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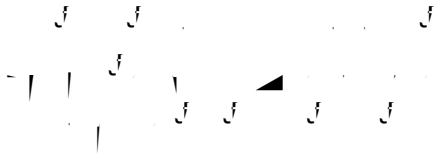

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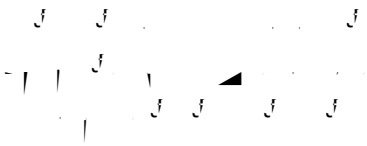
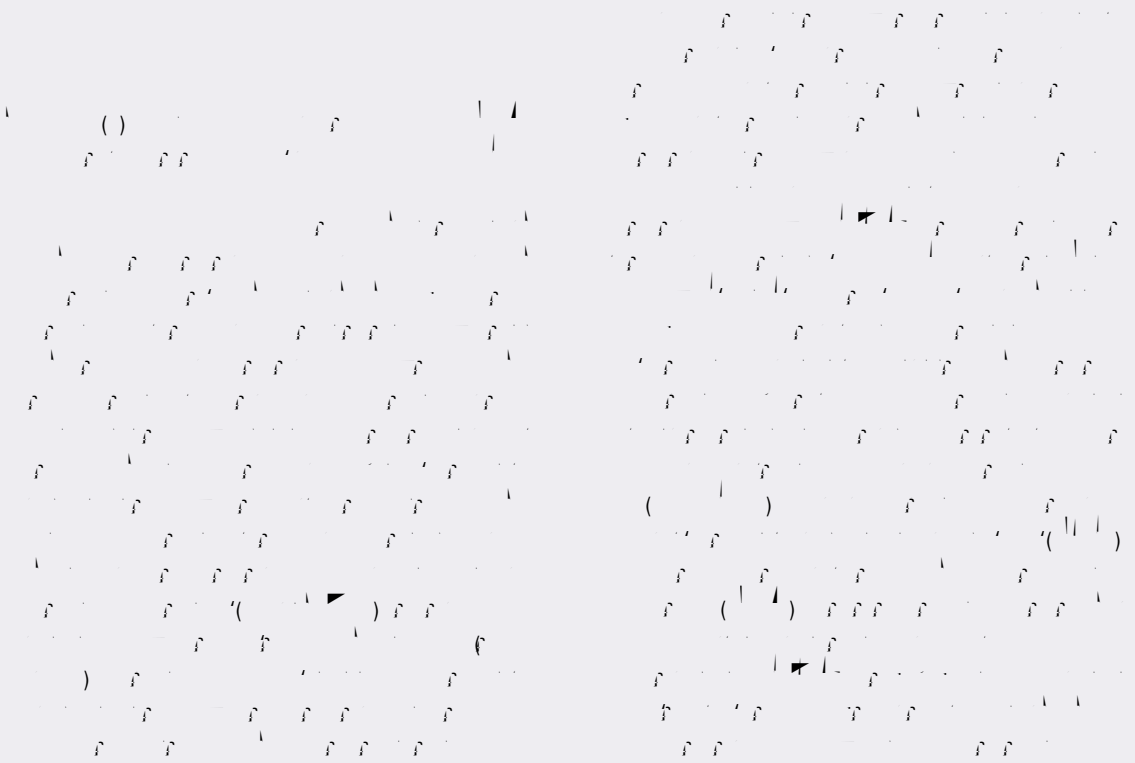
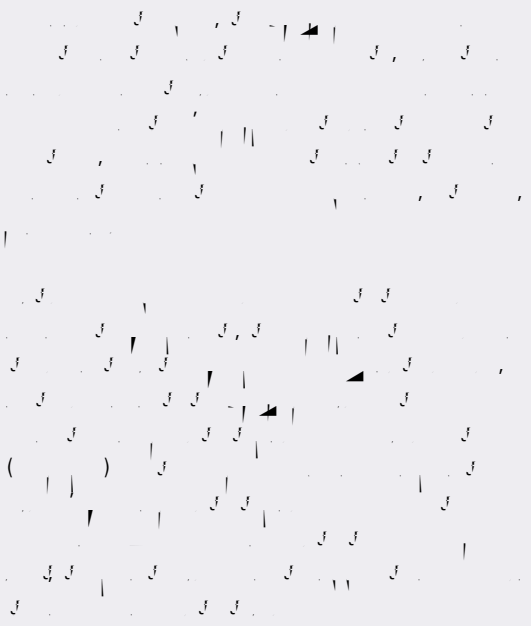
Child Mortality

