

Young students in a
pre-primary class, Sierra Leone.
Credit: GPE/Ludovica Pellicoli



Literature search protocol: Mapping early childhood development publications in international databases by researchers located in sub-Saharan Africa

Authors

This mapping protocol was written by Daniel Hawkins Iddrisu, who developed the protocol with support from Eunice Mueni Williams. Pauline Rose provided oversight of the process, guidance, and review of the protocol.

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List of abbreviations

- AERD:** African Education Research Database
- CESA:** Continental Education Strategy for Africa
- ECD:** Early Childhood Development
- ECDAN:** Early Childhood Development Networks
- ECE:** Early Childhood Education
- IQ:** Intelligence Quotient
- SDG:** Sustainable Development Goals
- SSA:** sub-Saharan Africa
- UNICEF:** United Nations Children's Fund

Summary

Evidence shows that early childhood development is important to children's healthy growth and future life opportunities. This protocol provides information on literature searches to identify publications and research conducted by researchers based in sub-Saharan Africa (SSA) and/or institutions in relation to Early Childhood Development (ECD) to inform policy and practice. This protocol complements two related literature search protocols: a) mapping country-based literature on ECD in five countries (Williams, *et al.*, 2024), and b) mapping and evaluating literature related to foundational literacy and numeracy in sub-Saharan Africa in English and French (Binesse, *et al.*, 2023).

1. Overview

This protocol takes as its starting point the search protocol by Mitchell and Rose (2018) prepared for mapping education research for the African Education Research Database (AERD). The purpose of this protocol is to provide information specifically for searching literature on early childhood development (ECD). It aims to establish clear search guidelines to facilitate consistency in ECD search processes, to ensure relevant ECD publications are captured, and provide a guide for future updates as well as for others interested in undertaking similar searches.

The importance of ECD for school readiness and future life opportunities is well documented. This recognition is captured in policy documents such as the Sustainable Development Goals (SDGs) and the Continental Education Strategy for Africa (CESA) 2016 – 2025 which stress the need to provide holistic development for children.

Despite the recognition of the importance of ECD, there is a concern about efforts geared towards helping children to get a good start in life. For example, 250 million children (43%) younger than five years in low-income and middle-income countries are at risk of not achieving their developmental potential (Black *et al.*, 2017).

However, we do not know enough from African researchers about this critical stage and how to improve the provision of services for this age group. An analysis of over 3,000 publications in the African Education Research Database showed that only 4% of studies focused on Early Childhood Education (ECE) (Asare *et al.*, 2021). There has been little change in this low percentage since 2010. Furthermore, only 2% of ECE studies received funding (Rose *et al.*, 2019). This finding links with the African Union's assertion that "*pre-primary education is a neglected area in terms of policy and investment*" (CESA 2016-2025, p. 14).

To date the AERD currently only includes information on ECE (therefore publications that include integrated approaches with health and nutrition are captured if there is an education component). In light of this, exploring the landscape of African ECD research and researchers is needed to understand the current landscape of ECD research in SSA, and to identify potential gaps that need to be filled to inform national and global policy and practice.

This protocol, therefore, outlines the approach to mapping early childhood development research and researchers in sub-Saharan Africa. It forms part of a wider project aimed at enhancing the use of African research evidence in decision-making, focusing here on early childhood development. The overall objectives of the project are to:

- Improve the visibility and accessibility of ECD research undertaken by SSA-based researchers.
- Establish a community of practice (network) and strengthen the capacity of SSA-based ECD researchers (based on an assessment of their needs).
- Advocate, communicate, and disseminate evidence on ECD research from SSA.

2. Identifying research for inclusion in the database

Definitions of Early Childhood Development

Researchers and practitioners may adopt different definitions of ECD, depending on the purpose for which they are being used. For this protocol, the starting point is the [nurturing care framework](#) (WHO, 2018). The framework was launched in 2018 by the United Nations International Children's Emergency Fund (UNICEF), World Bank, and World Health Organization (WHO) to provide strategic directions for supporting the holistic development of young children. The framework covers ECD for children aged 0 – 8 years. According to the framework, ECD involves the creation of favourable conditions to facilitate the cognitive, social, emotional, linguistic, and physical development of young children. It has five components, including *good health, adequate nutrition, responsive caregiving, opportunities for early learning, and security and safety (protection)*. Other related frameworks are drawn upon to identify the key components of ECD to be used for the purposes of this protocol (Table 1).

