EDUCATION POLICY AND DATA CENTER

ACADEMY FOR EDUCATIONAL DEVELOPMENT

Thoughts on an Early Childhood Care and Education Index

EPDC No. 08-06

Summer 2008

Working Paper Series

Thoughts on an Early Childhood Care and Education Index [1]

The **Education Policy and Data Center (EPDC)** is a partnership of the United States Agency for International Development (USAID) and the Academy for Educational Development (AED). The mission of EPDC is to improve information and policies for education through better access and use of data and policy-oriented evaluation and research.

ABSTRACT

This study identifies options for development of an index of the well-being of young children, which could serve, among other purposes, to monitor the first Education for All Goal: "Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children". This paper explores 58 education and health related indicators for use in an early childhood index. To identify the best list of potential indicators the EPDC applies four selection criteria to the indicators: broad coverage by country and collection interval, relevance to early childhood well-being, distinctiveness from other indicators, and coverage of the broad understanding of early childhood well-being. The analysis reveals that there are but a small number of indicators that meet all of the first three criteria. Using these "ideal indicators" and using indicators that are meaningful and distinct but not well-covered, the study analyzes six possible early childhood indices.

[1] This report has been prepared by the Education Policy and Data Center (EPDC) staff, Karima Barrow, Elisabeth Sommerfelt and Annababette Wils, with statistical assistance provided by Elyse Levine. The first draft of this paper was prepared as one of a series of reports the EPDC provided as background for the 2008 EFA Global Monitoring Report. The EPDC team is grateful to the GMR team for excellent guidance and commentary and for the collegial spirit in which this work was conducted. However, the views presented in this report are those of the EPDC only and do not necessarily reflect those of the Global Monitoring Report or any other organization.

INTRODUCTION

Early childhood care and education is the first and one of the broader EFA goals. It is stated as:

> Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children.

The goal explicitly goes beyond education to include "care", but does not specify what kind of care.

The GMR in its 2002 report writes the following summary about ECCE:

> "The extent of early childhood care and education (ECCE) is still relatively uncharted territory. This is a highly diverse area of learning which lacks good comparative data and widely accepted indicators. It includes learning opportunities that range from formal pre-schools in the national education system, via kindergartens and other centers, where care, play and education go hand in hand, to more informal, often home based activities. Most national ECCE policies focus on expanding and improving access to pre-primary care and education for children aged three and over, based on the knowledge that the learning outcomes of primary education are improved when learning during early years of life precedes regular schooling." (GMR, 2002:18)

Within this context of a) heightened awareness of the importance of ECCE for children, b) a broad, unspecified definition, and c) an absence of good comprehensive data and accepted indicators, it would be useful to identify a small set of indicators that can be used for an ECCE index or indices. It is important that the index be composed of measures that are reproducible for many countries and over time.

The GMR team at UNESCO commissioned the EPDC to undertake a preliminary exploration of what indicators could be used in an index. This report presents: the results of that exploration, beginning with an overview and review of a wide selection of indicators related to ECCE; a selection of indicators by *relevance, coverage,* and *distinctiveness;* a short list of proposed indicators and the calculation of a number of indices with various combinations of those indicators. The report closes with recommendations for the ECCE indices.

STRUCTURE OF THE STUDY

The data for this study is the ECCE database at UNESCO (http://gmr.uis.unesco.org/). This database contains 54 ECCE indicators for up to 203 countries, for the year 2005 or the most recent year available. The availability of these data across countries and over years varies. The EPDC added four additional health-related indicators from UNICEF. Thus, in total 58 indicators were considered in this study.

To sort through this list the indicators are filtered with four *selection criteria*

1. *Coverage:* there is sufficient coverage across countries and over time.
2. *Relevance:* the indicator is meaningful/relevant to early childhood - it measures a real effect in children's lives;
3. *Distinctiveness:* the indicator is distinct - it is not so highly correlated with one of the other indicators in the index as to be duplicative;
4. *Broad understanding:* ECCE is a complex concept that includes health, survival, health care, home care, and schooling. The selected indicators should cover these different aspects.

As it turns out, only a few indicators meet all four criteria. These can be called "ideal indicators". Indicators that do not meet criteria 2 and 3 were dropped from consideration for the ECCE indices. But some indicators that meet criteria 2 and 3, but not necessarily 1, were considered to show whether additional coverage of these indicators would meaningfully add to

the understanding of ECCE and whether better coverage should be advocated.

The methodologies for selecting the indicators vary, depending on the criterion. The *coverage* of indicators is presented in Table 1, showing for how many countries there is data for an indicator, and the extent to which the indicator is reproduced annually, or at some other regular interval. Coverage is simply the ratio of actual observations of the indicator – for how many countries and for how many years the indicator is produced - compared to an optimal 100% of all countries and all years from 2000-2005. Higher coverage ratios are considered more desirable.

The *relevance* of the indicators was decided based on expert judgment. One of the authors of this report provided expert judgment based on decades-long experience working as a pediatrician with children in Africa and as a statistician with Macro International for the Demographic and Health Surveys (DHS). Some of the valuations have been corroborated with text from the 2007 GMR report on Early Childhood. Ultimately, even while based on long experience, this judgment is subjective. The study does as best as possible by being transparent and providing a description of how each of the indicators affects young children's lives and learning and why it is important.

The *distinctiveness* of the indicators is based on a statistical factor analysis. Factor analysis evaluates a group of indicators and shows which indicators are highly correlated to each other – these indicators are grouped together in clusters. For an index which seeks to differentiate countries with a mix of indicators, distinctiveness is important because if indicators are too highly correlated, the information they contain is redundant.

The *broad understanding* of ECCE means the indicators in an index should cover. One way to organize these aspects is in a hierarchy leading to better learning and attendance in primary and higher schooling. This hierarchy would tell us that 1) a child must survive to reach school age, 2) the child must be in good health, and 3) the child should have received good pre-school care. This last aspect can mean good home care as well as pre-school. In the ECCE index, each of these three aspects of early childhood – survival, health, schooling – should be represented.

Each of these criteria is dealt with in four consecutive sections, where the fourth section on *broad understanding* includes all of the foregoing information on *coverage*, *relevance* and *distinctiveness*. A tabulation of each of the 58 indicators considered, organized by the broad understanding of ECCE: survival, health, and care/schooling, as well as coverage, relevance, and distinctiveness enables a fairly objective (or at least: transparent) selection of a small number indicators that "best" represent early childhood well-being and could be used in an ECCE index.

COVERAGE

The 58 indicators used in the report vary in their availability across countries and over years. It is important for an index to have indicators that are widely covered and, preferably, reproduced regularly at short intervals, so progress can be tracked over time for a large number of countries.

Table 1. Indicators in the GMR Early Childhood Care and Education database, arranged by subject and with an indication of how many countries and years are covered.

			Coverage by collection interval			
	Number countries covered	Collection interval	5-year Estimates (2005)	Annual Data (2000-5)	Non-Annual (Average Coverage 1996-2005)	Collecting agency
Child Survival						
Infant mortality rate	193	annual		98+		UNICEF
Under five mortality rate	180	5-year	98+			UNICEF
Life expectancy at birth (years), total	180	5-year	89			UN/POPIN
Life expectancy at birth (years), male	180	5-year	89			UN/POPIN
Life expectancy at birth (years), female	180	5-year	89			UN/POPIN
Child Health						
Infants with low birth-weight	181	non-annual			15	UNICEF HH Surveys
% of births attended by skilled health professional	165	non-annual			12	UNICEF HH Surveys
% of children under five underweight (moderate and severe)	127	non-annual			6	UNICEF HH Surveys
% of children under five wasting (moderate and severe)	124	non-annual			6	UNICEF HH Surveys
% of children under five stunting (moderate and severe)	126	non-annual			6	UNICEF HH Surveys
% of children exclusively breast fed (< 6months)	129	non-annual			7	UNICEF HH Surveys
% of children breast fed w/ complementary foods (6-9 months)	111	non-annual			6	UNICEF HH Surveys
% of children still breast feeding (20-23 months)	111	non-annual			6	UNICEF HH Surveys
% of children immunized against tuberculosis (1 year olds)	157	annual		77*		WHO
% of children immunized against DPT (1 year olds)	192	annual		95*		WHO
% of children immunized against Polio (1 year olds)	193	annual		95*		WHO
% of children immunized against Measles (1 year olds)	193	annual		95*		WHO
% of children immunized against Hepatitis B (1 year olds)	156	annual		77*		WHO
% of households consuming iodized salt	110	non-annual			7	UNICEF HH Surveys
% of households with vitamin A supplements dose 1	69	non-annual			35	UNICEF HH Surveys
% of households with vitamin A supplements dose 2	42	non-annual			19	UNICEF HH Surveys
Care and Early Schooling						
Total fertility rate (children per woman)	180	5-year	89			UN/POPIN
Total population (000)	203	5-year	100			UN/POPIN
Average annual growth rate (% of total population)	203	5-year	100			UN/POPIN

+ Based on data from 2000, 2002, 2005 and 2006.

* In principle the indicator is available annually, but due to time constraints it was only possible to add one year of data to the database. This year is 2005 for all the countries marked except for female labor force participation, which is from 2004.

Table 1 Continued.

			Coverage by collection interval			
	Number countries covered	**Collection interval**	**5-year Estimates (2005)**	**Annual Data (2000-5)**	**Non-Annual (Average Coverage 1996-2005)**	**Collecting agency**
Care and Early Schooling						
Average annual growth rate (% of total population age 0-4)	180	5-year	89			UN/POPIN
Female labor force participation rate (age 15+)	179	annual		88*		ILO
Duration of paid maternity leave (weeks)	148	non-annual			24	ILO
Youngest age group targeted in early childhood programs	104	annual		51*		UIS
Enrollment in pre-primary education (total)	178	annual		79		UIS
% female enrollment in pre-primary education	170	annual		76		UIS
Enrollment in private institutions as % of pre-primary enrollment	149	annual		60		UIS
Pre-primary GER, total	175	annual		78		UIS
Pre-primary GER, male	169	annual		75		UIS
Pre-primary GER, female	169	annual		75		UIS
Pre-primary GER gender parity index (F/M)	169	annual		75		UIS
Pre-primary NER, total	143	annual		55		UIS
Pre-primary NER, male	134	annual		51		UIS
Pre-primary NER, female	134	annual		51		UIS
Pre-primary NER gender parity index (F/M)	134	annual		51		UIS
Total GER, Pre-primary and other ECCE programs	141	annual		70*		UIS
Male GER, Pre-primary and other ECCE programs	136	annual		67*		UIS
Female GER Pre-primary and other ECCE programs	136	annual		67*		UIS
Pre-primary and other ECCE programs GER gender parity index (F/M)	136	annual		67*		UIS
Pre-primary school life expectancy, total (years)	175	annual		75		UIS
Pre-primary school life expectancy, male (years)	170	annual		72		UIS
Pre-primary school life expectancy, female (years)	170	annual		72		UIS
% of new entrants to primary with ECCE experience, total	58	annual		18		UIS
% of new entrants to primary with ECCE experience, male	57	annual		18		UIS
% of new entrants to primary with ECCE experience, female	57	annual		18		UIS
Age of compulsory education	194	annual		94		UIS
Pre-primary total teaching staff	162	annual		68		UIS
% of female pre-primary teaching staff	156	annual		65		UIS
% Pre-primary trained teachers, total	69	annual		23		UIS
% Pre-primary trained teachers, male	45	annual		13		UIS
% Pre-primary trained teachers, female	67	annual		22		UIS
Pre-primary Pupil teacher ratio	162	annual		68		UIS
Official programs targeting children under age 3 (yes/no)	133	annual		66*		UIS
Age group of pre-primary education	203	annual		100*		UIS

Table 1 shows the 58 indicators used in this study. Fifty four of the indicators are from the GMR database (http://gmr.uis.unesco.org/), and four health indicators are taken from other sources - percent of births attended by a health care professional, percent of households consuming iodized salt, percent of under 5 children who received one annual vitamin A supplements (dose 1), and percent who received two doses of vitamin A supplements (dose 2)[2].