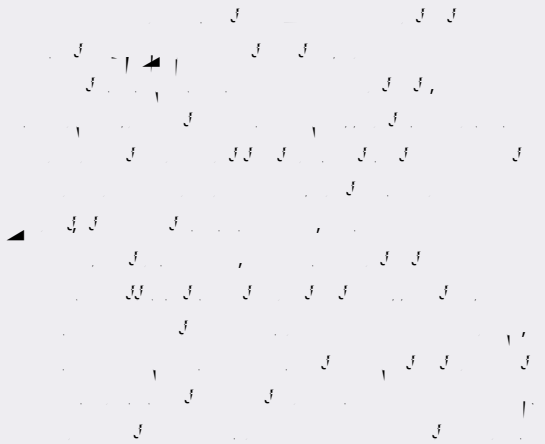
Report 2021







UN IGME estimates and other modelled estimates



Under-five mortality and SDG assessment

The continued burden of child mortality represents an enormous loss of life – in 2020 alone, 5.0 (4.8–5.5)[19] million children died before reaching their fth birthday, even without

TABLE 1

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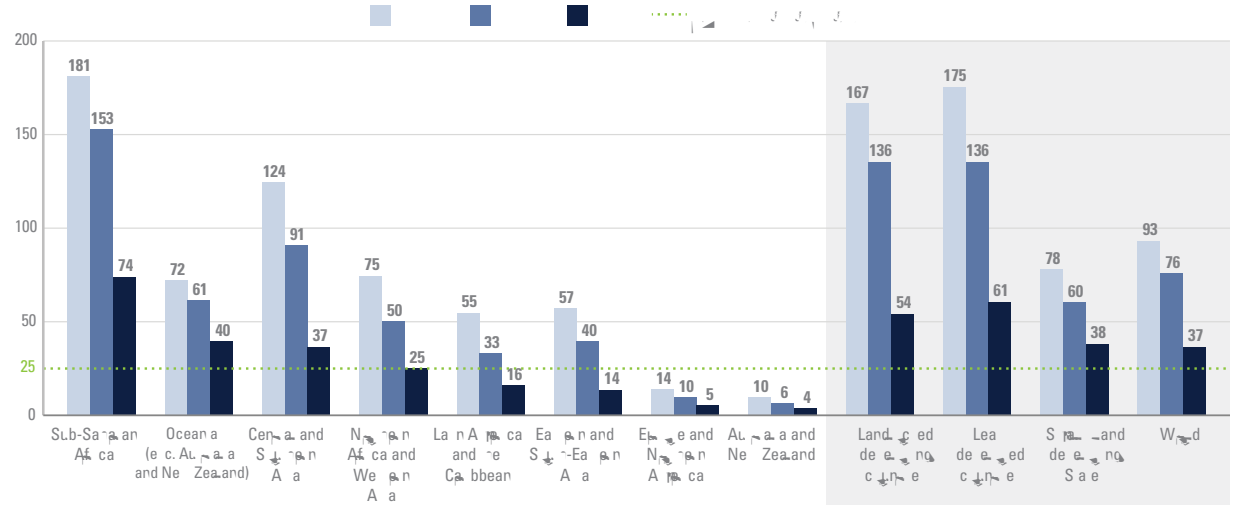
FIGURE 3 **Under-five mortality rate (deaths per 1,000 live births) by Sustainable Development Goal region, 1990, 2000 and 2020**

