SERF Index Methodology

2017 Technical Note

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How to cite this document:

Randolph, Fukuda-Parr, Lawson-Remer,Reisinger, & Stewart, SERF Index Methodology: 2017 Technical Note, Economic and Social Rights Empowerment Initiative, 2017,www.serfindex.org/overview/.

How to cite 2017 Update of the International SERF Index Data:

Randolph, Stewart, Reisinger, Fukuda-Parr & Lawson-Remer, International SERF Index Data,Economic and Social Right Empowerment Initiative 2017 Update, 2017, www.serfindex.org/data.

2017 SERF Index Methodology: Technical Note

The purpose of this technical note is to explain the construction of the Social and Economic Rights Fulfillment (SERF) Index and the methodology used to estimate the 2017 International SERF Index Scores, covering the years 2005 to 2015 as well as future updates of the International SERF Index that use the same methodology. The basic SERF Index methodology was created through a three year consultative process by Susan Randolph, Sakiko Fukuda-Parr and Terra Lawson-Remer. As with all measurement indices, the methodology has evolved to take account of emerging conceptual and data issues. The International SERF Index has been refined three times since it was initially published in 2009. The 2017 Update is a comprehensive update that includes the updating and re-estimation of all Achievement Possibility Frontiers(APFs)using the new 2011 PPP$ GDP per capita data series, the corresponding absolute poverty cut-off of $3.10 (2011 PPP$) per day, and taking advantage of an expanded data series, the modern contraceptive use rate, to assess access to reproductive health care. The book, *Fulfilling Social and Economic* Rights by Sakiko Fukuda-Parr, Terra Lawson-Remer and Susan Randolph (Oxford: Oxford University Press, 2015) provides a detailed account of the approach and insights gained from its application that is accessible to practitioners. The conceptual and methodological underpinnings of the SERF Index are fully elaborated in two peer reviewed publications:

- Fukuda-Parr, Sakiko, Terra Lawson-Remer and Susan Randolph (2009)'An Index of Economic and Social Rights Fulfillment: Concept and Methodology.' *Journal of Human Rights*. 8: 195-221.(http://www.informaworld.com/smpp/title~db=all~content=g914018350)
- Randolph, Susan, Sakiko Fukuda-Parr, Terra Lawson-Remer (2010)'Economic and Social Rights Fulfillment Index: Country Scores and Rankings.' *Journalof Human Rights*, 9.3, 230-261. (http://www.informaworld.com/smpp/title~db=all~content=g926038290)

Overview

The International SERF Index measures the performance of countries on the fulfillment of their economic and social rights obligations. The index uses objective, internationally comparable, publically accessible statistical data published by national and international bodies. The International SERF Index is a summary index that is grounded in international law. The International Covenant for Economic, Social, and Cultural Rights (ICESCR) articulates a list of essential substantive economic and social rights that 170 signatory nations, representing a wide range of cultural traditions, have concurred are essential. These are the rights to food, health, education, housing, work, and social security. The International SERF Index is an average of Right Indices for five out of six of these, with social security being the one we don't yet have sufficient data on to independently include. However, the indicators used to measure the right

to work also capture key elements of the right to social security; available data just do not enable a full separation between the right to work and the right to social security.

A fundamental principal of international law is that countries have a duty to progressively realize economic and social rights to the maximum of available resources. Statistics like school enrollment and infant mortality tell us only the extent to which individuals enjoy economic and social rights, but not whether a state is complying with its obligations to progressively respect, protect, and fulfill human rights. *Measuring economic and social rights fulfillment requires considering the perspectives of both the rights-holding individual and the duty-bearing government.* While many widely available socio-economic indicators and other indices, such as the Human Development Index (HDI) assess the level of rights enjoyment, they ignore the obligation level of the duty bearing state. The SERF Index methodology estimates obligations for progressive realization by using an innovative approach that maps an evidence based 'achievement possibilities frontier' (APF) to benchmark each country's obligation at any given time. The SERF Index methodology is the only index methodology that:

- Considers the perspective of both the rights-holder and the duty-bearer measuring state compliance with obligations of progressive realization;
- Makes possible objective assessment of whether the overall situation in a country is improving or deteriorating;
- Allows cross-country comparisons of rights fulfillment; and
- Provides a methodology to examine disparity in rights fulfillment between regions, or between racial and ethnic or other population sub-groups.

The International SERF Index and underlying Right Index scores measure a country's achievement relative to what it is feasible to achieve at the country's per capita income level. That is, they look at the enjoyment level of a right relative to the best practice, the benchmark level of rights enjoyment. More specifically, the SERF and Right Index scores show the percentage of the feasible achievement obtained, given the country's per capita income level. A low score means a country is not fulfilling the rights concerned nearly to the extent that is possible at its per capita income level. In the case of a country with a high per capita income, the country's SERF score on a right or right aspect could well be lower than the raw indicator score reflecting the enjoyment level of the right or right aspect. A SERF score of 100% on a right or right aspect **does not mean** everyone in the country enjoys the right; it means the country is doing as well at ensuring the right as the best performing country has at that per capita income level. Thus, in the case of a very poor country, the SERF or Right Index score on the right can be quite high even though the enjoyment level of the right is quite limited.

Data constraints coupled with the different rights challenges in high income OECD countries versus other countries has led to our creation of two separate International SERF Indices, our Core International SERF Index for most countries and a supplementary index for high income OECD countries. Both the Core International SERF Index and Supplementary Index

for high income OECD countries are calculated for all countries (core and high income OECD countries) with available data, enabling researchers to evaluate countries with the available data on either standard. The 2017 Update of the International SERF Index is comparable across time for each country, as well as between countries. When computing the International SERF Index and underlying Right Index values, the most recently available data on a given right enjoyment indicator (and the per capita income data for the corresponding year) is used. However, because the surveys providing many of the indicators on enjoyment of rights are not conducted annually, the data used for each year are not always unique. For example, in the case of the Right to Education Index for Turkey, the 2012, 2013, 2014, and 2015 series use data on the primary school completion rate in 2012. If the most recently available data on an indicator is more than 10 years prior, the index score for that right is recorded as "missing". The downloadable excel files for each year's data provide information on the "most recent data year" for each indicator used in the construction of each right index for each year, enabling researchers who prefer a less generous look back period to recode observations they consider to old as missing.

The construction of the International SERF Index is illustrated in figures A.1 and A.2 of the appendix and further elaborated below.

Sources and Definitions of Rights and Obligations

The International Covenant of Economic, Social, and Cultural Rights (ICESCR)[1] commits governments to achieve realization of economic, social and cultural rights *progressively*. As stated in Article 2.1:

> Each State Party to the present Covenant undertakes to take steps, individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources, with a view to achieving progressively the full realization of the rights recognized in the present Covenant, by all appropriate means including particularly the adoption of legislative measures.

The '*progressive realization'* provision recognizes that states have very different starting points in their ability to achieve full enjoyment of economic and social rights. Countries across the world face hugely different levels of deprivation and capacity. Inherent in the idea of progressive realization is that a government's ability to achieve realization of rights depends on the level of resources (financial and other) available in the country. The enjoyment of the right to the highest attainable standard of health, for example, cannot be achieved overnight, as

[1]United Nations (1966). International Covenant on Economic, Social and Cultural Rights (ICESCR). Adopted 16 December 1966, General Assembly Resolution 2200 (XXI), U.N. GAOR, 21st Session, Supp. No. 16, U.N. Document A/6316 (1966), 993 U.N.T.S. 3 (*entered into force* 3 January 1976).

facilities need to be built, personnel trained, and policy incentives for businesses and households put in place and so on, for people to have access to healthcare. These arrangements require financial resources which may be beyond what governments and households can mobilize. Consequently, the performance of states with regard to progressively realizing economic and social rights cannot be judged on the basis of outcomes – enjoyment of rights by people – alone. For example, the performance of the United States and Malawi cannot be compared on the basis of their respective levels of child survival rates considering the hugely different levels of capacity in these two countries. Thus, a country's performance in fulfilling obligations for economic and social rights depends on both: (i) the actual economic and social rights (ESR) outcomes people enjoy, as indicated by socio-economic statistics that proxy for particular rights; and (ii) a society's capacity for fulfillment, as determined by the amount of economic resources available overall to the duty-bearing state.

