions. For a subset of Group I causes (i.e., communicable, maternal, perinatal, and nutritional conditions), we drew on the impact modeling undertaken for the *Lancet* Commission on Investing in Health report.(9) These included under-five deaths from all causes and deaths among individuals 5-69 years from tuberculosis, HIV/AIDS, and maternal conditions. For other Group I causes and for Group II (noncommunicable diseases) and Group III (injuries) causes, we used effect sizes from the literature and in some cases expert opinion.

We assumed that effect sizes would be similar in LI and LMI countries but that the increases in coverage required to reach 80% target coverage would be smaller in LMI countries. A companion working paper on the cost of EUHC and the HPP details the data sources and assumptions used to estimate current intervention coverage in LI and LMI countries.(5) We also assumed that intervention effect sizes would be the same across all age groups and that the increase in coverage would equally benefit all cases regardless of age. Since this analysis focuses on premature mortality only, we view this as a plausible assumption. Table 1 summarizes effect sizes and changes in coverage for the major causes addressed in this analysis.

The effect sizes in Table can be viewed as “ex post” assessments of relative reduction in mortality, compared to current levels, assuming full implementation of the intervention(s) among

the target population. In some cases, they incorporate the combined effect of several interventions. For instance, the HPP specifies three interventions for ischemic heart disease: aspirin for acute coronary syndromes, secondary prevention using four-drug combination therapy, and medical management of heart failure. The impact on mortality was estimated as the cumulative relative risk reduction of these three interventions, about 52% compared to "doing nothing." The EUHC package contained an expanded set of IHD interventions that included more advanced treatment for acute coronary syndromes as well as primary prevention of IHD, resulting in a cumulative relative risk reduction of about 69% compared to "doing nothing." Hence in Table 1 the EUHC effect is larger than the HPP effect for a number of causes of death.

Finally, we should note that for neoplasms, the effect sizes only account for the overall mortality impact of early detection and treatment of early stage cancer; they thus assume a significant reduction in death but in a minority of cases – i.e., stage I or II at presentation. (*DCP3*

does not recommend cancer screening in its HPP or EUHC packages with the exception of cervical cancer screening, which is more likely to be cost-effective in limited resource settings.)

Step 3. Calculation of deaths avertable from increased intervention coverage

The final step in the analysis was to calculate the number of deaths avertable by either EUHC or the HPP. Following the method of Bhutta and colleagues,(15) we estimated the total number of deaths averted in 2030, D_{av}, as:

$$D_{av} = \sum_{i=1}^{n} \frac{D_{proj,i} \times Eff_i \times Qual \times (Cov_{i,1} - Cov_{i,0})}{\left[1 - (Eff_i \times Qual) \times Cov_{i,0}\right]}$$

Where $D_{proj,i}$ is the projected number of deaths under 70 for cause *i* in 2030; Eff_i is the combined effect size of all interventions for cause *i* in either the HPP or EUHC, i.e., the relative reduction in mortality compared to doing nothing, $Cov_{i,1}$is the target coverage level for intervention *i* in 2030 and $Cov_{i,0}$ the current coverage level, and $Qual$ is a "quality" factor that scales down the effectiveness of the intervention to reflect realistic delivery of the interventions. For this analysis, we set $Cov_{i,1}$ for all interventions to 80% and assumed $Qual$ to be 80%, i.e., that the impact of the intervention in the real world would only be about 80% of what would be predicted with perfect intervention delivery and patient adherence. Finally, as described in the

Findings, we conducted sensitivity analyses on these assumptions for a few important causes of death.

Findings

Table 2 provides an overview of the counterfactual impact of EUHC and HPP in LI and LMI countries in 2030. Because of projected demographic and epidemiological changes, we estimate that the mortality consequences of UHC would be different by age group, cause of death, and income group. We project about 7.4 and 17 million deaths among individuals 0-69 in LI and LMI countries in 2030, respectively. The Norheim and colleagues 40x30 target would imply a reduction by 3.0 and 7.0 million deaths (respectively) in 2030. We estimate that the HPP would achieve about half the 40x30 target and EUHC about two-thirds of the target in both country income groups.