Table 1: Keywords/components describing ECD by selected institutions

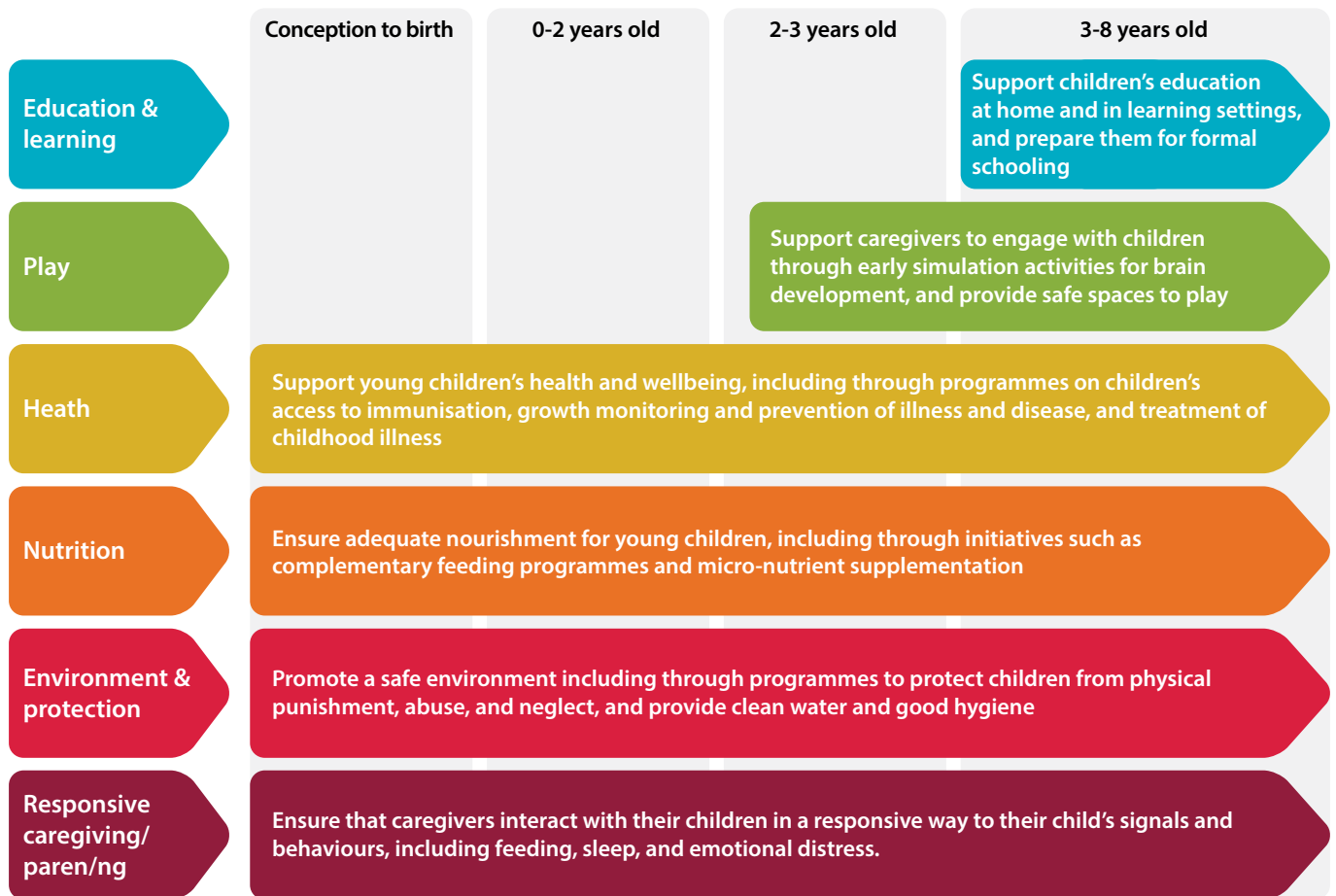
	UNICEF/WHO	ECDAN	UNESCO	World Bank
Education	Early Learning	Learning	Education/learning	Learning
Nutrition	Nutrition	Nutrition	Nutrition	Nutrition
Health	Health Care	Health	Health	Health
Caregiving	Responsive Caregiving	Responsive Caregiving	Parental/family support	Nurturing care
Play	Play, sing etc	Playful parenting		
Environment/ Protection	Protection from Harm	Safety and Security	Social Protection	Protection from exposure to stress
Age group	0 – 3 years	0 – 3 years	0 – 8 years	0 – 5 years

Source: Compiled from the institutions' websites.