The provision of progressive realization has complicated and frustrated efforts to monitor countries' fulfillment of their economic and social rights obligations, since, as Human Rights measurement scholar Chapman notes: 'it necessitates the development of a multiplicity of performance standards for each right in relationship to the varied… contexts of specific countries'[2].That is, measures of ESR outcomes must reflect variable local specificities. The monitoring procedure adopted by the Committee on Economic, Social and Cultural Rights assesses performance relative to 'benchmarks'. But this leaves the problem of setting the benchmark. In the absence of a conceptual and evidence-based model for setting benchmarks, States enjoy considerable discretion over where their benchmark is set, thus effectively leaving open an 'escape hatch' for States to avoid meeting their ESR obligations.

The SERF Index overcomes this problem. The innovation of the SERF Index methodology lies in the construction of Achievement Possibilities Frontiers (APFs) that use an evidence based approach to specify each country's level of obligation *for progressive realization* with regard to various aspects of each economic and social right.

The construction of the SERF Index involves the following steps:
Step 1: Identify indicators to broadly summarize the enjoyment level of the substantive rights articulated in the legal instruments and country resource capacity.
Step 2: Specify country obligations with regard to the substantive rights indicators and compute indicator performance scores for each indicator reflecting the extent to which a country meets its obligations.
Step 3: Aggregate indicator performance scores into indices for each of the core rights and the composite SERF Index.

[2]Chapman, Audrey. 'The Status of Efforts to Monitor Economic, Social, and Cultural Rights,' in *Economic Rights: Conceptual, Measurement and Policy Issues, eds.* Shareen Hertel and Lanse Minkler (Cambridge: Cambridge University Press, 2007). Chapter 7, pp 143-164.

Right Indicators: Indicators of Economic and Social Rights Enjoyment and State Resources

Sources and definitions of rights and obligations

The SERF Index draws on international law– the Universal Declaration of Human Rights[3] (UDHR), ICESCR[4] and numerous other international human rights legal instruments[5]–to define rights of individuals and obligations of states. The substance of these rights is detailed in General Comments of the Committee on Economic, Social, and Cultural Rights (CESCR)[6]. The General Comments identify seven substantive economic and social rights; the right to adequate food, education, highest attainable standards of physical and mental health, adequate housing, water, decent work, and social security. Following the Office of the High Commissioner for Human Rights 2012 guidelines on using indicators to monitor human rights, we collapse these into six rights, in view of the fact that access to water is a key component of the right to housing.[7]

States bear the primary responsibility for the realization of the rights of citizens and individuals residing within their borders. Their obligations are threefold: *to respect, to protect, and to fulfill* rights. These obligations also include the cross-cutting *procedural rights of non-discrimination, participation, and accountability*. General Comments 3[8] and 9[9] along with the *Limburg Principles*[10]and *Maastricht Guidelines*[11] elaborate the nature and extent of the obligations accepted by State parties to the Covenant.

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[3]United Nations (1948). *Universal Declaration of Human Rights (UDHR.,* Adopted 10 Dec. 1948, United Nations General Assembly Res. 217 A (III), (1948).

[4] United Nations (1966).

[5] These international legal instruments include the General Comments of the relevant treaty body committees, reports of Special Rapporteurs, and other documents such as reports of seminars, task forces and working groups.

[6]Committee on Economic Social and Cultural Rights.(1991)'General Comment 4: The Right to Adequate Housing', 6th Session, 13 December; (1997) 'General Comment 7: The Right to Adequate Housing—Forced Evictions', 16th Session, 20 May; (1999a) 'General Comment 11: Plans of Action for Primary Education', 20th Session, Geneva, 26 April – 14 May 1999, Document E/C.12/1999/4; (1999b) 'General Comment 12: The Right to Adequate Food', 20th Session, Geneva, 26 Apr – 14 May, Doc. E/C.12/1999/5; (1999c) 'General Comment 13: The Right to Education', 21st Sess. 15 November – 3 December 1999, Document E/C.12/1999/10; (2000) 'General Comment 14: The Right to the Highest Attainable Standard of Health', 22nd Session, 25 April – 12 May 2000, Document E/C.12/2000/4 ; (2005) 'General Comment 18: The Right to Work', 35th Session, 7-25 November 2005, Document E/C.12/GC/18, 6 February 2006;(2008) 'General Comment 19: The Right to Social Security", 39th Session, 5-23 November. Document E/C.12/GC/19, 4 February 2008.

[7]United Nations Office of the High Commissioner for Human Rights (2012). *Human Rights Indicators: A Guide to measurement and implementation.* HR/PUB/12/5. New York: Office of the High Commissioner for Human Rights, United Nations.

[8] Committee on Economic, Social and Cultural Rights (1990) 'General Comment 3: The Nature of States Parties' Obligations' , 5th Sess., December 14.

[9] Committee on Economic, Social and Cultural Rights (1998) 'General Comment 9: The Domestic Application of the Covenant' 19th Session, 16 November – 4 December, Document E/C.12/1998/24, 3 December 1998.

[10]United Nations (1987). The Limburg Principles on the Implementation of the International Covenant on Economic, Social and Cultural Rights. Guidelines adopted at a workshop sponsored by the International

The SERF Index measures State parties' compliance with their obligations for progressive realization of economic and social rights, focusing on outcomes reflected in enjoyment of rights by people and adjusted for state capacity. It does not attempt to assess the extent to which States ensure the *procedural rights* of non-discrimination, participation and accountability. The SERF Index complements other measurement tools such as those suggested by the Office of the High Commissioner for Human Rights[12]. These and other recent initiatives, such as the Right to Education Index[13] focus on different aspects of obligations, such as 'process' (or policy efforts made by government), structure (institutionalized provisions), outcomes (level of rights enjoyment in the population) and assess performance on 50 to 100 aspects of each right. However, none attempts to provide a broad summary of performance and benchmark outcomes according to the obligation of progressive realization as the SERF Index does.

Selecting the indicators of rights enjoyment and resource capacity

A number of criteria govern the selection of the indicators. First, selected indicators must be: (i) based on reliable data; (ii) measured with objective methods; (iii) legitimately comparable across countries and over time; and (iv) publicly accessible. To satisfy these criteria, all data sets used to construct the SERF Index are international series that are maintained by international organizations. Further considerations for indicator selection include: (v) data availability and country coverage; (vi) frequency of data collection; and (vii) the extent of variation among countries. Indicator sets are selected (viii)to reflect the challenges most relevant to fulfilling a given right, rather than to encompass all aspects of a given right. Indicators (ix) specifying the percentage of the population enjoying the right were preferred to those indicating the average level of enjoyment of the right across the population. Further, (x) indicators of flow variables were preferred to indicators of stock variables, and(xi) preference was given to bell weather indicators sensitive to a variety of factors related to rights fulfillment. In general we have sought to keep the number of indicators reflecting different key aspects of a given right down to three.

Our selection of indicators is also practically constrained by current data availability. This, plus different rights challenges in high income OECD countries versus most other countries led to our creation of two separate sets of indicators: one for most countries, the Core SERF

Commission of Jurists, the Faculty of Law of the University of Limburg, and the Urban Morgan Institute for Human Rights, University of Cincinnati, Maastricht, Netherlands, 22-26 January 1997, Document E/CN.4/1987/17.

[11]United Nations (2000). The Maastricht Guidelines on Violations of Economic, Social and Cultural Rights. Guidelines adopted at a workshop sponsored by the International Commission of Jurists, the Urban Morgan Institute for Human Rights and the Center for Human Rights of the Faculty of Law of Maastricht University, Maastricht, Netherlands, 22-26 January, 1997. Document E/C.12/2000/13.

[12]United Nations Office of the High Commissioner for Human Rights (2012). For comparison of SERF with other proposals, see Randolph et al, *Journal of Human Rights* 2010, and Fukuda-Parr, Sakiko, 'The Metrics of Human Rights: Complementarities of Human Rights and Capabilities Approach', *Journal of Human Development and Capabilities,* Vol. 12:1 pp73-89.

[13] See http://www.results.org/issues/global_poverty_campaigns/right_to_education_index/.