There are several factors that influence the HPP and EUHC not meeting the 40x30 target. First, as described below, the reduction in under-five deaths is relatively modest compared to what could be achieved, because these interventions are already being delivered at high levels of coverage, and the incremental fraction of the population that would benefit by achieving 80% coverage is modest. (Child mortality can be nearly eliminated at full coverage of a powerful set of interventions against infections and undernutrition that have already been deployed at near-universal coverage in most high- and upper-middle-income countries. At 80% coverage, about half of the total under-five deaths would remain, with the remainder able to be averted by scaling from 80% to near-100% coverage.) Second, while the sub-targets for 5-69 deaths from Group I causes are nearly met at 80% coverage, the sub-targets for 5-69 deaths from Group II-III causes

are not, particularly in LMI countries, and particularly for neoplasms and injuries. Third, the quality of intervention delivery does reduce the expected effect of the interventions – in this case, accounting for a 20% undershoot relative to ideal delivery conditions and an 11-17% undershoot of the 40x30 target in absolute terms.

We conducted a set of sensitivity analyses on under-five deaths and 5-69 deaths from HIV/AIDS to further explore the impact of our assumptions around EUHC intervention effectiveness, coverage targets, and quality of intervention delivery (Figures 1-2). Our assumptions, particularly around sub-universal coverage and sub-optimal quality, do significantly attenuate the impact of the under-five and HIV/AIDS packages. However, as noted in the footnotes to these figures, more optimistic assumptions and coverage targets (similar to what other groups have employed) would facilitate reaching the 40x30 sub-targets for these two groups.

We also relaxed our conservative assumption around intervention delivery quality and looked at achieving 95% coverage of the HPP and EUHC packages on the whole. Under these more aspirational conditions, the HPP would nearly reach the 40x30 target (97%) in LI countries and make more substantial progress (81%) in LMI countries. (The lesser progress in LMI countries is likely due to the greater proportion of deaths from Group II-III causes and the smaller number of

interventions against these causes included in the HPP.) Similarly, EUHC would *exceed* the 40x30 target by 20% in LI countries and fully acheive it in LMI countries.

Interpretation

We found that our proposed EUHC and HPP interventions could make substantial progress towards the SDG3 "40x30" target proposed by Norheim and colleagues. Just as importantly, we demonstrate the sensitivity of our findings to less-than-universal (albeit more realistic) target levels of coverage and to less-than-optimal quality of intervention delivery. We also stress that LMI countries are facing demographic and epidemiological headwinds that make the 40x30 sub-target for noncommunicable diseases more challenging to reach.

Our modest estimates of the impact of the HPP and EUHC on under-five deaths would require some careful explanation and qualification when being presented to decision makers. An overwhelming body of evidence suggests that some of the most powerful technologies that exist address child mortality and that large reductions in mortality are feasible over relatively short periods of time. Our analysis suggests that countries that wish to prioritize child health would need to invest in measures that ensure very high levels of coverage (probably around 95%) are achieved by 2030. A similar set of arguments could be made for Group I causes of death among adults, such as HIV/AIDS, tuberculosis, and malaria.

Our incredibly modest estimates of the impact of the HPP and EUHC on neoplasms also deserves further reflection, particularly in the context of the upcoming (2018) UN High-Level Meeting on NCDs. Of the 0.22 and 0.60 million cancer deaths projected for 2030 in LI and LMI countries, only 0.010 to 0.039 million (LI) and 0.10 to 0.16 million (LMI) are avertable with

treatment of early-stage disease. Norheim and colleagues, in proposing their 40x30 target, looked at historical progress on noncommunicable disease (including cancer) deaths worldwide – including high- and upper-middle-income countries – and concluded that about one-third of projected deaths, including deaths from cancer, could be prevented between 2010 and 2030. We suspect that the remainder of these deaths not addressed by EUHC could in principle be addressed through a combination of (1) treatment of a broader subset of cancers by site (e.g., lung and oral cancer), (2) implementation of organized screening activities (particularly for breast and colorectal cancers, for which screening is routinely offered in high-income countries), and (3) addition of interventions that address behavioral risks (such as tobacco and alcohol use) and environmental risks (such as environmental carcinogens). We do note, however, that the latter largely fall outside the scope of the health sector to address (i.e., they are part of the health agenda but not the UHC agenda) and may require decades (i.e., after 2030) to reach full impact. Still, given the clear evidence of a large health impact of a number of intersectoral policies (such as tobacco and air pollution control), an important message from this analysis is that early action in these noncommunicable disease risk factor areas is a critical complement to health sector action and is urgently needed in order to address disability and death that is likely to increase in the coming decades if current trends continue.