Based on these other frameworks, we included a specific category for play and extended the focus on education for the pre-primary age group, rather than the narrower focus on early learning in the Nurture Care Framework. Figure 1 depicts the six components of ECD adopted for this protocol used to guide the searches.

We focused on 0-3 years and extended this to include publications for children up to eight years provided the research outputs were related to early childhood development. This was to ensure we captured early childhood education given the pre-primary education age range is 4-6 years but could extend to age 8 (particularly where children are over-age). The cut-off age was also informed by other related frameworks drawn from various institutions as shown in Table 1.

Figure 1: Integrated approach to Early Childhood Development



Source: Adapted from Zubairi & Rose, 2021, and WHO, UNICEF & World Bank Group, 2018.

Relevance criteria

The searches focus on literature related to the six components of ECD identified from the different frameworks in Table 1, which have implications for education policy and practice in sub-Saharan Africa (SSA). Implications for policy and practice mean research that advances national, regional, and global policy, such as the African Union's (AU) Agenda 2063, CESA 2016 – 2025, and SDG 4: ensuring inclusive and quality education for all.

Specifically, the relevance criteria include:

- Research conducted by at least one SSA-based researcher in a SSA country (except South Africa).
- Addressing at least one of these components - health, nutrition, caregiving, early learning/education, play, and environment and protection.
- Focusing on children aged 0-8 years (with a particular focus on the 0-3 age group).
- Empirical research studies and systematic reviews.

Literature search strategy

Selection of databases

The search process draws on four academic electronic databases: Dimensions, Scopus, Web of Science, and PubMed. The approach to searching varies according to the structure of each database, so the search is adapted to each database. Overall, the data extraction process follows the procedure outlined in Mitchell and Rose (2018). However, given the focus on ECD, new keywords are identified that relate to the six components outlined in Figure 1.

The existing AERD has focused on social science publications related to education and so includes ECE but no other components of ECD. For searches of ECD literature, in addition to publications from the social sciences, publications from other relevant research and subject categories, such as health science, are included.

The searches apply Boolean operators (AND and OR) with high-level terms covering each of the components of ECD, which are then filtered for other relevant information, including year of publication, and country. A comprehensive keyword list for this protocol and the search strategy is outlined below.

List of Countries

Given the context of this study, for all searches, all countries in sub-Saharan Africa (except South Africa as already mentioned) are included using the search guide for each database. The list of countries for this study includes the following:

((“Angola” OR “Benin” OR “Botswana” OR “Cameroon” OR “Burundi” OR “Burkina Faso” OR “Cape Verde” OR “Central African Republic” OR “Cote D’Ivoire” OR “Chad” OR “Comoros” OR “Democratic Republic of Congo” OR “Djibouti” OR “Equatorial Guinea” OR “Eritrea” OR “Eswatini” OR “Ethiopia” OR “Gabon” OR “Ghana” OR “Guinea-Bissau” OR “Guinea” OR “Ivory Coast” OR “Kenya” OR “Lesotho” OR “Liberia” OR “Madagascar” OR “Malawi” OR “Mali” OR “Mauritius” OR “Mauritania” OR “Mozambique” OR “Namibia” OR “Niger” OR “Nigeria” OR “República de Cabo Verde” OR “Republic of Congo” OR “Rwanda” OR “Sao Tome and Principe” OR “Senegal” OR “Seychelles” OR “Sierra Leone” OR “Somalia” OR “South Sudan” OR “Sudan” OR “Swaziland” OR “Tanzania” OR “The Gambia” OR “Togo” OR “Uganda” OR “Zambia” OR “Zimbabwe”))

Sources of search terms

Selected systematic review publications conducted on ECD, in and outside SSA were reviewed to identify the various keywords used for similar searches. A total of 13 systematic reviews covering all six components of ECD were examined. Table 2 presents the references of systematic publications that were reviewed, and the keywords used across the six components of ECD.