Index, and a supplementary index for high income OECD countries, the high income OECD country index. For example, the high income OECD country index includes an indicator of the quality of schooling, performance on the Program for International Student Assessment (PISA) test, among the education indicators. The quality of education is no less a concern for all other countries, it's just that there is no indicator with broad coverage available at this time for non-OECD countries. Regarding relevance, ensuring all students complete primary school is not an issue for OECD countries, so although this is an indicator we use for our core countries, it is not an indicator for high income OECD countries. Data limitations currently preclude defining separate indicator sets for all six rights. The Core SERF Index is an average of five separate right indices—the rights to food, health, education, housing, and work—with key elements of the right to social security captured by the right to work. Available data do not enable us to fully separate the right to work from the right to social security at this time. The SERF Index for high income OECD countries incorporates four of the six rights; it was not feasible to identify acceptable indicators for either the right to housing or the right to social security, although as in the case of the Core SERF Index, key elements of the right to social security are captured in the Right to Work Index for high income OECD countries. Given the differences in data availability and current rights challenges between the two groups of countries, the standards underlying the two variants of the International SERF Index differ. However, both the Core International SERF Index and Supplementary Index for high income OECD countries are calculated for all countries (core and high income OECD countries) with available data, enabling researchers to evaluate countries with the available data on either standard.

Table 1 below shows the indicators currently used to reflect key aspects of each right enjoyment for both variants of the SERF Index.[14] Appendix Table A.1 gives details of sources and definitions for each indicator. A detailed discussion of why particular indicators were selected is provided in Fukuda-Parr, Lawson-Remer, and Randolph (2015). As noted at the outset, States are required to fulfill economic and social rights *progressively,* and to commit the *maximum of available resources* to meet this obligation. The SERF Index uses per capita GDP as the indicator of State resource capacity measured in 2011 purchasing power parity (PPP) dollars. While it might be argued that States with larger budgets or better institutions have a greater capacity to fulfill economic and social rights than those with the same per capita income but smaller budgets or poorer institutions, a State's capacity depends on the choices it makes with

[14] In response to feedback from a wide range of scholars and practitioners, some of the indicators used to construct the SERF Index as well as some of the values used to rescale the index have been refined in the current version of the SERF Index and differ from those reported in Randolph, Fukuda-Parr and Lawson-Remer (2010) and Fukuda-Parr, Lawson-Remer, and Randolph (2015). In particular, the gross combined school enrollment rate replaces the gross secondary school enrollment rate, the percentage of the rural population with access to improved water replaces the percentage of total population with improved water access, the modern contraceptive use rate replaces births attended by skilled health workers, the percentage of the population surviving to age 65 replaces life expectancy, and the $3.10 (2011PPP$) a day poverty rate, equivalent to the $2.00 (2005 PPP$) a day poverty rate replaces the $1.25 poverty rate.

regard to its taxing policies and institutional structure. Since the obligation to progressively realize economic and social rights requires States to collect and expend resources at the level necessary to meet their rights obligations, it is appropriate to measure resource capacity as reflected by the total resources available to the State, not the portion of those resources the State chooses to tap. The 2017 Update measures GDP per capita data in 2011 international purchasing power parity dollars (2011 PPP$) to standardize for inflation and purchasing power across countries and thus enable comparison over time and across countries.[15]

Human Right Index Variant	**Indicator**
Food Core Country High Income OECD Country	• % children (under 5) not stunted • % babies not low birth weight
Education Core Country Both High Income OECD Country	• Primary school completion rate • Combined school enrollment rate (gross) • Average math & science PISA score
Health Core Country Both Both	• Modern Contraceptive use rate • Child (under 5) survival rate • Age 65 survival rate
Housing Core Country Core Country	• % rural population with access to improved water source • % population with access to improved sanitation
Decent Work Core Country High Income OECD Country High Income OECD Country	• % with income >$3.10 (2011 PPP$) per day • % with income > 50% median income • % unemployed not long-term unemployed.

Table 1: Rights Enjoyment Indicator Sets Used in the SERF Index

Indicator Performance Scores

Benchmarking a Country's Obligations of Progressive Realization: Achievement Possibility Frontiers

The Achievement Possibility Frontiers (APFs) use an evidence based approach to benchmark each country's obligation with regard to each indicator reflecting the different

[15] Purchasing power parities (PPPs) are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. The year 2011 is the most recent survey year of the International Comparison Project that estimates PPP$ and accordingly the PPP$ prices are the prices prevailing in 2011. See for example http://siteresources.worldbank.org/ICPEXT/Resources/ICP_2011.html for more information.

aspects of each right. The APFs reflect what is feasible to achieve when a country allocates the maximum of available resources to fulfilling economic and social rights and uses those resources effectively as is evidenced by the experience of the best performing countries at different per capita GDP levels. The frontiers are constructed so as to be stable over the medium term thus enabling inter-temporal comparison.[16]Specifically, the APF for a given indicator is constructed by plotting the observed value of the indicator against per capita GDP (2011 PPP$) for each country over the 1995 to 2015 period.[17] The frontier itself is defined as the outer envelope of the scatter plot, and the equation specifying the frontier is estimated by fitting a curve to the observations that define the outer envelope of the scatter.[18]The 2017 Update re-estimated all the frontiers using the recently available 2011 PPP$ which are based on an improved methodology and broader survey coverage than the 2005 PPP$ series. Table A.2 in the Appendix identifies the country/year observations defining the outer envelope of the scatter for each indicator. The fact that the observations defining the frontier do not cluster in the 2014-15 period but rather come from throughout the 1995-2015 period provides assurance that the frontiers are stable over the medium term. Table A.3 in the Appendix shows the equations specifying the frontier for each indicator.[19]

To better understand the process, consider the construction of the Core Right to Food Index. The first step as discussed above is to figure out the best statistical indicators to monitor. For some of the Right Indices, there are multiple indicators, but for the Core Right to Food Index there is just one indicator—a measure of child malnutrition prevalence. Specifically, as shown in Table 1, we use the percentage of children under 5 years of age who are not stunted, that is, whose height is not unusually low relative to the median (precisely not more than 2 standard deviations below the median). These data come from the World Health Organization's Global Database on Child Growth and Malnutrition. The stunting rate is a bellwether indicator of family malnutrition. It has been found to be more sensitive to both chronic caloric insufficiency and a diet chronically lacking in adequate protein and micronutrients and is less likely to be influenced by temporary illness than other indicators of child under-nutrition. Also, because parents protect the nutritional wellbeing of their children

[16] Although knowledge of how to transform resources into rights enjoyment will change over time, rapid and abrupt changes in best practice technology are unlikely.

[17] The APFs were constructed in 2017 for this update using all data available at that time since 1995.

[18]The book, Fukuda-Parr, Lawson-Remer, and Randolph (2015) and two papers, Fukuda-Parr, Lawson-Remer, and Randolph (2009), and Randolph, Fukuda-Parr and Lawson-Remer (2010) further detail the basic methodology, although the current version of the index incorporates some additional refinements as indicated in this technical note.

[19] To guard against measurement error and ensure that the frontiers reflect what is reasonably achievable, observations from a minimum of four countries were required to define the frontier, and potential outliers were eliminated. In particular, observations from countries engaged in civil war at the time of the observation were eliminated, and for purposes of estimating the frontier, the per capita income corresponding to observations occurring in the wake of the Post USSR transition when per capita income levels in many of the former Soviet Republics and Eastern European countries briefly and temporarily plummeted were reset to the per capita income level just prior to the start of the transition until per capita income levels recovered. See Fukuda-Parr, Lawson-Remer, and Randolph (2015, 2009), and Randolph, Fukuda-Parr and Lawson-Remer (2010) for further details.

over their own, the child stunting rate also reflects the inability of parents to adequately ensure their own nutritional wellbeing. Because our focus is on rights enjoyment, we subtract the child stunting percentage from 100%. We then construct a scatter plot of this against GDP per capita (2011$) using all available country observations from 2005 to 2015. In figure 1 below, each black dot is a single country observation for a particular year. The most recent observations available for Mozambique, Kenya, Sudan, and India (MOZ, KEN, SDN, IND, respectively) are highlighted with a star. As can be seen there is a substantial spread between the best and worst performing countries at each per capita GDP level. We use econometric techniques to fit a curve to the outer-boundary of the scatter plot, the solid black curve in figure 1. This fitted curve is the Achievement Possibilities Frontier (APF). Based on country experience, it benchmarks for each per capita income level, the percentage of children it is feasible to ensure are not stunted. The APF defines the level of a State's obligation for any given per capita GDP level (2011 PPP$).