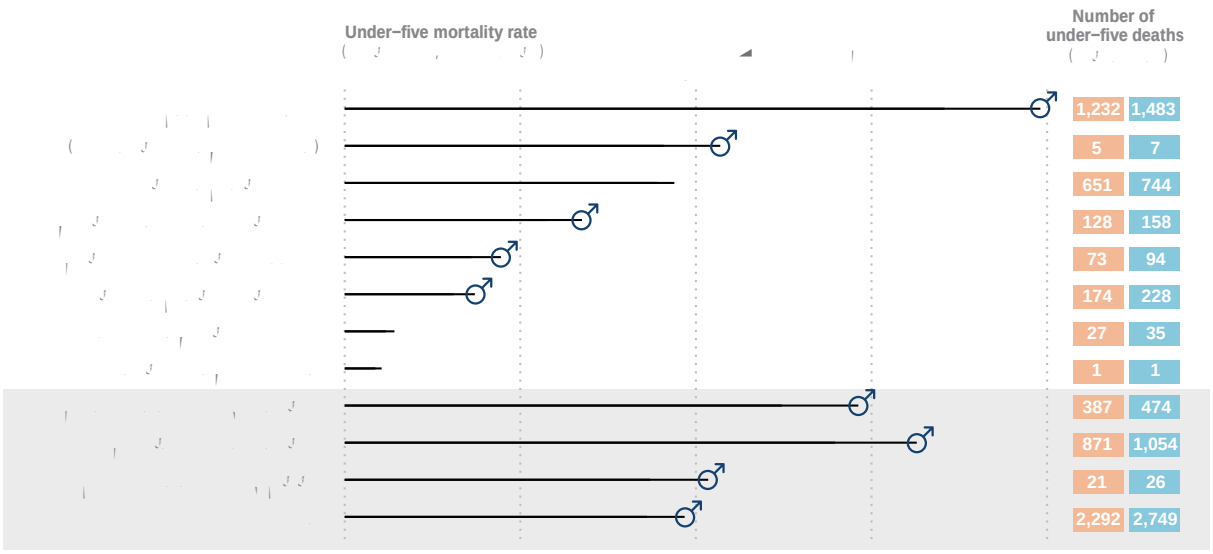


in Europe and Northern America and 19 times

TABLE
4

under- ve deaths (see Table 4) but the region accounts for just 27 per cent of 2020 live births. Another 27 per cent of the global total of deaths occurred in Southern Asia, with 1.4 (1.2–1.5) million under- ve deaths; Southern Asia accounted for 26 per cent of live births in 2020. These two regions also bear most of the world's newborn deaths, with sub-Saharan Africa leading in the global share of these deaths at 43 per cent (1.0 (0.9–1.2) million), followed by Southern Asia at 36 per cent (0.9 (0.8–0.9) million (see Table 2). Notably, the Southern Asia region has unusually high neonatal mortality given the level of under- ve mortality, and neonatal deaths have stagnated at 1 million deaths annually in sub-Saharan Africa .1 (t)-33.8(s)-1.5 (u11.9 (8)-5(s)-1.5 (u11.9 (.4 (h)12. t)-19.6 (r)-30.8 (-13.3 (n)64i)19 5i)10.32(f)]TJ0 -
of unde0lioua

FIGURE 6 **Under-five mortality rate and number of under-five deaths by sex and Sustainable Development Goal region, 2020**



Geographic and economic disparities, along with fragile and con ict-affected situations, heighten the risk of death for children and threaten universal achievement of the SDGs. Of the 54 countries off track to meet the SDG target on under- ve mortality, nearly 75 per cent (40) are in sub-Saharan Africa (see Figure 4), 85 per cent (46) are classi ed as low- or lower-middle-income countries, and about half are classi ed as fragile and con ict-affected situations. For the neonatal mortality target, 70 per cent of the countries at risk of missing the target are in sub-Saharan Africa, 84 per cent (51) are low- or lower-middle-income, and 39 per cent are classi ed as fragile and con ict-affected situations.

If countries at risk of missing the SDG target on under- ve mortality accelerated progress to achieue y 2-14.6(4)-10.8 (11.7(4)-18 (a)-1)11.8 (f m)-338.4 (e)-864 (e)-8.3 (l)38 Td[(o)ch ed-338(g)-463 (r)-10.3 (cn(n)-5 ')337 (s)

Across all regions, the risk of dying between the ages of 5 and 24 is lower than for children under 5 years old. At about half the level of global under- ve mortality, the probability of dying among children and youth aged 5–24 years was 18 (17–19) deaths per 1,000 children aged 5 years in 2020 (see Table 5 and Figure 7). Noteably, exposure to the risk of death is four times longer in the age group 5–24 than the under- ve age group. Globally, the age pattern of child and youth mortality rates sees mortality fall from the peak of under- ve mortality to a low among 10–14 year-olds, then increase again. While the level of mortality differs considerably between regions, this age pattern is generally consistent across regions except for the regions of Australia and New Zealand, Europe and Northern America, and

that risk is relatively low compared to other age groups presented in this report, 0.9 (0.9–1.0) million adolescents died in 2020. Globally, about 43 per cent of the deaths among those aged 5–24 years occurred among adolescents (see Table 6).