Table 2: Keywords used in systematic reviews related to ECD

References	Child/Early childhood	Early Development	Health	Play	Learning	Responsive caregiving	Environment and Protection	Nutrition
Adams, S., & Savahl, S. (2017).	Children, childhood/s.	Childhood experiences		Nature, space, children space, children places				
Akombi, B. J., et al. (2017).	Child, under-five, infant, baby, paediatric, preschooler							Malnutrition, malnourish, undernourish, undernutrition, Stunting, wasting, underweight.
Dulal, S., et al. (2021).	Child preschool child, infant, newborn	Early childhood development		Play and playthings, play, Stimulation, psychosocial stimulation,	Early intervention education, education intervention	Parenting, parent-child relations, parent-child interaction, responsive feeding		Nutrition, breastfeeding promotion, food supplementation, feeding behavior, micronutrients, dietary supplements, food, fortified; micronutrient supplementation, nutrients, macronutrient supplementation, nutritional supplementation

References	Child/Early childhood	Early Development	Health	Play	Learning	Responsive caregiving	Environment and Protection	Nutrition
de Oliveira, K. et al. (2020).	Infant, toddler							Food insecurity, food security, food supply, food security
Gayatri, M. (2020).	Children, early childhood				Education, online learning, home learning, home-schooling, kindergarten			
Jeong J., Pitchik H.O., Fink G. (2021).	Infant, child, neonates, neonatal, newborn, new born, baby, babies, toddler, toddlers, toddlerhood, early childhood, young children, age zero, aged zero, age 1, aged two, 1 year old, one year old, 2 year old, 3 year old, two year old, three year old, etc	behavior, behavioral, behaviors, behaviour, behavioural, behaviours, motor skills, communicative, compliance, conduct problem, emotional, emotions, fine motor, motivation, social, socio emotion, socioemotion, child behavior, child development,		Peer relation, play skills, prosocial,	Preschool, pre school, reading, socialisation, socio emotion*, socioemotion*, executive function, language, mastery, cognition, cognitive, communication, emotional intelligence	Attachment, attention, Maternal behaviour, parenting, child rearing, parent-child relations, parents, caregivers, parenting, mother, mothers, parental, paternal behavior, parent infant, infant parent, father, fathers, caregiver, care giver, parent child, parent training, parent education, parental training, parental education		
Momberg, D. J., et al. (2021).	Children, , infant, Under Five years of age, preschool, pre school						Water, sanitation, hygiene, WASH,	Undernutrition, waste-ed/ing, under-nutrition, under Nutrition, Malnutrition, stunt-ed/ing, underweight,
Prado E.L. et al. (2019).	Child, childhood, infant, infancy, pregnancy, pregnant, maternal	socio-emotional, mental development, psychomotor, sensorimotor, intelligence, Intelligence Quotient (IQ), emotion, brain	Antibiotic, antiretroviral, deworming, malaria treatment, intermittent preventive therapy		Learning, information processing, literacy, reading, math, school readiness, preschool, Language, cognitive, executive function, memory, attention,	Stimulation, parenting, home visits, home visiting, foster care, kangaroo care	Water sanitation and hygiene, cash, cash transfer, conditional cash transfer	Nutrition, supplementation, supplement, food supplements, nutrients, micronutrient, infant food, diet, feeding, iron, iodine, breastfeeding, stunted, stunting, height, length, length-for-age
Rahim K.A., Bhamani S., and Lassi Z.S. (2021)	Early childhood, child, infant, toddler, children, newborn, neonate, kid, pre-schooler	Infant development, child socioemotional development, child physical development, child growth			child cognitive development, Child linguistic development, Early education, early childhood education, preschool curriculum	Child care, early childhood care		

References	Child/Early childhood	Early Development	Health	Play	Learning	Responsive caregiving	Environment and Protection	Nutrition
Rao, N., et al. (2014).		child development, Developmental Quotient, , brain development, neural development	Early childhood health intervention,		language development, cognitive development, Preschool experience, early childhood education, early learning, early cognitive stimulation, early reading programme, school readiness, academic achievement, literacy, mathematical achievement, problem-solving, skills, learning outcome, intelligence, attention and executive functions, basic concepts, thinking, communication skills, vocabulary.	Parental support and education, home-visiting programme		Nutritional supplementation, breakfast programme, lunch programme
Timmons, B. W., et al. (2012).	Infant, preschool child, paediatric* paediatric*, preschool*, child.	child development, growth and development, motor development, development, early childhood development, childhood development social adjustment,	Insulin resistance, metabolic cardiovascular syndrome, metabolic syndrome, cardiovascular, heart, vascular, hypertension, blood pressure, diabetes mellitus, glucose intolerance	Motor activity, physical exertion, exercise/aerobic exercise, play, locomotor activity, psychomotor performance, gross motor skill, childhood play development, physical activity	Cognitive development, language development,			obesity, obesity* or obese, overweight, overweight, body fat distribution, body composition, waist circumference, skinfold thickness, skin fold, skinfold, BMI, body mass index, body weight and measures,
Vilcins, D., Sly, P. D., & Jagals, P. (2018).		Growth and development, growth					Environ*	Stunt*, body size, height, body height
Zhang, L., et al. (2021).	Child, toddler, infant, infancy, baby	Development, Psychosocial, social,		Motor	cognitive, language	Stimulation, attachment,		