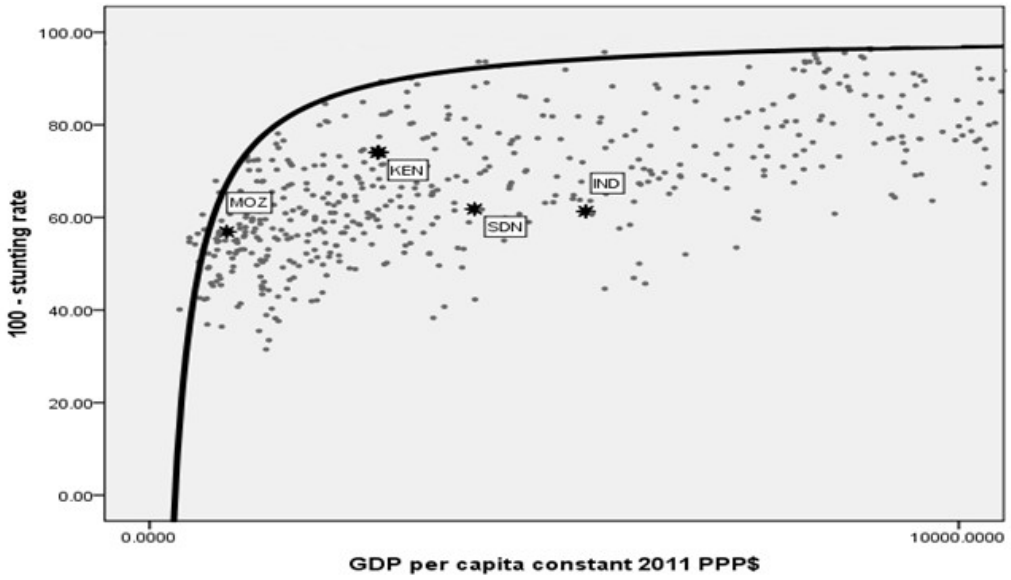

Figure 1: Achievement Possibilities Frontier for Percentage Children Not Stunted

Assessing State Performance: The Adjusted Indicator Performance Score

Ignoring for the moment some critical refinements, the approach to assessing State performance is to compare the State's actual performance to the feasible performance as benchmarked by the APF. So again, looking at figure 1, India's child stunting rate in 2014 (the most recent year data were available for India) was 38% implying the percentage of children not stunted was 62%. However, at its then per capita GDP of $5,391 (2011 PPP$), it should be possible as shown by the APF to ensure 94% of children under 5 are not stunted. Thus our first cut at assessing India's performance is to take the ratio of the observed percentage of children

that are not stunted (62%) to the benchmark percentage of children not stunted (94%) and then multiply by 100 to yield the percentage of the feasible level achieved.

Two things should be noted about figure 1 above. First, the observed percentage of children that are not stunted never reaches a value approaching zero. In fact, the lowest value observed is 31%, the percentage of children not stunted in Bangladesh in 1995. The observed minimum score differs widely across indicators. For example, the minimum observed score for the child survival rate (100%-% child mortality rate) is 68% (Niger in 1990) and that for the percentage of the rural population with access to improved rural water is 0% (Cambodia and Mozambique in 1990). Given that we are comparing multiple indicators in the construction of the SERF Index, we need to standardize these indicators for two reasons. First, if we failed to do so indicators with a larger actual range will drive the composite SERF Index. Second, in recognition of the fact that even in the absence of any focus on rights, certain indicators, such as the child survival rate, would have positive values while positive scores on other indicators, such as access to an improved water source, or primary school completion rates, substantially depend on public provision of goods and services and could be zero or close to zero.

We standardize the scores by computing the percentage of the feasible level achieved with reference to the minimum observed score on the indicator in the case of those indicators that do not substantially depend on public provision of goods and services. In figure 2 below, the red horizontal line shows the minimum observed score of 31% on the child not stunted rate. So, looking again at India, its achievement relative to this minimum observed score is 62%-31%=31% of children not stunted—the height of the blue arrow. Relative to the minimum, it is feasible for India to achieve 94%-31%=63% of children not stunted—the height of the red arrow. Thus, India's score on the Right to Food is calculated as (31%/63%) x 100 = 49.2%. More generally, the rescaling formula is:

S = 100 [(actual value – minimum value) / (frontier value – minimum value)]

Here **S is the rescaled indicator performance score**. The numerator of the ratio in brackets reflects the extent to which a given right aspect is enjoyed, while the denominator of the ratio reflects the level of the State's obligation to ensure that right aspect. After multiplying by 100, the rescaled indicator scores can be interpreted as the percentage of obligation met. The minimum values are set to approximate the indicator value one would expect to observe in a country with a subsistence per capita income level that places no priority on ensuring economic and social rights. This is approximated as zero for those indicators for which the score significantly depends on state provision of goods and services (e.g. the primary school completion rate); otherwise as discussed above it is approximated as the minimum value

observed in any country in any year since 1990.[20]The minimum scores for each indicator are shown in Table A.3.

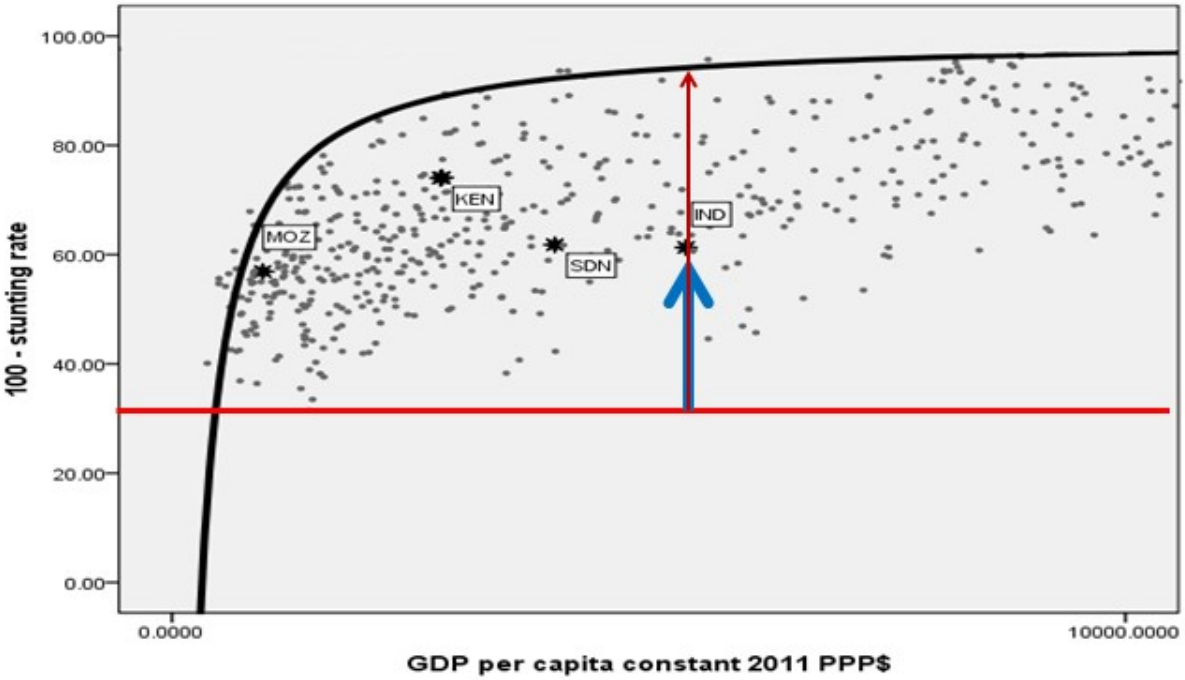

Figure 2: Rescaling the performance scores.

There is one more issue that needs to be taken into account: some countries have many times the resources needed to ensure all people enjoy a given right but fail to ensure that all people in fact enjoy that right. Figure 3 below fills out the scatter plot and APF for the percentage of children that are not stunted to include higher per capita income levels. Notice that the APF peaks and then becomes horizontal. The indicator value where the APF peaks, call it Xp, implies the right aspect concerned is enjoyed by everyone in the country. In the case of the % of children that are not stunted, this occurs at 97.7%, since the height of 2.3% of children is expected to be more than 2 standard deviations below the median height for a well-nourished population. Table A.3 of the appendix specifies the Xp values for all the indicators. It should also be noted that in many cases, the frontier reaches a peak and then plateaus at a per capita GDP level well below the highest observed per capita income level. Call the per capita income level where the frontier first reaches its peak Yp. This is the minimum per capita GDP required to ensure enjoyment of the right aspect concerned by everyone in the population given current knowledge of the structures and measures (legislation, policies, programs, etc.) that promote that goal. In general, countries with income levels exceeding Yp have more than sufficient income to ensure everyone enjoys the aspect of the right concerned. The Yp values differ substantially across indicators and are also shown in Table A.3 of the appendix. The rate

[20] With regard to the minimum values used to rescale indicators, the distinction between those indicator scores that substantially depend on public provision of goods and services (with a consequent 0 minimum) and those that do not is a refinement incorporated into the 2011 and later updates of the SERF Index as well as this 2017 Update.

at which resources can be transformed into enjoyment of the right aspect concerned is shown by the shape of the frontier as it rises to its peak value and is implicit in the estimated frontier equations; those rising more steeply imply greater ease in transforming income into enjoyment of the right aspect concerned.