Stenberg and colleagues at WHO recently published an investment case for SDG3 that looked at the cost and mortality impact of investing in health systems in low- and middle-income countries.(16) Their analysis included specific mortality consequences for a package of 187 health interventions (though not all of their interventions had a direct impact on deaths). There is alignment between many problem areas, causes of death, and specific interventions in their package as compared to EUHC, particularly for Group I causes. (Generally, we regard *DCP3* as

being more detailed in its recommendations for Group II and III causes, such as childhood neoplasms, management of heart failure and kidney disease, advanced care for ischemic heart disease, and congenital and musculoskeletal disorders, many of which impact our estimates of mortality reduction in this group of causes.) However, there are important differences in the analytic scope and set of countries included in the two analyses, leading to differences in the results. Table 3 outlines the major similarities and differences.

Although the consequences of EUHC on premature mortality in LMI countries would not be sufficient to reach the 40x30 target, we note other important health and non-health consequences of EUHC. These include mortality among individuals over 70, reductions in disability, reductions in fertility and increases in educational attainment, and financial risk protection. (A few extended cost-effectiveness analyses suggest that financial protection outcomes may be relatively more impressive than health outcomes for a variety of interventions, including those against noncommunicable diseases.(17)) Hence we suspect that the full spectrum of benefits from EUHC, if monetized, would likely be much larger than the benefits from reduced premature mortality. While data and methods for conducting benefit-cost analysis of UHC schemes are still in their infancy, this sort of broad assessment of EUHC would be warranted and would further the case for investing in the health sector, particularly in LMI countries.

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Tables

Table 1. Effect size and coverage assumptions used in this analysis

	Effect size, HPP	Effect size, EUHC	Coverage gap, LI	Coverage gap, LMI
Group I				
All under-five causes	86%*	95%*	19%**	25%**
Causes for ages 5-69				
Tuberculosis	86%*	95%*	24%**	26%**
HIV/AIDS	82%*	91%*	42%**	58%**
Malaria	98%	98%	61%	31%
Maternal conditions	85%*	94%*	48%**	40%**
Neglected tropical diseases	90%	90%	25%	19%
Lower respiratory infections	75%	75%	61%	31%
Nutritional deficiencies	25%	25%	40%	30%
Group II				
Neoplasms				
Colon and rectum cancers	9%	12%	65%	43%
Breast cancer	9%	12%	65%	43%
Cervix uteri cancer	15%	80%	65%	43%
Pediatric blood cancers	17%	30%	65%	43%
Cardiovascular diseases				
Rheumatic heart disease	80%	80%	76%	49%
Hypertensive heart disease	64%	64%	76%	49%
Ischemic heart disease	52%	69%	76%	49%
Ischemic stroke	46%	66%	76%	49%
Cardiomyopathy	64%	64%	76%	49%
Other diseases				
Diabetes mellitus	67%	84%	76%	49%
Sickle cell disorders and trait	80%	80%	70%	60%
Epilepsy	80%	80%	50%	30%
Schizophrenia	25%	25%	55%	40%
Alcohol use disorders	25%	25%	75%	70%
Opioid use disorders	25%	25%	70%	60%
COPD	10%	13%	76%	49%
Asthma	67%	83%	76%	49%
Group III				
Road injury	53%	66%	21%	13%
Falls; burns	53%	66%	21%	13%

* Aggregate effect as estimated by Boyle and colleagues.(9) ** approximate coverage gap (actual coverage levels vary from those used by Boyle and colleagues).

Table 2. Estimated deaths avertable by Essential UHC (EUHC) and the Highest Priority UHC Package (HPP) in low-income and lower middle-income countries in 2030.