The indicators are arranged by the three categories of broad understanding: survival, health, and care/education. Within these categories, the indicators are arranged alphabetically. There are five indicators in the category *survival*: infant mortality, under-five mortality rates, and life-expectancy - total, male, and female. Sixteen (16) of the indicators are in the *health* category, and cover a range of issues such as physical growth, measured by stunting and weight; breastfeeding; vaccinations; and micro-nutrient supplementation. The *care/education* category contains 37 indicators. These range from approximations of how much care mothers can give to their children, measured by total fertility rate, population growth rate, maternity leave, female labor force participation; to measures of how many children participate in formal pre-school education; and the staffing of pre-schools.

The indicators come from a variety of sources and are collected at differing intervals. The table indicates the collection frequency. Some indicators are collected annually by large UN organizations, such as the pre-school enrolment rates and pre-school staffing (UIS), labor force participation (ILO), and immunization rates (WHO). Other indicators are estimated at 5-year intervals – these are the demographic indicators of mortality, life expectancy, fertility and population size and growth, produced by the UN Population Division. A third group of indicators is collected at non-regular intervals (non-annually) by household surveys. These include the weight and stunting measures and breastfeeding. The table shows at what interval each indicator is collected and provides the coverage by collection interval. An exceptional indicator is maternity leave, which is compiled by the ILO, but, because these laws change, is not compiled in a database where annual changes in provisions can be queried.

The coverage of the *survival* indicators is very high (89-98%), in particular, infant and under-five mortality, reported annually by UNICEF. The coverage values for the life expectancy indicators appear high, but this is somewhat misleading because the data are updated only every five years.

Health indicators collected from surveys, birth attendance, physical growth, and breastfeeding, are found for many countries (111-181 of the 203) but because the data are collected intermittently, the actual annual coverage is low, 6-15%, so it would be difficult to track rapid changes. On the other hand, immunization rates, collected by the WHO, are, where possible, updated annually. The coverage is 77-95% and there are 156-193 countries reported. Supplementation of vitamin A, also collected by UNICEF, is available for far fewer countries.

The coverage of a number of indirect *care* indicators for the availability of mother's time for children - the fertility rate and female labor force participation - are available for many countries, with high coverage (180 and 179 countries with 89 and 88% coverage, respectively). Arrangements for maternity leave are available for 148 countries, but, because the data is not stored in an annual database, the coverage is low – 24%. Maternity leave is regulated by laws and does not change in the same incremental way as the other ECCE indicators collected here, and so it may not matter that it is not collected annually. The coverage of *pre-school education* is almost entirely the domain of UIS. The variables relating to participation in pre-schooling are

[2] For more information on the database of Vitamin A supplements see the UNICERF webpage http://www.childinfo.org/vitamina_monitor.html (accessed July 18, 2008)

available on an annual basis for 57-178 countries, with coverage levels ranging from 13-100%. The higher coverage rates apply to more general indicators such as total enrolment and gross enrolment, while the lower coverage applies to more specific indicators such as net enrolment in pre-school programs. Significantly lower coverage rates are found for the indicators that relate pre-school education to primary school (the portion of primary entrants with pre-school experience), and also to the indicators relating to staffing of pre-school programs.

In summary, the highest coverage rates are found for:

- Demographic indicators on mortality and fertility
- Immunization indicators
- Higher-level pre-school indicators such as total or gross enrolment.

RELEVANCE

This section discusses the indicators' relevance to the well-being of young children, their survival, health, care, and education. The views expressed here are based the 2007 GMR report on Early Childhood and on expert judgment provided by one of the report authors, Elisabeth Sommerfelt, who spent many years in Africa working as a pediatrician and subsequently worked on the child and maternal health modules of the Demographic and Health Surveys. While the authors believe the views expressed here reflect wide agreement among the health community, they remain subjective. The goal in this section is to provide thoughtful reflection on the ECCE indicators for the readers and to be transparent about the process.

Child Survival Indicators and ECCE

A child's survival is the most basic requirement for early childhood care, and in some countries child survival is not nearly guaranteed. According to the 2008 GMR report, "Reducing infant and child mortality has long been a key public health priority. Vaccination campaigns have reduced child mortality considerably, yet more than 10 million children aged 5 or under still die every year." (GMR, 2007: 110)

There are two child survival indicators: the infant mortality rate and the under-five, or child, mortality rate. The infant mortality rate is the number of deaths in the first year of life per 1000 live births; the under-five mortality is the number of deaths in the first five years per 1000 live births. Five- year estimates for both are available for 180 countries from the United Nations World Population Prospects database and at intermittent intervals from household surveys. The WHO website compiles household survey data and yearly estimates for some countries.

In particular under-five mortality can be considered highly relevant to early childhood care and education because it provides information on the number of children alive who will have the opportunity to be exposed to education.

Child Health Indicators and ECCE

These indicators cover measurements of the birth circumstances, nutrition, supplements of vitamins and minerals, breastfeeding, immunizations, characteristics of women/mothers, and demographic characteristics.

Circumstances at birth

Early childhood health starts at childbirth. The indicators of birth circumstances are percentage of children with low birth-weight and proportion of births attended by a skilled health care professional. Access to appropriate care during delivery and in the neonatal period can be important for later development and ability to learn. The percent of infants with low birth weight is highly relevant to child health as an indicator of intra-uterine nutrition, growth retardation, mortality, and overall health.

Nutrition

"Under-nutrition has a negative impact on cognitive development, including language skills, both in the short term and until adolescence or adulthood; on motor development; and on socio-emotional development." (GMR, 2007: 110) There are three basic indicators considered that measure under-nutrition: % of children under five underweight, % of children under five with wasting, and % of children under five with stunting. The patterns of under-nutrition differ by world region and by country such that one measure may be more relevant depending on the country or region. For example, in South Asia (e.g. Bangladesh, India, and Nepal), children tend to be both short for their age (being stunted or having low height-for-age) and thin (being wasted or having low weight-for-height). In such countries, the prevalence of being underweight (having low weight-for-age)—which is influenced both by stunting and by wasting—tends to be at least as high as the prevalence of stunting. In contrast, in most Latin American countries, where wasting is generally not seen, stunting levels tend to be much higher than the prevalence of being underweight.

The measures of under-nutrition that are particularly relevant to overall development, school participation, and achievement are: weight at birth and being moderately to severely underweight. The percent of stunting, moderate and severe, is also important as a comprehensive measure of nutrition, much like being underweight.

Micro-nutrient deficiencies

Vitamin A supplementation and the percent of households consuming iodized salt are two micro-nutrient indicators. A deficiency in Vitamin A is the leading cause of preventable childhood blindness. According to UNICEF, vitamin A deficient children face a 23% greater risk of dying from ailments such as measles, diarrhea, or malaria.

Consumption of iodine in salt is also an indicator of child health in particular with regards to learning. Iodine deficiency is the most common cause of preventable brain damage. Intrauterine iodine deficiency causes permanent damage and results in decreased intellectual capacity. The percent of households consuming iodized salt is a highly relevant indicator of early childhood well-being. While many countries do not have data available, a severe iodine deficiency is the most common cause of preventable brain damage and causes still births and increased mortality.

Breastfeeding

Breastfeeding is important to child health because breast milk provides infants with essential nutrients, hormones, antioxidants, and antibodies. According to UNICEF, "Immediate and exclusive breastfeeding is the best source of nutrition for a child, providing physical warmth and strengthening immune systems." (UNICEF, 2008:11). Recommended breastfeeding practices are exclusive breastfeeding up to 6 months, breastfeeding with complementary foods during 6-9 months, and continued breastfeeding for up to 2 years with complementary foods. These three practices are measured by the following indicators: % of children exclusively breastfed (less than 6 months), % of children breastfed with complementary foods (6-9 months), and % of children still breast feeding (20-23 months).

Both breastfeeding measures (percent exclusively breastfed under 6 months and percent breastfed with complementary foods 6-9 months) are highly relevant to early childhood well-being. A composite indicator by the WHO such as the infant and young child feeding composite indicator (IYCF), taking into account breast-feeding, the number of times a child is fed, and the diversity of the diet, would be preferable. However, in the absence of composite indicators with more details, both breast-feeding indicators are critical.

Immunizations

Immunizations help children to survive, but also prevent periods of and permanent disability due to diseases. BCG is a vaccine given to reduce

the likelihood of contracting tuberculosis. This injection is usually given soon after birth; among the indicators included in the study, this might suggest also contact with health services around the time of delivery or in the neonatal period. The measles vaccine is important because measles is a devastating disease that places children at increased risk of dying, and of developing serious complications such as pneumonia or diarrhea, and of becoming under-nourished with the ensuing risk of decreased learning capacity. DPT refers to the combined diphtheria, pertussis, and tetanus vaccine. The polio vaccine prevents children from being paralyzed or incapacitated by polio. The hepatitis B vaccine protects children from a viral infection that causes inflammation of the liver.

The indicators considered most relevant to ECCE are: immunization against tuberculosis and measles. Immunization against measles prevents child death and serious illness which affects the mortality and nutritional status of children. It also provides some indication of the degree of functioning of the health care system. Similarly, immunization against tuberculosis reflects the quality of the health care system and, because it is administered at birth in developing countries, it is also an indicator of whether children will have a chance to receive an education.

Early Childhood Education

Characteristics of women/mothers

The indicators on early childhood education include the female labor participation rate and the duration of paid maternity leave. These are important indicators of women's economic power, gender dynamics in the family, women's education level, but also indicate the time mothers have available to take better care of infants after birth.

One demographic factor - total fertility rate - can be considered important to early childhood, because it indicates how many siblings and therewith competition for parental resources each young child faces. High fertility rates are also associated with lower health outcomes for mothers and infants.

The total fertility rate has been highlighted as the most relevant population/fertility indicator because it is related to infant health and also reflects the number of children competing for resources and attention in the family. On the other hand, it is an indirect measure of family care, and excludes important factors such as home care by close relatives.

Early childhood programs

Early childhood education is covered by many indicators - GER and NER in pre-primary, GER in pre-primary plus other ECCE programs, pre-primary school-expectancy, and the percentage of first graders with ECCE program experience. In addition, the list of indicators includes the gender parity index for those five indicators, the age range of compulsory education, the age of targeted early childhood programs, percent of private enrollment, pre-primary teaching staff, trained teaching, and pre-primary pupil teacher ratio.

Early childhood education is important because it prepares children for participation in all later levels of schooling. Early childhood programs can "enhance physical well-being and motor development, social and emotional development, language development, and basic cognitive skills. ECCE programs can improve school readiness; make enrollment in the first grade of primary school more likely; reduce delayed enrollment, dropout, and grade repetition; and increase completion and achievement."(GMR, 2007: 111).

Of the pre-school program indicators, the pre-primary life expectancy/entrants and pre-primary gross enrollment rates have been rated as the most relevant, although the portion of children entering first grade with pre-primary experience is also important. Total pre-primary school life expectancy has been prioritized above new entrants with ECCE experience because data for more countries is available for pre-primary life expectancy. The total gross

enrollment rate an overall measure of participation in early childhood education programs has the highest coverage of all of the pre-primary enrollment indicators.