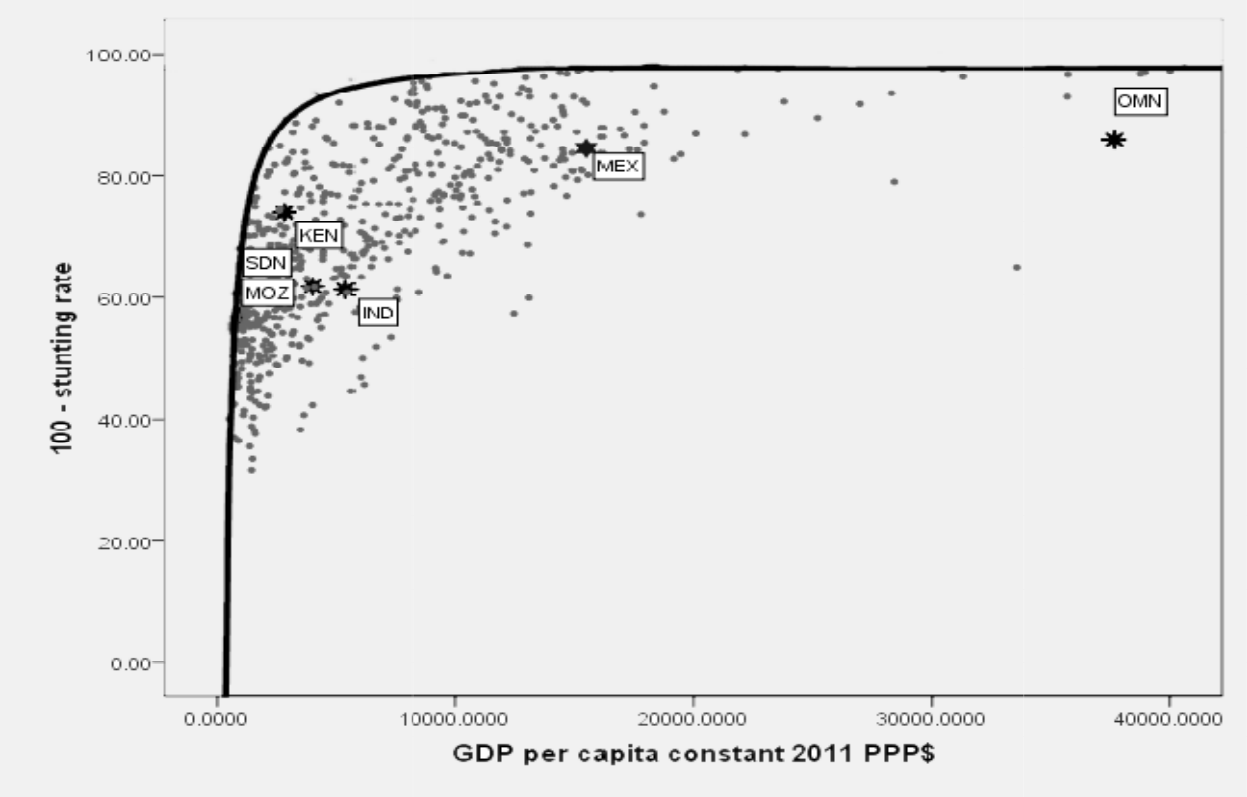

Figure 3: Oman's resources exceed the level needed to eliminate child stunting.

The frontier value of the indicator will be the same for countries with per capita income levels above Yp whether their per capita income level is exactly Yp or two times Yp, or even 10 times Yp, and thus their rescaled performance indicator score will be the same. However, it makes little sense to evaluate two countries with the same indicator score as performing equally well if one has twice as much income as another. Looking again at figure 3, notice that Oman (OMN) and Mexico (MEX) have nearly the identical percentage of children that are not stunted (86.4% for Mexico and 85.9% for Oman), yet Oman's per capita income is nearly 2.5 times higher than Mexico's ($37,667 vs. $16, 158 measured in 2011 PPP$). Also notice that for per capita income levels higher than Mexico's (or more precisely higher than $13,608 (2011 PPP$), the value of Yp for the % of children not stunted) the frontier reaches its peak value (97.7%), so resources no longer constrain countries' ability to eliminate child stunting. For countries like Oman with per capita income levels multiple times what is needed to reach the frontier but who still fail to do so, we impose a penalty on their score. In Oman's case, based on the formula discussed below this is about 10 percentage points so that Oman's score on the indicator performance score ends up being about 10 percentage points lower than Mexico's.

More generally, the final step in calculating the performance indicator score is to deduct a penalty from the rescaled indicator score when a country has income that is more than sufficient to ensure everyone in the country enjoys the right aspect concerned but fails to ensure that everyone does so. Thus, the final **adjusted indicator performance score, A,** is:

A = S if Y <= Yp

A = S – penalty if Y >Yp

A number of alternative penalty formulas were considered in Fukuda-Parr, Lawson-Remer, and Randolph (2009) along with a set of axioms defining the characteristics one would like such a penalty formula to have. On the basis of the axioms, penalty formula F was identified as meeting all but the flexibility criterion. A refinement of penalty formula F offered in Randolph, Fukuda-Parr, Lawson-Remer (2010) ensures it meets the flexibility criterion as well. The resultant **adjusted indicator performance score, A, when Y>Yp is**:

$$\mathbf{A} = \mathbf{100}[\left(\frac{\boldsymbol{S}}{\mathbf{100}}\right)^{\left(\frac{\boldsymbol{Y}}{\boldsymbol{Yp}}\right)^{\boldsymbol{\beta}}}]$$

The value of β determines the severity of the penalty and for purposes of calculating the SERF Index, β is set equal to 0.5. Figure 2 plots the adjusted performance indicator score against the ratio of a country's per capita GDP to the Yp value for rescaled performance indicator scores, S scores, of 95%, 90%, 80%, 60%, and 40%. For example, the figure indicates that if a country has an S score of 95%, the penalty reduces the adjusted performance indicator score to 85% as its income rises to ten times the minimum amount necessary to fulfill the right aspect concerned.

