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The Human Capital PROJECT

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Contents

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INTRODUCTION

By improving their skills, health, knowledge, and resilience—their human capital—people can be more productive, flexible, and innovative. Investments in human capital have become more and more important as the nature of work has evolved in response to rapid technological change. As highlighted in the 2019 *World Development Report (WDR): The Changing Nature of Work,* markets are increasingly demanding workers with higher levels of human capital, especially advanced cognitive and sociobehavioral skills. In Vietnam, for example, workers able to perform nonroutine analytical work earn nearly 25 percent more than those who cannot.[1]

Despite substantial progress, significant gaps in human capital investments are leaving the world poorly prepared for what lies ahead. As detailed in *WDR 2018: Learning to Realize Education's Promise,* children in many countries are struggling to learn in school.[2] Nearly a quarter of children worldwide are stunted, leaving them vulnerable to poor cognitive development and hampering their ability to learn. Meanwhile, half of the world's population is not covered by essential health services, and 80 percent of poor people in low-income countries lack a social safety net.[3]

Even though human capital is a central driver of sustainable growth and poverty reduction, policy makers sometimes find it hard to make the case for human capital investments.[4] After all, the benefits of investing in people can take a long time to materialize. Building roads and bridges can generate quick economic—as well as political—benefits. But investing in the human capital of young children will not deliver economic returns until those children grow up and join the workforce.

The result? Countries often underinvest in human capital, thereby missing an opportunity to create a virtuous cycle between physical and human capital and growth and poverty reduction. In response to the risks to stability and prosperity posed by this underinvestment, the World Bank Group has launched the Human Capital Project (HCP). It makes the case for investing in people through country engagement and analytical work, while raising awareness of the costs of inaction and bolstering demand for interventions that will build human capital. The project emphasizes the importance of sustained leadership and coordination across all levels of government—including tackling complex issues such as inadequate or inefficient spending, governance and service delivery challenges, population dynamics, fragility and conflict, and gaps in infrastructure. The HCP has three pillars:

1. *The Human Capital Index (HCI)*. The index is designed to capture the amount of human capital a child born today could expect to attain by age 18. The HCI will be updated periodically to monitor progress, and it will be expanded and refined as data improve.

2. *Scaling up measurement and research*. This medium-term program of data and analytical work is aimed at improving measurement of a wide range

of human capital outcomes, better understanding human capital formation, and linking it to policy actions at the country level.

3. *Country engagement*. This is the key component of the HCP. The World Bank Group is supporting governments, together with development partners, to identify national priorities for human capital development and to implement policies that tackle the barriers preventing countries from reaching their goals.

This introduction summarizes the purpose, scope, and structure of the HCP. The main body of this volume—which also appears as chapter 3 in WDR 2019—describes the evidence supporting the importance of human capital for people, economies, and societies and lays out the rationale and context for the HCP's pillars and its theory of change. The appendix to this volume describes the methodology of the Human Capital Index in detail.

The Human Capital Index

The first version of the Human Capital Index will be released at the October 2018 Annual Meetings of the International Monetary Fund and The World Bank Group in Bali, Indonesia. This simple cross-country metric is expected to generate the political attention needed for catalytic action worldwide. Historically, the creation of transparent, easily understood metrics has helped to build consensus around similar issues. For example, when the results of the first Programme for International Student Assessment (PISA) were released in 2001, the relatively poor performance of German students sparked a "PISA shock" that led to educational reforms. And these reforms made a difference—by 2012 German students had surpassed the average of the member countries of the Organisation for Economic Co-operation and Development (OECD).[5]

The index measures the human capital of the next generation, defined as the amount of human capital that a child born today can expect to achieve in view of the risks of poor health and poor education currently prevailing in the country where that child lives. The HCI has three components:

1. *Survival*. This component reflects the fact that children born today need to survive until the process of human capital accumulation through formal education can begin. Survival is measured using the under-5 mortality rate.

2. *Expected years of learning-adjusted school.* Information on the quantity of education a child can expect to obtain by age 18 is combined with a measure of quality: how much children learn in school based on countries' relative performance on international student achievement tests. This combination produces the expected years of learning-adjusted school. By adjusting for quality, this component reflects the reality that children in

some countries learn far less than those in other countries, despite being in school for a similar amount of time.

3. *Health.* This component uses two indicators for a country's overall health environment: (1) the rate of stunting of children under age 5; and (2) the adult survival rate, defined as the proportion of 15-year-olds who will survive until age 60. The first indicator reflects the health environment experienced during prenatal, infant, and early childhood development. The second reflects the range of health outcomes that a child born today may experience as an adult.

The health and education components of the index are combined in a way that reflects their contribution to worker productivity, based on evidence from rigorous microeconometric empirical studies. The resulting index ranges between 0 and 1. A country in which a child born today can expect to achieve both full health (no stunting and 100 percent adult survival) and full education potential (14 years of high-quality school by age 18) will score a value of 1 on the index. Therefore, a score of 0.70 signals that the productivity as a future worker for a child born today is 30 percent below what could have been achieved with complete education and full health. Because the theoretical underpinnings of the HCI are in the development accounting literature, the index is linked to real differences in how much income a country can generate in the long run.[6] If a country has a score of 0.50, then the gross domestic product (GDP) per worker could be twice as high if the country reached the benchmark of complete education and full health.

A number of criteria guided the design of the index: a focus on salient outcomes, a coherent aggregation strategy across its different components, and broad cross-country coverage of directly measured components. An outcome- rather than inputs-based index is more likely to center the conversation on what matters—results—and to provide incentives for countries not only to invest more but also to invest better. Conversely, an index measuring spending on health, education, or social protection would only capture dollars spent on specific sectors and not whether spending led to better outcomes. The need to produce a salient metric that is responsive to policy action in the short to medium term has oriented the choice of components toward measuring the human capital of the next generation rather than measuring the stock of human capital of the current workforce, which largely is the result of policy choices made decades ago when the current workforce was of school age.

Human capital has many dimensions, but the literature has recognized the usefulness of moving from "a large and eclectic dashboard" to a single summary metric.[7] However, doing so requires a coherent aggregation method.[8] Finally, the likelihood that a cross-country exercise can spur policy action is strongly influenced by the over-time and cross-country coverage of a metric that is transparent and can be meaningfully mapped to direct measurement.

Scaling up measurement and research

The Human Capital Index will provide a bird's-eye view of each country's level of human capital. The Human Capital Project has also launched a medium-term program of data and analytical work to improve measurement of a wide range of human capital outcomes, better understand how human capital is accumulated, and identify the country policies that can promote it.

This work will strengthen measurement of outcomes, including key components of the HCI. Many countries lack the key data needed to recognize their gaps in human capital investments. For example, only 71 countries have participated in PISA and only 65 in the Trends in International Mathematics and Science Study (TIMSS), and coverage of developing countries has been limited.[9] The HCP will promote new measurement initiatives and convene stakeholders to facilitate agreement on developing instruments for existing initiatives.

The HCP will also develop analytics and tools to generate new data on the factors that contribute to human capital development. To that end, the project will support both an expansion of measurement and a research program directed at understanding the interactions between the components of human capital such as how nutrition and education complement one another during a child's early years. It will also aim to understand how these interactions change over time.[10]

The Human Capital Project will accomplish these goals by helping to scale up initiatives such as the Measuring Early Learning Quality and Outcomes (MELQO) surveys, which assess the school readiness of children between the ages of 3 and 6. It will also take advantage of existing measurement efforts to expand both coverage and the types of questions that can be answered. For example, the Living Standards Measurement Study (LSMS) could be used to implement new modules designed to understand the skills and workplace readiness of adolescent children and connect those measurements to household characteristics such as poverty. These measurement initiatives will be complemented with a research agenda designed to expand understanding of the links between the various components of human capital.

In addition to better understanding how human capital develops, the HCP will intensify efforts to understand what policies can help countries rapidly increase their human capital. It will explicitly connect measurements of human capital outcomes (such as learning) to policy actions (such as improving the quality of schooling or social support through cash transfer programs). In doing so, the HCP will support expansion of the World Bank's Service Delivery Indicators (SDI) program. SDI surveys measure the quality of education and basic health services in 11 countries, and the SDI program is currently being extended throughout Africa and beyond. The SDI initiative will cover 30 countries by 2021, and new modules will measure, for example, the quality of management practices in schools and health facilities.

The HCP will also expand and build on existing system benchmarking initiatives—such as the Systems Approach for Better Education Results (SABER), Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE), and measurement of progress toward Universal Health Coverage (UHC)—to inform the more specific policy levers available in a country. These initiatives will be complemented by a research program that draws on data on both policy actions and outcomes to isolate the causal link between the two.

Data and research on human capital are crucial global public goods supported by the World Bank, which can use its convening power to coordinate the improvement or expansion of existing measurement initiatives. When it has a comparative advantage, the World Bank will finance or conduct these efforts itself, such as by including new modules in the LSMS.

Country engagement

A critical contribution of the Human Capital Project is to scale up the World Bank's engagement with countries to bring about transformative investments in human capital. This effort will complement the steady increase in the World Bank's support of human capital through its lending for human development projects.

The HCP is already working with nearly 30 countries seeking to develop priorities for human capital development, to identify the areas in most need of attention, and to find the best path to overcoming barriers to better results. These governments have nominated focal points, usually in their ministry of finance or planning, to lead a conversation across all of government. These countries will also form a network for sharing knowledge and evidence on the challenges of implementation.

The Human Capital Project will expand as more countries participate and pursue more and better investments in human capital. Strategic support through the project is available to all World Bank client countries, including through an effort focusing on Sub-Saharan Africa.

Patterns of spending and outcomes

The Human Capital Project will consider the various contexts that countries face in investing in human capital, reflecting different levels of financing and efficiency of spending for human capital. These contexts vary significantly, but at least four broad patterns of spending and outcomes are common.

The first of these patterns is a combination of *low capacity to mobilize resources, low investment in human capital, and high needs*. Many countries have a limited capacity for investment in human capital, and so they may need time to increase domestic resources as they build institutions, curb leakages, and improve public financial management. These are typically the world's poorest or most vulnerable countries, many of which need help with resources for foundational investments, often in the aftermath of devastating crises. Many are characterized by high fertility rates and dependency ratios as well as weak coverage of quality social services. Limited resources are a bottleneck, and coordinated external assistance remains important.

The second pattern is a *high capacity to mobilize resources, low investment in human capital, and weak outcomes*. These countries could raise more resources for human capital, but they chronically underinvest, sometimes in the face of severe challenges. Characterized by a low share of public spending on human development, they may have limited revenues overall for several reasons, including low taxation, or they may fail to give human capital priority within an otherwise reasonable level of resources. These countries also may face serious governance, implementation, and equity challenges. They need to expand their public resources for human capital development and manage their resources for maximum impact.

The third pattern is *high investment in human capital without commensurate outcomes*. Governance and management challenges may translate into inefficient, low-quality service delivery. Increasing value for money and efficiency of spending are critical in these countries.

The fourth pattern is *a high level or efficiency of human capital spending that achieves good outcomes*. Although several countries are investing well and receiving excellent returns on their human capital investments, the challenge of sustaining results is an ongoing one because of the changing nature of work. The frontier for skills is not static, so these countries also need to continually evolve and adapt.

The HCP will analyze these patterns in the development and customization of strategies to improve human capital outcomes. It will then connect countries that can benefit from knowledge sharing based on current and historical experiences.

Call to action: A "whole-of-government" approach

In addressing the many serious barriers to human capital and suboptimal patterns of spending and outcomes, the HCP emphasizes the need for "whole-of-government" strategies. Three elements cut across politics, institutions, and knowledge.

The first element is to *sustain effort across political cycles.* A long-term commitment across political cycles is fundamental to human capital transformation. Country experience shows that sustained prioritization of issues is both possible and effective in diverse contexts. For example, it is difficult to imagine that in 1950 adults in Singapore had, on average, just two years of formal schooling. By paying sustained attention to human development, Singapore is now among the world's highest performers on learning and in the Human Capital Index. Today, the country remains attentive to human capital issues in the face of rapid technological advancement.

The second element is to *link sectoral programs*. Improvements in human capital do not depend exclusively on social sector policies. Investments in the infrastructure sectors, complemented with investments in the social sectors, can make substantial contributions to advancing the human capital agenda. For example, historical data show that sewage and clean water interventions together accounted for a large share of the decline in child mortality in Massachusetts between 1880 and 1920.[11]

The third element is to *expand the evidence base for policy design*. Undertaking new analyses, even using existing measurement, can help identify which interventions deliver the highest returns to investment and can in turn aid in the design of cost-effective interventions. For example, a deeper understanding is needed of how aspects of human capital interact. This is especially true at early ages. Recent pathbreaking analyses of the long-term impact of early childhood interventions in the United States have helped quantify the long-term benefits of targeted investments early in life.[12] Research is also under way on the benefits of similar interventions in developing countries, thereby shedding light on the interaction between interventions in different sectors such as education, health, and social protection, and helping to identify affordable and transformational interventions. As countries strive to bridge the human capital gap, they need to assess how best to apply these principles to their contexts. Doing so will be critical to ensuring that people are able to realize their full productive potential.

As the Human Capital Project expands, the demand from countries for better results will continue to grow. Through the International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD), the World Bank Group already works to meet this increasing demand through, for example, results-based financing for human capital in which financing is linked to the achievement of pre-agreed results. Fifty countries have asked to join the Global Financing Facility to scale up promising results-based approaches in health. Of those, 27 have received support so far, the majority in Africa and Asia. In education, the World Bank Group has far exceeded its 2015 commitment to double results-based financing for education from US$2.5 billion to US$5 billion in five years—and to reach US$7 billion in just three more years. In addition, Sub-Saharan Africa and Asia are rapidly expanding coverage of social safety nets and allocating substantial resources to conditional cash transfer programs. In these programs, cash transfers to households are conditional on key human capital investments such as immunizations, nutrition counseling, or enrolling children in school.

