UNESCO
Holistic Early Childhood Development Index (HEDHI)

- Developing a single-value index to describe the status of young children around the world

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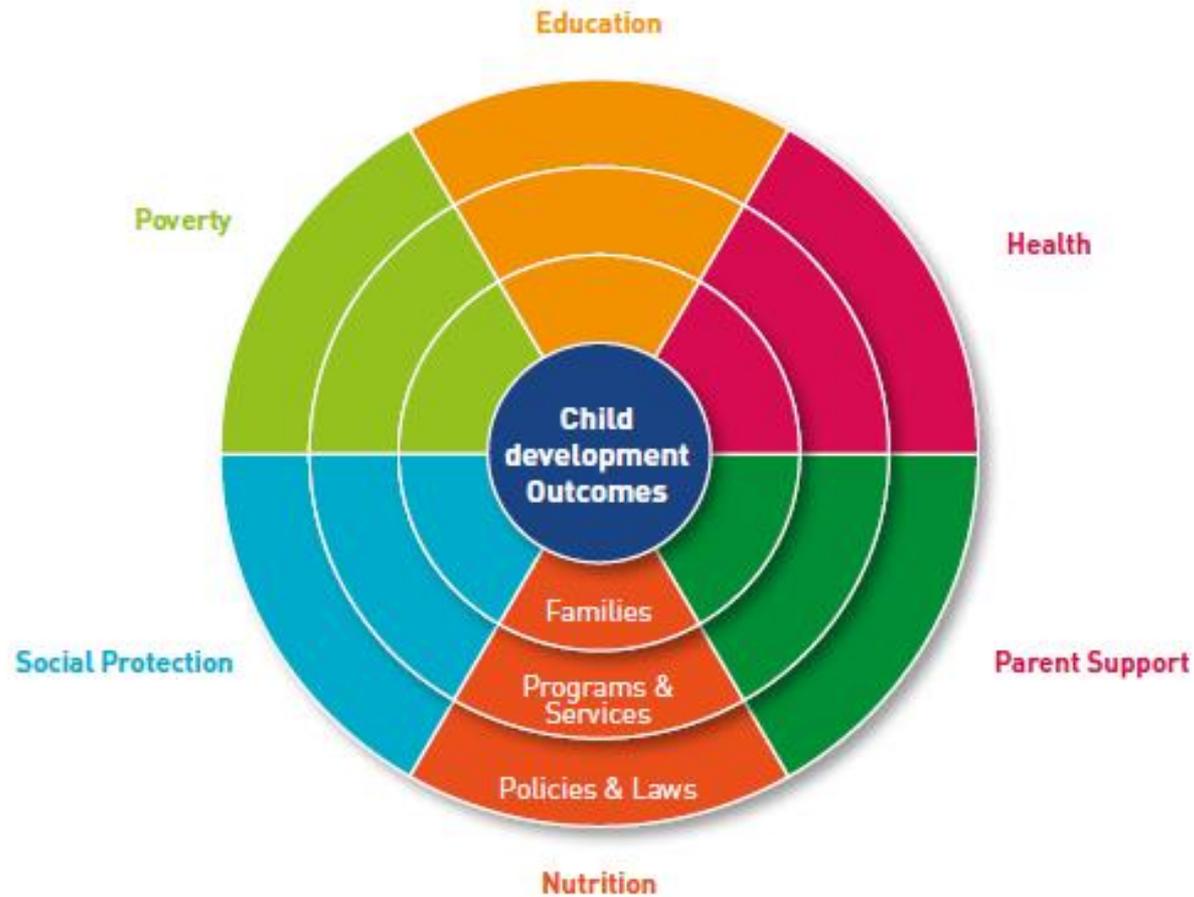
Development of the HECDI

- HECDI first proposed at the UNESCO World Conference of ECCE in September 2010

- After extensive consultation, the **HECDI Framework** developed in 2014 includes
  - Targets, sub-targets and proposed indicators identified in domains of **health, nutrition, education, social protection, poverty** and **parent support.**

Domains of HECDI

Figure 1: HECDI conceptual model

4 targets – 20 sub-targets

Target		Subtarget		Area of focus
1.	Children survive and demonstrate age-appropriate development and learning	1.1	Children survive past age 5	Health
		1.2	Children are born without low birth weight (LBW)	Health
		1.3	Children do not suffer from frequent illness or chronic conditions	Health
		1.4	Children demonstrate age-appropriate development and learning	Education
		1.5	Children have healthy weight (obesity)	Nutrition
		1.6	Children have healthy weight (malnutrition)	Nutrition
2.	Children experience cognitively stimulating, emotionally supportive home environments with adequate resources	2.1	Children have access to improved drinking water and sanitation	Health
		2.2	Policies ensure paid leave for parents of newborns in both formal and informal settings	Parent support
		2.3	Parents have access to programmes for parent support and education	Parent support
		2.4	Mothers have experienced formal education	Parent support
		2.5	Mothers experience well-being and the absence of maternal depression	Parent support
		2.6	Children experience emotionally supportive home environments as defined by the absence of exposure to domestic violence and violent discipline	Parent support
		2.7	Children experience frequent cognitive stimulation to support learning and school readiness	Parent support
		2.8	Children experience adequate daily care	Parent support
		2.9	Children are not living in poverty	Poverty
3.	Children and families have access to quality programmes and services addressing health care, good nutrition, education and social protection	3.1	Country or community monitors and responds as necessary to children's growth and nutritional status	Nutrition
		3.2	Children have access to comprehensive preventive and medical care including well-baby checks, immunizations and responses to emergency needs	Health
		3.3	Mothers have access to pregnancy and birth services	Health
		3.4	Children have access to quality ECCE that is appropriate and affordable, from birth to school entry	Education
4.	Children's rights are protected and upheld through the implementation of policies and programmes to support children and families	4.1	Country and/or state provides legal guarantee of children's rights regardless of religion, race, national origin, gender or disabilities	Equity and social protection