Developing the search strings

Searches were conducted across all four databases – Dimensions, Scopus, Web of Science, and PubMed, focusing initially on 2021 as the year of review. These were combined with relevant search terms sourced from the 14 selected review publications in Table 2. The results for each of the searches are presented below. The total number of publications retrieved per database is recorded with the most common research or subject area identified by the search, and SDGs featured (where this feature is available).

To ensure as many publications as relevant are captured, search terms were tried, refined, and retested. This section explains the stages and step-by-step development of the search strategy.

Search string 1

The search began with key terms related to each of the six ECD components sourced from selected systematic reviews (Table 2). As shown in Table 3, the results for search string 1 retrieved many publications, ranging from 1,108 in Web of Science to 6,737 in Dimensions. Most of these were irrelevant. For example, publications that contained words such as ‘cognitive’ or ‘language’ or ‘socio-emotional’ were included, irrespective of their focus context, target group, and age range. Around 90% of the results in this search focused on health sciences, raising the question of whether the search terms were adequately capturing other aspects of ECD. The search terms included:

((neonate OR neonatal OR “newborn*” OR new-born OR baby OR babies OR toddler OR toddlerhood OR preschool* OR pre-school* OR “young child*” OR child OR childhood OR “early childhood” OR infant OR infancy* OR kid OR kids) AND (development OR growth OR cognitive OR mental OR cognition* OR “executive function” OR “socio-emotional” OR socioemotional OR emotional OR “emotional Intelligence” OR social* OR linguistic OR language OR literacy OR vocabulary OR communication* OR speech OR physical OR motor* OR “motor skills” OR behavior* OR behaviour*) OR (“childhood play” OR “early stimulation” OR “childhood physical development” OR “child physical growth” OR “growth” OR “outdoor play” OR “child motor development” OR “environmental play” OR “early childhood education” OR “early childhood learning” OR “early learning” OR “child learning stimulation” OR “pre-school” OR “preschool” OR “kindergarten” OR “elementary school” OR “nursery” OR “home learning activities” OR “responsive stimulation” OR “psychosocial stimulation” OR “baby school” OR “pre-primary” OR “preprimary” OR “daycare” OR “day care” OR “nutrition” OR “supplementation” OR “supplement” OR “food supplements” OR “nutrients” OR “micronutrient” OR “dietary supplements” OR “micronutrient supplementation” OR “macronutrient supplementation” OR “nutritional supplementation” OR “infant food” OR “diet” OR “feeding” OR “iron” OR “iodine” OR “breastfeeding” OR “Food and Nutrition Security” OR “Food Supply” OR “Food Security” OR “food insecurity” OR “stunted” OR “stunting” OR “height” OR “length” OR “growth” OR “length-for-age” OR “child health” OR “child wellbeing” OR “child well-being” OR “underweight” OR “under-weight” OR “wasting” OR “malnutrition” OR “water, sanitation and hygiene” OR “water and sanitation” OR hygiene OR “child safety” OR “child protection” OR “environmental safety” OR “birth registration” OR parenting OR “Child Rearing” OR child-rearing OR caregiving OR mothering OR fathering OR caregiv* OR care giv* OR “perinatal Care” OR perinatal OR antenatal OR “ante natal” OR postnatal OR post-natal OR attachment OR attention OR empathy OR “Parent-Child Relations” OR “maternal behav*” OR “parental behav*” OR “paternal behavior” OR “parent training” OR “parent education” OR “parental training” OR “parental education”))