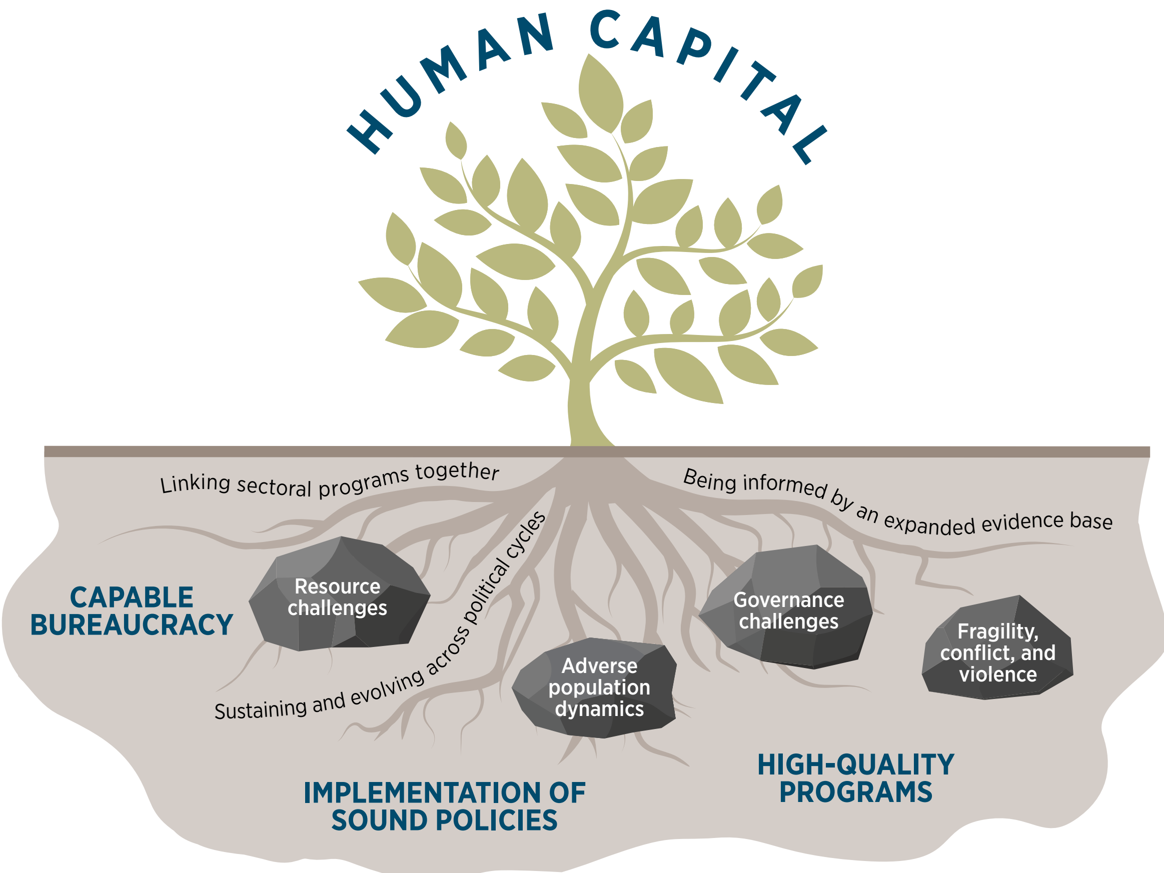
A project for the world

The World Bank Group has long-standing engagements with its client countries in health, education, social protection, water and sanitation, and many other sectors influencing human capital outcomes. Over the last decade, much progress has been made in getting children into school, reducing child mortality and tackling communicable diseases, increasing life expectancy, and expanding social safety nets in low-income countries. However, to meet the remaining and increasingly urgent challenges, further acceleration and prioritization of human capital outcomes are needed (figure I.1).

Progress is possible. Countries that have successfully managed to align support around reform have seen impressive levels of improvement (box I.1). For example, Poland enacted education reforms between 1990 and 2015 that led to one of the fastest improvements in a PISA score in OECD countries.[13] Vietnam also achieved a meteoric rise in learning, and it recently topped the OECD average PISA score. With concerted political effort and a clear target, Peru managed to reduce its rate of stunting by roughly 15 percentage points over an eight-year period. Malawi succeeded in reducing its rate of stunting by nearly 20 percentage points in under two decades.

As the world faces rapid change and technological advancement, the stage is set for more and better investments in people. In addition to improving incomes and fostering sustainable growth and poverty reduction, these investments are good in and of themselves. The goal of the Human Capital Project is to realize a world in which all children arrive at school well nourished and ready to learn, their classrooms are places that facilitate real learning, and they are given a chance to grow up to live and work as healthy, skilled, and productive adults.

FIGURE I.1 Nurturing human capital



BOX I.1 What do countries stand to gain from engagement in the Human Capital Project?

The Human Capital Project (HCP) supports countries through a customized package of data, policies, and interventions to accelerate human development outcomes. It focuses on the following areas:

- *Providing access to policy benchmarking and diagnostic tools* to identify resources for metrics, programming, and financing of efficient and effective interventions. The World Bank Group offers a host of tools, including the Systems Approach for Better Education Results (SABER), Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE), Service Delivery Indicators (SDI), Primary Health Care Performance Indicators (PHCPI), Water Supply, Sanitation, and Hygiene (WASH), and Poverty Diagnostics.
- *Advising on evidence-based interventions tailored to the country context, including lessons from states affected by fragility, conflict, and violence where applicable.* The World Bank Group's Strategic Impact Evaluation Fund (SIEF) measures the impact of programs and policies aimed at improving education, health, access to quality water and sanitation, and early childhood development in developing countries.
- *Connecting governments with advances in disruptive technology.* For example, in 2018 the World Bank Group launched TechEmerge Health Brazil to help small firms scale up innovations able to boost health outcomes in the country. The platform matches these firms with health care providers to help improve affordability, scale, and efficiency. Such a program could be replicated in other countries.
- *Facilitating peer learning on how to raise interest in building human capital.* The World Bank Group will support a variety of ways in which countries can connect with others to discuss aspirations, plans, opportunities, and the challenges of implementation. This community of practice could be supplemented by twinning or partnering relationships, staff exchange programs, or an HCP fellows program.
- *Improving the efficiency of resource allocation* by focusing on and demonstrating results, including through expenditure reviews, governance reforms, and program effectiveness. Public expenditure reviews are one tool to help identify ways to improve efficiency in the social sectors. Reforms aimed at results-based financing are also an area of focus.
- *Increasing resources for human capital through resource mobilization or reallocation.* The World Bank Group could support efforts to close tax loopholes and exceptions, improve revenue collection, explore excise taxes, and remove or reform regressive subsidies.
- *Engaging citizens in increasing the take-up and improving the delivery of public services.* The World Bank Group has both a wealth of information on social accountability and citizen engagement tools to advise governments on how the end users of public services can help improve those services. Such an effort could include awareness-building campaigns on various interventions.

Notes

1. Bodewig and Badiani-Magnusson (2014).
2. World Bank (2018b).
3. WHO and World Bank (2017); World Bank (2018a).
4. Parts of this volume elaborate on ideas in Kim (2018).
5. OECD (2014).
6. Caselli (2005).

7. Stiglitz, Sen, and Fitoussi (2009).
8. Ravallion (2011).
9. Altinok, Angrist, and Patrinos (2018).
10. Cunha and Heckman (2007).
11. Alsan and Goldin, forthcoming.
12. García et al. (2016).
13. World Bank (2010).

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BUILDING HUMAN CAPITAL

The world is healthier and more educated than ever. In 1980 only 5 in 10 primary school-age children in low-income countries were enrolled in school. By 2015 this number had increased to 8 in 10. In 1980 only 84 of 100 children reached their fifth birthday, compared with 94 of 100 in 2018. A child born in the developing world in 1980 could expect to live for 52 years. In 2018 this number was 65 years.

But a large and unfinished agenda remains. Life expectancy in the developing world still lags far behind that of rich countries such as the Republic of Korea, where a girl born in 2018 can expect to live more than 85 years. Nearly a quarter of children under age 5 are malnourished. In many places, the working memory and executive functions (such as sustained attention) of poor children begin to lag as early as at 6 months of age.[1] Worldwide, more than 260 million children and youth are not in school. Meanwhile, nearly 60 percent of primary school children in developing countries fail to achieve minimum proficiency in learning.

Human capital consists of the knowledge, skills, and health that people accumulate over their lives, enabling them to realize their potential as productive members of society. It has large payoffs for individuals, societies, and countries. This was true in the 1700s when the Scottish economist Adam Smith wrote, "The acquisition of . . . talents during . . . education, study or apprenticeship, costs a real expense, which [is] capital in [a] person. Those talents [are] part of his fortune [and] likewise that of society."[2] This is still true in 2018.

For individuals, an additional year of school generates higher earnings on average. These returns are large in low- and middle-income countries, especially for women. However, what children learn matters more than how long they stay in school. In the United States, replacing a low-quality teacher in an elementary school classroom with an average-quality teacher raises the combined lifetime income of that classroom's students by US$250,000.[3]

Despite the larger supply of educated workers, returns to investments in education have increased since 2000.[4] Returns to education are especially high when technology is changing—people with higher human capital adapt faster to technological change. Indeed, a worker's future success depends on working with machines, not fearing them. In Mexico, the benefits of increased labor productivity resulting from the 1994 North American Free Trade Agreement (NAFTA) have been concentrated among more skilled workers.

Developing sociobehavioral skills such as an aptitude for teamwork, empathy, conflict resolution, and relationship management enlarges a person's human capital. Globalized and automated economies put a higher premium on human capabilities that cannot be fully mimicked by machines. Abilities such as grit have economic returns that are often as large as those associated with cognitive skills.

Health is an important component of human capital. People are more productive when they are healthier. In Nigeria, a program providing malaria testing and treatment increased workers' earnings by 10 percent in just a few weeks.[5] A study in Kenya showed that deworming in childhood reduced school absences while raising wages in adulthood by as much as 20 percent, all thanks to a pill that costs 25 cents to produce and deliver.[6]

From an early age, the dimensions of human capital complement each other. Proper nutrition in utero and in early childhood improves children's physical and mental well-being. Evidence from the United Kingdom revealed that schoolchildren who had healthier diets significantly increased their achievements in English and science.[7] Meanwhile, a multicountry study in Southeast Asia found that both underweight and obese children had lower IQ scores than healthy-weight children.[8] In India, giving preschoolers mathematics-based games generated enduring improvements in their intuitive abilities.[9]

The benefits of human capital transcend private returns, extending to others and across generations.[10] Deworming one child decreases the chances of other children becoming infected with worms, which in turn sets those children up for better learning and higher wages.[11] Maternal education, through better prenatal care, improves infant health. In Pakistan, children whose mothers have even a single year of education spend an extra hour a day studying at home.[12]

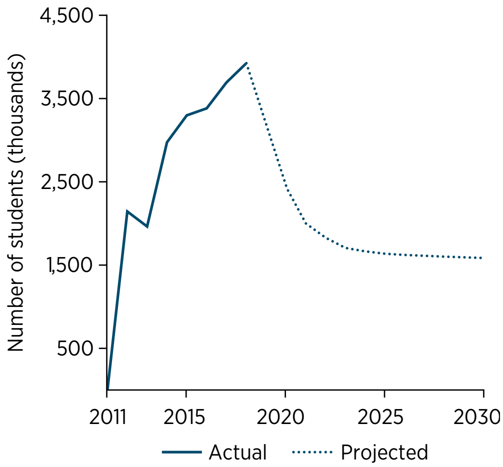
These individual returns to human capital add up to large benefits for economies—countries become richer as more human capital accumulates. Human capital complements physical capital in the production process and is an important input to technological innovation and long-run growth. As a result, between 10 and 30 percent of per capita gross domestic product (GDP) differences is attributable to cross-country differences in human capital.[13] This percentage could be even higher when considering the quality of education or the interactions between workers with different skills. And not to be overlooked, by generating higher incomes, human capital accelerates the demographic transition and reduces poverty.

Over the longer term, human capital matters for societies. In the mid-1970s, Nigeria introduced universal primary education, sending a large cohort of children through primary school who otherwise would not have gone. Years later, the members of that cohort were found to be more engaged in political life. They paid closer attention to the news, spoke to their peers about politics, attended community meetings, and voted more often than those who did not go to primary school. Young participants in the National Volunteer Service Program in Lebanon, an intercommunity soft skills training program, display higher levels of overall tolerance. As the scientist Marie Curie once said, "You cannot hope to build a better world without improving the individuals."

Human capital also fosters social capital. Surveys typically find that more educated people are more trusting of others. Research suggests that the large wave of compulsory school reforms that took place across Europe in the mid-20th century made people more tolerant of immigrants than they were before.[14] Social capital in turn is associated with higher economic growth.[15] Conversely, failing to protect human capital undermines social cohesion.

Human capital is one of the first things to suffer when things fall apart. Wars often prevent whole generations from realizing their potential. For example, between 2011 and 2017 almost 4 million Syrian children left school because of the civil war. Many of them are likely to never make up for these lost years of school (figure 1).

FIGURE 1 In the Syrian Arab Republic, the number of children out of school because of war rose between 2011 and 2017



Source: WDR 2019 team.

Note: The number of children out of school between 2011 and 2017 is based on estimates of actual declines in school enrollment relative to prewar trends and on the assumed impact war has had on student enrollment. The scenario from 2018 onward explores the long-term consequences of these trends by assuming that school enrollments gradually return to prewar trends and corrects for the population dynamics of refugee in-and-out flow rates (if they are similar to those after past international conflicts). Similar assumptions are also made for internally displaced persons but with higher return rates during the first few years after the end of the war.

Why governments should get involved

Individuals and families often cannot afford the costs of acquiring human capital. Even when human capital investments are affordable, individual decisions may be shaped by lack of information, or restricted because of the prevalent social norms. Individuals also do not necessarily consider the wider social benefits for others. For these reasons, governments have an important role to play in fostering human capital acquisition.

Many disadvantaged families want to invest in better health and education for their children but cannot afford to do so. The proof is how families spend their money once budget constraints are even slightly relaxed. In Sierra Leone, only three to four months after the introduction of a public works program that increased income, participating families significantly increased their spending on health services, especially for children.[16]

Even when education is free, the cost of transportation and school supplies, together with the earnings lost while a child is in school instead of working, make education prohibitively expensive. Many poor rural families cannot afford the time it takes to travel to the nearest school or medical facility. In Niger, only 24 percent of the population lives within a one-hour walk of the nearest medical facility during the wet season.[17]

In cases such as these, government interventions make a big difference. Cash transfer programs have improved the health and education of millions of children in low- and middle-income countries, even when they have provided only partial subsidies for the cost of school. Shombhob, a conditional cash transfer program piloted in Bangladesh, reduced wasting among children ages 10–22 months and taught mothers about the benefits of breastfeeding.[18] And the effects of these programs are felt over time. A two-year conditional cash transfer program in Malawi targeting adolescent girls and young women produced a large increase in educational attainment and a sustained reduction in the total number of births in girls who were out of school at the start of the program. These benefits persisted after the program ended.[19]

Programs can improve people's incentives to invest in human capital when they make its long-term benefits salient or provide mechanisms to make good choices binding. Young people may not want to stay in school or take care of their health because they lack self-control or do not fully appreciate the benefits of education and good health.[20] However, when they receive information about human capital it has big effects on their behavior. In the Philippines, young people were offered a voluntary commitment program in which money they had placed in a savings account was returned to them only if they passed a smoking cessation test. The program saw a significant reduction in smoking.[21]

Human capital investment generates significant social returns as well, but these are often hard for parents to quantify, let alone factor into their decisions. When deciding to deworm their children, parents may not consider the fact that other children are also less likely to be infected. Parents deciding to send their children to preschool may not consider the wider future societal benefits such as lower crime and incarceration rates that have been associated with early childhood development programs. A 2010 study of Perry Preschool, a high-quality program for 3- to 5-year-olds developed in the 1960s in Michigan in the United States, estimated a return to society over and above the private return of about US$7–$12 for each dollar invested.[22] Without government interventions, families might not choose to invest enough in these types of programs.

