Human capital: Comparison of IHME and World Bank estimates published in 2018

"Measuring human capital: a systematic analysis of 195 countries and territories, 1990–2016," published by IHME in *The Lancet* on September 24, 2018, introduces estimates for a new measure of the level of human capital in each country (article available at https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31941-X/fulltext).

In Chapter 3 of the 2019 World Development Report (WDR), the World Bank also introduces a new measure of human capital. (Current draft available at http://pubdocs.worldbank.org/en/816281518818814423/2019-WDR-Draft-Report.pdf). Further methodological details are available from a World Bank working paper (available at http://documents.worldbank.org/curated/en/300071537907028892/pdf/WPS8593.pdf). *All information presented in this document reflects the WDR draft dated September 13, 2018, and the working paper dated September 2018.*

Both the IHME and World Bank human capital measures utilize data on mortality, health, education, and learning to create a comprehensive metric of the human capital of the future workforce that is comparable across countries. The two measures differ, however, in their conceptual basis, including what is captured in each component, the data sources utilized, the methods of aggregation across the various components, and the countries and years for which estimates are produced. This document provides a comparison of the construction of these two human capital measures and a preliminary comparison of the results.

There are four key differences between the World Bank measure of human capital and the IHME measure of human capital:

1. **The IHME measure incorporates post-secondary education by measuring the total years of completed education.** In contrast, the World Bank measure uses data on educational attainment up to the end of secondary school; this implies that in the World Bank measure, tertiary education (i.e., university, college, or trade school) does not increase human capital.

2. **The IHME measure includes a number of health conditions for which the scientific literature supports strong links to productivity and/or cognitive function.** In the World Bank measure, functional health is measured by only one condition, stunting in children under age 5, in addition to the adult survival rate as a proxy for overall health. In many countries for which stunting estimates are not available, only adult survival is used.

3. **The IHME measure covers 195 countries from 1990 to 2016, including low- and middle-income countries with minimal data.** The IHME measure includes a time-series (based on the relationship between covariates and spatial and temporal patterns) in order to assess progress in building human capital over the past 25+ years, disaggregates the measure by sex for all countries in order to understand gender differences, and can be re-estimated for all countries annually. The World Bank measure covers only 157 countries and for the most recent year for which data are available. The World Bank reports these values as being representative of 2018,

assuming that 2018 values are the same as the most recent year for which the data are available.

4. **The IHME measure is based on a larger range of data sources and improved methods.** IHME uses educational attainment data from 2,522 censuses and surveys, whereas the World Bank measure of educational attainment is based on enrollment data, which are known to have quality issues. For example, these data tend to overestimate attendance due to students repeating grades or older learners returning to school – to address this problem the World Bank attempts to correct for repetition of school years. For health, the World Bank relies on UN Population Division estimates of adult survival, which in Africa are largely derived from model predictions based on under-5 death rates and do not use sibling survival data.

The remainder of this document provides further detail of differences between the IHME and World Bank human capital measures.

I.   Basic construction

	IHME	World Bank
Definition	Expected years lived from age 20 to 64 years, adjusted for educational attainment, learning, and functional health status	The amount of human capital a child born in 2018 can expect to acquire by age 18
Units	Health-, education-, and learning-adjusted expected years lived between age 20 and 64 years (by sex for all countries) [range = 0 to 45]	Productivity of the next generation of workers relative to the benchmark of complete education and full health (by sex for 131 countries) [range = 0 to 1]
Formula	$\left(\frac{\sum_{x=20}^{64} nL_{xt}FH_{xt}}{l_0}\right)\left(\frac{\sum_{x=5}^{24} Edu_{xt}Learn_{xt}}{18}\right)$ nL_{xt} is the expected years lived in age group x for year t; FH_{xt} is the functional health status in age group x in year t, transformed to a 0 to 1 scale; l_0 is the starting birth cohort; Edu_{xt} is the years of education attained during age group x for year t; $Learn_{xt}$ is the average standardized test score in age group x for year t, transformed to a 0 to 1 scale	$(p/p^*)\left(e^{\phi(s_{NG}-s^*)}\right)\left(e^{\gamma(z_{NG}-z^*)}\right)$ p is the probability that a child born today survives; p^* is the benchmark of complete survival, 1; s_{NG} is expected future education; s^* is the benchmark of complete quality-adjusted schooling, 14 years; z_{NG} is expected future health; z^* is the benchmark of complete health, 1; ϕ is 0.08 (8% increase in productivity per additional year of school); γ is 0.65 for adult survival rate and 0.35 for not-stunted rate (estimated return to productivity per unit increase in each health indicator)