AND countries

Table 3: Number of publications identified for search string 1

Search string/stage	Dimensions	Web of Science	Scopus	PubMed ⁱⁱⁱ
Search string 1	<p>Total: 6,737</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 3,058 • Public health - 1,890 • Biomedical & clinical Science - 4,500 • Health services systems - 1,001 • Clinical science - 1,955 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being - 4,486 • Zero hunger - 507 • Gender equality - 170 • Quality education - 187 • Peace, justice, & strong institution - 146 • Reduced inequalities - 50 • Clean water & sanitation - 68 • No poverty - 34 • Decent work & economic growth - 34 • Life on land - 20 • Affordable & clean energy - 18 	<p>Total: 1, 108</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Public environmental occupational health - 262 • Paediatrics - 110 • Medicine general internal - 85 • nutrition dietetics - 95 • Infectious diseases - 54 • Health care sciences - 68 • Education - 29 	<p>Total: 5,233</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Medicine – 3,628 • Social science – 676 • Immunology & Microbiology – 578 • Multidisciplinary – 514 • Nursing – 470 • Biochemistry, genetics, molecular biology – 282 • Agriculture & biological science – 277 • Psychology – 254 • Environmental sciences – 248 • Arts and humanities – 132 • Neurosciences – 82 • Health profession – 60 	<p>Total: 3,057</p>

Search string 2

The search terms were refined to address the challenges in search string 1. For example, search terms such as 'linguistic', 'language', 'emotional', etc, were replaced with 'linguistic development' or 'mental development' or 'child physical growth' etc to make them more precise. In addition, searches were included for each of the sub-categories of ECD separately. Consequently, the search results presented in Table 4 shows a decrease of about 98% compared to search string 1 results. For example, in search string 1, Dimensions retrieved a total of 6,737 publications while in search string 2, it reduced drastically to 194 publications. However, the results were still skewed towards health and nutrition publications. While this might be because there are more publications in these sub-sectors, it raised a concern of whether the search terms were still missing some ECD categories.

General ECD: ("neonat*" OR "newborn" OR "new-born" OR "baby" OR "babies" OR "toddler*" OR "preschool*" OR "pre-school*" OR "young child*" OR "child*" OR "childhood" OR "early childhood" OR "infant" OR "infancy" OR "kid" OR "kids" OR "under-five" AND "child development" OR "child growth" OR "child cognitive development" OR "mental development" OR "executive function" OR "socio-emotional development" OR "socioemotional development" OR "emotional development" OR "emotional intelligence development" OR "linguistic development" OR "language development" OR "literacy development" OR "vocabulary development" OR "speech development" OR "child physical growth" OR "child motor development" OR "child motor skills" OR "child behavior*" OR "child behaviour*" OR "sensorimotor development" OR "child psychomotor" OR "child intelligence quotient" OR "child memory development" OR "child psychosocial development" OR "child compliance")

AND

Play: ("early stimulation" OR "play" OR "outdoor play" OR "environmental play" OR "playthings" OR "nature space*" OR "children space*" OR "children place*" OR "physical activity" OR "motor activity" OR "physical exertion" OR "locomotor activity" OR "prosocial")

OR

Learning/Education: ("education" OR "learning" OR "early learning" OR "child learning stimulation" OR "pre-school" OR "preschool" OR "kindergarten" OR "elementary school" OR "nursery" OR "home learning activities" OR "responsive stimulation" OR "psychosocial stimulation" OR "baby school" OR "pre-primary" OR "preprimary" OR "daycare" OR "day care" OR "literacy" OR "reading" OR "numeracy" OR "preschool curriculum" OR "early cognitive stimulation" OR "home-schooling")

OR

Health: (OR "child health" OR "child wellbeing" OR "child well-being" OR)

OR

Environment and Protection: ("water, sanitation and hygiene" OR "WASH" OR "water and sanitation" OR "hygiene" OR "child safety" OR "child protection" OR "environmental safety" OR "birth registration" OR "environ*")

OR

Responsive caregiving: ("parenting" OR "child rearing" OR "child-rearing" OR "caregiving" OR "mothering" OR "fathering" OR "caregiv*" OR "care giv*" OR "perinatal Care" OR "perinatal" OR "antenatal" OR "ante natal" OR "postnatal" OR "post-natal" OR "attachment" OR "attention" OR "empathy" OR "parent-child relations" OR "maternal behav*" OR "parental behav*" OR "paternal behav*" OR "parent training" OR "parent education" OR "parental training" OR "parental education" OR "parent-child relationships" OR "maternal behav*" OR "paternal behav*" OR "parental" OR "parent infant" OR "infant parent" OR "early childhood care" OR "parent* support")