Ensuring access to a quality education closes early gaps in cognitive and sociobehavioral skills. By the age of 3, children from low-income families have heard 30 million fewer words than their more affluent peers. As children turn into teenagers, interventions to close these gaps become more expensive. Evidence suggests that, for governments seeking to invest wisely in human capital, there is no better possibility than investing in the first thousand days of a child's life. Without such interventions early in life, it is more likely that a spiral of increasing inequality will ensue: subsequent public investments in education and health are more likely to benefit people who start out better off.

Government actions to support investment in human capital go well beyond spending on health, education, and social protection programs. In Nepal, investments in sanitation are contributing significantly to preventing anemia.[23] Housing programs improve the education and labor market outcomes of the most disadvantaged by changing the quality of the peers with whom they interact. The earlier children are exposed to better-off neighbors, the stronger are the effects.

Why measurement helps

Governments have a vital role to play in building human capital: as providers of health, education, and financing to ensure equitable access to opportunities and as regulators of accreditation and quality control of private providers. And yet they often fail to deliver. Most governments commit a significant share of their budgets to education and health, but public services are often too low quality to generate human capital. Sometimes, those services fail only the poor. Sometimes, they fail everyone—and the rich simply opt out of the public system.

Shortfalls in quality persist for two reasons. First, pursuing good policies does not always pay off politically. Second, bureaucracies may lack the capacity or incentives to convert good policies into effective programs. If public health is not politically relevant until there is a health crisis, politicians have little reason to prepare for future pandemics. Even when politicians and voters agree on the importance of an issue, they may disagree about the solution. Rarely is it popular to fund public health programs by raising taxes or by diverting money from more visible expenditures, such as on infrastructure or public subsidies.

The government of Nigeria encountered resistance in 2012 when it tried to repeal fuel subsidies to spend more on maternal and child health services. The media focused on the unpopular subsidy repeal and paid scant attention to the much-needed expansion of primary health care. The subsidy was thus reinstated because of public protests. Such a response to proposed changes occurs in some countries because the organized interests that stand to lose from reforms are powerful. In others, it happens because of a weak social contract: citizens do not trust their government, and so they are hesitant to pay taxes that they worry will be misspent. The consequence is that governments favor spending more on the politically visible aspects of human capital such as constructing schools and hospitals but much less on intangible aspects—such as the quality and competence of teachers and health workers. Campaigning politicians often promise new schools or hospitals, but rarely do they discuss actual learning levels or stunting rates.

Because investments in human capital may not produce economic returns for years, politicians tend to think of shorter-term ways to burnish their reputations. Although people with a basic education earn more than people with no education, labor market returns for a basic education are not realized until 10–15 years after these investments are made. This is even truer of investments in early childhood education. In Jamaica, providing toddlers with psychosocial stimulation increased earnings by 25 percent, but these returns only materialized 20 years later.[24]

One illustration of how technical and political complexities get in the way of delivering human capital interventions is in the area of early childhood development. Scholars generally agree that investments in children have high rates of return. However, challenges make the large-scale implementation of such investments difficult. First, as just noted, it takes a long time for society to benefit from these investments. Second, services have to be delivered in a synergic way over a short period within a person's life cycle. Third, multiple government departments are involved in the delivery of early childhood investments. Still, the experiences of countries such as Brazil, Chile, and Colombia reveal that large-scale early childhood development policies are feasible. One program, Chile Crece Contigo (Chile Grows with You), launched in 2006, serves as a reference point for middle-income countries willing to invest in children on a large scale. The Chilean early childhood development program integrates health, education, and social protection services for young children, combining universal and targeted programs. Rigorous evaluations boost the demand for political commitment.

Bureaucracies charged with implementing policies to build human capital often lack the capacity or the incentives to do so effectively. The World Bank's Service Delivery Indicators surveys conducted in seven countries in Sub-Saharan Africa (together representing close to 40 percent of the continent's population) found that, on average, 3 in 10 fourth-grade teachers had not mastered the language curriculum they were teaching. On a positive note, 94 percent of Kenyan teachers had done so. The surveys paint an equally mixed picture for health care facilities: about 80 percent of Kenyan doctors could correctly diagnose a basic condition such as neonatal asphyxia, whereas less than 50 percent of Nigerian doctors were able to do so.

Better measurement of outcomes sheds light on the political and bureaucratic failures that lead to the poor-quality delivery of social services. Information is an essential first step toward encouraging citizens to demand more from their leaders and service providers. In Uganda, releasing report cards on the performance of local health facilities galvanized communities to press for service delivery reforms. This pressure led in turn to sustained improvements in health outcomes, including a reduction in mortality for children under 5.

Better measurement also increases policy makers' awareness of the importance of investing in human capital, thereby creating momentum for action. Twaweza, a Tanzanian organization, launched a survey to assess children's basic literacy and numeracy. The dismal results—released in 2011—showed that only 3 in 10 third-grade students had mastered second-grade numeracy, and even fewer could read a second-grade story. The World Bank's own Service Delivery Indicators, released around the same time, shone a spotlight on the low levels of teacher competence and high levels of absenteeism in Tanzania. Together, these results led to a loud public outcry and the introduction of Tanzania's Big Results Now initiative, a government effort to track and address low levels of learning. It is already leading to tangible results.

More information is also needed to design and deliver cost-effective policies, even when a government is fully willing to invest in human capital. Both Peru and Vietnam have implemented ambitious policies to improve human capital. But only a comprehensive measurement of the factors that contribute to individual learning will shed light on the reasons behind differentials between these two countries. Once the gaps have been identified, cost-effective policies have to be designed and brought to scale.

The Human Capital Project

Credible measurement of education and health outcomes raises the importance of human capital locally, nationally, and globally. Measurement spurs the demand for policy interventions to build human capital in countries where governments are not doing enough. Good measurement is essential to developing research and analysis to inform the design of policies that improve human capital.

With this goal in mind, the World Bank has launched the Human Capital Project—a program of advocacy, measurement, and analytical work to raise awareness and increase demand for interventions to build human capital. The project has three components: (1) a cross-country metric—the Human Capital Index, (2) a program of measurement and research to inform policy action, and (3) a program of support for country strategies to accelerate investment in human capital.

The first step in the project is an international metric to benchmark certain components of human capital across countries.[25] The new index measures the amount of human capital that a child born in 2018 can expect to attain by age 18 in view of the risks of poor education and poor health that prevail in the country in which she was born. The index is designed to highlight how improvements in the current education and health outcomes shape the productivity of the next generation of workers: it assumes that children born in a given year experience current educational opportunities and health risks over the next 18 years. A focus on outcomes—and not inputs such as spending or regulation—directs attention to results, which are what really matter. It also makes the Human Capital Index relevant to the policy makers who design and implement interventions to improve these outcomes in the medium term.

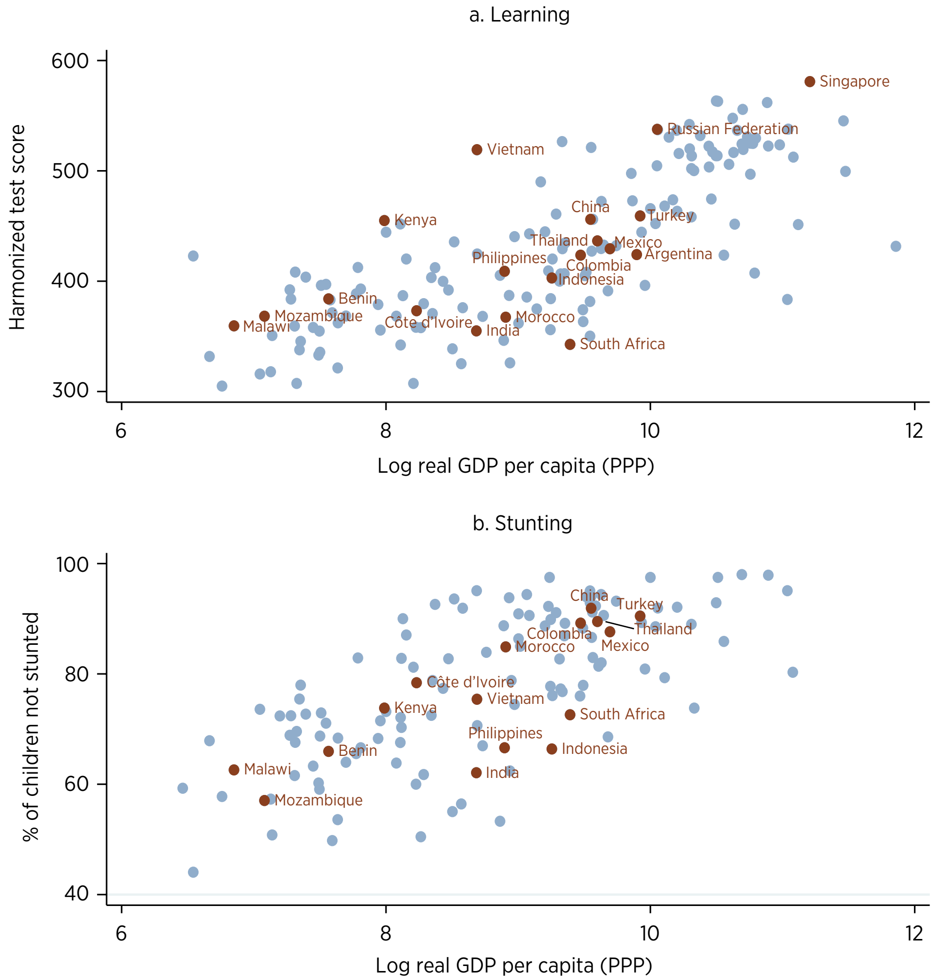
The index follows the trajectory from birth to adulthood of a child born in a given year. In the poorest countries, there is a significant risk that the child does not even survive to see her fifth birthday. Even if she does reach school age, there is a further risk that she does not start school, let alone complete the full cycle of education through grade 12 that is the norm in rich countries. The time she does spend in school may translate unevenly into learning, depending on the quality of her teachers and schools and the support she receives from her family. After she reaches her 18th year, she carries with her the lasting childhood effects of poor health and nutrition that limit her physical and cognitive abilities as an adult.

The Human Capital Index quantifies the milestones in this trajectory in terms of their consequences for the productivity of the next generation of workers. It has three components: (1) a measure of whether children survive from birth to school age (age 5); (2) a measure of expected years of quality-adjusted school, which combines information on the quantity and quality of education (figure 2, panel a); and (3) two broad measures of health—stunting rates (figure 2, panel b) and adult survival rates.

Survival to age 5 is measured using under-5 mortality rates compiled by the United Nations Inter-agency Group for Child Mortality Estimation. Nearly all children survive from birth to school age in rich countries. But in the poorest countries, as many as 1 in 10 children do not see their fifth birthday. The deaths of these children are not just a tragedy, but also a loss of their human capital, which never is realized.

The quantity of education is measured as the number of years of school a child can expect to obtain by her 18th birthday, given the prevailing pattern

FIGURE 2 Learning and stunting are two components of the Human Capital Index



Sources: Harmonized test scores are drawn from Patrinos and Angrist (2018); stunting data are from the UNICEF–WHO–World Bank Joint Child Malnutrition Estimates database, supplemented with data provided by World Bank country teams.

Note: GDP = gross domestic product; PPP = purchasing power parity.

of enrollment rates across grades, and assuming she starts preschool at age 4. The best possible outcome occurs when children stay in school for 14 years, through age 18. High enrollment rates throughout the school system bring many rich countries close to the 14-year benchmark. But in the poorest countries, children can expect to complete only half of that.

The World Bank Group and its partners are developing a comprehensive new database of international student achievement test scores covering nearly 160 economies to benchmark what children learn. The database harmonizes results from international and regional testing programs so they are comparable. For the first time, learning is measurable in nearly all countries using the same yardstick.

The differences in learning are dramatic. Country-level average test scores range from around 600 in the best-performing countries to around 300 in the worst-performing. To put these numbers in perspective, a score of roughly 400 corresponds to a benchmark of minimum proficiency set by the Programme for International Student Assessment (PISA), the largest international testing program. Less than half of students in developing countries meet this standard, compared with 86 percent in advanced economies. In Singapore, 98 percent of students reach the international benchmark for basic proficiency in secondary school; in South Africa, only 26 percent of students meet that standard. Essentially, then, all of Singapore's secondary school students are prepared for a postsecondary education and the world of work, while almost three-quarters of South Africa's young people are not.

For health, there is no single directly measured and widely available indicator comparable to years of school as a measure of educational attainment. In the absence of such a measure, two proxies for the overall health environment make up this component of the index: adult survival rates and the rate of stunting for children under age 5. Adult survival rates are used as a proxy for the range of nonfatal health outcomes that a child born in a given year is likely to experience as an adult if current conditions prevail into the future. Stunting measures the share of children who are unusually small for their age. It is broadly accepted as a proxy for the prenatal, infant, and early childhood health environment, and it summarizes the risks to good health that children are likely to experience in their early years—with important consequences for health and well-being in adulthood.

The education and health components of human capital just described have an intrinsic value that is undeniably important—but also undeniably difficult to quantify. It is therefore challenging to combine the components into a single index that meaningfully reflects their contributions to human capital. Many existing indexes of human capital and human development resort to arbitrary aggregation of their components. By contrast, the components of the Human Capital Index are aggregated by first transforming them into measures of their respective contributions to worker productivity relative to a benchmark corresponding to a complete education and full health. This approach follows the development accounting literature.[26] The size of the contributions of education and health to worker productivity is anchored in the extensive microeconometric literature on estimating returns to education and health.

Because the Human Capital Index is measured in terms of the productivity of the next generation of workers relative to the benchmark of complete education and full health, the units of the index have a natural interpretation: a value of x for a country means that the productivity as a future worker of a child born in a given year in that country is only a fraction x of what it could be under the benchmark (table 1). This future productivity is divisible into the contributions of the three components of the index, each of which is also expressed in terms of productivity relative to the benchmark. The three components are then multiplied to arrive at the overall index.