DISTINCTIVENESS

Within an index, each indicator ideally contributes somewhat differently to the country's rating. Indicators that are highly correlated contribute to the country's rating in the same way, and to that extent, are redundant. To sort out the correlation between indicators, a factor analysis of the indicators was conducted using SPSS. This exercise also reduces the number of indicators that remain to be considered for the index, thus simplifying the task of selecting indicators.

Because of the large number of indicators and points, indicators are split into two groups – those related to schooling and non-schooling indicators (health, survival, demographics.) The analysis uses a principal factor method of extraction and quartimax rotation to optimize distinctions between the variables[3]. The results of the analysis identify 6 clusters of non-schooling variables and 3 clusters of schooling variables that explain the majority of the variance of all variables. Table 2 below shows the clusters of indicators and the factor correlation scores.

It turns out that, not entirely surprisingly, the indicators are clustered more or less by topic, and the clusters can be named by content. This is useful, because it means that ultimately, even if only one indicator were selected from each cluster, there would still be coverage of a broad range of topics with distinct influence on the ECCE indices.

[3] For the purpose of this exercise, variables were not tested or transformed to achieve multivariate normality, which is an assumption for factor analysis. Further, it was assumed that data accessed from multiple agencies were weighted or otherwise transformed using compatible methods.

The clusters are:

Cluster 1: mortality rates and life expectancy (with the expected inverse correlation of life expectancy and mortality). The factor correlations of infant mortality and under-five mortality are relatively high, 0.73 and 0.81.

Cluster 2: Nutrition with birth weight, stunting, breastfeeding, plus two non-nutrition indicators, immunization against Hepatitis and total population. The factor correlations of the nutrition indicators are 0.64 to 0.80, somewhat lower than those of mortality.

Cluster 3: Demographic indicators, fertility and population growth (this clustering implies that fertility is a more powerful driver of population growth than mortality).

Cluster 4: Immunization with four immunization variables – tuberculosis, DPT, Polio, measles. This clustering indicates that children who receive one form of immunization are more likely to receive other immunizations as well – implying that immunization is an indirect indicator of access to the country's health system as well as a direct indicator of child health.

Cluster 5: Stunting and iodine and vitamin A supplements. Unexpected is the positive correlation between the use of iodized salt and stunting – perhaps this is a selection factor (countries with higher stunting have more iodized salt programs).

Cluster 6: Breastfeeding. Interestingly, breastfeeding is not necessarily correlated with stunting or wasting.

Cluster 7. Pre-primary school life expectancy and first graders with pre-school experience.

Cluster 8. Pre-primary enrolment rates are all highly correlated – net, gross, including pre-primary only or a broader range of ECCE programs, and regardless of gender.

Cluster 9. Gender parity indices are all three more highly correlated than any other clusters.

Table 2. Factor Analysis Cluster Groups and Factor Correlation Scores.

Clusters	Indicator	Factor Correlation
Cluster 1: Mortality/Life Expectancy	Infant mortality rate	0.734
	Under-5 mortality rate	0.807
	Life expectancy, total	-0.952
	Life expectancy, male	-0.947
	Life expectancy, female	-0.947
Cluster 2: Nutrition	Infants with low birth weight	0.796
	Underweight, moderate and severe	0.693
	Wasting, moderate and severe	0.638
	Still breast feeding, 20-23 months	0.671
	Immunization against Hepatitis B	-0.611
	Total population	0.822
Cluster 3: Population and Fertility	Total fertility rate	0.77
	Average annual growth rate	0.97
	Average annual growth rate, 0-4	0.892
Cluster 4: Immunization	Immunization against tuberculosis	0.778
	Immunization against DPT	0.651
	Immunization against Polio	0.663
	Immunization against measles	0.694
Cluster 5: Nutrition Supplements/Deficiencies	Stunting, moderate and severe	-0.616
	Iodized salt	-0.745
	Vitamin A dose 1	0.858
	Vitamin A dose 2	0.516
Cluster 6: Breastfeeding	Exclusively breast-fed, less than 6 months	0.954
	Breast-fed with complementary food, 6-9 months	0.794
Cluster 7: Pre-Primary Life Expectancy/ Entrants	Pre-primary life expectancy, total	0.729
	Pre-primary life expectancy, male	0.696
	Pre-primary life expectancy, female	0.757
	New entrants to primary with ECCE experience, total	0.809
	New entrants to primary with ECCE experience, male	0.815
	New entrants to primary with ECCE experience, female	0.8
Cluster 8: Pre-Primary Enrollment Rates	Pre-primary GER, total	0.705
	Pre-primary GER, male	0.698
	Pre-primary GER, female	0.709
	Pre-primary NER, total	0.662
	Pre-primary NER, male	0.665
	Pre-primary NER, female	0.658
	Pre-primary and ECCE programs GER, total	0.696
	Pre-primary and ECCE programs GER, male	0.689
	Pre-primary and ECCE programs GER, female	0.699
Cluster 9: Gender in Pre-Primary Schooling	Total female pre-primary enrollment	-0.876
	GPI, pre-primary GER	-0.934
	GPI, pre-primary NER	-0.916

COMBINED CRITERIA OF RELEVANCE, DISTINCTIVENESS, COVERAGE, AND BROAD UNDERSTANDING

It is now possible to define each indicator along the four criteria for inclusion in an ECCE index or analysis: relevance, distinctiveness, coverage, and broad understanding. Table 3 (page 13) shows the ECCE indicators along these four selection criteria.

The indicators are organized by distinctiveness (cluster), as distinctiveness is the least ambivalent criterion for selection: only one indicator from each cluster needs to be selected for the ECCE index. The first column in the table shows the indicator names; the second the cluster names. The third designates the indicator's relevance: High, Medium, and Low. Again, these are subjective measures and other experts may make alternative assessments. The fourth column provides the % coverage. The fifth column shows which of the three aspects of the broad understanding of ECCE the indicator belongs to: survival, health, and care/education. The optimal indicators are relevant, have high coverage, and are distinct (is one out of a cluster). The indicators that meet these three criteria are marked in bold letters.

It turns out that optimal indicators are found in six of the nine clusters. The remaining three clusters do contain highly relevant indicators, but with low coverage. Only the immunization cluster contains two optimal indicators. In the summary box below, the list of seven optimal indicators is organized along the three aspects of ECCE - survival, health, and care/education.

There is also a group of indicators that are *highly meaningful and distinct*, but with low coverage. These are: percent of infants with low birth weight, percent of underweight moderate and severe, percent of stunting moderate and severe, percent of households consuming iodized salt, percent exclusively breast fed (less than 6 months), percent breast-fed with complementary foods (6-9 months).

Box 1. Summary list of optimal ECCE indicators

By these definitions, the **optimal indicators,** covering three aspects of ECCE are:

1. Child survival – under-five mortality rate.
2. Child health –percent of children immunized against tuberculosis, and percent of children immunized against measles.
3. Child care/education – total fertility rate, pre-primary life expectancy, pre-primary GER, and GPI for pre-primary GER.

Table 3. ECCE indicators along three criteria for selection: meaningful, distinct, and covered. (Highlighted indicators are the 11 high relevance indicators)

Indicators	Distinctiveness – Cluster name	Relevance	Coverage	Broad understanding
Infant mortality rate	Mortality/Life Expectancy	Medium	89	Survival
Under-5 mortality rate		High	89	Survival
Life expectancy, total		Medium	89	Health
Life expectancy, male		Low	89	Health
Life expectancy, female		Low	89	Health
Infants with low birth weight	Nutrition	High	15	Health
Underweight, moderate and severe		High	6	Health
Wasting, moderate and severe		Medium	6	Health
Still breast feeding, 20-23 months		Low	6	Health
Immunization against Hepatitis B		Low	77	Health
Total population		Low	100	Health
Total fertility rate	Population and Fertility	High	89	Health
Average annual growth rate		Low	100	Health
Average annual growth rate, 0-4		Low	89	Health
Immunization against tuberculosis	Immunization	High	77	Health
Immunization against DPT		Medium	95	Health
Immunization against Polio		Medium	95	Health
Immunization against measles		High	95	Health
Stunting, moderate and severe	Nutrition Supplements/ Deficiencies	High	6	Health
Iodized salt		High	7	Health
Vitamin A dose 1		Medium	35	Health
Vitamin A dose 2		Medium	19	Health
Exclusively breast-fed, less than 6 months	Breastfeeding	High	7	Health
Breast-fed with complementary food, 6-9 months		High	6	Health
Pre-primary life expectancy, total	Pre-Primary Life Expectancy Entrants	High	75	Education
Pre-primary life expectancy, male		Medium	72	Education
Pre-primary life expectancy, female		Medium	72	Education
New entrants to primary with ECCE experience, total		Low	18	Education
New entrants to primary with ECCE experience, male		Low	18	Education
New entrants to primary with ECCE experience, female		Low	18	Education
Pre-primary GER, total	Pre-Primary Enrollment Rates	High	78	Education
Pre-primary GER, male		Medium	75	Education
Pre-primary GER, female		Medium	75	Education
Pre-primary NER, total		Medium	55	Education
Pre-primary NER, male		Medium	51	Education
Pre-primary NER, female		Medium	51	Education
Pre-primary and ECCE programs GER, total		Low	70	Education
Pre-primary and ECCE programs GER, male		Low	67	Education
Pre-primary and ECCE programs GER, female		Low	67	Education
Total female pre-primary enrollment	Gender in Pre-Primary Schooling	Low	79	Education
GPI, pre-primary GER		High	75	Education
GPI, pre-primary NER		Medium	51	Education

TESTING OF POSSIBLE ECCE INDICES

This section produces multiple hypothetical indices using the selected indicators. This exercise is preliminary and not meant to be an exhaustive guide to what indices could be calculated. The exemplary indices provide some indication of the variation that might be expected with different combinations of indicators.

One *base index* is constructed using five optimal indicators. It is not necessarily proposed as the most ideal index, but it is useful to have one basic composition of indicators, and to test what effect variations have on the values. Ultimately, a different index than the base may be chosen as the ideal or best index to use.

Two variations on this base index are constructed using two alternative best indicators. Another set of three variations adds indicators that have low coverage but are meaningful and distinct. Although smaller combinations of indicators could be used, and may ultimately be more ideal, these combinations all consist of 5-6 indicators in each index. Each index is constructed using information about survival, health, and pre-primary schooling/care.

To make the values comparable within an index, all the data is normalized to a scale of 0 to 100, where 100 is the highest possible score. Also some indicators were transformed so that the highest score would reflect better early childhood well-being outcomes (for example, mortality rates). The normalization and transformation for each index is described in the Annex. An index for a country is calculated if at least two of the indicators are available. Table 4shows the indicators within each of the six indices calculated. The values for the six indices are shown in Table 5 in the Annex.

Base Index

The Base Index (Index 1) is comprised of the five indicators: under-five mortality, percent of children immunized against measles, total fertility rate, pre-primary GER, and GPI of pre-primary GER. It includes aspects of survival (mortality), health (immunization), home care (fertility), pre-school (pre-primary GER), and gender equity (GPI). The index is shown in Figure 1 (page 16) in two panels, one for Latin America; the second for countries in Africa. The index values are shown in blue dots. The rankings of the countries, according to the full base index, are about where one would expect. In Latin America, Cuba and Aruba rank very high, while Haiti ranks lowest. In Africa, the highest ranking countries are Mauritius and South Africa, while the lowest scores are found in Chad, Angola, and Niger. In general the range of values is lower in Latin America than in Africa.