OR

Nutrition: ("nutrition" OR "supplement*" OR "food supplements" OR "nutrient" OR "micronutrient" OR "dietary supplement" OR "micronutrient supplementation" OR "macronutrient supplementation" OR "nutritional supplementation" OR "infant food" OR "diet" OR "feeding" OR "iron" OR "iodine" OR "breastfeeding" OR "food and nutrition security" OR "food supply" OR "food security" OR "food insecurity" OR "stunted" OR "stunting" OR "height" OR "length" OR "growth" OR "length-for-age" OR "length for age" OR "weight-for-height" OR "weight for height" OR "underweight" OR "under-weight" OR "wasting" OR "malnutrition" OR "malnourish*" OR "undernourish*")

AND countries

Table 4: Number of publications identified for search string 2

Search string/stage	Dimensions	Web of Science	Scopus	PubMed
Search string 2	<p>Total: 194</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 84 • Public health - 51 • Biomedical & clinical science - 121 • Health services systems - 37 • Nutrition & dietetics - 41 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being - 78 • Zero hunger - 35 • Gender equality - 4 • Quality education-20 • Peace, justice, & strong institution - 4 • Reduced inequalities - 1 • Clean water & sanitation - 3 • No poverty - 5 • Decent work & economic growth - 2 	<p>Total: 102</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Environmental science - 25 • medicine general - 11 • Nutrition dietetics - 24 • Paediatric - 9 • Infectious disease - 6 • Education - 3 	<p>Total: 242</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Medicine – 170 • Nursing – 51 • Social science – 32 • Psychology – 29 • Agriculture & biological sciences – 25 • Environmental sciences – 18 • Immunology & microbiology – 13 • Multidisciplinary – 11 • Arts and humanities - 9 	<p>Total: 185</p>

Search string 3

The reduction in publications identified raised questions of whether relevant ones were being missed. To increase the number of relevant publications, the search terms for each component in search string 3 were reduced narrowing the search terms. Table 5 shows the search results for the 4 databases. The striking observation with this search string results is the difference between Dimension and the other three databases. As shown in Table 5, Dimensions retrieved 5,856 publications compared to 194 publications in search string 2. Meanwhile, with the same search string 3, Scopus, Web of Science, and PubMed retrieved 233, 101, and 177 publications, respectively. Based on screening the titles and abstracts of the first 1000 publications in Dimensions, many were still identified as irrelevant. This is potentially in part due to how we performed the search in Dimensions.

General ECD: ("child development" OR "child growth" OR "child cognitive development" OR "mental development" OR "executive function" OR "socio-emotional development" OR "socioemotional development" OR "emotional development" OR "emotional intelligence development" OR "linguistic development" OR "language development" OR "literacy development" OR "vocabulary development" OR "speech development" OR "child physical growth" OR "child motor development" OR "child motor skills" OR "child behavior*" OR "child behaviour*" OR "sensorimotor development" OR "child psychomotor" OR "child intelligence quotient" OR "child memory development" OR "child psychosocial development" OR "child compliance") AND ("neonat*" OR "newborn" OR "new-born" OR "baby" OR "babies" OR "toddler*" OR "preschool*" OR "pre-school*" OR "young child*" OR "child*" OR "early childhood" OR "infan*" OR "Kid" OR "under-five" OR "under five").

AND

Nutrition: ("nutrition*" OR "supplement*" OR "nutrient" OR "micronutrient" OR "macronutrient" OR "food*" OR "diet" OR "feeding" OR "breastfeeding" OR "food security" OR "stunt*" OR "wast*" OR "underweight" OR "underweight" OR "malnutrition" OR "nourish*")

OR

Play: ("early stimulation" OR "child play" OR "play" OR "child physical activity" OR "child physical exertion")

OR

Responsive parenting: ("parent*" OR "child rearing" OR "child-rearing" OR "child care*" OR "mother*" OR "father*" OR "care" OR "caring" OR "attachment" OR "attention")

OR

Environment: ("water, sanitation and hygiene" OR "WASH" OR "water and sanitation" OR "hygiene" OR "safety" OR "child protection" OR "birth registration" OR "environ*")

AND countries

Table 5: Number of publications for search string 3

Search string/stage	Dimensions	Web of Science	Scopus	PubMed
Search string 3	<p>Total: 5,856</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 2,769 • Public health - 1,745 • Biomedical & clinical science - 1,884 • Health services systems - 928 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being - 3,983 • Zero hunger - 455 • Gender equality - 156 • Quality education - 172 • Peace, justice, & strong institution - 129 • Reduced inequalities - 48 • Clean water & sanitation - 67 • No poverty - 32 • Decent work & economic growth - 33 • Climate action - 11 • Life on land - 14 	<p>Total: 101</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Public health - 25 • Nutrition - 23 • Medicine general - 11 • Paediatrics - 9 • Infectious diseases - 6 • Education - 3 	<p>Total: 233</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Agriculture & biological science - 25 • Arts & humanities - 9 • Biochemistry, genetics & molecular biology - 8 • Environmental Science - 17 	<p>Total: 177</p>