TABLE 1 Measuring the productivity as a future worker of a child born in 2018

Maximum productivity = 1

	Component	*A country in the* 25th percentile *for component X has a value of . . .*	*A country in the* 50th percentile *for component X has a value of . . .*	*A country in the* 75th percentile *for component X has a value of . . .*
	Component 1: survival			
1	Probability of survival to age 5	0.95	0.98	0.99
A	*Contribution to productivity*	*0.95*	*0.98*	*0.99*
	Component 2: school			
	Expected years of school	9.5	11.8	13.1
	Test score (out of approx. 600)	375	424	503
2	Quality-adjusted years of school	5.7	8.0	10.5
B	*Contribution to productivity*	*0.51*	*0.62*	*0.76*
	Component 3: health			
3	Fraction of children not stunted	0.68	0.78	0.89
4	Adult survival rate	0.79	0.86	0.91
C	*Contribution to productivity*[a]	*0.88*	*0.92*	*0.95*
	Overall Human Capital Index[b]	**0.43**	**0.56**	**0.72**

Source: WDR 2019 team.

Note: "Contribution to productivity" measures how much each component of the index, as well as the overall index, contributes to the expected future productivity as a worker of a child born in 2018 relative to the benchmark of a complete education and full health. A value of *x* means that productivity is only a fraction *x* of what it would be under the benchmark of a complete education and full health. Estimates of productivity contributions are anchored in microeconometric evidence on the returns to education and health. "Quality-adjusted years of school" equals the country's test score relative to the global best test score multiplied by the country's expected years of school.

a. C is calculated as the geometric average of the contributions of numbers 3 and 4 to productivity.
b. A × B × C.

Differences in human capital have large implications for the productivity of the next generation of workers. In a country at around the 25th percentile of the distribution of each of the components, a child born in 2018 will be only 43 percent as productive as that child would be under the benchmark of complete education and full health.

The index, because of its units, can be connected in a straightforward fashion to scenarios for future per capita income and growth. Imagine a status quo scenario in which the expected years of quality-adjusted school and level of health, as measured in the index for a given year, persist into the future. Over time, new entrants to the workforce with status quo education and health replace current members of the workforce, until eventually the entire workforce of the future has the expected years of quality-adjusted school and level of health captured in the current Human Capital Index. It is possible to then compare this scenario with one in which the entire future workforce benefits from a complete education and enjoys full health.

In the long run, per capita GDP in this scenario is higher than in the status quo scenario through two channels: the direct effects of higher worker productivity and the indirect effects that reflect the greater investments in physical capital that are induced by having more productive workers. Combining these effects, a country with an index score of x will in the long run have per capita GDP in the status quo scenario that is only a fraction x of what it could be with a complete education and full health. For example, a country with an index of $x = 0.5$ would in the long run have per capita incomes twice as high as the status quo if its citizens enjoyed a complete education and full health. What this means in terms of average annual growth rates depends on the time period. If 50 years—or about two generations—are required for these scenarios to materialize, then a doubling of future per capita income relative to the status quo corresponds to roughly 1.4 percentage points of additional growth per year.

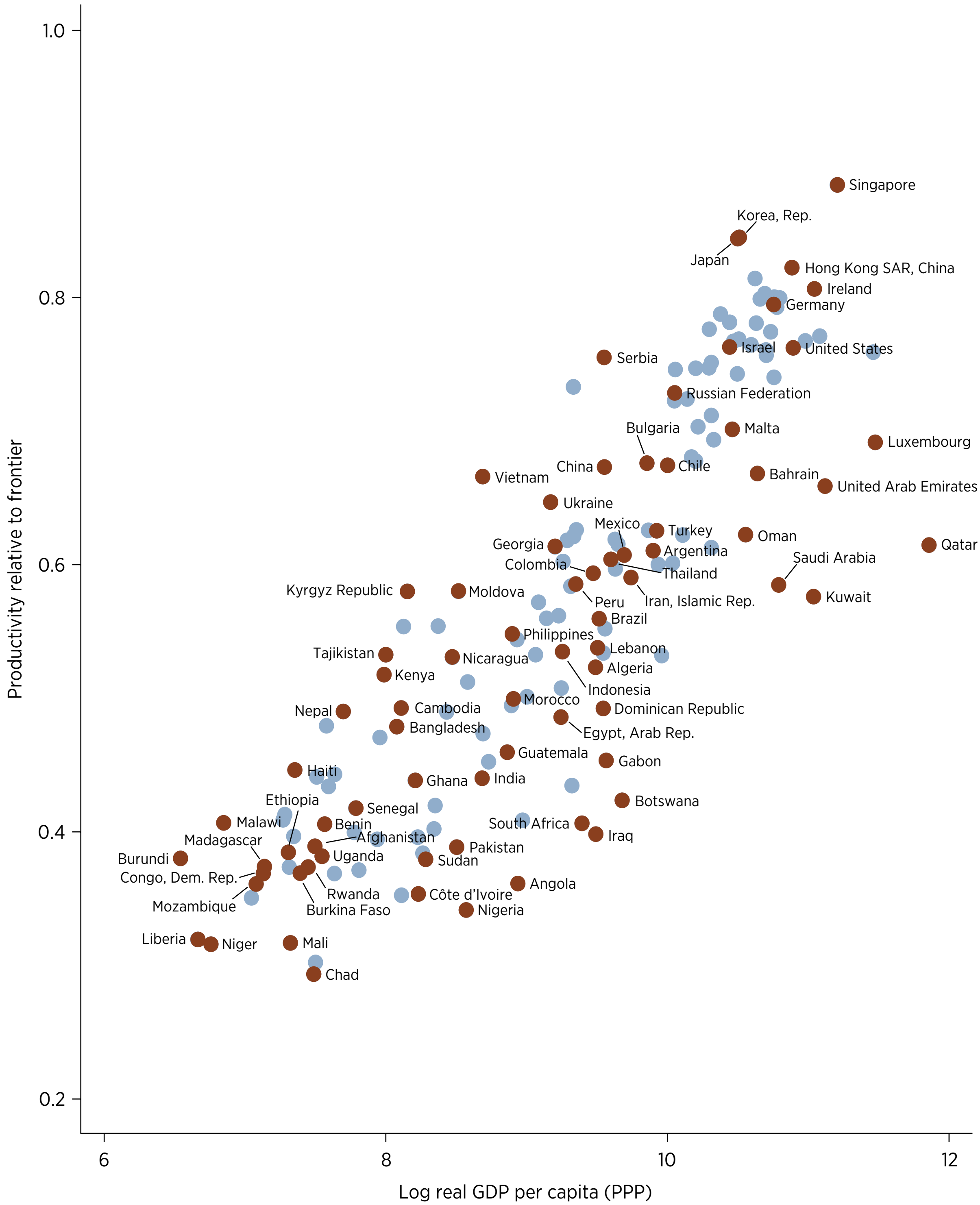
The index measures the amount of human capital that the average child born in 2018 expects to achieve (figure 3). However, averages hide a great deal of variation. Most of the components of the index can be disaggregated by gender for most countries so that differences in the prospects of boys versus girls can be observed. Although it is not possible to do so systematically for a large set of countries, in individual countries in which the data are richer, differences in the components of the index across regions and socioeconomic groups can also be illustrated.

The Human Capital Index presented here is the first edition. Like all cross-country benchmarking exercises, it has limitations, with scope for improvement and expansion in subsequent versions. Components of the index such as stunting and test scores are measured only infrequently in some countries and not at all in others. Data on test scores are retrieved from international testing programs in which the age of the test takers and the subjects covered vary. Test scores may not accurately reflect the quality of the entire education system of a country to the extent that test takers are not representative of the population of all students. Reliable measures of the quality of tertiary education do not yet exist, despite the importance of higher education for human capital in a rapidly changing world. Data on enrollment rates, needed to estimate expected school years, often have many gaps and are reported with significant lags. Sociobehavioral skills are not explicitly captured. Adult survival rates are imprecisely estimated in countries where vital registries are incomplete or nonexistent.

One objective of the Human Capital Index is to call attention to these data shortcomings and to galvanize action to remedy them. Improving data takes time. In the interim, and recognizing these limitations, country scores on the index should be interpreted with caution. While providing estimates of how current education and health shape the productivity of future workers, the index is not a finely graduated measurement of small differences between countries. Because it captures outcomes, it is not a checklist of policy actions. The type and scale of interventions required to build human capital are not the same from country to country.

Although there has been significant improvement in the availability of data on education and health outcomes, there is still a long way to go. For example, advanced cognitive and sociobehavioral skills, which are not incorporated in the index, are important contributors to individual productivity.

FIGURE 3 **The Human Capital Index, 2018**



Source: WDR 2019 team.

Note: The Human Capital Index ranges between 0 and 1. The index is measured in terms of the productivity of the next generation of workers relative to the benchmark of complete education and full health. An economy in which the average worker achieves both full health and full education potential will score a value of 1 on the index. GDP = gross domestic product; PPP = purchasing power parity.

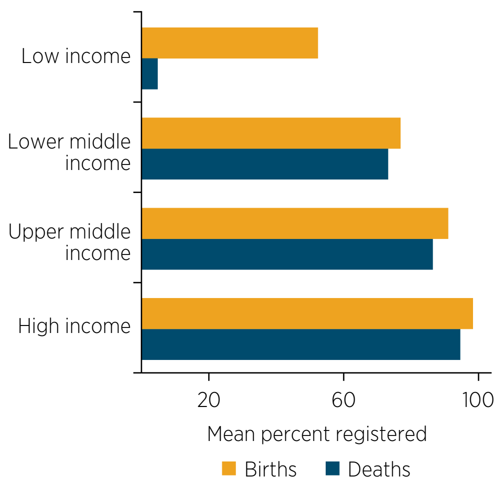
And comparable data are lacking on early childhood development, which is a significant foundation for the quality of the future labor force.

Yet another task is measuring the intermediate factors that affect these outcomes. Although citizens of low- and middle-income countries face similar constraints in the accumulation of human capital, the relevance of these constraints is often context-specific. Understanding which constraints matter the most is essential to setting priorities across policy areas.

A first step is improving the quality of basic administrative data in education and health. Only one in six governments publish annual education monitoring reports. Just 100 countries or so report reasonably complete and up-to-date data on net enrollment rates at different levels of education to the UNESCO Institute for Statistics—the body tasked with compiling this data internationally. Monitoring of even the most basic health information—births and deaths—is insufficient in low- and middle-income countries (figure 4). The pace of improvement in these systems has been slow. Worldwide, between 2000 and 2012 the percentage of registered deaths changed from only 36 percent to 38 percent. The percentage of children under 5 whose births were registered only increased from 58 percent to 65 percent.[27] High-quality basic administrative data are essential for governments to understand their needs and to plan the allocation of public services.

FIGURE 4 Records of births and deaths remain inadequate

Civil registrations of births and deaths by country income group, 2018



Source: WDR 2019 team.

Note: Figure shows estimates of birth and death registration coverage based on available data for 180 and 120 countries, respectively. Birth registration data are based on the *United Nations Demographic Yearbook.* For countries with incomplete civil registration systems, birth registration is estimated from mothers' self-reporting of their children's birth registration status, as collected in household surveys. Death registration data are based on estimates by the World Health Organization.

Increasing the number of countries in which the learning achievements of children are measured—both those in and out of school—would allow much better tracking of countries' performance for school access and learning. This should include making data on learning fully representative of all children rather than the selection—often from higher-income families—of those who stay in school. The *Annual Status of Education Report* is a rare example of a survey that provides an annual assessment of the learning levels of children—in this case from India's rural households—of those who are also out of school.

Initiatives that create comparable measures of learning across countries would be a remedy. They would seek to bring together stakeholders to agree on a set of common questions to include in learning assessments, thereby allowing results to be harmonized across tests. In the short term, the existing data platforms—national household surveys, Demographic and Health Surveys, Living Standards Measurement Study, and Service Delivery Indicators—could be used to increase the availability of data on human capital outcomes in a cost-effective way.

Similar efforts are under way in health. To improve the coordination of health data collection, the Health Data Collaborative was launched in 2015 by a group of international agencies, bilateral and multilateral donors, foundations, and governments. New technologies such as the global positioning system and mobile phones are driving down costs of data collection. The Primary Health Care Performance Initiative, launched by the Bill & Melinda Gates Foundation, World Bank Group, and World Health Organization in 2015, provides an international benchmarking of primary care quality.

A second step is to better understand the many dimensions of sociobehavioral and other skills, health, and the correlation between the two. Sociobehavioral skills are multidimensional. Initiatives such as the World Bank's Skills Towards Employability and Productivity surveys and the Organisation for Economic Co-operation and Development's Programme for the International Assessment of Adult Competencies surveys have sought to measure these skills on a large scale among working-age individuals. There has not been a similar attempt among school-age children, even though there is evidence that abilities such as grit and self-regulation matter for learning. Interventions that have reduced iron deficiency anemia have been found to improve student learning outcomes, but the correlation between health status and student test scores has not yet been quantified. The introduction of health modules in school surveys would be an important first step. Relatively low-cost assessments, such as those of student vision acuity and anthropometric status, can go a long way toward improving understanding of the relationship between learning and health.

Vietnam's experience illustrates the potential benefits of mapping pathways of change. The country's schoolchildren scored in the top quarter of the mostly middle- and high-income countries that participated in the 2012 and 2015 PISA. This performance is remarkable in view of Vietnam's level of per capita income. Understanding this success could provide important lessons for how to ensure that schooling achieves learning.

As the nature of work changes, human capital becomes more important. Yet significant gaps in human capital persist across the world. These gaps—manifested in low education and health outcomes—hurt the future productivity of workers and future competitiveness of economies. To address this issue, governments must seek remedies. However, because of the long time needed for human capital investments to yield economic returns, the political incentives for human capital investments are often missing. The Human Capital Project aims to create not just these incentives, but also the policy guidance for more and better investments in human capital.

Notes

1. Fernald and Hidrobo (2011).
2. Smith ([1776] 1937, book 2, chap.1), as reported in Goldin (2016).
3. Chetty, Friedman, and Rockoff (2014).
4. Psacharopoulos and Patrinos (2018).
5. Dillon, Friedman, and Serneels (2014).
6. Ahuja et al. (2015).
7. Belot and James (2011).
8. Sandjaja et al. (2013).
9. Dillon et al. (2017).
10. Flabbi and Gatti (2018).
11. Ahuja et al. (2015).
12. Andrabi, Das, and Khwaja (2012).
13. Hsieh and Klenow (2010).
14. Cavaillé and Marshall (2017).
15. Knack and Keefer (1997).
16. Rosas and Sabarwal (2016).
17. Blanford et al. (2012).
18. Ferré and Sharif (2014).
19. Baird, McIntosh, and Özler (2016).
20. Jensen (2010).
21. Giné, Karlan, and Zinman (2010).
22. Heckman et al. (2010).
23. Coffey, Geruso, and Spears (2018).
24. Gertler et al. (2014).
25. Kraay (2018).
26. Caselli (2005); Weil (2007).
27. Mikkelsen et al. (2015).