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Target 1 : Children survive and demonstrate age-appropriate development and learning

Target		Subtarget		Area of focus
1.	Children survive and demonstrate age-appropriate development and learning	1.1	Children survive past age 5	Health
		1.2	Children are born without low birth weight (LBW)	Health
		1.3	Children do not suffer from frequent illness or chronic conditions	Health
		1.4	Children demonstrate age-appropriate development and learning	Education
		1.5	Children have healthy weight (obesity)	Nutrition
		1.6	Children have healthy weight (malnutrition)	Nutrition

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Target 2 : Children experience cognitively stimulating, emotionally supportive home environments with adequate resources

2.	Children experience cognitively stimulating, emotionally supportive home environments with adequate resources	2.1	Children have access to improved drinking water and sanitation	Health
		2.2	Policies ensure paid leave for parents of newborns in both formal and informal settings	Parent support
		2.3	Parents have access to programmes for parent support and education	Parent support
		2.4	Mothers have experienced formal education	Parent support
		2.5	Mothers experience well-being and the absence of maternal depression	Parent support
		2.6	Children experience emotionally supportive home environments as defined by the absence of exposure to domestic violence and violent discipline	Parent support
		2.7	Children experience frequent cognitive stimulation to support learning and school readiness	Parent support
		2.8	Children experience adequate daily care	Parent support
		2.9	Children are not living in poverty	Poverty

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Target 3 : Children experience cognitively stimulating, emotionally supportive home environments with adequate resources

3.	Children and families have access to quality programmes and services addressing health care, good nutrition, education and social protection	3.1	Country or community monitors and responds as necessary to children's growth and nutritional status	Nutrition
		3.2	Children have access to comprehensive preventive and medical care including well-baby checks, immunizations and responses to emergency needs	Health
		3.3	Mothers have access to pregnancy and birth services	Health
		3.4	Children have access to quality ECCE that is appropriate and affordable, from birth to school entry	Education

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Target 4 : Children's rights are protected and upheld through the implementation of policies and programs to support children and families

| 4. | Children's rights are protected and upheld through the implementation of policies and programmes to support children and families | 4.1 | Country and/or state provides legal guarantee of children's rights regardless of religion, race, national origin, gender or disabilities | Equity and social protection |

The challenge:

Combining 20 sub-targets spanning 6 dimensions into a single index that lies between 0 and 1

* **1** being the **best** possible
* **0** being the **worst** possible

Steps for formulating HECDI – a single-value index

1. For a given population, use data on relevant indicators to calculate a **component score ranging from 0 to 1** for each of the sub-targets

2. Combine the 20 component scores into a single-value index – ie the HECDI

Step 1: Calculate Component Scores

Example: Target 1.1 – Children Survive past age 5

$$Component\ Score$$
$$= 1 - \frac{\%\ children\ that\ die\ before\ age\ 5}{100\%}$$

0 – all children in population die before age 5

1 – no children in population die before age 5

Step 2: Aggregate 20 component scores into single index – the HECDI

* Target 1.1: **C.S = 0.31**
 – performing poorly on children surviving past 5

* Target 1.2: **C.S = 0.52**
– performing average on children born w/out low birthweight

* Target 1.3: **C.S = .88**
– performing well on children not suffering from frequent/chronic illness

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* Target 4.1: **C.S = .81**

- Performing well on protecting children's rights

Q: How to combine these scores?

Aggregation of HECDI component scores into a single index

- Using linear aggregation methods (summing or averaging components) have limitations:
  - Components assumed to be interchangeable
  - Uniformity across component scores is not rewarded
- Instead utilise displaced ideal theory by employing the **inverse of the normalized Euclidian distance from the ideal**

Unweighted Formula:

$$\text{HECDI} = 1 - \sqrt{\frac{(1-cs_1)^2 + (1-cs_2)^2 + \cdots + (1-cs_{20})^2}{20}}$$

Advantages:

- Improves the ability to discriminate between mid-range participants,

i.e. the subtleties across the midrange of index scores

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Weighting component scores

- **Unweighted approach**

  – Each component score – ie each sub-target has an **equal contribution** to the overall HECDI index score

- **Weighted approach**

  – Component score – ie sub-targets can have differing **contributions** to the overall HECDI index score

  – Can establish prioritisations of certain sub-targets over others in regards to the HECDI

Weighted Index

- Where the unweighted formula used equal weightings of 1, and divided over the sum of the components (also the sum of weights), we formulate a similar version with weights as follows:

$$\text{HECDI} = 1 - \sqrt{\frac{w_1(1-cs_1)^2 + w_2(1-cs_2)^2 + \cdots + w_{20}(1-cs_{20})^2}{\sum w_i}}$$

- We can reformulate the aggregation in terms of normalized weights

$$\text{HECDI} = 1 - \sqrt{\frac{w_1}{\sum w_i}(1-cs_1)^2 + \frac{w_{20}}{\sum w_i}(1-cs_2)^2 + \cdots + \frac{w_{20}}{\sum w_i}(1-cs_{20})^2}$$

$$\text{HECDI} = 1 - \sqrt{W_1(1-cs_1)^2 + W_2(1-cs_2)^2 + \cdots + W_{20}(1-cs_{20})^2}$$

$$W_1 = \frac{w_1}{\sum w_i}$$

How to determine the weights?

- Empirically – i.e. the predictive strength of each component against an agreed outcome.

- Consultation with experts – i.e. experts utilise their existing knowledge of practice and policy to prioritise individual components over others.