	Low-income countries				Lower middle-income countries			
	Projected deaths, 2030	40x30 reduction target	Expected reduction, HPP	Expected reduction, EUHC	Projected deaths, 2030	40x30 reduction target	Expected reduction, HPP	Expected reduction, EUHC
By age group								
0-4	2.2	1.5	0.62	0.77	3.3	2.2	1.1	1.3
5-69	5.2	1.5	0.99	1.2	14	4.8	2.2	2.9
0-69	7.4	3.0	1.6	2.0	17	7.0	3.2	4.2
By cause group (5-69)								
Group I	1.9	0.76	0.59	0.65	3.2	1.5	0.85	0.94
Tuberculosis	0.34	0.22	0.11	0.13	0.90	0.60	0.29	0.35
HIV/AIDS	0.44	0.29	0.18	0.20	0.48	0.32	0.23	0.26
Malaria	0.087	0.058	0.051	0.051	0.055	0.037	0.026	0.026
Maternal conditions	0.17	0.11	0.075	0.086	0.20	0.13	0.079	0.092
Other diseases	0.90	0.074	0.18	0.18	1.6	0.40	0.22	0.22
Group II	2.5	0.60	0.36	0.53	8.9	2.7	1.3	1.9
Neoplasms	0.65	0.22	0.010	0.039	1.8	0.60	0.10	0.16
Cardiovascular diseases	0.93	0.31	0.24	0.36	4.0	1.3	0.89	1.4
Other diseases	0.93	0.076	0.11	0.13	3.2	0.80	0.28	0.35
Group III	0.77	0.13	0.043	0.060	2.0	0.54	0.070	0.10
Road injuries	0.25	0.085	0.032	0.046	0.57	0.19	0.048	0.069
Other injuries	0.52	0.042	0.010	0.014	1.4	0.36	0.022	0.032

Note: All estimates are in millions of deaths.

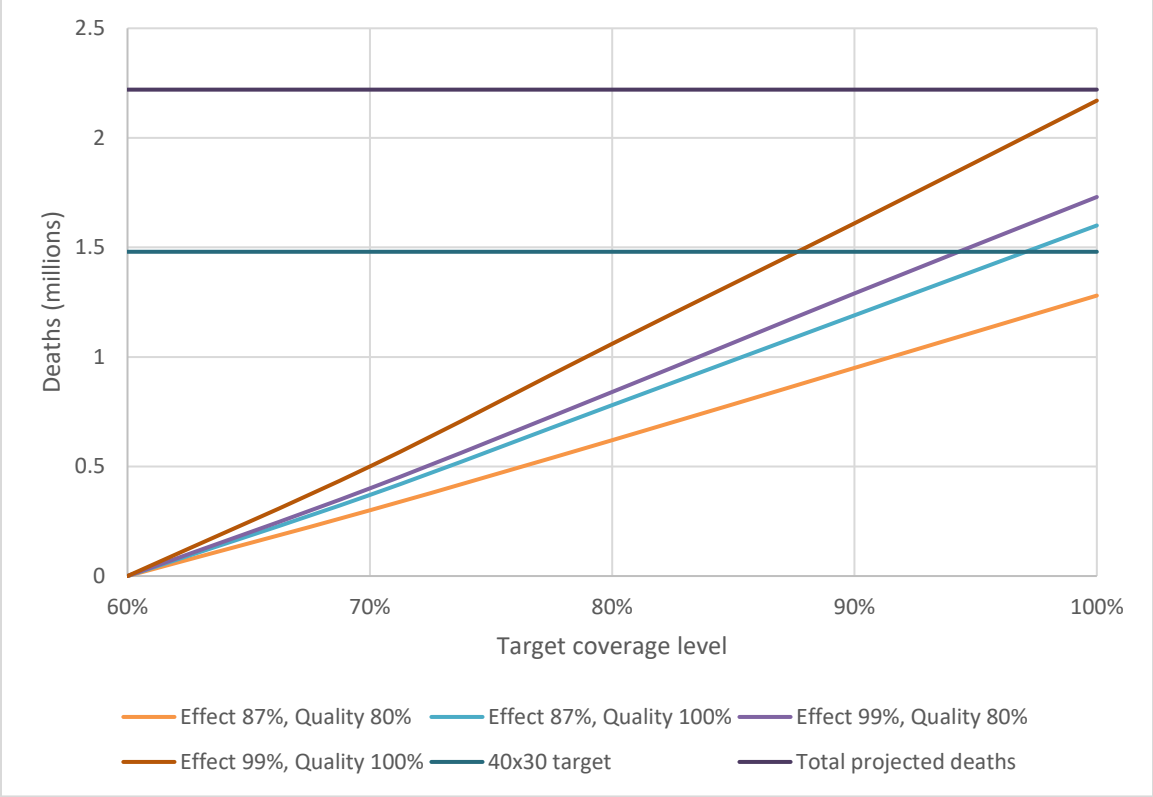
Table 3. Comparison of methods, data, and findings of the DCP3 UHC impact evaluation and the WHO SDG3 investment case (Stenberg and colleagues, 2017).