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TABLE 2

THE HUMAN CAPITAL INDEX, 2018

TABLE 2 The Human Capital Index (HCI), 2018

Rank	Economy	Lower bound	Value	Upper bound
157	Chad	*0.28*	**0.29**	*0.31*
156	South Sudan	*0.27*	**0.30**	*0.33*
155	Niger	*0.30*	**0.32**	*0.33*
154	Mali	*0.29*	**0.32**	*0.34*
153	Liberia	*0.31*	**0.32**	*0.33*
152	Nigeria	*0.32*	**0.34**	*0.36*
151	Sierra Leone	*0.33*	**0.35**	*0.37*
150	Mauritania	*0.32*	**0.35**	*0.38*
149	Côte d'Ivoire	*0.33*	**0.35**	*0.37*
148	Mozambique	*0.34*	**0.36**	*0.38*
147	Angola	*0.33*	**0.36**	*0.39*
146	Congo, Dem. Rep.	*0.35*	**0.37**	*0.39*
145	Yemen, Rep.	*0.35*	**0.37**	*0.38*
144	Burkina Faso	*0.35*	**0.37**	*0.38*
143	Lesotho	*0.35*	**0.37**	*0.39*
142	Rwanda	*0.36*	**0.37**	*0.39*
141	Guinea	*0.35*	**0.37**	*0.39*
140	Madagascar	*0.35*	**0.37**	*0.39*
139	Sudan	*0.37*	**0.38**	*0.39*
138	Burundi	*0.36*	**0.38**	*0.40*
137	Uganda	*0.37*	**0.38**	*0.39*
136	Papua New Guinea	*0.36*	**0.38**	*0.40*
135	Ethiopia	*0.37*	**0.38**	*0.40*
134	Pakistan	*0.37*	**0.39**	*0.40*
133	Afghanistan	*0.38*	**0.39**	*0.40*
132	Cameroon	*0.37*	**0.39**	*0.42*
131	Zambia	*0.37*	**0.40**	*0.42*
130	Gambia, The	*0.37*	**0.40**	*0.42*
129	Iraq	*0.38*	**0.40**	*0.41*
128	Tanzania	*0.39*	**0.40**	*0.41*
127	Benin	*0.38*	**0.41**	*0.43*
126	South Africa	*0.40*	**0.41**	*0.42*
125	Malawi	*0.39*	**0.41**	*0.42*
124	eSwatini	*0.38*	**0.41**	*0.43*
123	Comoros	*0.36*	**0.41**	*0.44*
122	Togo	*0.39*	**0.41**	*0.43*
121	Senegal	*0.40*	**0.42**	*0.43*
120	Congo, Rep.	*0.39*	**0.42**	*0.44*
119	Botswana	*0.40*	**0.42**	*0.44*
118	Timor-Leste	*0.41*	**0.43**	*0.45*
117	Namibia	*0.41*	**0.43**	*0.45*
116	Ghana	*0.42*	**0.44**	*0.45*
115	India	*0.43*	**0.44**	*0.45*
114	Zimbabwe	*0.42*	**0.44**	*0.46*
113	Solomon Islands	*0.43*	**0.44**	*0.45*
112	Haiti	*0.42*	**0.45**	*0.47*
111	Lao PDR	*0.43*	**0.45**	*0.47*
110	Gabon	*0.43*	**0.45**	*0.48*
109	Guatemala	*0.44*	**0.46**	*0.47*
108	Vanuatu	*0.45*	**0.47**	*0.48*
107	Myanmar	*0.46*	**0.47**	*0.49*
106	Bangladesh	*0.47*	**0.48**	*0.49*
105	Kiribati	*0.45*	**0.48**	*0.50*
104	Egypt, Arab Rep.	*0.47*	**0.49**	*0.50*

Rank	Economy	Lower bound	Value	Upper bound
103	Honduras	*0.47*	**0.49**	*0.50*
102	Nepal	*0.48*	**0.49**	*0.50*
101	Dominican Republic	*0.48*	**0.49**	*0.51*
100	Cambodia	*0.47*	**0.49**	*0.51*
99	Guyana	*0.48*	**0.49**	*0.51*
98	Morocco	*0.49*	**0.50**	*0.51*
97	El Salvador	*0.49*	**0.50**	*0.51*
96	Tunisia	*0.50*	**0.51**	*0.52*
95	Tonga	*0.50*	**0.51**	*0.53*
94	Kenya	*0.50*	**0.52**	*0.53*
93	Algeria	*0.51*	**0.52**	*0.53*
92	Nicaragua	*0.51*	**0.53**	*0.54*
91	Panama	*0.52*	**0.53**	*0.54*
90	Paraguay	*0.51*	**0.53**	*0.55*
89	Tajikistan	*0.51*	**0.53**	*0.55*
88	Macedonia, FYR	*0.53*	**0.53**	*0.54*
87	Indonesia	*0.52*	**0.53**	*0.55*
86	Lebanon	*0.52*	**0.54**	*0.55*
85	Jamaica	*0.53*	**0.54**	*0.56*
84	Philippines	*0.53*	**0.55**	*0.56*
83	Tuvalu	*0.53*	**0.55**	*0.57*
82	West Bank and Gaza	*0.54*	**0.55**	*0.56*
81	Brazil	*0.55*	**0.56**	*0.57*
80	Kosovo	*0.55*	**0.56**	*0.57*
79	Jordan	*0.54*	**0.56**	*0.58*
78	Armenia	*0.56*	**0.57**	*0.58*
77	Kuwait	*0.56*	**0.58**	*0.59*
76	Kyrgyz Republic	*0.57*	**0.58**	*0.59*
75	Moldova	*0.57*	**0.58**	*0.59*
74	Sri Lanka	*0.57*	**0.58**	*0.59*
73	Saudi Arabia	*0.57*	**0.58**	*0.60*
72	Peru	*0.57*	**0.59**	*0.60*
71	Iran, Islamic Rep.	*0.57*	**0.59**	*0.61*
70	Colombia	*0.58*	**0.59**	*0.61*
69	Azerbaijan	*0.58*	**0.60**	*0.62*
68	Uruguay	*0.59*	**0.60**	*0.61*
67	Romania	*0.59*	**0.60**	*0.62*
66	Ecuador	*0.59*	**0.60**	*0.61*
65	Thailand	*0.59*	**0.60**	*0.62*
64	Mexico	*0.60*	**0.61**	*0.61*
63	Argentina	*0.60*	**0.61**	*0.62*
62	Trinidad and Tobago	*0.59*	**0.61**	*0.63*
61	Georgia	*0.60*	**0.61**	*0.63*
60	Qatar	*0.60*	**0.61**	*0.63*
59	Montenegro	*0.61*	**0.62**	*0.62*
58	Bosnia and Herzegovina	*0.61*	**0.62**	*0.63*
57	Costa Rica	*0.61*	**0.62**	*0.63*
56	Albania	*0.61*	**0.62**	*0.63*
55	Malaysia	*0.61*	**0.62**	*0.63*
54	Oman	*0.61*	**0.62**	*0.63*
53	Turkey	*0.61*	**0.63**	*0.64*
52	Mauritius	*0.60*	**0.63**	*0.65*
51	Mongolia	*0.60*	**0.63**	*0.65*

Rank	Economy	Lower bound	Value	Upper bound
50	Ukraine	*0.61*	**0.65**	*0.68*
49	United Arab Emirates	*0.64*	**0.66**	*0.67*
48	Vietnam	*0.65*	**0.67**	*0.68*
47	Bahrain	*0.65*	**0.67**	*0.68*
46	China	*0.66*	**0.67**	*0.68*
45	Chile	*0.66*	**0.67**	*0.69*
44	Bulgaria	*0.65*	**0.68**	*0.70*
43	Seychelles	*0.65*	**0.68**	*0.71*
42	Greece	*0.67*	**0.68**	*0.69*
41	Luxembourg	*0.68*	**0.69**	*0.70*
40	Slovak Republic	*0.68*	**0.69**	*0.71*
39	Malta	*0.69*	**0.70**	*0.71*
38	Hungary	*0.69*	**0.70**	*0.72*
37	Lithuania	*0.70*	**0.71**	*0.73*
36	Croatia	*0.71*	**0.72**	*0.74*
35	Latvia	*0.71*	**0.72**	*0.74*
34	Russian Federation	*0.68*	**0.73**	*0.77*
33	Iceland	*0.73*	**0.74**	*0.75*
32	Spain	*0.74*	**0.74**	*0.75*
31	Kazakhstan	*0.72*	**0.75**	*0.77*
30	Poland	*0.73*	**0.75**	*0.76*
29	Estonia	*0.73*	**0.75**	*0.76*
28	Cyprus	*0.74*	**0.75**	*0.76*
27	Serbia	*0.74*	**0.76**	*0.77*
26	Belgium	*0.75*	**0.76**	*0.77*
25	Macao SAR, China	*0.75*	**0.76**	*0.76*
24	United States	*0.75*	**0.76**	*0.77*
23	Israel	*0.75*	**0.76**	*0.78*
22	France	*0.76*	**0.76**	*0.77*
21	New Zealand	*0.76*	**0.77**	*0.78*
20	Switzerland	*0.75*	**0.77**	*0.78*
19	Italy	*0.76*	**0.77**	*0.78*
18	Norway	*0.76*	**0.77**	*0.78*
17	Denmark	*0.76*	**0.77**	*0.79*
16	Portugal	*0.77*	**0.78**	*0.79*
15	United Kingdom	*0.77*	**0.78**	*0.79*
14	Czech Republic	*0.77*	**0.78**	*0.79*
13	Slovenia	*0.78*	**0.79**	*0.80*
12	Austria	*0.78*	**0.79**	*0.80*
11	Germany	*0.78*	**0.79**	*0.81*
10	Canada	*0.79*	**0.80**	*0.81*
9	Netherlands	*0.79*	**0.80**	*0.81*
8	Sweden	*0.79*	**0.80**	*0.81*
7	Australia	*0.79*	**0.80**	*0.81*
6	Ireland	*0.79*	**0.81**	*0.82*
5	Finland	*0.80*	**0.81**	*0.82*
4	Hong Kong SAR, China	*0.81*	**0.82**	*0.83*
3	Japan	*0.83*	**0.84**	*0.85*
2	Korea, Rep.	*0.83*	**0.84**	*0.86*
1	Singapore	*0.87*	**0.88**	*0.90*

HCI < 0.40 | 0.40 ≤ HCI < 0.50 | 0.50 ≤ HCI < 0.60 | 0.60 ≤ HCI < 0.70 | 0.70 ≤ HCI < 0.80 | 0.80 ≤ HCI

Source: World Bank staff calculations.

Note: The Human Capital Index ranges between 0 and 1. The index is measured in terms of the productivity of the next generation of workers relative to the benchmark of complete education and full health. An economy in which a child born today can expect to achieve complete education and full health will score a value of 1 on the index. Lower and upper bounds indicate the range of uncertainty around the value of the HCI for each economy.

APPENDIX

THE HUMAN CAPITAL INDEX METHODOLOGY

Components of the Human Capital Index[1]

The Human Capital Index (HCI) measures the human capital that a child born today can expect to attain by age 18, given the risks to poor health and poor education that prevail in the country where she lives. The HCI follows the trajectory from birth to adulthood of a child born today. In the poorest countries in the world, there is a significant risk that the child does not survive to her fifth birthday. Even if she does reach school age, there is a further risk that she does not start school, let alone complete the full cycle of 14 years of school from preschool to grade 12 that is the norm in rich countries. The time she does spend in school may translate unevenly into learning, depending on the quality of the teachers and schools she experiences. When she reaches age 18, she carries with her the lasting effects of poor health and nutrition in childhood that limit her physical and cognitive abilities as an adult.

The HCI quantitatively illustrates the key stages in this trajectory and their consequences for the productivity of the next generation of workers, with three components:

Component 1: Survival. This component of the index reflects the unfortunate reality that not all children born today will survive until the age when the process of human capital accumulation through formal education begins. It is measured using the under-5 mortality rate (figure A.1, panel a), with survival to age 5 as the complement of the under-5 mortality rate.

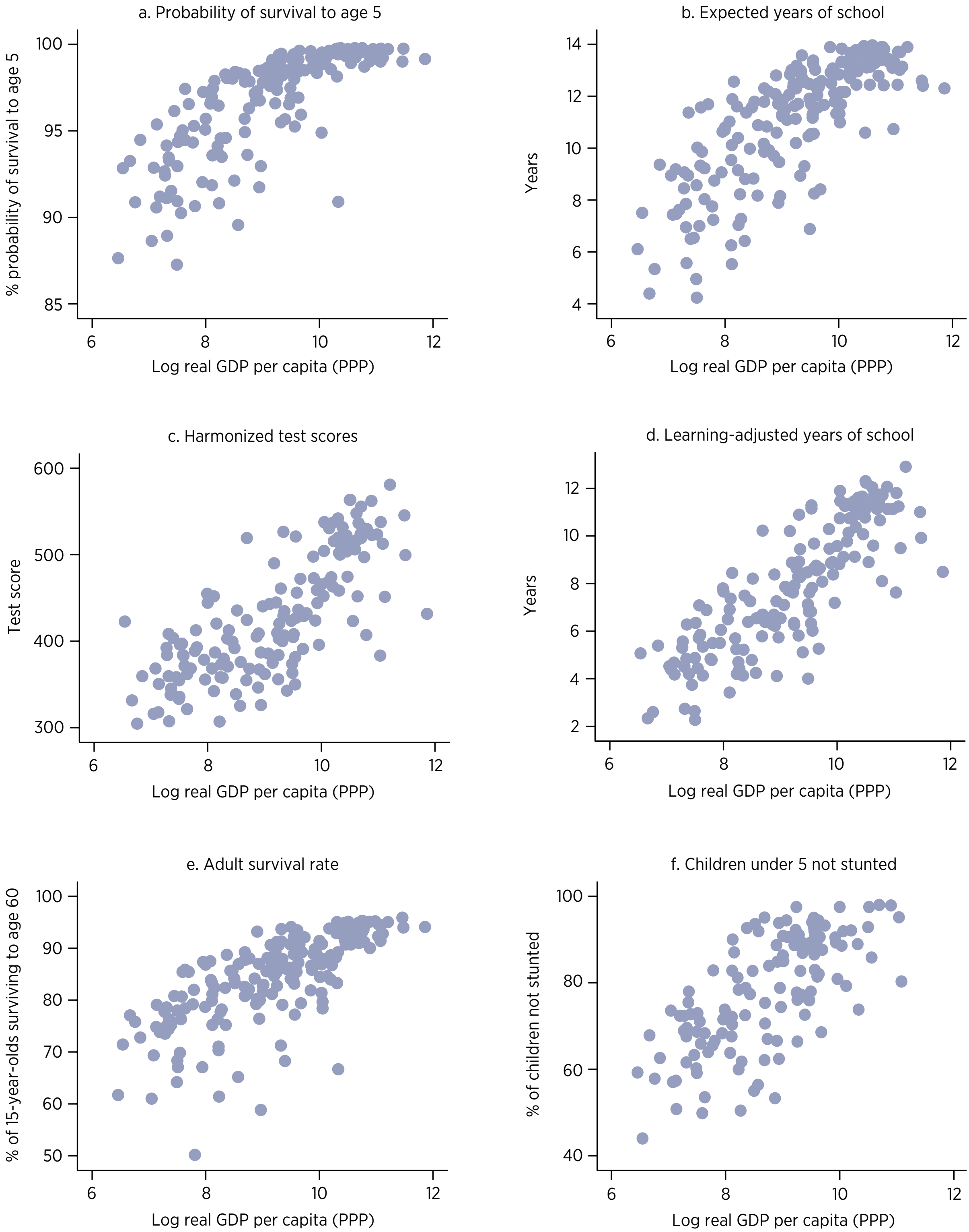
Component 2: School. This component of the index combines information on the quantity and quality of education.