The figure also shows five variations of the Base Index, each of which has one indicator removed, to gain an understanding of how each indicator influences the index. The values for all six indexes can be found in Table 6 in the Annex. On average there are only small differences between the base index and the five variants that exclude one of the indicators:

- *Variation 1* (excludes under-five mortality) results in almost no difference to the base index, close to one percentage point. For the remaining indices, removing indicators has a greater effect.
- *Variation 2* (excluding immunization against measles) results in a lower index by an average of three percentage points.
- *Variation 3* (excluding total fertility) raises the index on average by four percentage points.
- *Variation 4* (excluding pre-primary GER) raises the index on average by three percentage points.
- *Variation 5* (excluding GPI of pre-primary GER) comes in lower than the base index, on average by six percentage points.

Based on the analysis of the five alternative indices, excluding GPI of pre-primary GER has the largest impact on the base index. Excluding immunization against measles, total fertility, and pre-primary GER has an effect of a similar magnitude while under-five mortality makes little difference. The variability caused by each individual indicator is higher in Sub-Saharan Africa than it is in Latin America. The addition or removal of any particular indicator would result in some shifts in the ranking of particular countries (for example, removing the immunization would shift Guinea-Bissau, Liberia, and Rwanda to a lower rank among African countries).

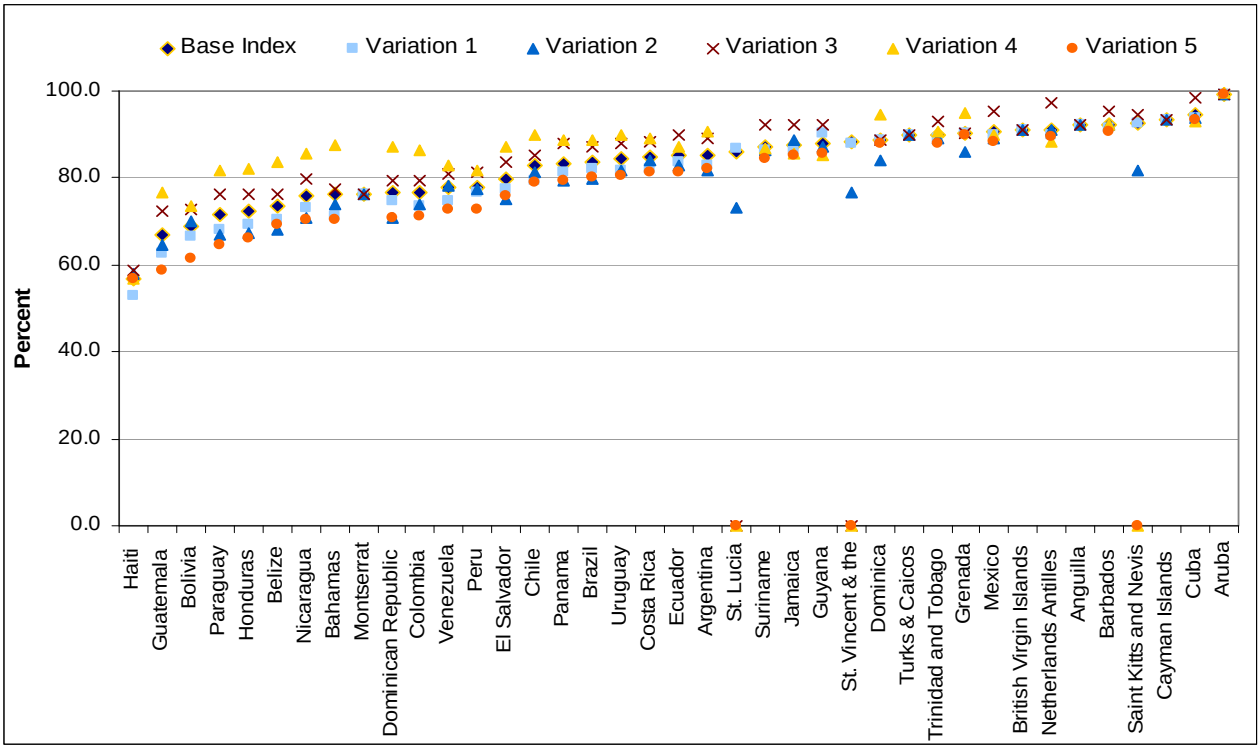
The effects of the variations were similar in other regions – Asia and Eastern Europe (not shown).

Table 4. Selected indicators for six tested ECCE indices.

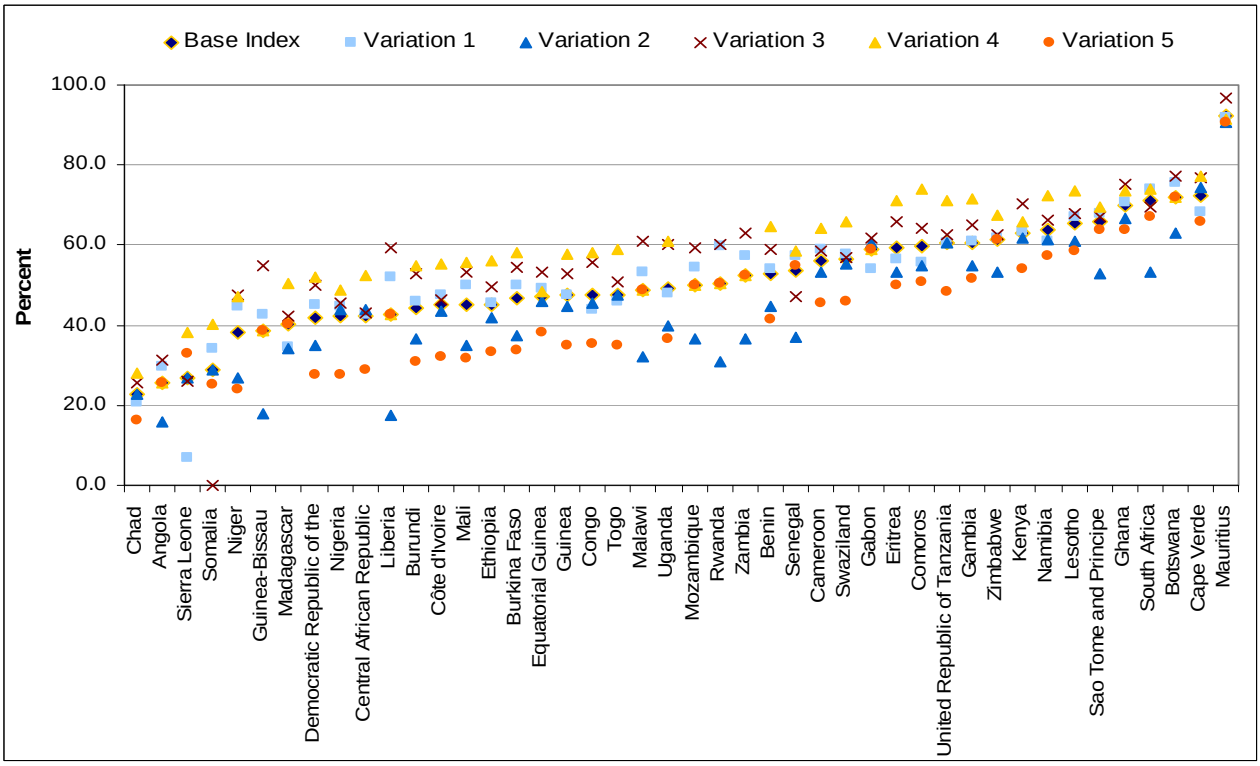
Base Index		**Alternatives on Base Index using b indicators**		**Alternatives on Base Index adding relevance but low coverage indicators**	
Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Under-five mortality	Under-five mortality	Under-five mortality	Under-five mortality	Under-five mortality	Under-five mortality
Percent of children immunized against measles	***Percent of children immunized against tuberculosis***	Percent of children immunized against measles	Percent of children immunized against measles	Percent of children immunized against measles	Percent of children immunized against measles
Total fertility rate	Total fertility rate	Total fertility rate	Total fertility rate	Total fertility rate	Total fertility rate
Pre-primary GER	Pre-primary GER	Pre-primary GER	Pre-primary GER	Pre-primary GER	Pre-primary GER
GPI of pre-primary GER	GPI of pre-primary GER	***Pre-primary school life expectancy***	GPI of pre-primary GER	GPI of pre-primary GER	GPI of pre-primary GER
			Percent of households consuming iodized salt	***Percent underweight, moderate & severe***	***Percent breast-fed with complementary food, 6-9 months***

Figure 1. ECCE Base Index and five variations for countries by region.

Latin America



Africa



Alternative Indices Using Different Indicators – Base index (1) Compared to Indices 2 & 3

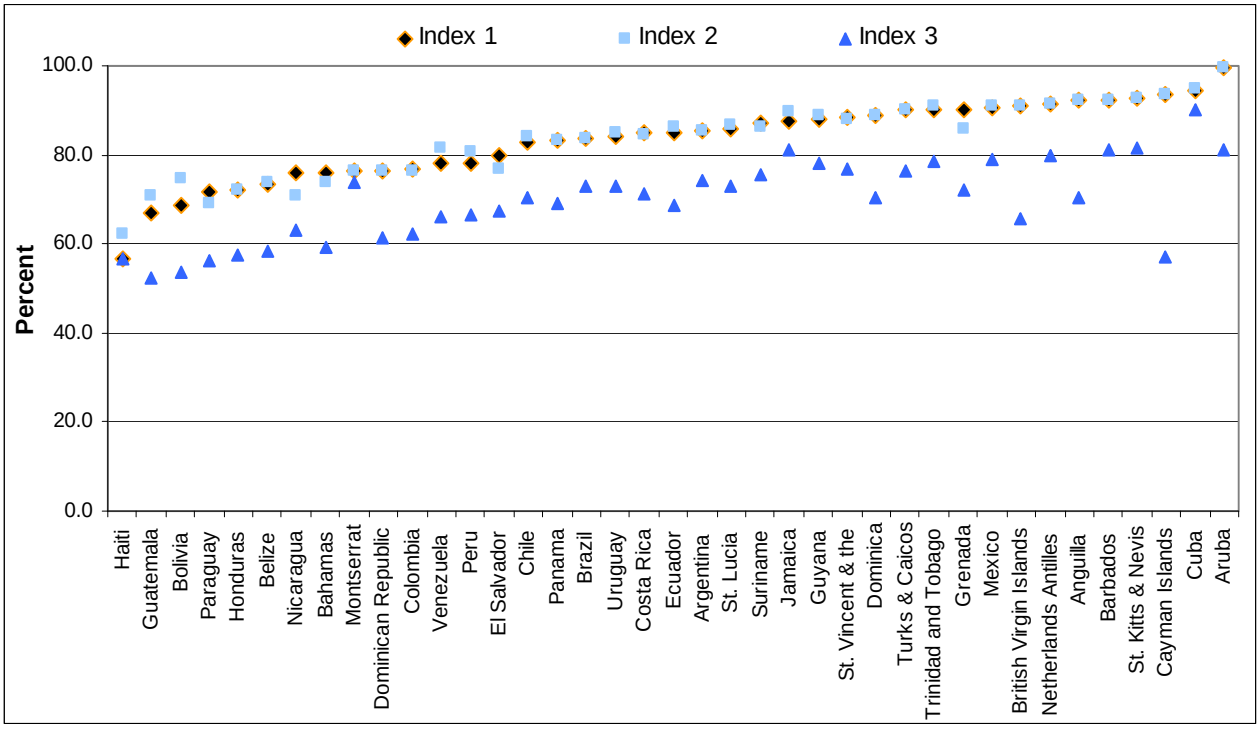
Two alternatives to the Base Index use two different best indicators. Figure 2 (page 18) shows the values of these alternative indices compared to the Base Index.