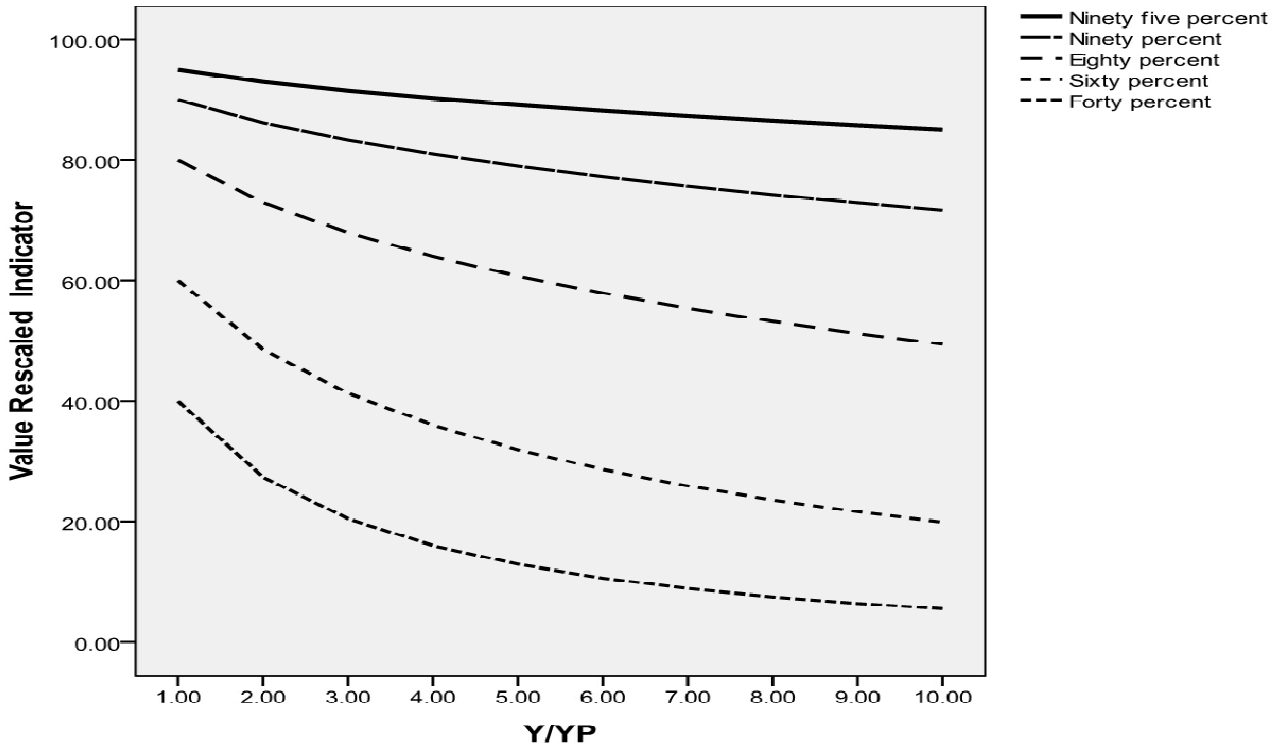

Figure 2: Penalty for different Y/Yp values

Right Indices

Each substantive right index is computed as the simple average of the underlying adjusted indicator performance scores for the different aspects of the right assessed. So for example, the Core Right to Education Index is the average of the adjusted indicator performance scores for the primary school completion rate and the combined school enrollment rate. In the event that only a single aspect of a substantive right is assessed, the substantive right index is simply the adjusted performance indicator score on the corresponding indicator. So for example, the Core Right to Food Index is the adjusted indicator performance score for the percentage of children that are not stunted. Thus, differentiating between the different adjusted performance indicator scores with i, and denoting n as the number of adjusted indicator scores relevant to right k, the formula for a given **substantive right index, R_k**, is:

$$R_k = \Sigma A_i/n$$

Composite Index – Social and Economic Rights Fulfillment Index

The SERF Index itself is a weighted average of the substantive rights indices. Denoting m as the number of substantive rights incorporated in the SERF Index (5 in the current version of the Core SERF Index, and 4 in the case of the current version of the SERF Index for High Income OECD countries), the **SERF Index is defined as**:

$$\mathbf{SERF = [\Sigma R_k^{1/\alpha}/m]^{\alpha}}$$

As in previous updates, the 2017 Update of the SERF Index sets α equal to 1 and thus is the simple average of the substantive rights indices. Higher values of α place more weight on those rights where fulfillment falls shortest. The data files provide the Right Index scores for each of the rights allowing users to calculate the SERF Index for any value of alpha.

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Appendix

Table A.1: SERF Index Indicator Definitions

Aspect Country Group	Indicator	Primary Source	Date Accessed	Indicator Definition
Resource Capacity				
Both	**GDP pc (PPP 2011 $)**	World Bank International Comparison Project. Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/9/2017	GDP per capita based on purchasing power parity (PPP), PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2011 international dollars.
Right to Food				
Core	**Malnutrition Prevalence - height for Age (% children under 5)**	WB WDI, source: World Health Organization, Global Database on Child Growth and Malnutrition. Aggregation is based on UNICEF, WHO, and the World Bank harmonized dataset (adjusted, comparable data) and methodology. Extracted from World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	1/30/2017	% of children under 5 stunted (+2 standard deviation below median) new def: Prevalence of stunting is the percentage of children under age 5 whose height for age is more than two standard deviations below the median for the international reference population ages 0-59 months. For children up to two years old height is measured by recumbent length. For older children height is measured by stature while standing. The data are based on the WHO's new child growth standards released in 2006.
High Income OECD	**Low-Birth Weight Babies**	Priority data source OECD http://stats.oecd.org/viewhtml.aspx?datasetcode=HEALTH_STAT&lang=en# ;Secondary data source WB WDI, UNICEF, State of the World's Children, Childinfo, and Demographic and Health Surveys., Extracted from World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	WDI 01-30-17; OECD 02/15/2017	Low-birthweight babies are newborns weighing less than 2,500 grams, with the measurement taken within the first hours of life, before significant postnatal weight loss has occurred.

Aspect Country Group	Indicator	Primary Source	Date Accessed	Indicator Definition
Right to Education				
Core	**Primary School Completion Rate**	WB WDI, United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics. Extracted from World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	1/30/2017	Primary completion rate, or gross intake ratio to the last grade of primary education, is the number of new entrants (enrollments minus repeaters) in the last grade of primary education, regardless of age, divided by the population at the entrance age for the last grade of primary education. Data limitations preclude adjusting for students who drop out during the final year of primary education.
Both	**Gross Combined School Enrollment Rate**	UNESCO Institute of Statistics Extracted from http://data.uis.unesco.org/Index.aspx?queryid=142# Extracted from World Bank Edstatshttp://databank.worldbank.org/data/reports.aspx?source=Education-Statistics-~-All-Indicators	WDI 1/30/2017 UNICEF 2/15/17	Total enrollment in primary, secondary and tertiary education, regardless of age, expressed as a percentage of the total population of primary school age, secondary school age and the five-year age group following on from secondary school leaving. (Capped at 100%)
High Income OECD	**Average of Math and Science PISA Scores**	Organisation for Economic Cooperation and Development Program for International Student Assessment (PISA) http://www.oecd.org/pisa/ Extracted from World Bank EdStats Extracted from World Bank Edstatshttp://databank.worldbank.org/data/reports.aspx?source=Education-Statistics-~-All-Indicators	2/2/2017	Average of country mean quality of learning outcome scores on mathematics and science subject tests.

Aspect Country Group	Indicator	Primary Source	Date Accessed	Indicator Definition
Right to Health				
Core	**Modern Contraceptive Use Rate (% women 15-49)**	Compiled by United Nations Population Division from household surveys, including Demographic and Health Surveys and Multiple Indicator Cluster Surveys. Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	1/30/2017	Contraceptive prevalence rate is the percentage of women who are practicing, or whose sexual partners are practicing, at least one modern method of contraception. It is usually measured for women ages 15-49 who are married or in union. Modern methods of contraception include female and male sterilization, oral hormonal pills, the intra-uterine device (IUD), the male condom, injectables, the implant (including Norplant), vaginal barrier methods, the female condom and emergency contraception.
Both	**Survival to Age 65 (%cohort)**	The United Nations Population Division's World Population Prospects Extracted from World Bank Health and Nutrition Statistics data base. https://data.worldbank.org/data-catalog/health-nutrition-and-population-statistics	2/17/2017	Survival to age 65 refers to the percentage of a cohort of newborn infants that would survive to age 65, if subject to age specific mortality rates of the specified year. Computed by authors from age specific survival to age 65 rates and age specific population age 0 rates.
Both	**Child Mortality Rate/ Child Survival Rate**	Estimates developed by the UN Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA Population Division) at www.childmortality.org. Projected data are from the United Nations Population Division's World Population Prospects. Extracted from World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/1/2017	The child mortality rate is the probability per 1000 births that a newborn baby will diebefore reaching age five if subject to age-specific mortality rates of the specified year. To get the percentage child survival rate, this value was divided by 10 and subtracted from 100 by the authors.

Aspect Country Group	Indicator	Primary Source	Date Accessed	Indicator Definition
Right to Housing				
Core	**Improved Sanitation (% population with access)**	WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (http://www.wssinfo.org/). Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/09/2017	Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to piped sewer system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet.
Core	**Improved RURAL Water (% rural population with access)**	WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (http://www.wssinfo.org/)., Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/09/2017	Access to an improved water source, rural, refers to the percentage of the rural population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection)
Right to Work				
Core	**Poverty Head Count <3.10 (2011 PPP$) per day**	World Bank, Development Research Group. Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. Data for high-income economies are from the Luxembourg income study database. For more information and methodology see PovcalNet (http://iresearch.worldbank.org/PovcalNet/Index.htm). Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/1/17	Poverty headcount ratio at $3.10 a day is the percentage of the population living on less than $3.10 a day at 2011 international prices.