Parameter	WHO	DCP3
Countries included	27 low-income, 22 lower-middle-income, and 18 upper-middle-income countries (World Bank 2016 classification); 67 countries in total	34 low-income and 49 lower-middle-income countries (World Bank 2014 classification); 83 countries in total
Selection of interventions	187 interventions recommended by WHO disease-specific clusters	218 interventions recommended by technical experts (*DCP3* authors and editors)
Scenarios assessed	1. Progress = target coverage limited by absorptive capacity of system (target coverage levels vary by country and intervention type) 2. Ambitious = most countries achieve high levels of target coverage (and hence SDG3 coverage and mortality targets)	1. Essential UHC (EUHC) = sum of all recommended health sector interventions in *DCP3* 2. Highest-priority package (HPP) = narrower scope (~ 100 services) compared to EUHC (prioritized on the basis of explicit criteria); same target coverage level (80%)
Inclusion of impact of non-health sector interventions	Yes	No
Scope of potential avertable deaths	Deaths projected by OneHealth Tool's demographic model, including deaths averted by family planning (from individuals who may never have been born) and stillbirths	Deaths avertable according to demographic projections by UNPD (does not include deaths due to counterfactual changes in fertility rates beyond what the UN projects; also does not include stillbirths)
Analytic tool(s) and cost data	Core analyses done in OneHealth Tool (LiST, AIM, FamPlan, and the NCD module), with cancer and TB deaths (among others) calculated in Excel	Core analyses done in Excel. Effect sizes for under-five deaths, adult HIV/AIDS and tuberculosis, and maternal conditions, taken from the OneHealth Tool-based analysis conducted for Global Health 2035 (Boyle and colleagues, 2015)
Main findings (annual cost per capita; WHO estimates deflated to 2012 US dollars)	LI countries: 2.9 million *total**deaths averted in 2030; 3.3-year gain in life expectancy at birth LMI countries: 6.1 million *total**deaths averted in 2030; 2.2-year gain in life expectancy at birth	LI countries: 1.6 to 2.0 million premature deaths averted in 2030 (HPP vs. EUHC) LMI countries: 3.2 to 4.2 million premature deaths averted in 2030 (HPP vs. EUHC)

*As noted above, these estimates, unlike the *DCP3* estimates, include deaths averted due to family planning measures. Family planning averts unwanted pregnancies and hence potential deaths of women and children that would have occurred as a result of those averted pregnancies. Ambitious scale-up of family planning services accounted for 50% of averted child and maternal deaths and over 65% of averted stillbirths in the WHO analysis (K. Stenberg, 2017 – personal communication). These estimates also include stillbirths averted and deaths over 70 years, which *DCP3* does not consider (as these are not included in the 40x30 target). According to Stenberg and colleagues, the reduction in stillbirths accounted for 0.4 and 0.2 years of additional life expectancy at birth in LI and LMI countries, respectively. Finally, it should be noted that a direct comparison of estimates between WHO and *DCP3* is difficult because the set of countries included, and hence the demographic and epidemiological features of either income group, is different. For example, Bangladesh, Kenya, and Cambodia are included in the LMI category in the WHO analysis but in the LI category in the *DCP3* analysis.