Index 2. Replacing immunization against measles with immunization against tuberculosis. Overall, the Base Index (Index 1) scores are very close to Index 2, in which the vaccination for measles is replaced with the vaccination against tuberculosis. . Index 1 ranges from 23% to 99% while Index 2 ranges from 7% to 99%. Of the twenty-five lowest scoring countries, Index 2 has twenty-two countries that are the same as Index 1 and 20 out of the 25 highest scoring countries are the same. In Index 2, using percent of children immunized against tuberculosis instead of percent immunized against measles has little effect on the index scores.

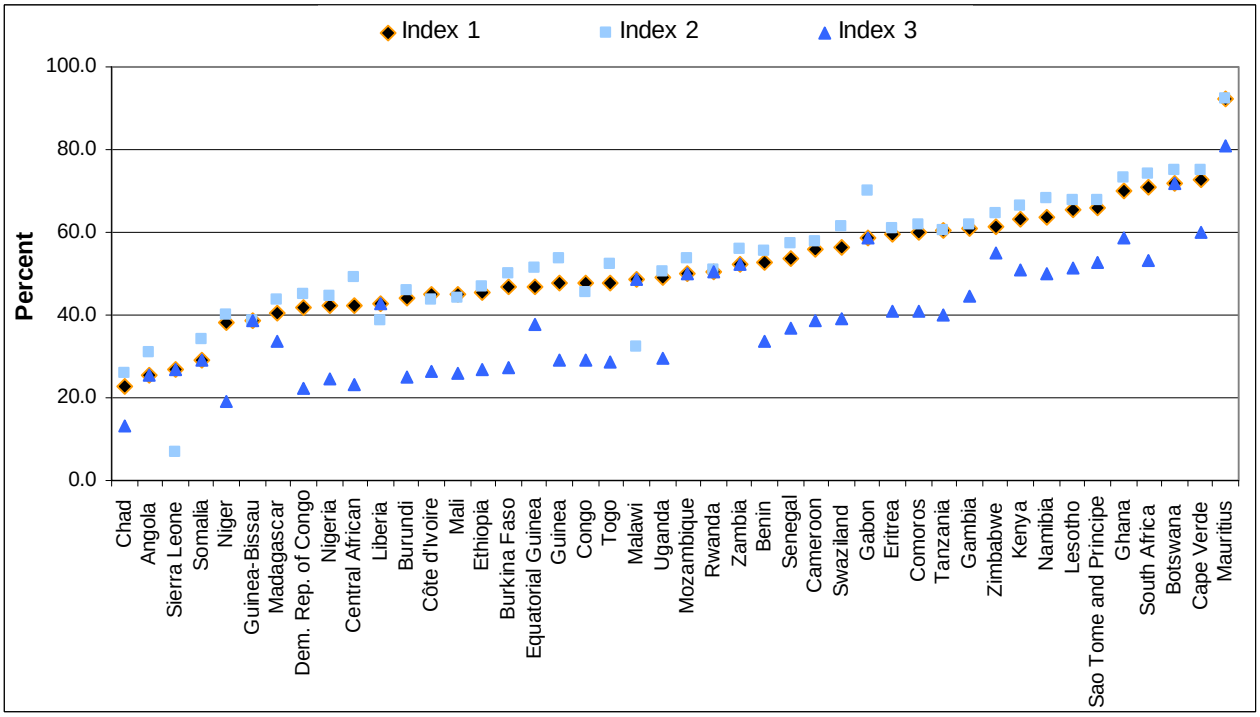
Index 3: Replacing GPI of pre-primary GER with pre-primary school life-expectancy. Changing one of the pre-school indicators from gender parity at pre-primary to pre-primary school life-expectancy (Index 3) makes a bigger difference both to the level of the index values and the ranking of countries. The Index 3 scores range from 13 to 95. At the lower end, 21 out of the 25 lowest-ranking countries are the same using Index 1 and Index 3. There is less similarity at the top end of the scale between Index 1 and Index 3 - only 13 countries are the same. One reason for the differences is that the values for school life-expectancy are low for most countries, and not available for many. For those countries where the indicator is available, the Index 3 value is pulled down; whereas for those countries where it is missing, the Index value is artificially high. This could be remedied by excluding those countries which do not have all of the indicators necessary to Index 3, but that would reduce the number of countries for which the Index could be calculated compared to Index 1.

Figure 2. ECCE Base Index (Index 1) and two alternative indices for countries by region.

Latin America & the Caribbean



Africa



ECCE Indices Including Meaningful, Distinct, but Not Well-Covered Indicators

Three alternative ECCE indices were explored by adding one of the meaningful, distinct, but not well-covered indices to the Base Index. These three indices were only calculated for countries where those indicators are available. The three indicators added are: percent of households consuming iodized salt, percent underweight moderate and severe, and percent breast-fed with complementary food, 6-9 months. These indicators are collected in household surveys, but not on an annual basis by an international body. Figure 3 (page 20) shows the values of the Base Index (Index 1) compared to these three alternatives.

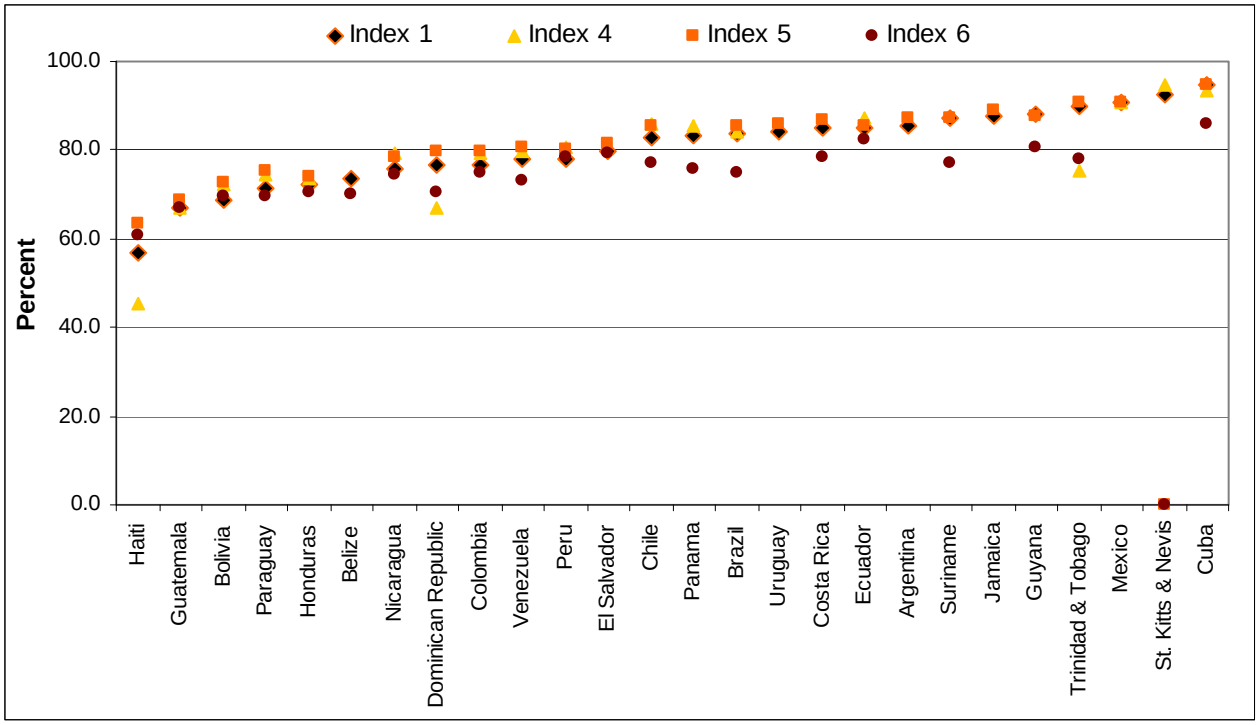
Index 4. Base Index plus iodized salt consumption
Adding the percent of households consuming iodized salt does not appear to contribute significantly to the index. The average difference between Index 1 and 4 across all countries available is a decrease of less than one percentage point. The results of including this new indicator are mixed- for 57 countries it raises the index score and for 52 countries it lowers the score. There is very little difference in terms of country rankings. Out of the lowest 25 scoring countries, 20 are the same. The same is true for the highest scoring countries, 20 out of 25 are the same.

Index 5. Base Index plus percent underweight
Including percent underweight, moderate and severe, increases the scores of the majority of countries. On average, the score increases by 3 percentage points, but more importantly, the ranking of the countries is not much affected by adding this score. On country ratings, Index 4 varies only slightly from the Base Index. Out of the lowest ranking 25 countries, 23 are the same, and out of the 25 highest ranking countries, 22 are the same. This pattern is evident in the figure for Sub-Saharan Africa, while for Latin America & the Caribbean Index 1 is extremely close to Index 5.

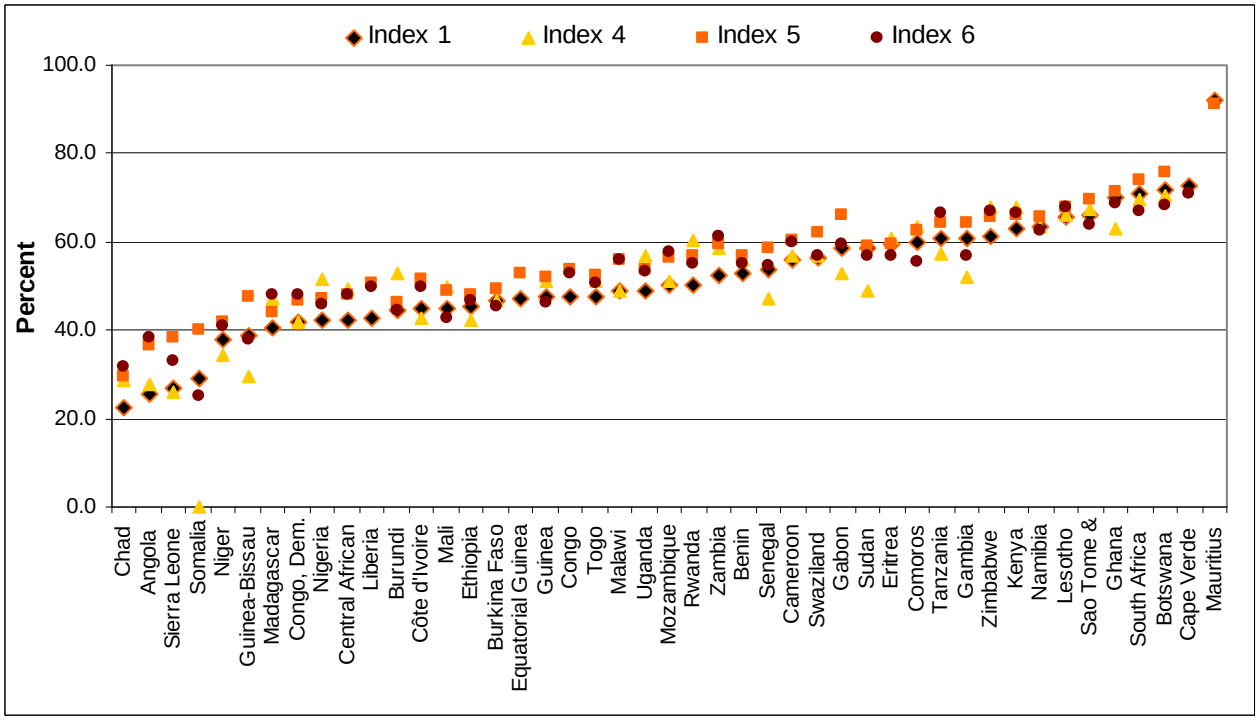
Index 6. Base Index plus breastfeeding
Much like Index 4, the results of adding percent breast feeding with complementary foods (6-9 months) are mixed. For 45 countries it increases the score, and for 66 countries it decreases the score in comparison to the Base Index. On average, the new indicator causes a decrease by one percentage point. The effects on country rankings are small. Of the 25 lowest scoring countries, 23 are the same, and of the highest 25, 19 are the same.