Aspect Country Group	Indicator	Primary Source	Date Accessed	Indicator Definition
High Income OECD	**Long-Term Unemployment Rate (% of unemployment)**	International Labour Organization, Key Indicators of the Labour Market database. Extracted from World Bank World Development Indicators http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators	2/1/17	Long-term unemployment refers to the number of people with continuous periods of unemployment extending for a year or longer, expressed as a percentage of the total unemployed.
High Income OECD	**Relative Poverty Rate**	LIS Cross-National Data Center in Luxembourg. Extracted from Inequality and Poverty Key Figures http://www.lisdatacenter.org/lis-ikf-webapp/app/search-ikf-figures	2/24/17	Indicator of poverty status of the household to which the individual belongs to, based on the equivalised disposable household income concept and with respect to the 50% of the median

Table A.2: 2017 SERF Index Update: Countries Defining the Frontier

Right Country Group	**Indicator**	**Countries Defining the Frontier**
Right to Food		
Core	% Not Stunted	Germany 2005, Korea, Rep. 2010, Australia 1995, Chile 2008, 2013, Macedonia, FYR 2004, Samoa 1999, Tuvalu 2007, West Bank and Gaza 1996, Senegal 2012, Haiti 2012, Togo 2008, Central African Republic 1995.
High Income OECD	% Not Low Birth Weight	Tonga 2001, China 2000, 2003, 2005-8, Albania 2009, Samoa 1997, Turkmenistan 2006, Uzbekistan 1996, 2006, Kiribati 1998, 2011, Tuvalu 2000, Vanuatu 2001, Timor-Leste 2002, Congo, Dem. Rep. 2010, Chad 2000.
Right to Education		
Core	Primary School Completion Rate	Vanatu 2001, Vietnam 1999, 2000, China 1995, Zimbabwe 2012, Cambodia 2005, Togo 2013, Malawi 2012-3, Congo, Dem. Rep. 2012
Both	Gross Combined School Enrollment (Primary through University)	Belarus 2012-13, Greece 2012, Cuba 2007, Lithuania 2009, Barbados 2009, Palau 2013, Ukraine 2012-13, Peru 2000-1, Bolivia 2002-3, Kiribati 2001, 2003-6, Malawi 1995
High Income OECD	PISA (Average mean of Math & Science)	Singapore 2009, 2012, Hong Kong2012, Finland 2006, Korea, Rep.2000, 2003, 2009 Estonia 2012, Poland 2003, Latvia 2000, 2003, Indonesia 2003, 2006.

Right Country Group	**Indicator**	**Countries Defining the Frontier**
Right to Health		
Core	Modern Contraceptive Use Rate	United Kingdom 2007, 2009, Portugal 2006, Costa Rica 2010, Thailand 2001, 2006, Vietnam 2007-8, Zimbabwe 2006, Malawi 2004, 2006, 2010, Mozambique 2004, Congo, Dem. Rep. 2010.
Both	Age 65 Survival Rate	Hong Kong SAR, China 2013, Israel 2010, Greece 2012-13, Lebanon 2008-9, Albania 2000, 2002-13, China 1998, 2000-1, 2003, Vietnam 2006, West Bank and Gaza 2008, Bangladesh 1999, 2005, 2008, 2010, 2013, Vanuatu 2006, Solomon Islands 2013, Madagascar 2013, Ethiopia 2010, 2012-13, Niger 2005, 2008-10, 2013, Burundi 2012, Malawi 1999, 2006.
Both	% Child (Under 5) Survival Rate	Bosnia & Herzegovina 2005, 2007, Cuba 1998, 1999, 2000, Liberia 1995-6, Madagascar 2014, Malawi 2001-2, 2004-5, 2008, 2011, 2014, Montenegro 2010, 2013-14, Samoa 2014, Serbia 2014, Solomon Islands 2009, 2014, Vanuatu 2002, Vietnam 2010
Right to Housing		
Core	Access Improved Water % Rural Population	Armenia 2013-14, Bhutan 2014, Belize 2012-13, Portugal 2012, Tonga 1995-98, 2010-12, 2014, Bulgaria 2001, Samoa 2013, Marshall Islands 1999, 2004, 2012, Tuvalu 2010, The Gambia 2011, 2014, Malawi 1995, 1999, 2003, 2006, 2009, Central African Republic 2013,Papua New Guinea 2004.
Core	Access Improved Sanitation % Population	Palau 2007, 2009, 2013, Korea, Rep. 1995-96, 1999, Seychelles 1995, Jordan 1996, 2003, 2007, Grenada 2002, Tonga 1995, Samoa 1995, West Bank and Gaza 1995-96,Tuvalu 1996, Burundi 1998, 2013, Malawi 1998, Central African Republic 2013, Liberia 1996.
Right to Work		
Core	Not Absolutely Poor (> 3.10 2011 PPP$ per day)	Belarus 2004-6, Montenegro 2005, Jordan 2006, Mongolia 2010, 2012, Albania 2008, Paraguay 2013, Kosovo 2005, 2009, Bolivia 2004, 2008-9, 2013, Morocco 2000, Bhutan 2003, Honduras 1999, 2001, Mauritania 2000, 2008, Nicaragua 1998, Ghana 1998, 2005, Cambodia 2008, Kenya 2005, The Gambia 2003, Guinea 2012, Timor-Leste 2001, Togo 2011, Niger 2011, Central African Republic 2003, Malawi 2004.
High Income OECD	Not Long-term Unemployed (% unemployed)	Korea, Rep. 2004-6, 2009-12, Mexico 1998, 2001-2, 2004, Pakistan 1997-98, 2000, 2002, Costa Rica 1995, Timor-Leste 2010
High Income OECD	Not Relatively Poor (> 50% Median Income)	Finland 1995, 2000, Czech Republic 2002, 2004, Denmark 1995, Netherlands 2010, Luxembourg 1997, 2000, Hungary 1999, Poland 1995, 1999, China 2002.

Table A.3: 2017 SERF Index Update

Frontier Equations, Peak Indicator Values, Income level at Peak Indicator Value, Minimum Value

Right/Indicator	Frontier Equation	Peak Value (Xp)	Income Level at Xp (Yp)	Minimum Value
Right to Food				
% Not Stunted	Y = 100 – 31300/x for X<13608; else 97.7	97.7 (based on WHO definition that 2.3% population will be > 2 s.d below mean in healthy population)	$13608 (2011 PPP)	31% (Bangladesh in 1995)
% Not Low Birth Weight	Y = 97 – 5600/x	97%	Asymptotic	40% (Lao PDR 1991, 1994)
Right to Education				
PISA (Average mean of Math & Science)	Y = 600 – 1335000/x	600	Asymptotic	310 (Peru in 2000 = 312.5)
Gross Combined School Enrollment (Primary through University)	Y =72 + .003x - .00000008x^2 for x<17480; else=100	100	$17480 (2011 PPP)	0% (14% in Afghanistan in 2001)
Primary School Completion Rate	Y = 108 – 25000/x for x<3125; else=100	100	3125 (2011 PPP)	0% (10% Mali in 1990
Right to Health				
Age 65 Survival Rate	Y = 92 – 38000/x	92%	asymptotic	16% (Zimbabwe=16% in 2002)
% Child (Under 5) Survival Rate	Y = 100 – 6000/x	100%	asymptotic	68% (Niger in 1990)
Modern Contraceptive Use Rate	Y = 85 – 30000/x	85%	asymptotic	0% (South Sudan 1% in 2006)
Right to Housing				
Access Improved Water % Rural Population	Y = 105 – 29000/x if x<$5800; else=100%	100%	$5800 (2011 PPP)	0% (Cambodia and Mozambique in 1990)
Access Improved Sanitation % Population	Y = 105 – 47000/x for x<9400; else 100%	100%	$9400 (2011 PPP)	0% (3% Ethiopia in 1990)

Right/Indicator	Frontier Equation	Peak Value (Xp)	Income Level at Xp (Yp)	Minimum Value
Right to Work				
Not Long-term Unemployed (% unemployed)	Y = 100 – 22000/x	100%	Asymptotic	9% (Bosnia &Herzegovina 2012)
Not Relatively Poor (> 50% Median Income)	Y = 96 – 45000/x	96%	Asymptotic	70% (Peru 70% in 2004)
Not Absolutely Poor (> 3.10 2011 PPP$ per day)	Y = 108 – 60000/x for x < 7500; else = 100	100%	$7500 (2011 PPP)	0% (Congo, Dem. Rep 3% in 2004 using 2011 PPP$; Guinea 1% in 1991 using 2005 PPP$)