Survival chances for children and youth aged 5–24 years depend heavily on the regions and countries they are born into. At 39 (38–44) deaths per 1,000 children aged 5 years, sub-Saharan Africa has the highest regional probability of dying for the age group 5–24 in 2020, followed by Oceania (excluding Australia and New Zealand) with 21 (17–26) deaths per 1,000, and Southern Asia 16 (15–19) deaths per 1,000 (see Table 5). Sub-Saharan Africa and Oceania (excluding Australia and New Zealand) have the highest regional mortality rates across all four ve-year age groups in 2020, save for Latin America and the Caribbean, which replaces Central and Southern Asia with the third highest regional rate for older adolescents aged 15–19 years and youth aged 20–24 years (see Table 5 and Figure 7). The average probability of a ve-year-oitrea

aged 5–24 years. Over 70 per cent of all deaths among 5–24-year-olds occurred in sub-Saharan Africa (45 per cent) and Southern Asia (26 per cent) (see Table 6).

If current trends continue, nearly 21 million children and youth aged 5–24 years will die between 2021 and 2030. Of these projected deaths, 8.9 million will occur among adolescents aged 10–19 years, and 72 per cent will occur in just two regions: sub-Saharan Africa (9.9 million) and Southern Asia (4.9 million)

Data gaps in child mortality

Timely, reliable data on child mortality for all countries remain elusive. On average, the most recent quality data point on child mortality across all countries was 4.8 years old, with half the countries in the world having a data point within the past 3.5 years. For about a third of all countries, the latest available child mortality data point was more than ve years old (see Figure 8 and Map 5).

Data availability worsens for some regions and income groups. In sub-Saharan Africa, more than half of all countries in the region have a gap of more than ve years between the most recent available data point and the common reference year 2020 – globally, just 35 per cent of countries have a most recent data point this old (see Figure 8). Similarly, on average, the most recent data point among low-income countries was 7.3 years

uncertainty in the recent period and greater reliance on extrapolation.

Just 40 countries had high-quality national data for 2020 included in the estimation model, though national or subnational data were avai22.7TJ0 - scnGS..9 (a)-5 (l)-6 3 (e.5 (t)-41.3 h)-27(r 2)-22.7(0)-3. (d)-7 2 (4)10.3 ((v)-20.2 (e e)-22.6(d h)-34.43 h

Conclusion

While the world was gripped by the unfolding COVID-19 pandemic in 2020, children continued to face the same crisis they have for decades: intolerably high mortality rates and vastly inequitable chances at life. In total, 5.0 million children under age 5, including 2.4 million newborns, along with 2.2 million children and youth aged 5 to 24 years – 43 per cent of whom are adolescents – died in 2020. This tragic and massive loss of life, most of which was due to preventable or treatable causes, is a stark reminder of the urgent need to end preventable deaths of children and young people.

Based on the best available empirical evidence, representing more than 80 countries and areas, and acknowledging that estimates in this report differ from some models that predicted increased deaths in 2020 due to service disruptions or economic downturns, the UN IGME did not find significant excess mortality among children in 2020 and therefore makes no adjustment to its 2020 estimates. Still, these data have limitations in their representativeness, and the pandemic and resulting mortality profile could change substantially from what has been observed thus far. We must continue to collect data, where available, to monitor the mortality situation of children and youth.

Even as child and youth mortality in 2020 continued to show a downward trend from years prior, the task of ending preventable child deaths remains unfinished. If current trends continue, 54 countries will not meet the SDG target on under-five mortality, more than 60 countries will miss the target on neonatal mortality and 43 million under-five deaths are projected to take place between 2021 and 2030. About half of these deaths will be newborns and more than half will take place in tae

systems to improve the coverage and equity of care in delivering high-quality and high-impact maternal, newborn and child survival interventions.