Figure 3. Base ECCE Index with three variations that add indicators covered by household surveys.

Latin America & the Caribbean



Sub-Saharan Africa



CONCLUSIONS AND RECOMMENDATIONS

The EPDC's exploration of early childhood well-being indices reveals that they are all similar in terms of the overall results for countries. The country ranking does not change significantly when comparing the Base index (index 1) and its variations, to Index 2 or Index 1 to 4-6. The exception is Index 3 (replacing gross pre-primary enrolment with pre-primary school life expectancy) because the values are consistently lower than index 1 and the value is missing for many countries. Indices 4-6, which each have one additional low-coverage household survey indicator from household surveys added, also are not much different from Index 1.

From this analysis, it appears that the value of an ECCE index and the ranking of the countries is fairly robust, regardless of what mix of indicators is used. We base this conclusion on an analysis of a set of different indices using indicators from clusters of correlated measures. Adding or removing any one of five optimal indicators that we tested only marginally affects the level of the index scores and the ranking of countries. The ECCE indices we tested are not measurably influenced by, for example, including vaccination against measles instead of vaccination against tuberculosis, or adding the use of iodized salt, or prevalence of malnutrition indicators. The underlying pattern may be that many of the 58 ECCE indicators included in this analysis shift together as a basket of early childhood development.

We would not expect – although we cannot be sure - that we missed one indicator out of the 58 analyzed that has a particularly strong effect because the indicators that we tested had already been filtered with cluster analysis.

The one caveat to this general conclusion is that there are some indicators, such as school-life expectancy, that have relatively low values *and* are missing for many countries. The inclusion of this variable in the Index results either in the exclusion of many countries, if those where the value is missing are excluded, or, if all countries are included even if some values are missing, in a downward bias of the index value for countries where the indicator is available. For these reasons, this indicator, and others with similar features, is not ideal for inclusion in the ECCE index.

Based on this result, we are not convinced that making two distinct indices, one for children below 3 and those between 3 and primary school age, or, one for health and survival and one for education/care, would provide much additional distinction or value.

In some ways this result may simplify the discussion of what indicators to select for an early childhood index – the rankings of countries are not greatly affected by the outcome, and the discussion can focus on which topics and issues need to be covered. Moreover, the methods in this analysis can be used to provide some guide to the selection of indicators.

REFERENCES

UNESCO, 2002. *EFA Global Monitoring Report 2002: Education for All – Is the World on Track?* Paris, UNESCO.

UNESCO, 2007. *EFA Global Monitoring Report 2002: Education for All by 2015: Will we make it?* Paris, UNESCO.

UNICEF, 2007. *The State of the World's Children 2008: Child Survival.* New York, UNICEF.

ANNEX 1. TRANSFORMATION OF THE INDICATORS TO A SCALE OF 1-100

The following indicators used in calculating the six indices did not require any transformation or normalization because they were already on a scale of 100 and oriented so that the highest score reflects the highest early childhood outcomes.

Indicator Name
Percent of children immunized against measles
Percent of children immunized against tuberculosis
Pre-primary GER
Percent of underweight, moderate and severe
Percent of households consuming iodized salt
Percent breast-fed with complementary food, 6-9 months

Four indicators did require normalization or transformation and the calculations are described below.

Under five mortality
Normalized mortality score= 100- (mortality rate/2.78)

Total fertility
Normalized fertility score= 100 – (total fertility * 13.5)

Pre-primary life expectancy
Normalized pre-primary life expectancy= pre-primary life exp * 22.72

GPI pre-primary GER
Normalized GPI (for scores below 100)= 100 * GPI
Normalized GPI (for scores below 100)= 200- (100 * GPI)

ANNEX 2. ALTERNATE INDEX VALUES

Table 5. Country values for all six indices, in ascending order of Index 1.

	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Chad	22.7	26.1	13.1	28.6	29.4	31.7
Angola	25.5	30.8	25.5	27.8	36.4	38.4
Sierra Leone	26.9	6.9	26.9	26.0	38.4	32.9
Somalia	29.1	34.1	29.1	-	40.3	25.0
Afghanistan	33.0	34.8	17.2	32.2	37.7	32.4
Mauritania	34.9	41.4	28.1	28.3	41.5	43.5
Niger	38.1	40.1	19.2	34.2	41.7	41.1
Guinea-Bissau	38.6	38.6	38.6	29.4	47.7	38.0
Madagascar	40.3	43.6	33.7	47.3	43.9	47.9
Dem. Rep. of the Congo	42.0	44.8	22.4	41.7	46.5	48.2
Nigeria	42.2	44.8	24.4	51.3	47.0	45.8
Central African Republic	42.2	49.2	23.3	49.5	47.8	48.0
Liberia	42.9	38.9	42.9	-	50.6	49.6
Burundi	44.3	46.1	25.0	52.9	46.1	44.6
Côte d'Ivoire	45.0	43.5	26.2	42.7	51.4	49.7
Mali	45.0	44.2	25.8	49.8	48.7	42.9
Ethiopia	45.2	46.8	26.8	42.4	48.0	46.7
Burkina Faso	46.8	49.8	27.2	46.5	49.3	45.3
Equatorial Guinea	47.0	51.4	37.9	-	52.7	-
Guinea	47.5	53.7	29.1	50.9	51.9	46.4
Congo	47.7	45.6	29.1	-	53.9	52.7
Togo	47.7	52.1	28.4	50.9	52.3	50.6
Lao PDR	48.6	53.4	30.8	53.1	50.5	42.2
Malawi	48.8	32.2	48.8	48.8	56.1	56.1
Uganda	49.1	50.3	29.5	56.7	53.7	53.4
Mozambique	50.1	53.4	50.1	51.0	56.6	57.6
Rwanda	50.4	51.0	50.4	60.3	57.0	55.0
Djibouti	51.1	48.5	32.3	-	54.7	-
Yemen	51.6	49.6	34.7	47.9	52.0	55.7
Zambia	52.4	55.7	52.4	58.6	59.3	61.0
Benin	52.7	55.5	33.6	55.9	56.8	54.9
Timor-Leste	53.4	54.0	36.4	56.5	53.5	58.2
Senegal	53.6	57.2	36.8	47.3	58.5	54.8
Cameroon	56.1	57.9	38.5	56.9	60.4	59.9
Swaziland	56.4	61.2	39.1	56.9	62.0	57.0
Haiti	56.6	62.3	56.6	45.2	63.2	60.7
Cambodia	57.1	58.7	40.1	49.9	56.7	59.6
Gabon	58.8	70.1	58.8	53.1	66.1	59.6
Sudan	58.8	58.2	41.2	49.1	58.8	56.8
Eritrea	59.4	60.8	41.0	60.8	59.5	56.7
Comoros	59.9	61.9	41.1	63.6	62.4	55.6
Tajikistan	60.0	62.8	43.5	54.7	-	65.2
Iraq	60.2	60.8	40.8	56.9	64.9	58.7

	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Tanzania	60.7	60.7	39.8	57.2	64.1	66.7
Gambia	60.7	61.7	44.6	51.9	64.5	56.8
Zimbabwe	61.3	64.5	54.9	67.7	65.6	67.0
Kenya	63.1	66.3	50.7	67.7	65.9	66.6
Samoa	63.6	69.4	53.4	-	-	-
Namibia	63.6	68.0	49.9	63.5	65.7	62.5
Nepal	64.4	67.0	48.7	64.1	62.4	64.7
Kiribati	65.3	84.3	60.5	-	-	-
Bangladesh	65.6	69.2	47.4	66.3	63.3	66.2
Lesotho	65.6	67.8	51.4	66.2	68.0	67.9
Sao Tome and Principe	65.9	67.9	52.8	67.2	69.4	63.8
India	66.1	69.5	51.9	63.5	63.9	62.4
Pakistan	66.6	67.4	53.2	58.3	65.8	60.6
Papua New Guinea	66.6	69.2	50.6	-	-	67.8
Guatemala	66.9	70.7	52.3	66.9	68.6	66.9
Fiji	67.0	71.0	50.3	-	-	-
Tonga	67.0	67.0	56.4	-	-	-
Algeria	68.3	71.3	49.6	68.3	71.9	63.2
Solomon Islands	68.5	70.9	54.3	-	-	-
Bolivia	68.8	74.6	53.6	72.4	72.7	69.7
Saudi Arabia	69.2	69.2	51.5	-	72.0	67.6
Vanuatu	69.5	67.9	69.5	-	-	-
Myanmar	69.7	71.0	69.7	67.2	69.3	68.8
Turkey	70.0	69.6	52.3	68.9	74.3	64.7
Ghana	70.1	73.3	58.9	63.1	71.4	68.7
Palestinian Aut. Territories	70.2	70.2	53.8	69.4	-	71.5
Oman	70.4	70.4	52.3	68.8	72.3	74.0
Syrian Arab Republic	70.5	70.7	53.6	71.9	74.2	67.0
South Africa	71.1	74.1	53.3	69.6	73.9	66.9
Egypt	71.3	71.3	53.9	68.8	75.0	70.5
Kyrgyzstan	71.3	70.7	53.6	66.3	74.2	72.2
Paraguay	71.6	69.2	56.1	74.3	75.5	69.6
Indonesia	71.8	73.8	55.5	72.0	71.8	72.3
Botswana	72.0	75.0	72.0	70.4	75.7	68.2
Bhutan	72.2	74.2	72.2	77.9	74.4	-
Honduras	72.2	72.0	57.5	73.5	74.0	70.3
Libya	72.3	72.7	53.1	-	76.1	-
Cape Verde	72.6	75.2	60.0	-	-	71.1
Uzbekistan	72.6	71.4	58.9	63.7	75.8	68.6
Andorra	73.1	99.3	90.2	-	-	-
Belize	73.4	73.6	58.3	-	-	70.2
Morocco	73.6	73.2	65.4	68.2	76.4	72.4
Jordan	73.9	72.7	58.0	76.3	77.6	73.2
Azerbaijan	73.9	73.9	58.2	66.0	77.1	68.1
Philippines	74.0	76.2	56.6	71.1	73.7	71.3
Mongolia	74.3	74.3	63.9	74.4	77.4	71.1