II.   Indicators

	IHME	World Bank
Survival	Mortality rates by 5-year age groups, from birth to age 64 [converted to expected years lived from age 20 to 64]	Probability of survival to age 5
Health	Prevalence of seven conditions linked to productivity/learning: (i) wasting, (ii) stunting, (iii) anemia, (iv) cognitive impairment, (v) vision loss, (vi) hearing loss, (vii) infectious diseases (HIV, TB, malaria, NTDs, diarrhea, other common illnesses), by 5-year age groups, from age 20 to 64 (except stunting/wasting, for under age 5 only) [scaled 0-1]	Fraction of children not stunted (under age 5); adult survival rate (from age 15 to 60)
Education	Average years of completed schooling, by 5-year age groups, from 5 to 24 [range = 0-18]	Expected years of completed schooling by age 18
Learning	Harmonized average test score, relative to highest national average score, by 5-year age groups, from 5 to 19 [scaled 0-1]	Harmonized average test score (out of a benchmark score of 625)

III.   Data sources

	IHME	World Bank
Survival	GBD 2016 mortality estimates (based on 165,674 data points for child mortality, 47,279 data points for adult mortality, and 32,174 empirical life tables)	United Nations Inter-agency Group for Child Mortality Estimation, supplemented with data provided by World Bank staff
Health	GBD 2016 prevalence estimates (based on the following number of data sources for each condition: stunting (1,230), wasting (1,308), anemia (1,108), hearing loss (587), vision loss (988), cognitive impairment (64), and infectious diseases (149,540))	UN Population Division (adult survival rates); UNICEF-WHO-World Bank Joint Child Malnutrition Estimates database, supplemented with data provided by World Bank country teams (stunting)
Education	2,522 censuses and household surveys from 194 countries	UNESCO Institute for Statistics school enrollment rates, updated with estimates provided by World Bank staff
Learning	1,894 student achievement tests from 132 countries and 163 subnational locations	Student achievement tests from 162 economies, as presented in Patrinos & Angrist (2018)[1]

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[1] Patrinos HA & Angrist N. 2018. "A Global Dataset on Education Quality: A Review and an Update (1965–2018)." *World Bank Policy Research Working Paper No. 8592*.

IV.   Coverage of estimates

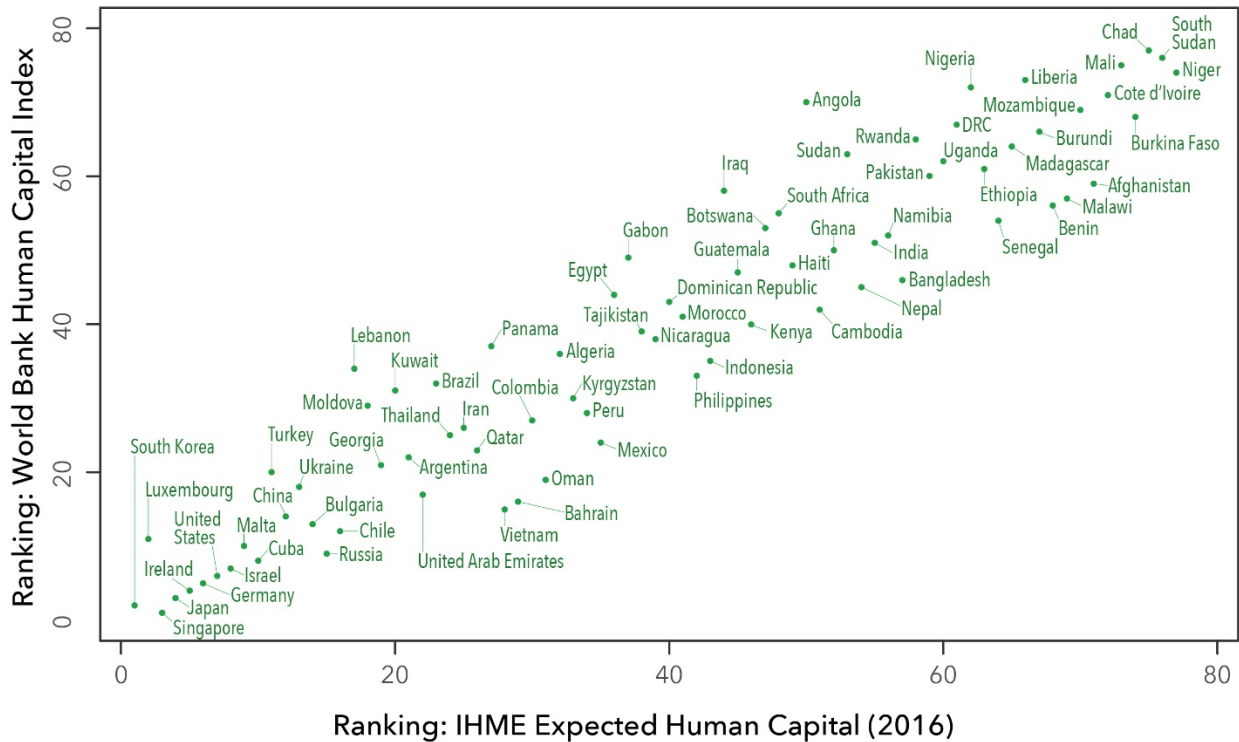|	**IHME**	**World Bank**
Countries	195 countries	157 countries
Years	1990–2016	Varies by country based on available data