It will also require investment and expansion of the data collection systems required to monitor mortality in the future. As mentioned, data to assess excess mortality in 2020 are limited in age-disaggregation and geographic representativeness, and just about one fth of the 195 countries covered in this report had high-quality under- ve mortality data for 2020 available at the time these estimates were generated. Moreover, in the places where estimated mortality rates are highest, data tend to be most outdated – in sub-Saharan Africa, the most recent data point on child mortality was more than ve years old in over half the countries in the region. These data gaps present serious challenges to timely and accurate estimation and monitoring of child mortality.

The world is urgently engaged in limiting the mortality impact of the COVID-19 virus – this same focus must be applied to avert the millions of equally tragic child and adolescent deaths from all other causes that are projected to take place in the coming years, if we maintain the status quo. The COVID-19 pandemic has forced businesses, organizations and individuals to leave behind pre-pandemic mindsets and reevaluate ways of working to develop new methods that increase effectiveness. It is also time to leave behind the pre-COVID complacency around child mortality and recommit to every child's right to survive. With proper attention and action, ending preventable child deaths is still possible.

Country consultation

In accordance with the decision by the Statistical Commission and the United Nations Economic and Social Council resolution 2006/6, UN IGME child mortality estimates, which are used for the compilation of global indicators for SDG monitoring, are produced in consultation with countries.[26] UNICEF and the WHO undertook joint country consultations in 2021. The country consultation process gave each country's ministry of health, national statistics of ce or relevant agency the opportunity to review all data inputs, the estimation methodology, and the draft estimates for under- ve mortality and mortality among children and young adolescents aged 5–14 years and youth aged 15–24 years. The objective was to identify relevant data that were not included in the UN IGME database and to allow countries to review and provide feedback on estimates. In 2021, 102 of 195 countries sent comments or additional data. After the consultations, the UN IGME draft estimates for mortality in children under age 5 were revised for 95 countries using new or updated data, and the estimates for mortality in children and young adolescents aged 5–14 years or in youth aged 15–24 years were revised for 100 countries, given new or updated data. All countries were informed about changes in their estimates.

Estimating child mortality

This chapter summarizes the methods the UN IGME uses to generate mortality estimates for children under age 5, older children and young adolescents aged 5–14 years, and older adolescents and youth aged 15–24 years.

The UN IGME updates its estimates of neonatal, infant, under- ve mortality and mortality among children aged 5–14 years and mortality among youth aged 15–24 years annually after reviewing newly available data and assessing their quality. These estimates are widely used in UNICEF's agship publications, the United Nations Secretary-General's annual SDG report, and publications by other United Nations agencies, governments and donors.

The UN IGME, which includes members from UNICEF, WHO, the World Bank Group and United Nations Pon atio (D)-8.2 (i-45 (v)-40.1 (i)-1321 (s)-0.9 (i)10.3 (o)8.7 (n-6.4 (, w)-22.5 (a)-28.4 (p)]TJ0 -1.2
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3. Fit a statistical model to these data to generate a smooth trend curve that averages possibly disparate estimates from the different data sources for a country; and

4. Extrapolate the model to a target year (in this case, 2020).

To increase the transparency of the estimation process, the UN IGME has developed a child mortality web portal, Child Mortality Estimation (CME) Info, available at <childmortality.org>. It includes all available data and shows estimates for each country as well as which data are currently of cially used by the UN IGME. Once new estimates are nalized, CME Info is updated accordinch(i)527.4Tc 0 Tw -1.714 -08 (a a)-20.1 (r.7 (e U)-24.8 (N I)10.2 (G)-2.3 (M)-26.2 (E)-26 (. O)-8.3 (n)-9.3 6-43.7)-7.4E.2 (pw5F (v

contains over 21,900 country-year data points from more than 1,600 series across 195 countries from 1990 (or earlier, back to 1911) to 2020. The databases for mortality among children aged 5–14 years and for mortality among children aged 15–24 years each contain more than 7,900 data points.

The increased empirical data have substantially changed UN IGME estimates for some countries from previous editions, partly because the tted trend line is based on the entire time series of data available for each country. The estimates presented in this report may differ from and are not necessarily comparable with previous sets of UN IGME estimates or the most recent underlying country data.