- *The quantity of education* is measured as the number of years of school a child can expect to obtain by age 18 given the prevailing pattern of enrollment rates (figure A.1, panel b). The maximum possible value is 14 years, corresponding to the maximum number of years of school obtained as of her 18th birthday by a child who starts preschool at age 4. In the data, expected years of school range from around 4 to close to 14 years.
- *The quality of education* reflects new work at the World Bank to harmonize test scores from major international student achievement testing programs into a measure of harmonized learning outcomes (HLOs).[2] HLOs are measured in units of the Trends in International Mathematics and Science Study (TIMSS) testing program and range from around 300 to around 600 across countries (figure A.1, panel c).

Test scores are used to convert expected years of school into learning-adjusted years of school (figure A.1, panel d). Learning-adjusted years of school are obtained by multiplying expected years of school by the ratio of test scores to 625, corresponding to the TIMSS benchmark of advanced achievement.[3] For example, if expected years of school in a country is 10 and the average test score is 400, then the country has $10 \times (400/625) = 6.4$ learning-adjusted years of school. The distance between 10 and 6.4 represents a learning gap equivalent to 3.6 years of school.

Component 3: Health. There is no single broadly accepted, directly measured, and widely available summary measure of health that can be used in

FIGURE A.1 Components of the Human Capital Index



Source: See "HCI data notes" section at the end of this appendix.

Note: GDP = gross domestic product; PPP = purchasing power parity.

the same way as years of school as a standard measure of educational attainment. Instead, two proxies for the overall health environment are used:

- *Adult survival rates*. This is measured as the share of 15-year-olds who survive until age 60. This measure of mortality serves as a proxy for the range of nonfatal health outcomes that a child born today would experience as an adult if current conditions prevail into the future.
- *Healthy growth among children under age 5*. This is measured using stunting rates, that is, as 1 minus the share of children under 5 who are below normal height for age. Stunting serves as an indicator for the prenatal, infant, and early childhood health environments, summarizing the risks to good health that children born today are likely to experience in their early years, with important consequences for health and well-being in adulthood.

Data on these two health indicators are shown in figure A.1, panels e and f, respectively.

Aggregation methodology

The components of the HCI are combined into a single index by first converting them into contributions to productivity.[4] Multiplying these contributions to productivity gives the overall HCI. The HCI summarizes how productive children born today will be as members of the future workforce, given the risks to education and health summarized in the components. The HCI is measured in units of productivity relative to a benchmark corresponding to complete education and full health.

In the case of survival, the relative productivity interpretation is stark: children who do not survive childhood never become productive adults. As a result, expected productivity as a future worker of a child born today is reduced by a factor equal to the survival rate, relative to the benchmark where all children survive.

In the case of education, the relative productivity interpretation is anchored in the large empirical literature measuring the returns to education at the individual level. A rough consensus from this literature is that an additional year of school raises earnings by about 8 percent.[5] This evidence can be used to convert differences in learning-adjusted years of school across countries into differences in worker productivity. For example, compared with a benchmark where all children obtain a full 14 years of school by age 18, a child who obtains only 9 years of education can expect to be 40 percent less productive as an adult (a gap of 5 years of education, multiplied by 8 percent per year).

In the case of health, the relative productivity interpretation is based on the empirical literature measuring the economic returns to better health at the individual level. The key challenge in this literature is that there is no unique directly measured summary indicator of the various aspects of health that matter for productivity. This microeconometric literature often uses proxy indicators for health, such as adult height.[6] This is because adult height can be measured directly and reflects the accumulation of shocks to health through childhood and adolescence. A rough consensus drawn from this literature is that an improvement in health associated with a 1-centimeter increase in adult height raises productivity by 3.4 percent.

Converting this evidence on the returns to one proxy for health (adult height) into the other proxies for health used in the HCI (stunting and adult survival) requires information on the relationships between these different proxies:[7]

- For stunting, there is a direct relationship between stunting in childhood and future adult height because growth deficits in childhood persist to a large extent into adulthood, together with the associated health and cognitive deficits. Available evidence suggests that an improvement in health that reduces stunting by 10.2 percentage points will lead to an improvement in worker productivity of 3.5 percent.
- For adult survival, the empirical evidence suggests that, if overall health improves, both adult height and adult survival rates increase in such a way that adult height rises by 1.9 centimeters for every 10 percentage point improvement in adult survival. This implies that an improvement in health that leads to an increase in adult survival rates of 10 percentage points is associated with an improvement in worker productivity of 1.9 × 3.4 percent, or 6.5 percent.

In the HCI, the estimated contributions of health to worker productivity based on these two alternative proxies are averaged together (if both are available) and are used individually (if only one of the two is available). The contribution of health to productivity is expressed relative to the benchmark of full health, defined as the absence of stunting, and a 100 percent adult survival rate. For example, compared with a benchmark of no stunting, in a country where the stunting rate is 30 percent, poor health reduces worker productivity by (30 × 0.35) percent, or 10 percent. Similarly, compared with the benchmark of 100 percent adult survival, poor health reduces worker productivity by (30 × 0.65) percent, or 19.5 percent, in a country where the adult survival rate is 70 percent. The average of these two estimates of the effect of health on productivity is used in the HCI.

The overall HCI is constructed by multiplying the contributions of survival, school, and health to relative productivity, as follows:

$$HCI = Survival \times School \times Health, \tag{1}$$

with the three components defined as:

$$Survival = \frac{1 - Under\text{-}5\ Mortality\ Rate}{1}, \tag{2}$$

$$School = e^{\phi\left(Expected\ Years\ of\ School \times \frac{Harmonized\ Test\ Score}{625} - 14\right)}, \tag{3}$$

$$Health = e^{\left(\gamma_{ASR} \times (Adult\ Survival\ Rate - 1) + \gamma_{Stunting} \times (Not\ Stunted\ Rate - 1)\right)/2}. \tag{4}$$

The components of the index are expressed here as contributions to productivity relative to the benchmark of complete high-quality education and full health. The parameter $\phi = 0.08$ measures the returns to an additional year of school. The parameters $\gamma_{ASR} = 0.65$ and $\gamma_{Stunting} = 0.35$ measure the improvements in productivity associated with an improvement in health, using adult survival and stunting as proxies for health. The benchmark of complete high-quality education corresponds to 14 years of school and a harmonized test score of 625. The benchmark of full health corresponds to 100 percent child and adult survival and a stunting rate of 0 percent.

These parameters serve as weights in the construction of the HCI. The weights are chosen to be the same across countries, so that cross-country differences in the HCI reflect only cross-country differences in the component variables. This facilitates the interpretation of the index. This is also a pragmatic choice because estimating country-specific returns to education and health for all countries included in the HCI is not feasible.

As shown in figure A.1, child survival rates range from around 90 percent in the highest-mortality countries to near 100 percent in the lowest-mortality countries. This implies a loss of productivity of 10 percent relative to the benchmark of no mortality. Learning-adjusted years of school range from around 3 years to close to 14 years. This gap in learning-adjusted years of school implies a gap in productivity relative to the benchmark of complete education of $e^{\phi(3-14)} = e^{0.08(-11)} = 0.4$, that is, the productivity of a future worker in countries with the lowest years of learning-adjusted school is only 40 percent of what it would be under the benchmark of complete education. For health, adult survival rates range from 60 to 95 percent, while the share of children not stunted ranges from around 60 percent to over 95 percent. Using adult survival rates indicates a gap in productivity of $e^{\gamma_{ASR}(0.6-1)} = e^{0.65(-0.4)} = 0.77$. Thus, based on adult survival rates as a proxy for health, the productivity of a future worker is only 77 percent of what it would be under the benchmark of full health. Using the share of children not stunted leads to a gap in productivity of $e^{\gamma_{Stunting}(0.6-1)} = e^{0.35(-0.4)} = 0.87$. The productivity of a future worker using the stunting-based proxy for health is therefore only 87 percent of what it would be under the benchmark of full health.

The Human Capital Index

The overall HCI is displayed in figure 3 in the main text and separately in table 2. Table A.1, which appears in a later section of this appendix, reports the overall HCI and the components for all 157 economies included in the index. The HCI data are also available at www.worldbank.org/humancapital. The HCI is higher on average in rich countries than in poor countries and ranges from around 0.3 to around 0.9. The units of the HCI have the same interpretation as the components measured in terms of relative productivity. Consider a country such as Morocco, which has an HCI of around 0.5. If current education and health conditions in Morocco persist, a child born today will be only half as productive as she could have been if she enjoyed complete education and full health.

All of the components of the HCI are measured with some error, and this uncertainty naturally has implications for the precision of the overall HCI. To capture this imprecision, the HCI estimates for each country are accompanied by upper and lower bounds that reflect the uncertainty in the measurement of the components of the HCI. These bounds are constructed by recalculating the HCI using lower- and upper-bound estimates of the components of the HCI. The upper and lower bounds are a tool to highlight to users that the estimated HCI values for all countries are subject to uncertainty, reflecting the corresponding uncertainty in the components. In cases where these intervals overlap for two countries, this indicates that the differences in the HCI estimates for these two countries should not be overinterpreted because they are small relative to the uncertainty around the value of the index itself. This is intended to help to move the discussion away from small differences in country ranks on the HCI and toward more useful discussions around the level of the HCI and what this implies for the productivity of future workers.

Another feature of the HCI is that it can be disaggregated by gender in those countries where gender-disaggregated data on all of the components of the index are available. Gender gaps are most pronounced in survival to age 5, adult survival, and stunting, where girls, on average, do better than boys in nearly all countries. The number of expected years of school is higher among girls than boys in about two-thirds of the countries, as are test scores. Overall, HCI scores are higher among girls than boys in the majority of countries.

The HCI uses the returns to education and health to convert the education and health indicators into differences in worker productivity across countries. The higher the returns, the larger the resulting worker productivity differences. The size of the returns also influences the relative contributions of education and health to the overall index. For example, if the returns to education are high, while the returns to health are low, then cross-country differences in education will account for a larger portion of cross-country differences in the index. Although varying the assumptions about the returns to education and health will affect the relative positions of countries on the index, in practice these changes are small because the health and education indicators are strongly correlated across countries.[8]

Connecting the Human Capital Index to future growth and income

The HCI can be connected to future aggregate income levels and growth following the logic of the development accounting literature. This literature typically adopts a simple Cobb-Douglas form for the aggregate production function, as follows:

$$y = Ak_p^{\alpha} k_h^{1-\alpha}, \quad (5)$$

where y is gross domestic product (GDP) per worker; k_p and k_h are the stocks of physical and human capital per worker; A is total factor productivity;

and α is the output elasticity of physical capital. To analyze how changes in human capital may affect income in the long run, rewrite the production function as follows:

$$y = \left(\frac{k_p}{y}\right)^{\frac{\alpha}{1-\alpha}} A^{\frac{1}{1-\alpha}} k_h \quad . \tag{6}$$

In this formulation, GDP per worker is proportional to the human capital stock per worker, holding constant the level of total factor productivity and the ratio of physical capital to output, $\frac{k_p}{y}$. This formulation can be used to answer the question, "By how much does an increase in human capital raise output per worker in the long run after taking into account the increase in physical capital that is likely to be induced by the increase in human capital?" Equation (6) shows the answer: output per worker increases equiproportionately to human capital per worker, that is, a doubling of human capital per worker will lead to a doubling of output per worker in the long run.

Linking this framework to the HCI requires a few additional steps. First, assume that the stock of human capital per worker that enters the production function, k_h, is equal to the human capital of the average worker. Second, the human capital of the next generation, as measured in the HCI, and the human capital stock that enters the production function need to be linked. This can be done by considering different scenarios. Imagine first a status quo scenario in which the expected years of learning-adjusted school and health as measured in the HCI today persist into the future. Over time, new entrants to the workforce with status quo health and education will replace current members of the workforce until eventually the entire workforce of the future has the expected years of learning-adjusted school and health captured in the current HCI. Let $k_{h,NG} = e^{\phi S_{NG} + \gamma z_{NG}}$ denote the future human capital stock in this baseline scenario, where S_{NG} represents the number of learning-adjusted years of school of the next generation of workers, and γz_{NG} is shorthand notation for the contribution of the two health indicators to productivity in the HCI in equation (4). Contrast this with a scenario in which the entire future workforce benefits from complete education and enjoys full health, resulting in a higher human capital stock, $k_h^* = e^{\phi s^* + \gamma z^*}$, here s^* represents the benchmark of 14 years of high-quality school, and z^* represents the benchmark of full health.

Assuming that total factor productivity and the physical capital-to-output ratio are the same in the two scenarios, the eventual steady-state GDP per worker in the two scenarios is as follows:

$$\frac{y}{y^*} = \frac{k_{h,NG}}{k_h^*} = e^{\phi\left(s_{NG} - s^*\right) + \gamma\left(z_{NG} - z^*\right)} \quad . \tag{7}$$

This expression is the same as the HCI in equations (1) through (4) except for the term corresponding to survival to age 5 (because children who do not survive do not become part of the future workforce). This creates a close link between the HCI and potential future growth. Setting aside the contribution of the survival probability to the HCI, equation (7) shows that a country with an HCI equal to x could achieve GDP per worker that would be $1/x$ times higher in the future if citizens enjoy complete education and full health (corresponding to $x = 1$). For example, a country such as Morocco with an HCI value of around 0.5 could, in the long run, have future GDP per worker in this scenario of complete education and full health that is $\frac{1}{0.5} = 2$ times higher than GDP per worker in the status quo scenario. What this means in terms of average annual growth rates depends on how long the long run is. For example, under the assumption that it takes 50 years for these scenarios to materialize, then a doubling of future per capita income relative to the status quo corresponds to roughly 1.4 percentage points of additional growth per year.