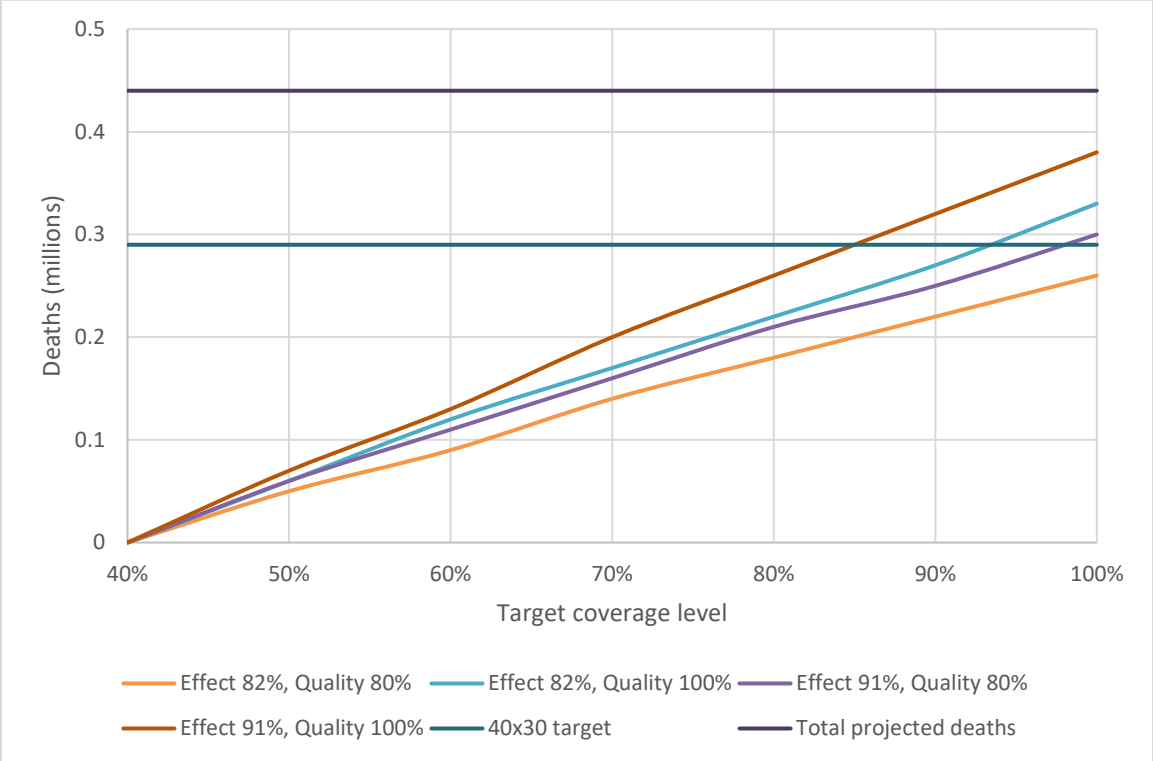
Figures

Figure 1. Sensitivity analysis: effect of varying model parameters on reaching the 40x30 target for under-five deaths in low-income countries.



Note: baseline coverage of under-five interventions in LI countries is currently about 60% on average. The "Effect 82%, Quality 80%" (yellow line) scenario at 80% coverage represents the base case scenario in this paper, resulting in an estimated 0.62 million deaths averted. For comparison, a variety of child health investment case modeling exercises have looked at the impact of delivering a similar package of interventions at 90-95% coverage and at an unspecified (implied to be 100%) level of quality, which would fall along the light blue or purple lines somewhere between the 90% and 100% coverage level, essentially meeting the 40x30 target of 1.5 million deaths averted.

Figure 2. Sensitivity analysis: effect of varying model parameters on reaching the 40x30 target for HIV/AIDS deaths among individuals 5-69 years in low-income countries.



Note: baseline coverage of under-five interventions in LI countries is currently about 40% on average. The "Effect 82%, Quality 80%" (yellow line) scenario at 80% coverage represents the base case scenario in this paper, resulting in an estimated 0.22 million deaths averted. For comparison, a rough sense of the impact of the 90-90-90 agenda would fall about halfway between the purple line and the red line (i.e., about 90% quality/adherence) at 90% coverage, essentially meeting the 40x30 target of 0.29 million deaths averted.