Whatever the method used to derive the estimates, data quality is critical. The UN IGME assesses data quality and does not include data sources with substantial non-sampling errors or omissions as underlying empirical data in its statistical model.

Civil registration data

Data from civil registration systems are the preferred data source for child mortality estimation. The calculation of under- ve mortality rates (U5MR, the probability of dying between birth and exactly 5 years of age, expressed per 1,000 live births), infant mortality rates (IMR, the probability of dying between birth and exactly one year of age, expressed per 1,000 live births), mortality rates among children aged 5–14 years (the probability a ve-year-old would die before reaching age 15, expressed per 1,000 children aged 5 years) and mortality rates among youth aged 15–24 years (the probability a 15-year-old would die before reaching age 25, expressed per 1,000 youths aged 15 years) are derived from a standard period abridged life table using the age-speci c deaths and midyear population counts from civil registration data. The neonatal mortality rate (NMR, the probability of dying between birth and exactly 28 days of age, expressed per 1,000 live births) is calculated with the number of deaths of infants under 28 days of age and the number of live births in a given year.

For civil registration data (with available data on the number of deaths and mid-year populations), annual observations were initially constructund thnual oi (y

considered virtually complete and no adjustment was used to adjust mortality estimates upwards. If completeness was between 80 and 95 per cent, the inverse of the completeness rate was multiplied by the number of deaths to obtain adjusted estimates. These adjustments are only applied to mortality data above age 5 as the death distribution methods cannot be applied to estimate completeness of registration of under- ve deaths.

af26 95 (c)12.-156rletes-27.4 (t)-39.6 b (m)15.9 (p)6.4 (l)10.3 (a)h 2 (i)18.9 (t)nf26 95 -16.7 286 Td[(a)-4.9

Survey data

The majority of survey data on child mortality ca on chiaa

FIGURE

mortality.[36, 37,38] SSH were used to estimate the probability of a 15-year-old dying before reaching age 25 ($_{10}q_{15}$) for a period of 0–12 years prior to each survey. This period was divided in intervals of various length (6, 4, 3, 2, 1 years) depending on the coef cient of the variation of the estimates.

Adjustment for missing mothers in high-HIV settings

In populations severely affected by HIV/AIDS, HIV-positive children will be more likely to die than other children and will also be less likely to be reported since their mothers will also have been more likely to die. Child mortality estimates will thus be biased downwards. The magnitude of the bias will depend on the extent to which the elevated under- ve mortality of HIV-positive children is not reported because of the deaths of their mothers. The TAG developed a method to adjust HIV/AIDS-related mortality for each survey data observation from FBH during HIV/AIDS epidemics (1980–present) by adopting a set of simpli ed but reasonable assumptions about the distribution of births to HIV-positive women, primarily relating to the duration of their infection, vertical transmission rates, and survival times of both mothers and children from the time of the birth.[39] This method was applied to all direct estimates from FBHs. The model was improved to incorporate the impact of antiretroviral therapies (ART) and prevention of mother to child transmission (PMTCT).[40] No adjustment was included for HIV-related biases in the age group 5–14, since no method currently exists to estimate the magnitude of this bias in the probability $_{10}q_5$. For mortality at ages 15–24, the vertical transmission of the virus is unlikely to introduce biases in the estimates, as mortality rates relate to the survival of the siblings of adult respondents.

Systematic and random measurement error

Data from these different sources require varied calculation methods and may suffer from different errors, such as random errors in sample surveys or systematic errors due to misreporting. Thus, different surveys often yield widely divergent estimates of U5MR for a given time period, as illustrated in Figure 10. In order to reconcile these differences and take better account of the systematic biases associated with the various types of data inputs, the TAG developed an estimation method to t a smoothed trend curve to a set of observations and to

extrapolate that trend to a de ned time point, in this case, 2020. This method is described in the following section.