The calibrated relationship between the HCI and future income described here is simple because it focuses only on steady-state comparisons. In related work, Collin and Weil (2018) elaborate on this by developing a calibrated growth model that traces out the dynamics of adjustment to the steady state. They use this model to trace out trajectories for per capita GDP and for poverty measures for individual countries and global aggregates under alternative assumptions for the future path of human capital. They also calculate the equivalent increase in investment rates in physical capital that would be required to deliver the same rises in output associated with improvements in human capital.

Limitations

Like all cross-country benchmarking exercises, the HCI has limitations. Components of the HCI (see table A.1) such as stunting and test scores are measured only infrequently in some countries and not at all in others. Data on test scores come from different international testing programs that need to be converted into common units, and the age of test-takers and the subjects covered vary across testing programs. Moreover, test scores may not accurately reflect the quality of the whole education system in a country, to the extent that test-takers are not representative of the population of all students. Reliable measures of the quality of tertiary education do not yet exist, despite the importance of higher education for human capital in a rapidly changing world. The data on enrollment rates needed to estimate expected years of school often have many gaps and are reported with significant lags. Sociobehavioral skills are not explicitly captured. Child and adult survival rates are imprecisely estimated in countries where vital registries are incomplete or nonexistent.

One objective of the HCI is to call attention to these data shortcomings and to galvanize action to remedy them. Improving data will take time. In the interim and in recognition of these limitations, the HCI should be interpreted with caution. The HCI provides rough estimates of how

TABLE A.1 The Human Capital Index and components, 2018

Economy	Probability of survival to age 5	Expected years of school	Harmonized learning outcome (HLO)	Learning-adjusted years of school	Adult survival rate	Fraction of children under 5 not stunted	Human Capital Index		
							Lower bound	Value	Upper bound
Afghanistan	0.93	8.6	355	4.9	0.78	0.59	0.38	0.39	0.40
Albania	0.99	13.0	429	8.9	0.94	0.77	0.61	0.62	0.63
Algeria	0.98	11.4	374	6.8	0.91	0.88	0.51	0.52	0.53
Angola	0.92	7.9	326	4.1	0.76	0.62	0.33	0.36	0.39
Argentina	0.99	13.1	424	8.9	0.89	—	0.60	0.61	0.62
Armenia	0.99	11.1	443	7.9	0.88	0.91	0.56	0.57	0.58
Australia	1.00	13.8	524	11.6	0.95	0.98	0.79	0.80	0.81
Austria	1.00	13.9	525	11.7	0.94	—	0.78	0.79	0.80
Azerbaijan	0.98	11.6	472	8.7	0.87	0.82	0.58	0.60	0.62
Bahrain	0.99	13.3	452	9.6	0.93	—	0.65	0.67	0.68
Bangladesh	0.97	11.0	368	6.5	0.87	0.64	0.47	0.48	0.49
Belgium	1.00	13.4	519	11.1	0.93	—	0.75	0.76	0.77
Benin	0.90	9.3	384	5.7	0.76	0.66	0.38	0.41	0.43
Bosnia and Herzegovina	0.99	11.7	461	8.6	0.91	0.91	0.61	0.62	0.63
Botswana	0.96	8.4	391	5.3	0.79	0.69	0.40	0.42	0.44
Brazil	0.99	11.7	408	7.6	0.86	0.94	0.55	0.56	0.57
Bulgaria	0.99	12.9	498	10.3	0.87	—	0.65	0.68	0.70
Burkina Faso	0.92	6.5	404	4.2	0.75	0.73	0.35	0.37	0.38
Burundi	0.94	7.5	423	5.1	0.71	0.44	0.36	0.38	0.40
Cambodia	0.97	9.5	452	6.9	0.83	0.68	0.47	0.49	0.51
Cameroon	0.92	9.1	379	5.5	0.67	0.68	0.37	0.39	0.42
Canada	0.99	13.7	537	11.7	0.94	—	0.79	0.80	0.81
Chad	0.88	5.0	333	2.6	0.64	0.60	0.28	0.29	0.31
Chile	0.99	12.8	466	9.6	0.91	0.98	0.66	0.67	0.69
China	0.99	13.2	456	9.7	0.92	0.92	0.66	0.67	0.68
Colombia	0.99	12.5	424	8.5	0.86	0.89	0.58	0.59	0.61
Comoros	0.93	8.4	392	5.3	0.78	0.69	0.36	0.41	0.44
Congo, Dem. Rep.	0.91	9.2	318	4.7	0.75	0.57	0.35	0.37	0.39
Congo, Rep.	0.95	8.8	371	5.2	0.75	0.79	0.39	0.42	0.44
Costa Rica	0.99	12.5	430	8.6	0.92	0.94	0.61	0.62	0.63
Côte d'Ivoire	0.91	7.0	373	4.2	0.61	0.78	0.33	0.35	0.37
Croatia	1.00	13.3	505	10.7	0.91	—	0.71	0.72	0.74
Cyprus	1.00	13.5	502	10.9	0.95	—	0.74	0.75	0.76
Czech Republic	1.00	13.9	522	11.6	0.92	—	0.77	0.78	0.79
Denmark	1.00	13.4	531	11.4	0.93	—	0.76	0.77	0.79
Dominican Republic	0.97	11.3	350	6.3	0.84	0.93	0.48	0.49	0.51
Ecuador	0.99	13.2	420	8.9	0.88	0.76	0.59	0.60	0.61
Egypt, Arab Rep.	0.98	11.1	356	6.3	0.85	0.78	0.47	0.49	0.50
El Salvador	0.99	11.3	362	6.5	0.83	0.86	0.49	0.50	0.51
Estonia	1.00	13.1	542	11.4	0.88	—	0.73	0.75	0.76
eSwatini	0.95	8.2	440	5.7	0.59	0.74	0.38	0.41	0.43
Ethiopia	0.94	7.8	359	4.5	0.79	0.62	0.37	0.38	0.40
Finland	1.00	13.7	548	12.0	0.93	—	0.80	0.81	0.82
France	1.00	14.0	506	11.3	0.93	—	0.76	0.76	0.77
Gabon	0.95	8.3	456	6.0	0.77	0.83	0.43	0.45	0.48
Gambia, The	0.94	9.0	338	4.8	0.74	0.75	0.37	0.40	0.42
Georgia	0.99	12.5	445	8.9	0.85	0.89	0.60	0.61	0.63
Germany	1.00	13.9	528	11.7	0.93	—	0.78	0.79	0.81
Ghana	0.95	11.6	307	5.7	0.76	0.81	0.42	0.44	0.45
Greece	0.99	12.9	474	9.8	0.94	—	0.67	0.68	0.69
Guatemala	0.97	9.7	405	6.3	0.84	0.53	0.44	0.46	0.47
Guinea	0.91	7.0	408	4.5	0.75	0.68	0.35	0.37	0.39

(continued)

TABLE A.1 The Human Capital Index and components, 2018 *(continued)*

Economy	Probability of survival to age 5	Expected years of school	Harmonized learning outcome (HLO)	Learning-adjusted years of school	Adult survival rate	Fraction of children under 5 not stunted	Human Capital Index		
							Lower bound	Value	Upper bound
Guyana	0.97	12.1	346	6.7	0.79	0.89	0.48	0.49	0.51
Haiti	0.93	11.4	345	6.3	0.76	0.78	0.42	0.45	0.47
Honduras	0.98	10.0	400	6.4	0.86	0.77	0.47	0.49	0.50
Hong Kong SAR, China	0.99	13.4	562	12.1	0.95	—	0.81	0.82	0.83
Hungary	1.00	13.0	516	10.7	0.87	—	0.69	0.70	0.72
Iceland	1.00	13.4	497	10.7	0.95	—	0.73	0.74	0.75
India	0.96	10.2	355	5.8	0.83	0.62	0.43	0.44	0.45
Indonesia	0.97	12.3	403	7.9	0.83	0.66	0.52	0.53	0.55
Iran, Islamic Rep.	0.99	11.7	432	8.1	0.92	0.93	0.57	0.59	0.61
Iraq	0.97	6.9	363	4.0	0.84	0.78	0.38	0.40	0.41
Ireland	1.00	13.7	538	11.8	0.95	—	0.79	0.81	0.82
Israel	1.00	13.8	503	11.1	0.95	—	0.75	0.76	0.78
Italy	1.00	13.6	514	11.2	0.95	—	0.76	0.77	0.78
Jamaica	0.98	11.7	387	7.2	0.87	0.94	0.53	0.54	0.56
Japan	1.00	13.6	563	12.3	0.94	0.93	0.83	0.84	0.85
Jordan	0.98	11.6	409	7.6	0.89	0.92	0.54	0.56	0.58
Kazakhstan	0.99	13.3	537	11.5	0.80	0.92	0.72	0.75	0.77
Kenya	0.95	10.7	455	7.8	0.79	0.74	0.50	0.52	0.53
Kiribati	0.95	11.6	383	7.1	0.81	—	0.45	0.48	0.50
Korea, Rep.	1.00	13.6	563	12.2	0.94	0.98	0.83	0.84	0.86
Kosovo	0.99	12.8	375	7.7	0.91	—	0.55	0.56	0.57
Kuwait	0.99	12.4	383	7.6	0.92	0.95	0.56	0.58	0.59
Kyrgyz Republic	0.98	12.6	420	8.4	0.82	0.87	0.57	0.58	0.59
Lao PDR	0.94	10.8	368	6.4	0.81	0.67	0.43	0.45	0.47
Latvia	1.00	13.3	530	11.3	0.85	—	0.71	0.72	0.74
Lebanon	0.99	10.5	405	6.8	0.94	—	0.52	0.54	0.55
Lesotho	0.91	8.7	393	5.5	0.50	0.67	0.35	0.37	0.39
Liberia	0.93	4.4	332	2.3	0.77	0.68	0.31	0.32	0.33
Lithuania	1.00	13.6	514	11.2	0.83	—	0.70	0.71	0.73
Luxembourg	1.00	12.4	500	9.9	0.94	—	0.68	0.69	0.70
Macao SAR, China	0.99	12.6	545	11.0	0.96	—	0.75	0.76	0.76
Macedonia, FYR	0.99	11.2	382	6.8	0.91	0.95	0.53	0.53	0.54
Madagascar	0.96	7.5	351	4.2	0.79	0.51	0.35	0.37	0.39
Malawi	0.94	9.4	359	5.4	0.73	0.63	0.39	0.41	0.42
Malaysia	0.99	12.2	468	9.1	0.88	0.79	0.61	0.62	0.63
Mali	0.89	5.6	307	2.7	0.74	0.70	0.29	0.32	0.34
Malta	0.99	13.3	474	10.1	0.95	—	0.69	0.70	0.71
Mauritania	0.92	6.3	342	3.4	0.80	0.72	0.32	0.35	0.38
Mauritius	0.99	12.5	473	9.5	0.86	—	0.60	0.63	0.65
Mexico	0.99	12.6	430	8.6	0.89	0.88	0.60	0.61	0.61
Moldova	0.98	11.8	436	8.2	0.83	0.94	0.57	0.58	0.59
Mongolia	0.98	13.6	435	9.4	0.79	0.89	0.60	0.63	0.65
Montenegro	1.00	12.4	433	8.6	0.91	0.91	0.61	0.62	0.62
Morocco	0.98	10.6	367	6.2	0.93	0.85	0.49	0.50	0.51
Mozambique	0.93	7.4	368	4.4	0.69	0.57	0.34	0.36	0.38
Myanmar	0.95	9.9	425	6.7	0.81	0.71	0.46	0.47	0.49
Namibia	0.96	8.9	407	5.8	0.71	0.77	0.41	0.43	0.45
Nepal	0.97	11.7	369	6.9	0.85	0.64	0.48	0.49	0.50
Netherlands	1.00	13.8	530	11.7	0.94	—	0.79	0.80	0.81
New Zealand	0.99	13.6	517	11.3	0.94	—	0.76	0.77	0.78
Nicaragua	0.98	11.6	392	7.3	0.86	0.83	0.51	0.53	0.54
Niger	0.92	5.3	305	2.6	0.76	0.58	0.30	0.32	0.33

(continued)