	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Micronesia	75.0	66.4	75.0	-	-	-
Kazakhstan	75.8	69.8	62.5	77.0	79.2	75.3
Maldives	75.9	76.3	62.8	70.6	74.9	77.4
Nicaragua	75.9	70.9	62.9	79.4	78.3	74.6
Bahamas	76.1	73.9	59.2	-	-	-
Armenia	76.2	76.2	65.2	77.4	79.5	73.0
China	76.3	76.3	63.5	79.0	78.9	68.9
Montserrat	76.4	76.4	73.9	-	-	-
Dominican Republic	76.6	76.6	61.3	66.9	79.7	70.7
Colombia	76.8	76.4	62.4	79.4	79.5	74.9
Tunisia	76.9	72.1	60.0	80.2	80.1	-
Turkmenistan	77.2	77.2	77.2	82.9	79.9	75.7
Marshall Islands	77.9	80.2	52.7	-	-	-
Iran	77.9	78.9	62.3	80.7	79.8	-
Venezuela	77.9	81.7	66.1	79.9	80.8	73.3
Peru	77.9	80.5	66.6	80.4	80.3	78.4
Qatar	78.0	78.0	63.7	-	80.7	73.0
Georgia	79.3	79.9	68.7	77.3	82.2	68.1
El Salvador	79.9	76.9	67.6	-	81.6	79.3
Macedonia	80.3	80.9	66.8	80.3	82.6	68.3
Viet Nam	81.3	81.3	71.1	81.5	79.9	-
Albania	81.3	81.5	68.0	78.0	82.1	71.8
Bahrain	81.4	77.0	68.4	-	83.0	78.7
Palau	81.9	73.9	68.3	-	-	-
Chile	82.9	83.9	70.5	85.8	85.6	76.9
Brunei Darussalam	83.0	82.8	70.4	-	-	-
United Kingdom	83.0	83.2	68.6	-	-	-
Nauru	83.1	86.4	66.7	-	-	-
United States	83.4	81.0	73.2	-	85.8	-
Panama	83.4	83.4	69.3	85.3	-	75.9
Brazil	83.6	83.6	72.8	84.3	85.4	74.7
Niue	83.8	83.1	73.9	-	-	-
Dem. Rep. of Korea	83.8	83.1	83.8	80.7	82.1	70.6
Croatia	83.9	84.3	72.8	84.9	86.4	-
United Arab Emirates	84.0	85.2	70.2	-	84.3	78.6
Uruguay	84.3	85.1	73.0	-	86.1	-
Cyprus	84.9	84.6	74.2	-	-	-
Costa Rica	84.9	84.7	71.3	-	86.6	78.6
Ecuador	85.0	86.2	68.7	87.4	85.5	82.5
Ireland	85.3	88.3	85.3	-	-	-
Argentina	85.3	85.3	74.3	-	87.1	-
St. Lucia	85.8	86.8	73.1	-	-	-
Republic of Moldova	86.0	86.0	77.8	77.2	87.7	82.7
Lebanon	86.1	83.7	76.7	86.2	87.8	77.6
Finland	86.2	86.4	77.1	-	-	-
Poland	86.4	85.6	76.2	-	-	-

	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Tuvalu	86.5	98.8	76.3	-	-	-
Greece	86.7	86.7	73.3	-	-	-
Kuwait	86.9	83.8	74.1	-	87.4	76.7
Suriname	87.3	86.3	75.7	-	87.2	76.9
Jamaica	87.7	89.9	81.3	-	89.1	-
Malaysia	87.8	89.6	75.6	-	88.0	-
Thailand	87.9	87.9	79.3	83.7	86.9	85.1
Guyana	88.1	88.9	78.3	-	87.7	80.4
Lithuania	88.1	88.5	81.0	-	-	-
Norway	88.2	87.6	82.6	-	-	-
St. Vincent & the Grenadines	88.4	88.0	76.7	-	-	-
Dominica	88.8	88.8	70.3	-	-	-
New Zealand	88.9	90.6	77.8	87.9	-	-
Austria	89.0	92.5	81.5	-	-	-
Portugal	89.1	88.3	80.1	-	-	-
Bosnia & Herzegovina	89.2	90.9	89.2	86.1	90.9	-
Romania	89.3	89.5	83.4	83.3	90.6	81.3
Sri Lanka	89.4	89.4	89.4	89.0	84.8	-
Tokelau	89.9	98.5	75.6	-	-	-
Israel	89.9	83.1	82.6	-	-	-
Turks & Caicos Islands	90.0	90.0	76.4	-	-	-
Trinidad & Tobago	90.0	91.0	78.5	75.2	90.6	78.1
Serbia and Montenegro	90.0	90.6	90.0	85.8	92.0	75.7
Russian Federation	90.1	89.7	86.2	80.9	91.3	-
Slovenia	90.2	89.2	81.8	-	-	-
Grenada	90.3	85.9	72.1	-	-	-
Bulgaria	90.5	90.9	85.0	91.7	-	-
Ukraine	90.5	90.5	82.8	80.7	91.9	-
Mexico	90.5	91.1	79.1	90.6	90.8	-
Canada	90.8	89.2	90.8	-	-	-
British Virgin Islands	90.9	90.9	65.6	-	-	-
Luxembourg	91.0	90.0	82.7	-	-	-
Japan	91.1	88.5	84.5	-	-	-
Netherlands Antilles	91.2	91.2	79.9	-	-	-
Latvia	91.3	92.1	86.8	-	-	-
Iceland	91.4	91.7	84.3	-	-	-
Sweden	91.5	75.9	87.7	-	-	-
Malta	91.6	93.0	81.7	-	-	-
Hungary	91.9	91.9	87.4	-	-	-
Switzerland	91.9	94.4	81.1	-	-	-
Netherlands	92.0	91.6	80.5	-	-	-
France	92.1	91.5	88.2	-	-	-
Anguilla	92.1	92.1	70.4	-	-	-
Mauritius	92.2	92.4	81.1	-	91.0	-
Barbados	92.3	92.1	80.9	-	-	-
Denmark	92.3	91.6	89.4	-	-	-

	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6
Singapore	92.4	93.1	92.4	-	93.6	-
Belgium	92.7	93.9	89.3	-	-	-
St. Kitts & Nevis	92.7	92.7	81.7	94.5	-	-
Italy	92.9	94.3	87.4	-	-	-
Cook Islands	93.0	93.0	70.4	-	-	-
Cayman Islands	93.5	93.5	57.1	-	-	-
Australia	93.7	93.6	78.4	-	-	-
Germany	94.0	94.2	87.4	-	-	-
Slovakia	94.1	94.1	87.5	-	-	-
Macao, China	94.1	94.1	84.8	-	-	-
Cuba	94.5	94.7	90.2	93.4	94.8	85.8
Estonia	94.6	95.2	94.6	-	-	-
Belarus	94.9	94.9	89.6	88.3	-	-
Czech Republic	95.0	95.4	90.6	-	-	-
Republic of Korea	95.2	94.8	79.9	-	-	-
Spain	95.4	95.0	90.9	-	-	-
Seychelles	99.1	99.1	83.0	-	-	-
Aruba	99.4	99.4	81.2	-	-	-

Table 6. Country values for all five variations of the Base Index, in ascending order of the Base Index.

	Base Index	Variation 1 Base Index w/o under-five mortality	Variation 2 Base Index w/o Immunization against measles	Variation 3 Base Index w/o total fertility	Variation 4 Base Index w/o pre-primary GER	Variation 5 Base Index w/o GPI Pre-primary GER
Chad	22.7	20.8	22.6	25.5	28.1	16.3
Angola	25.5	29.6	15.7	31.1	25.5	25.5
Slovenia	26.9	40.4	6.9	33.5	26.9	26.9
Sierra Leone	26.9	6.9	26.9	26.0	38.4	32.9
Sri Lanka	29.1	27.2	26.1	33.9	29.1	29.1
Somalia	29.1	34.1	29.1	-	40.3	25.0
Afghanistan	33.0	37.6	25.3	39.9	41.1	21.3
Mauritania	34.9	30.0	26.1	37.4	45.9	34.9
Niger	38.1	44.9	26.9	47.6	47.3	23.8
Guinea-Bissau	38.6	42.9	17.9	55.0	38.6	38.6
Madagascar	40.3	34.6	34.1	42.2	50.4	40.3
Democratic Republic of the Congo	42.0	45.3	35.1	49.9	52.2	27.8
Nigeria	42.2	44.7	43.9	45.4	48.9	27.8
Central African Republic	42.2	42.8	44.0	43.0	52.3	28.9
Liberia	42.9	51.8	17.3	59.4	42.9	42.9
Burundi	44.3	45.9	36.6	53.0	54.9	31.0
Côte d'Ivoire	45.0	47.8	43.5	46.2	55.5	32.2
Mali	45.0	49.8	34.8	53.3	55.7	31.7
Ethiopia	45.2	45.7	41.8	49.6	56.0	33.1
Burkina Faso	46.8	50.2	37.5	54.6	58.0	33.7
Equatorial Guinea	47.0	49.1	46.0	53.4	48.6	38.1
Guinea	47.5	47.6	44.6	52.7	57.7	34.9
Congo	47.7	43.8	45.6	55.6	58.2	35.3
Togo	47.7	46.1	47.7	50.7	59.1	35.1
Lao People's Democratic Republic	48.6	47.1	50.6	50.1	58.5	37.0
Malawi	48.8	53.2	32.2	61.0	48.8	48.8
Uganda	49.1	47.9	39.8	60.0	61.0	36.7
Mozambique	50.1	54.4	36.7	59.2	50.1	50.1
Rwanda	50.4	59.8	31.0	60.2	50.4	50.4
Djibouti	51.1	50.1	47.6	53.8	63.6	40.2
Yemen	51.6	46.6	45.5	58.4	64.3	43.3
Zambia	52.4	57.5	36.5	63.1	52.4	52.4
Benin	52.7	54.1	44.7	59.0	64.5	41.4
Timor-Leste	53.4	52.0	42.7	65.7	62.9	43.7
Senegal	53.6	57.2	36.8	47.3	58.5	54.8
Cameroon	56.1	59.1	53.1	58.7	64.1	45.4
Swaziland	56.4	57.6	55.5	57.1	65.9	45.8
Haiti	56.6	53.0	57.9	58.9	56.6	56.6