Estimation of under-five mortality rates

Estimation and projection of under- ve mortality rates was undertaken using the Bayesian B-splines bias-adjusted model, referred to as the B3 model.

r, i.e., log(r/1-r) where r is the ratio of the IMR estimate to the median B3 estimate of U5MR in the corresponding country-year. This is to restrict the IMR estimate to be lower than the U5MR estimate for any given year. For the remaining countries, the IMR is derived from the U5MR through the use of model life tables

Estimation of mortality rates among children aged 5–14 years and youth aged 15–24 years

Since 2017, the UN IGME has generated country-speci c trend estimates of the mortality in children aged 5–14 years – that is, the probability a ve-year-old would die before reaching age 15 ($_{10}q_5$). Since 2020, the UN IGME has also generated estimates of the mortality in youth aged 15–24 years – that is, the probability a 15-year-old would die before reaching age 25 ($_{10}q_{15}$). The methods used are similar to those used to estimate the U5MR. The B3 statistical model was applied to the 5–14 and 15–24 cyisto the 5ro11-16.6-13.2 -61-18.1 (s)-615.75 (c)-13.82 (y)8.8v6.4 (r)2.1 1-13.2 (s)-6

estimates is equal to the relative uncertainty in the non-adjusted estimates; this assumption will be revisited in the near future.

The UN IGME has assessed recent humanitarian crises and, based on the scarcity of currently available data and the dif culties of estimating the broader impact of these crises on health systems, decided to hold the estimates constant from the start of the crisis while increasing the uncertainty over the crisis time for three countries: South Sudan, Venezuela (Bolivarian Republic of) and Yemen. Where applicable, direct crisis deaths have been added to the constant trend estimate. The UN IGME will review new data, if available, in the next estimation round and revise estimates accordingly.

Estimation of uncertainty intervals

Given the inherent uncertainty in child mortality estimates, 90 per.3 (e)-0.6 (-2.i)18.9 o-na393 (s)-6.5(r)-24 (w n)12.7 (e-39.6 (y(, d)-2)-30.3 (i)-15.7 (m)-7.5 (a)25.8 (

support an adjustment at this time. First, direct COVID-19 deaths in the age groups estimated in this report are rare, and thus unlikely to impact national-level estimates. Second, while some scenario-based projections have suggested a large number of additional under- ve deaths could result indirectly from extended pandemic-related disruption to critical care and interventions, a UN IGME analysis of excess mortality using empirical data on deaths in 2020 from more than 80 countries and areas (more than 70 countries or areas had vital registration data available for this analysis and 11 countries had data from their Health Management Information System (HMIS) available for excess mortality analysis, along with data from the COMSA system in Mozambique) found no evidence of systematic excess mortality among children or youth in 2020 – perhaps re ecting recent reports suggesting an earlier and more robust rebound than anticipated in the provision of some of these interventions or protective effects of pandemic mitigation measures like social distancing, handwashing and masking.

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where and indicate, respectively, the death counts (either neonatal or fetal deaths) and exposure at risk, during month *t*. β_0 accounts for the intercept, βt for the secular change in mortality (as an exponential trend), and *cps*(*mth*) is a cyclical p-spline that accounts for seasonal variations. Con dence intervals, 95 per cent, were predicted using bootstrapping with 2,000 iterations. For the analysis of neonatal mortality rates, we use monthly live births as exposures. The monthly baseline of infant and child excess mortality were also obtained by tting a GAM model with quasi-Poisson distribution, similar to the model employed for neonatal mortality. However, the model employed for infant and child mortality does not account for monthly variations in the exposure, as these data were not available in the HMIS data and it is not expected to vary considerably during the observation months. As with the vital registration analysis, the monthly observations were assessed to detect any signi cant deviations from the expected number of deaths based on historical data.

Data from the Siaya Health and Demographic Surveillance Site in Kenya were also analysed in a similar manner to that described above and found no evidence of increased under- ve or neonatal mortality in 2020.

It should be noted that geographic and income variation in the data on excess deaths analysed by the UN IGME thus far is limited, and data collection continues to gather a more complete picture of COVID-19-related mortality among children and youth in 2020 and beyond. While these data do not support national-level adjustments for child mortality in 2020, the pandemic continues to evolve in unpredictable ways due to uneven vaccine rollouts, the emergence of more infectious variants and ongoing variation in pandemic response policy, among other factors. Thus, the UN IGME will continue to collect data for assessing excess deaths in 2020 and begin to assess excess mortality impact for 2021. The UN IGME will revisit this issue and generate adjustments where applicable and as needed based on evidence as it becomes available.