Figure A.1

Core Economic and Social Rights Fulfillment Index—SERF Index

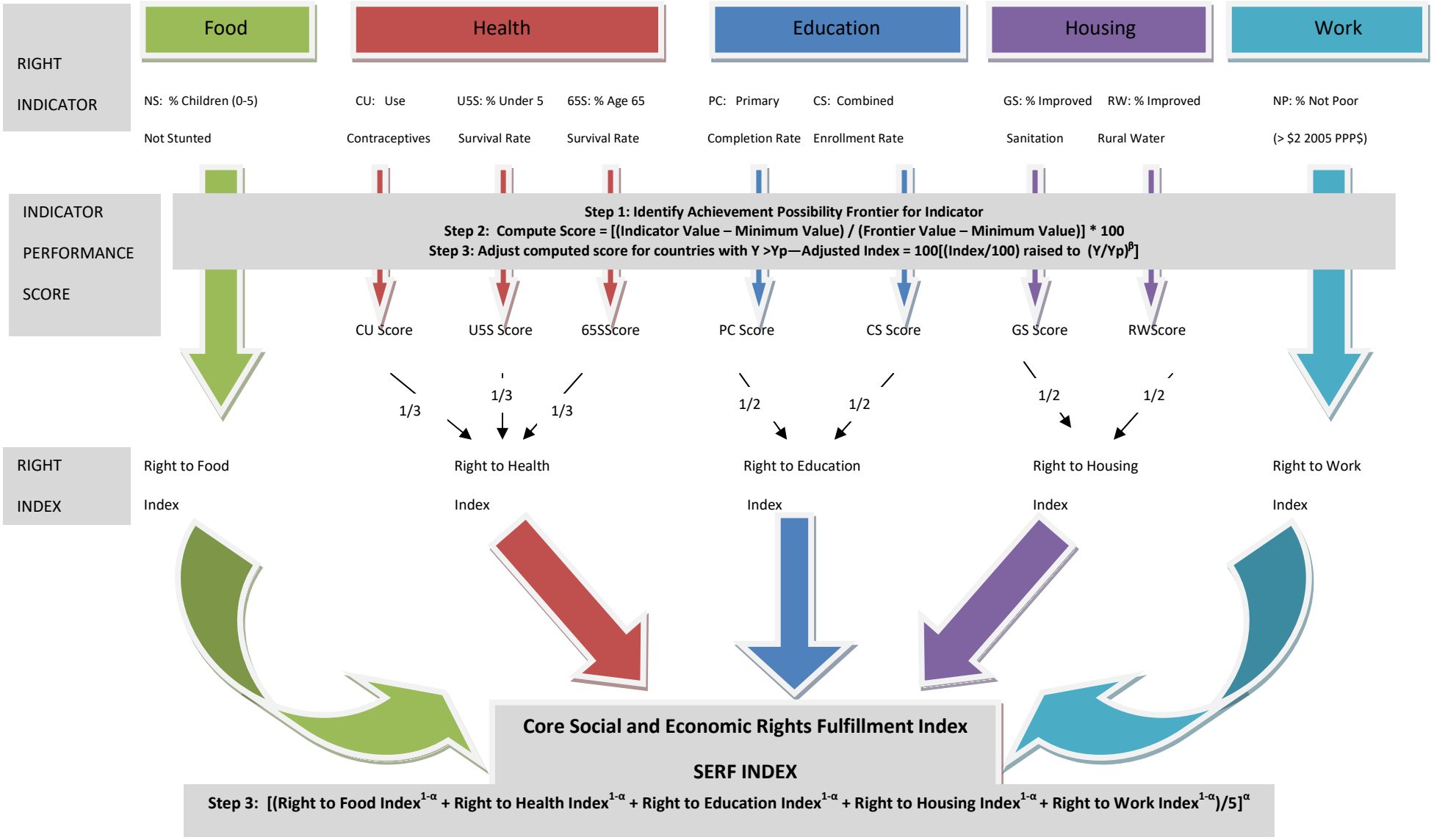

Figure 4.5 in Fukuda-Parr, Lawson-Remer and Randolph 2015

Figure A.2
Social and Economic Rights Fulfillment Index for High Income OECD Countries

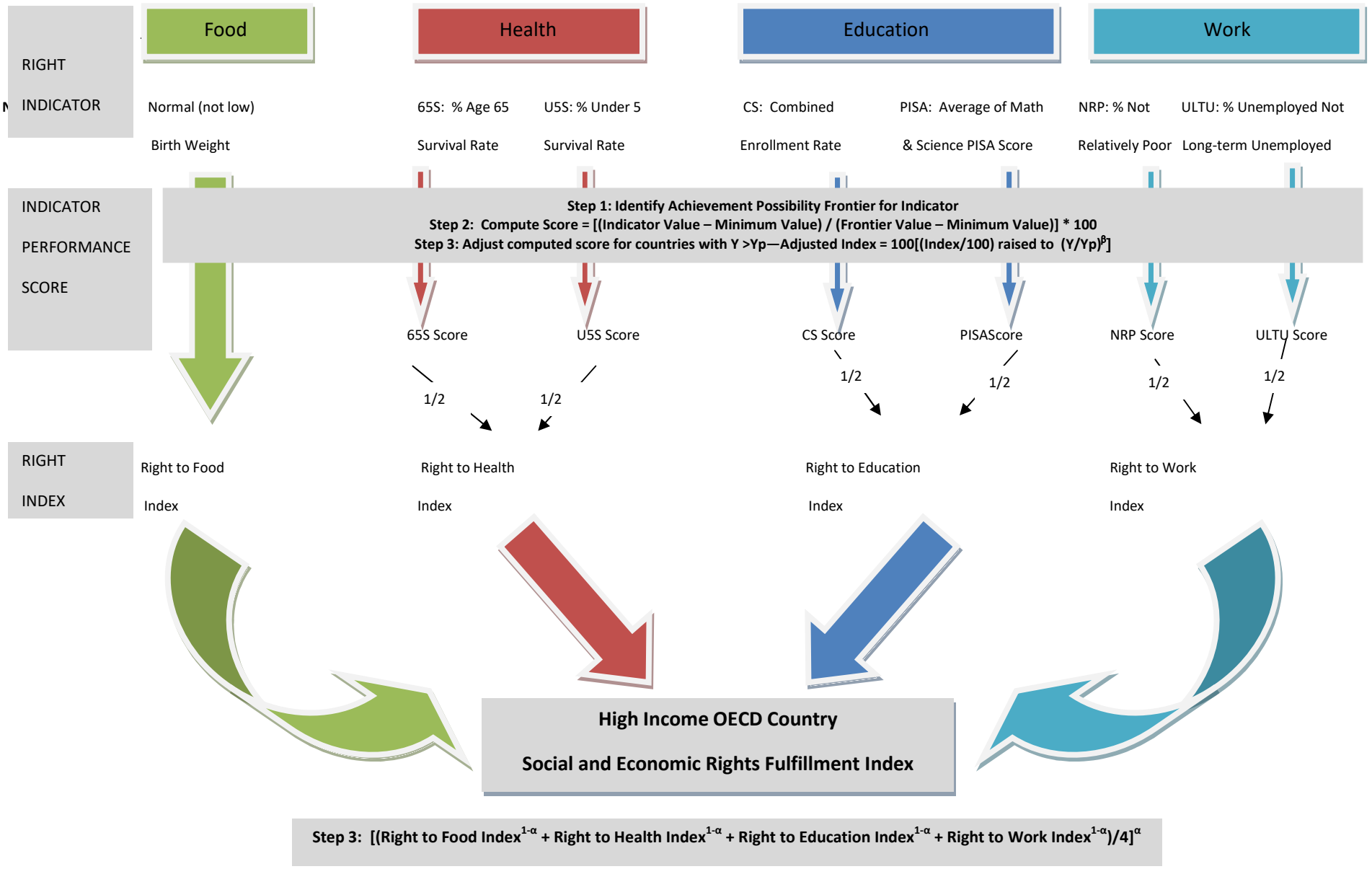

Figure 4.6 in Fukuda-Parr, Lawson-Remer and Randolph 2015