TABLE A.1 The Human Capital Index and components, 2018 *(continued)*

Economy	Probability of survival to age 5	Expected years of school	Harmonized learning outcome (HLO)	Learning-adjusted years of school	Adult survival rate	Fraction of children under 5 not stunted	Human Capital Index		
							Lower bound	Value	Upper bound
Nigeria	0.90	8.2	325	4.3	0.65	0.56	0.32	0.34	0.36
Norway	1.00	13.7	512	11.2	0.94	—	0.76	0.77	0.78
Oman	0.99	13.1	424	8.9	0.91	0.86	0.61	0.62	0.63
Pakistan	0.93	8.8	339	4.8	0.84	0.55	0.37	0.39	0.40
Panama	0.98	11.3	396	7.2	0.89	0.81	0.52	0.53	0.54
Papua New Guinea	0.95	8.2	358	4.7	0.78	0.50	0.36	0.38	0.40
Paraguay	0.98	11.5	386	7.1	0.86	0.94	0.51	0.53	0.55
Peru	0.99	12.7	407	8.3	0.88	0.87	0.57	0.59	0.60
Philippines	0.97	12.8	409	8.4	0.80	0.67	0.53	0.55	0.56
Poland	1.00	13.2	537	11.3	0.89	—	0.73	0.75	0.76
Portugal	1.00	13.8	520	11.5	0.93	—	0.77	0.78	0.79
Qatar	0.99	12.3	432	8.5	0.94	—	0.60	0.61	0.63
Romania	0.99	12.2	452	8.8	0.87	—	0.59	0.60	0.62
Russian Federation	0.99	13.8	538	11.9	0.78	—	0.68	0.73	0.77
Rwanda	0.96	6.6	358	3.8	0.81	0.63	0.36	0.37	0.39
Saudi Arabia	0.99	12.4	407	8.1	0.91	—	0.57	0.58	0.60
Senegal	0.95	7.2	412	4.8	0.82	0.83	0.40	0.42	0.43
Serbia	0.99	13.4	521	11.1	0.89	0.94	0.74	0.76	0.77
Seychelles	0.99	13.7	463	10.1	0.84	0.92	0.65	0.68	0.71
Sierra Leone	0.89	9.0	316	4.5	0.61	0.74	0.33	0.35	0.37
Singapore	1.00	13.9	581	12.9	0.95	—	0.87	0.88	0.90
Slovak Republic	0.99	13.0	500	10.4	0.89	—	0.68	0.69	0.71
Slovenia	1.00	13.6	532	11.6	0.93	—	0.78	0.79	0.80
Solomon Islands	0.98	9.2	362	5.3	0.86	0.68	0.43	0.44	0.45
South Africa	0.96	9.3	343	5.1	0.68	0.73	0.40	0.41	0.42
South Sudan	0.90	4.2	336	2.3	0.68	0.69	0.27	0.30	0.33
Spain	1.00	13.1	514	10.8	0.94	—	0.74	0.74	0.75
Sri Lanka	0.99	13.0	400	8.3	0.87	0.83	0.57	0.58	0.59
Sudan	0.94	7.3	380	4.4	0.78	0.62	0.37	0.38	0.39
Sweden	1.00	13.9	525	11.7	0.95	—	0.79	0.80	0.81
Switzerland	1.00	13.3	524	11.1	0.95	—	0.75	0.77	0.78
Tajikistan	0.97	10.8	444	7.7	0.87	0.73	0.51	0.53	0.55
Tanzania	0.95	7.8	388	4.8	0.79	0.66	0.39	0.40	0.41
Thailand	0.99	12.4	436	8.6	0.85	0.89	0.59	0.60	0.62
Timor-Leste	0.95	9.9	371	5.9	0.85	0.50	0.41	0.43	0.45
Togo	0.93	9.1	384	5.6	0.74	0.72	0.39	0.41	0.43
Tonga	0.98	10.9	376	6.5	0.87	0.92	0.50	0.51	0.53
Trinidad and Tobago	0.97	12.5	458	9.1	0.83	0.89	0.59	0.61	0.63
Tunisia	0.99	10.2	384	6.3	0.91	0.90	0.50	0.51	0.52
Turkey	0.99	12.1	459	8.9	0.90	0.90	0.61	0.63	0.64
Tuvalu	0.98	11.9	387	7.4	—	0.90	0.53	0.55	0.57
Uganda	0.95	7.0	397	4.4	0.70	0.71	0.37	0.38	0.39
Ukraine	0.99	13.0	490	10.2	0.81	—	0.61	0.65	0.68
United Arab Emirates	0.99	13.1	451	9.5	0.93	—	0.64	0.66	0.67
United Kingdom	1.00	13.9	517	11.5	0.94	—	0.77	0.78	0.79
United States	0.99	13.3	523	11.1	0.90	0.98	0.75	0.76	0.77
Uruguay	0.99	11.8	444	8.4	0.90	0.89	0.59	0.60	0.61
Vanuatu	0.97	10.6	356	6.1	0.87	0.72	0.45	0.47	0.48
Vietnam	0.98	12.3	519	10.2	0.88	0.75	0.65	0.67	0.68
West Bank and Gaza	0.98	11.4	412	7.5	0.89	0.93	0.54	0.55	0.56
Yemen, Rep.	0.94	8.0	321	4.1	0.78	0.54	0.35	0.37	0.38
Zambia	0.94	9.2	358	5.2	0.71	0.60	0.37	0.40	0.42
Zimbabwe	0.95	10.0	396	6.3	0.67	0.73	0.42	0.44	0.46

Source: See "HCI data notes" section at the end of this appendix.

Note: The Human Capital Index (HCI) ranges between 0 and 1. The index is measured in terms of the productivity of the next generation of workers relative to the benchmark of complete education and full health. An economy in which a child born today can expect to achieve complete education and full health will score a value of 1 on the index. Lower and upper bounds indicate the range of uncertainty around the value of the HCI for each economy.
— = not available.

current education and health will shape the productivity of future workers, but it is not a finely graduated measurement that can distinguish small differences between countries. Naturally, because the HCI captures outcomes, it is not a checklist of policy actions, and the proper type and scale of interventions to build human capital will be different in different countries. Although the HCI combines education and health into a single measure, it is too blunt a tool to inform the cost-effectiveness of policy interventions in these areas, which should instead be assessed based on careful cost-benefit analysis and impact assessments of specific programs. Because the HCI uses common estimates of the economic returns to health and education for all countries, it does not capture cross-country differences in how well countries are able to deploy productively the human capital they have. Finally, the HCI is not a measure of welfare, nor is it a summary of the intrinsic values of health and education; rather, it is simply a measure of the contribution of current health and education outcomes to the productivity of future workers.

HCI data notes

Under-5 mortality

Under-5 mortality rates are calculated by the United Nations Inter-agency Group for Child Mortality Estimation (IGME) based on mortality as recorded in household surveys and vital registries. The data are reported annually and cover 198 countries. Data from the September 2018 update of the IGME estimates are available at the Child Mortality Estimates website, http://www.childmortality.org/. The data are supplemented by data from the Global Burden of Disease (GBD) project for a few countries and territories not included in the IGME estimates.[9] The IGME estimates are disaggregated by gender and include uncertainty intervals corresponding to 95 percent certainty.

Expected years of school

The HCI includes the number of years of school a child can expect to complete by her 18th birthday, assuming she starts preschool at age 4. Expected years of school is defined as the sum of enrollment rates, by age, from ages 4 to 17 and ranges from a minimum of zero to a maximum of 14. Because age-specific enrollment rates are not systematically available for a broad cross-section of countries, more readily available data on enrollment rates by level of school are used to approximate enrollment rates in different age brackets. Specifically, preprimary enrollment rates approximate the age-specific enrollment rates among 4- and 5-year-olds; the primary rate approximates the rates among 6- to 11-year-olds; the lower-secondary rate approximates the rates among 12- to 14-year-olds; and the upper-secondary rate approximates the rates among 15- to 17-year-olds. Naturally, cross-country definitions in school starting ages and the duration of the various levels of school imply that these will only be approximations to the number of years of school a child can expect to complete by age 18.

The conceptually appropriate enrollment rate for this calculation is the repetition-adjusted total net enrollment rate. The primary source for enrollment and repetition rates is the United Nations Educational, Scientific, and Cultural Organization's Institute for Statistics (UIS), supplemented and revised using data provided by World Bank country teams that participated in an extensive data review process. In cases where the resulting data on total net enrollment rates are incomplete, adjusted net enrollment rates, net enrollment rates, or gross enrollment rates are used instead in that order of priority. The same enrollment rate is used for a given level of education over time.

The measure of expected years of school calculated here is conceptually similar to measures of "school life expectancy" calculated by the UIS. However, they differ because the UIS measure (a) is calculated using gross enrollment rates that often exceed 100 percent, sometimes by a substantial margin; (b) includes cross-country differences in the statutory duration of different levels of school; and (c) uses the UIS enrollment and repetition data as reported.[10]

Because expected years of school is constructed based primarily on administrative data on enrollment rates, uncertainty intervals are not available for this component of the HCI. Naturally, this does not imply that there is no measurement error here. An important agenda concerns the frequent and substantial discrepancies between household survey–based measures of school enrollment and administrative records. However, any uncertainty in the measurement of expected years of school is not reflected in the uncertainty intervals for the overall HCI.

There are 192 countries and territories with at least one data point on the expected years of school in the past 10 years, and the most recent observation within this period is used in the HCI.

Harmonized learning outcomes

The school quality adjustment is based on a new large-scale effort to harmonize international student achievement tests from several multicountry testing programs. A detailed description of the test score harmonization exercise is provided in Patrinos and Angrist (2018). This paper updates and expands the dataset described in Altinok, Angrist, and Patrinos (2018) that harmonized scores from three major international testing programs—the TIMSS, the Progress in International Reading Literacy Study (PIRLS), and the Programme for International Student Assessment (PISA)—as well as three major regional testing programs, the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), the Program for the Analysis of Education Systems (PASEC), and the Latin American Laboratory for Assessment of the Quality of Education (LLECE). Patrinos and Angrist (2018) have subsequently updated this dataset with more recent rounds of PIRLS, PASEC, and SACMEQ, and have also substantially expanded the cross-national coverage of the database by including Early Grade Reading Assessments (EGRAs) coordinated by the U.S. Agency for International Development. The expanded dataset covers over 160 countries. In most cases, the tests are designed to be nationally representative. There are, however, some notable cases in which they are not. For example, PISA scores for China in 2009 and 2012 are based only on reported data for Shanghai and, in 2015, for Beijing, Guangdong, Jiangsu, and Shanghai.[11] The HCI uses an extrapolated estimate of nationally representative test scores for China described in Patrinos and Angrist (2018). In a number of countries, EGRAs are not nationally representative and are identified as EGRANR in the data documentation.

Test scores are converted into TIMSS units, corresponding roughly to a mean of 500 and a standard deviation across students of 100 points. The harmonization method is based on the ratio of average country scores in each program to the corresponding country scores in the numeraire testing program for the set of countries participating in both the numeraire and the other testing program. For example, consider the set of countries that participate in both the PISA and the TIMSS assessments. The ratio of average PISA scores to average TIMSS scores for this set of countries provides a conversion factor for PISA into TIMSS scores that can then be used to convert the PISA scores of all countries into TIMSS scores. The set of common countries is referred to as doubloon countries; the resulting conversion factor as the doubloon index; and the test scores in common units as harmonized learning outcomes. In the version of the data used here, the doubloon index is calculated pooling all doubloon observations between 2000 and 2017 and is therefore constant over time. This ensures that within-country fluctuations in harmonized test scores over time for a given testing program reflect only changes in the test scores themselves and not changes in the conversion factor between tests.[12]

Test scores are harmonized by subject and grade and are then averaged across subjects and grades. The most recently available test for each country is used in the HCI.[13]

Uncertainty intervals for HLOs are constructed by bootstrapping. Patrinos and Angrist (2018) take 1,000 random draws from the distribution of subject-grade average test scores for each test in their dataset. They then form doubloon indexes and calculate HLOs in each bootstrapped sample. The 2.5th and 97.5th percentiles of the distribution of the resulting HLOs across bootstrapped samples form the lower and upper bounds of the uncertainty interval for the HLO.

Learning-adjusted years of school

Learning-adjusted years of school are calculated by multiplying expected years of school by the ratio of test scores in a country to a benchmark score of 625, which corresponds to the TIMSS standard of advanced achievement. Filmer et al. (2018) provide details on the rationale for this conversion from test scores into equivalent years of school.

Adult survival rates

Adult survival rates measure the share of 15-year-olds expected to survive until age 60. They are estimated based on prevailing patterns of death rates by age and are reported by the United Nations Population Division for five-year periods. The five-year data are interpolated to arrive at annual estimates. The measurement of adult survival rates requires data on death rates by age. While these are readily available in countries with strong vital registries, such data are missing or incomplete in roughly the poorest quarter of countries. In these countries, the United Nations Population Division estimates death rates by age by linking the limited available age-specific mortality data with model life tables that capture the typical pattern in the distribution of deaths by age.

While there is uncertainty on the primary estimates of mortality as well as the process for data modeling, uncertainty intervals are not reported in the data. Instead, uncertainty intervals reported in the GBD modeling process for adult survival rates are used.[14] The point estimates for adult survival rates in these two datasets are quite similar for most countries. The ratio of the upper (lower) bound to the point estimate of the adult survival rate in the GBD data is applied to the point estimate of the adult survival rate in the United Nations data to obtain upper (lower) bounds.

Stunting

The stunting rate is defined as the share of children under the age of 5 whose height is more than two reference standard deviations below the reference median for their ages. The reference median and standard deviations are standards set by the World Health Organization (WHO) for normal healthy child development. Data on stunting rates are taken from the Joint Child Malnutrition Estimates (JME) database.[15] This dataset contains 804 country-year observations based on health surveys that directly measure the prevalence of stunting. It has been supplemented with recent surveys provided by World Bank country teams. There are 132 countries and territories with at least one stunting observation in the past 10 years, and the most recent observation within this period is used in the HCI.

The JME database reports 95 percent confidence intervals around estimates of stunting for about 40 percent of the observations, primarily those on which the JME team had access to record-level survey data and has been able to perform reanalysis. Absent better alternatives, confidence intervals are imputed for the remaining observations in the JME database using the fitted values from a regression of the width of the confidence interval on the stunting rate.

Country coverage

HCI data are reported in tables 2 and A.1 for 157 World Bank member countries and their territories, as well as for West Bank and Gaza. HCI data are not reported for some member countries where the World Bank currently does not have active operational engagement. HCI scores cannot be calculated for 33 World Bank member countries that do not participate in any of the international testing programs on which harmonized learning outcomes are based.

Notes

1. This appendix provides a summary of the methodology for the Human Capital Index. For additional details, see Kraay (2018), on which this appendix is based.
2. The methodology for harmonizing test scores is detailed in Altinok, Angrist, and Patrinos (2018) and Patrinos and Angrist (2018).
3. This methodology was introduced by the World Bank (2018) and is elaborated on in Filmer et al. (2018).
4. This approach has been used extensively in the development accounting literature (for example, Caselli 2005; Hsieh and Klenow 2010). The approach for health closely follows Weil (2007). Galasso and Wagstaff (2016) apply a similar framework to measure the costs of stunting.
5. The seminal methodology is due to Mincer (1958). See Montenegro and Patrinos (2014) for recent cross-country estimates of the returns to schooling.
6. For example, see Case and Paxson (2008); Horton and Steckel (2011).
7. For details, see Weil (2007) and Kraay (2018), section A3, and accompanying references.
8. For more details, see Kraay (2018), section A4.
9. See "Global Burden of Disease (GBD)," Institute for Health Metrics and Evaluation, University of Washington, Seattle, http://www.healthdata.org/gbd.
10. For more details on these differences, see Kraay (2018), section A2.
11. In India, the PISA was administered in two states (Himachal Pradesh and Tamil Nadu). However, a comparison with state-level scores for all of India in the 2012/13 National Achievement Survey (NAS) suggests that the average NAS score for these two states is quite similar to the national average NAS score, indicating that the 2009 PISA scores probably are roughly representative of India as a whole (see Patrinos and Angrist 2018).
12. The one exception to this is the 2007 and 2014 PASEC rounds, which were not designed to be intertemporally comparable and in which there were different doubloon countries in any case.
13. See Kraay (2018), section A3, for further details.
14. See "Global Burden of Disease (GBD)," Institute for Health Metrics and Evaluation, University of Washington, Seattle, http://www.healthdata.org/gbd.
15. See JME (UNICEF-WHO-World Bank Joint Child Malnutrition Estimates) (database), 2018 edition, United Nations Children's Fund, New York, https://data.unicef.org/resources/jme/.

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