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Country, regional and global estimates of mortality among children under age 5

Country, regional and global estimates of mortality among children under age 5

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Country, regional and global estimates of mortality among children under age 5

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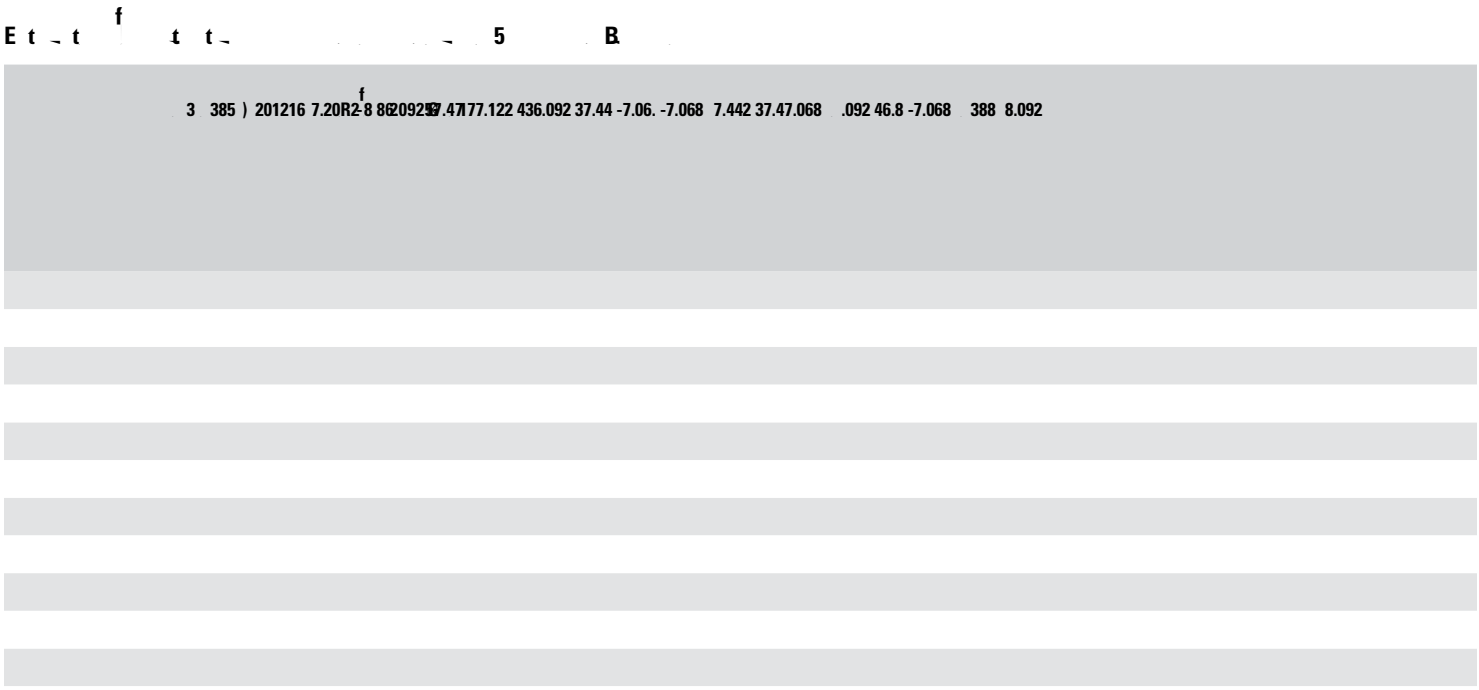
Country, regional and global estimates

Country, regional and global estimates of mortality among children under age 5



Country, regional and global estimates of mortality among older children, adolescents and youth aged 5–24 years

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Country, regional and global estimates of mortality among older children, adolescents and youth aged 5–24 years

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Country, regional and global estimates of mortality among older children, adolescents and youth aged 5–24 years

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Regional Classifications

Sub-Saharan Africa

Angola (LDC), Benin (LDC), Botswana (LLDC), Burkina Faso (LDC, LLDC), Burundi (LDC, LLDC), Cabo Verde (SIDS), Cameroon, Central African Republic (LDC, LLDC), Chad (LDC, LLDC), Comoros (LDC,

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