V.   Preliminary comparison of results

Comparison based on a subset of 77 countries, for which approximate values of the World Bank Human Capital Index are presented in World Development Report Figure 3.3 (draft dated 9/13/18).

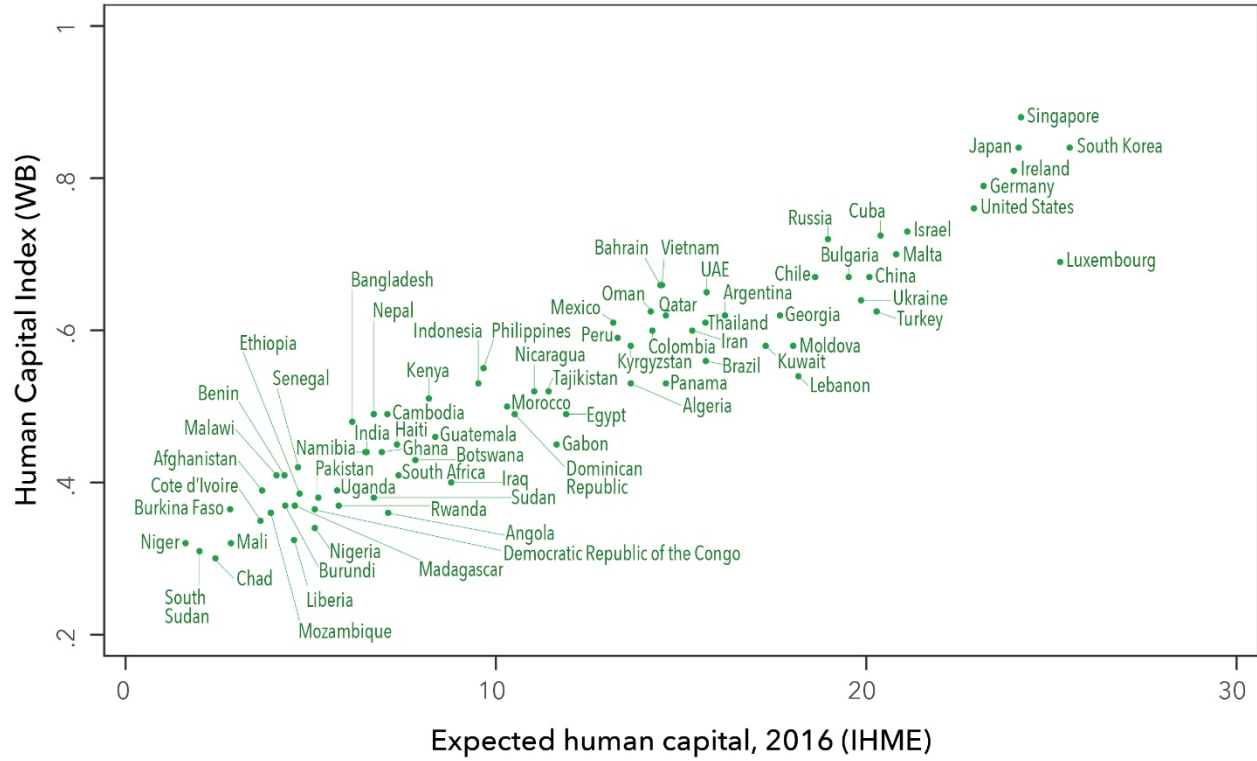*Country rankings*

Comparison of human capital country rankings
World Bank vs. IHME (selected countries)

Spearman's rho = 0.95

Level of human capital across countries

Comparison of human capital measures
World Bank vs. IHME (selected countries)

Expected human capital, 2016 (IHME)

r = 0.95