	Base Index	Variation 1 Base Index w/o under-five mortality	Variation 2 Base Index w/o Immunization against measles	Variation 3 Base Index w/o total fertility	Variation 4 Base Index w/o pre-primary GER	Variation 5 Base Index w/o GPI Pre-primary GER
Cambodia	57.1	57.6	51.6	58.7	69.0	48.4
Gabon	58.8	53.9	60.7	61.7	58.8	58.8
Sudan	58.8	58.1	58.5	61.7	67.1	48.6
Eritrea	59.4	56.5	53.2	66.1	71.2	49.9
Comoros	59.9	55.5	54.9	64.2	74.1	50.8
Tajikistan	60.0	59.9	54.0	61.2	72.7	52.3
Iraq	60.2	59.8	52.8	64.4	73.9	50.3
United Republic of Tanzania	60.7	60.7	60.7	62.4	71.0	48.5
Gambia	60.7	60.9	54.9	64.8	71.4	51.6
Zimbabwe	61.3	61.9	53.3	62.5	67.3	61.3
Kenya	63.1	63.5	61.6	70.4	65.8	54.1
Saudi Arabia	63.6	56.9	65.3	67.6	67.2	61.1
Namibia	63.6	61.0	61.3	66.1	72.3	57.5
Nepal	64.4	62.1	62.1	66.5	73.7	57.8
Kiribati	65.3	65.3		65.3		65.3
Bangladesh	65.6	62.8	61.7	66.9	79.2	57.3
Lesotho	65.6	67.2	60.8	68.0	73.7	58.6
Serbia and Montenegro	65.9	66.8	60.4	69.3	74.3	58.8
Sao Tome and Principe	65.9	67.9	52.8	67.2	69.4	63.8
India	66.1	65.4	68.2	66.9	72.4	57.9
Pakistan	66.6	67.2	63.7	70.6	70.6	60.7
Papua New Guinea	66.6	66.1	68.2	70.2	68.5	59.9
Guatemala	66.9	62.5	64.4	72.5	76.5	58.7
Fiji	67.0	61.0	66.3	67.8	79.8	60.2
Tonga	67.0	60.8	59.0	69.3	78.0	67.9
Algeria	68.3	63.3	64.6	68.3	83.8	61.3
Spain	68.5	65.4	67.7	73.3	75.5	60.9
Bolivia	68.8	66.5	70.0	72.7	73.6	61.3
Seychelles	69.2	63.4	62.5	73.4	84.0	62.6
Vanuatu	69.5	60.4	69.3	78.9	69.5	69.5
Myanmar	69.7	72.2	68.5	68.4	69.7	69.7
Turkey	70.0	66.3	64.7	70.2	85.0	63.7
Ghana	70.1	70.7	66.8	75.4	73.6	63.8
Palestinian Autonomous Territories	70.2	64.6	63.0	79.4	80.2	63.8
Oman	70.4	64.3	63.5	73.7	86.0	64.4
Syrian Arab Republic	70.5	64.7	63.6	73.3	85.5	65.2
South Africa	71.1	74.1	53.3	69.6	73.9	66.9
Egypt	71.3	67.2	64.6	74.0	85.0	65.5
Kyrgyzstan	71.3	69.6	64.3	72.3	85.9	64.1
Paraguay	71.6	68.2	66.9	76.3	81.7	64.8
Indonesia	71.8	68.5	71.7	72.1	81.2	65.5
Botswana	72.0	75.6	63.0	77.4	72.0	72.0

	Base Index	Variation 1 Base Index w/o under-five mortality	Variation 2 Base Index w/o Immunization against measles	Variation 3 Base Index w/o total fertility	Variation 4 Base Index w/o pre-primary GER	Variation 5 Base Index w/o GPI Pre-primary GER
Bhutan	72.2	70.9	61.8	83.9	72.2	72.2
Honduras	72.2	69.2	67.3	76.3	82.1	66.3
Libyan Arab Jamahiriya	72.3	67.0	66.2	74.5	88.5	65.5
Cape Verde	72.6	68.3	74.4	76.9	77.3	65.8
Uzbekistan	72.6	71.7	66.0	74.0	83.8	67.4
Andorra	73.1	97.5	99.3	97.5	96.3	97.0
Belize	73.4	70.3	68.0	76.2	83.5	69.1
Morocco	73.6	70.4	67.8	75.6	78.6	75.7
Jordan	73.9	69.3	68.6	77.8	84.7	69.0
Azerbaijan	73.9	75.1	67.9	73.5	85.1	67.9
Philippines	74.0	70.0	72.5	77.0	82.2	68.4
Mongolia	74.3	74.5	68.2	75.3	82.9	70.8
Micronesia (Federated States of)	75.0	70.1	64.5	90.4	75.0	75.0
Kazakhstan	75.8	76.3	70.0	75.9	86.2	70.4
Maldives	75.9	73.7	70.6	82.5	82.6	70.1
Nicaragua	75.9	73.0	70.9	79.7	85.7	70.3
Bahamas	76.1	71.4	73.9	77.5	87.4	70.4
Armenia	76.2	73.3	71.7	74.7	87.1	74.1
China	76.3	73.6	73.9	76.2	85.4	72.5
Montserrat	76.4	76.4	76.4	76.4		
Dominican Republic	76.6	74.6	71.0	79.3	87.3	70.8
Colombia	76.8	73.6	73.8	79.2	86.2	71.3
Tunisia	76.9	73.0	72.1	77.3	90.7	71.3
Turkmenistan	77.2	82.8	66.3	82.5	77.2	77.2
Marshall Islands	77.9	77.9	73.8	77.9	92.0	67.8
Iran, Islamic Republic of	77.9	75.2	73.9	79.2	86.0	75.2
Venezuela	77.9	74.8	78.4	80.9	82.9	72.7
Peru	77.9	76.5	77.4	81.3	81.8	72.6
Qatar	78.0	73.7	72.8	81.8	88.4	73.5
Georgia	79.3	77.8	76.1	78.8	86.4	77.3
El Salvador	79.9	77.5	75.1	83.8	87.2	75.8
The former Yugoslav Rep. of Macedonia	80.3	76.9	76.4	80.2	92.1	76.1
Viet Nam	81.3	79.4	77.8	83.7	86.6	78.7
Albania	81.3	79.3	77.4	83.9	89.3	76.7
Bahrain	81.4	78.1	77.0	84.3	90.0	77.6
Palau	81.9	81.9	73.9	81.9	91.1	80.8
Chile	82.9	79.4	81.1	85.1	90.0	78.8
Brunei Darussalam	83.0	79.3	79.5	86.4	90.7	79.0
United Kingdom	83.0	79.3	83.2	84.3	89.1	79.1
Nauru	83.1	83.1	84.6	83.1	88.9	75.7
United States	83.4	79.9	81.0	86.0	88.9	81.1

	Base Index	Variation 1 Base Index w/o under-five mortality	Variation 2 Base Index w/o Immunization against measles	Variation 3 Base Index w/o total fertility	Variation 4 Base Index w/o pre-primary GER	Variation 5 Base Index w/o GPI Pre-primary GER
Panama	83.4	81.5	79.6	87.8	88.9	79.5
Brazil	83.6	82.3	79.8	87.0	88.8	80.3
Niue	83.8	83.8	76.2	83.8	75.7	99.5
Democratic People's Republic of Korea	83.8	85.1	77.7	88.5	83.8	83.8
Croatia	83.9	80.5	80.8	84.3	93.2	80.5
United Arab Emirates	84.0	80.7	82.0	87.8	88.9	80.4
Uruguay	84.3	81.7	81.7	87.8	89.9	80.6
Cyprus	84.9	81.7	84.6	86.4	89.9	81.7
Costa Rica	84.9	82.2	83.9	88.2	89.0	81.4
Ecuador	85.0	83.6	83.1	89.9	87.2	81.5
Ireland	85.3	79.0	85.9	90.9	85.3	85.3
Argentina	85.3	83.0	81.9	89.2	90.6	81.9
St. Lucia	85.8	86.8	73.1	-	-	-
San Marino	85.8	83.9	83.8	89.6	88.9	83.0
Republic of Moldova	86.0	85.0	83.3	86.6	91.9	83.3
Lebanon	86.1	84.6	83.7	90.0	89.1	83.2
Finland	86.2	83.1	83.4	88.4	92.8	83.0
Poland	86.4	83.9	83.5	87.1	94.4	83.1
Tuvalu	86.5	86.5	98.7	86.5	80.0	80.7
Greece	86.7	84.1	86.4	87.6	91.6	83.9
Kuwait	86.9	84.6	83.8	91.1	90.4	84.4
Suriname	87.3	86.5	86.3	92.2	86.8	84.4
Jamaica	87.7	86.4	88.6	92.3	85.7	85.4
Malaysia	87.8	85.8	87.3	93.5	84.8	87.7
Thailand	87.9	86.8	87.1	91.1	89.3	85.2
Guyana	88.1	90.4	87.1	92.1	85.1	85.6
Lithuania	88.1	86.1	85.9	89.4	93.3	86.0
Norway	88.2	84.8	87.6	92.2	88.2	88.2
St. Vincent & the Grenadines	88.4	88.0	76.7	-	-	-
Dominica	88.8	88.8	84.2	88.8	94.4	87.8
New Zealand	88.9	86.7	90.6	92.6	87.8	86.7
Austria	89.0	86.7	92.5	90.9	88.4	86.4
Portugal	89.1	87.0	88.1	91.3	92.1	87.0
Bosnia and Herzegovina	89.2	86.3	88.8	92.5	89.2	89.2
Romania	89.3	88.5	87.4	90.8	92.8	87.1
Tokelau	89.9	89.9	99.8	89.9	84.8	85.0
Israel	89.9	87.9	88.6	96.3	89.3	87.5
Turks & Caicos Islands	90.0	90.0	90.0	90.0		
Trinidad and Tobago	90.0	89.1	89.2	92.8	90.6	88.1
Singapore	90.0	87.5	87.0	95.5	90.0	90.0
Russian Federation	90.1	89.6	87.9	92.3	91.7	89.1
Grenada	90.3	90.3	85.9	90.3	95.1	89.8

	Base Index	Variation 1 Base Index w/o under-five mortality	Variation 2 Base Index w/o Immunization against measles	Variation 3 Base Index w/o total fertility	Variation 4 Base Index w/o pre-primary GER	Variation 5 Base Index w/o GPI Pre-primary GER
Bulgaria	90.5	89.4	89.1	92.2	93.3	88.3
Ukraine	90.5	89.6	89.1	93.0	91.7	89.2
Mexico	90.5	90.0	89.2	95.3	89.9	88.3
Canada	90.8	87.2	89.2	95.9	90.8	90.8
British Virgin Islands	90.9	90.9	90.9	90.9		
Luxembourg	91.0	89.3	90.0	94.5	92.3	88.8
Japan	91.1	88.7	88.5	94.2	93.1	91.1
Netherlands Antilles	91.2	89.9	91.2	97.3	88.3	89.4
Latvia	91.3	90.2	90.3	93.4	93.0	89.3
Iceland	91.4	89.6	91.7	95.7	90.6	89.3
Sweden	91.5	89.7	90.8	95.1	92.2	89.5
Malta	91.6	90.2	93.0	94.5	89.5	90.8
Hungary	91.9	90.7	90.1	94.1	94.1	90.4
Switzerland	91.9	90.4	94.4	94.6	90.2	90.0
Netherlands	92.0	90.5	91.0	95.7	92.3	90.3
France	92.1	90.6	93.3	96.3	90.1	90.1
Anguilla	92.1	92.1	92.1	92.1		
Mauritius	92.2	91.7	90.8	96.7	91.4	90.4
Barbados	92.3	91.3	92.1	95.3	92.0	90.6
Denmark	92.3	90.9	91.6	96.2	92.1	90.6
Solomon Islands	92.4	89.3	90.6	97.3	92.4	92.4
Belgium	92.7	91.4	93.9	96.4	90.9	91.0
Samoa	92.7	92.7	89.6	92.7	89.1	99.5
Saint Kitts and Nevis	92.7	92.7	81.7	94.5	-	-
Italy	92.9	91.6	94.3	95.7	91.1	91.6
Cook Islands	93.0	93.0	90.1	93.0	93.8	95.2
Cayman Islands	93.5	93.5	93.5	93.5		
Australia	93.7	92.6	93.6	97.9	92.1	92.2
Germany	94.0	92.9	94.2	96.9	93.0	92.7
Macao, China	94.1	93.1	94.1	96.2	94.8	92.4
Cuba	94.5	93.7	93.6	98.6	93.1	93.5
Estonia	94.6	94.2	94.3	98.0	93.3	93.2
Belarus	94.9	95.2	93.9	97.7	93.6	94.1
Czech Republic	95.0	94.2	94.5	97.8	93.7	94.7
Republic of Korea	95.2	94.4	94.2	98.0	95.0	94.2
Saint Lucia	95.4	94.7	95.0	98.7	94.2	94.3
Slovakia	99.1	99.1	99.1	99.1	98.6	99.5
Aruba	99.4	99.1	99.4	99.4	99.7	99.4