Search string 4

The smaller number of publications identified in most of the databases in search string 3 raised questions of whether relevant publications were missed. In addition, the searches identified publications on areas such as economic growth or adult education, which is beyond the scope of this protocol. To expand the total number of search results while at the same time increasing the possibility of capturing publications for all the six components, we reduced the keywords further by removing all search terms related to each independent component and general ECD. This meant that any publication focusing on child development would be captured in this search string.

Table 6 summarises the results for search string 4. Compared to Table 5, two important conclusions can be deduced: first, a significant upsurge in the output from the searches, and second, a relatively consistent output across all four databases. Nonetheless, the assessment of the titles and abstracts of 500 publications for each database shows that a significant number were not relevant, and needed to be reviewed manually. In addition, there was a concern that some education-related publications were missing from this approach.

((neonat* OR "newborn" OR new-born OR baby OR babies OR toddler* OR "young child*" OR child* OR childhood OR "early childhood" OR infant OR infancy OR kid OR kids OR "under-five") AND (development OR growth OR education))

Table 6: Number of publications identified for search string 4

Search string/stage	Dimensions	Web of Science	Scopus	PubMed
Search string 4	<p>Total: 2,682</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 1350 • Public health - 894 • Biomedical & clinical science – 1,540 • Health services systems - 437 • Clinical science - 515 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being – 1,601 • Zero hunger - 299 • Gender equality - 95 • Quality education - 275 • Peace, justice, & strong institution - 54 • Reduced inequalities - 34 • Clean water & Sanitation - 45 • No poverty - 23 • Decent work & economic growth - 23 • Climate action – 10 • Sustainable cities & communities - 11 	<p>Total: 1,504</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Public environmental occupational health - 345 • Paediatrics - 134 • Medicine general internal - 101 • Nutrition dietetics - 110 • Infectious diseases - 88 • Health care sciences - 59 • Multidisciplinary sciences - 151 • Obstetrics gynaecology - 86 • Health policy - 36 • Social sciences biomedical - 32 • Family studies - 20 • Education - 74 • Environmental sciences - 48 • Psychology education - 4. 	<p>Total: 2,444</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Medicine - 1,589 • Nursing - 266 • Multidisciplinary - 228 • Social science - 412 • Psychology - 126 • Environmental science - 122 	<p>Total: 1,506</p>

Search string 5

Given the challenges identified in search strings 1-4, where many publications were not relevant, search string 5 took a different approach. The search terms were narrowed to the keywords associated with each of the components of ECD, rather than including other related terms. Using this approach, PubMed, for example, increased from 1,506 in search string 4, to 5,179 publications in search string 5. Moreover, Dimensions, Web of Science, and Scopus decreased from thousands to hundreds. In Web of Science, 388 publications were retrieved, most of which were relevant to the six components. Variations of these were trialled to check for missed but relevant publications. For example, "WASH", "Environment", 'play' and 'parenting' were added. As seen in Table 7, the total results increased substantially from 388 to 2,828. It was observed that this added many publications that were not relevant, for example containing 'play' as a verb. Publications related to 'WASH' and 'Environment' were often on environmental education, mining, and agricultural environment etc., which are irrelevant to the focus of this protocol. The next section explores an updated search string (search string 6) to address these challenges.

"early child* development*" OR "early child* growth" OR "early child* education" OR "child* protect*" OR "child* nutrition*" OR "child* health" AND countries

Table 7: Number of publications identified for search string 5

Search string/stage	Dimensions	Web of Science	Scopus	PubMed
Search string 5	<p>Total: 679</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 516 • Public health - 393 • Biomedical & clinical science - 361 • Health services systems -194 • Reproductive medicines - 108 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being - 532 • Zero hunger - 105 • Gender equality - 29 • Quality education - 21 • Peace, justice, & strong institution - 13 • Reduced inequalities - 10 • Clean water & sanitation 8 • No poverty - 5 • Decent work & economic growth - 3 • Affordable & clean energy - 2 • Sustainable cities & communities - 1 	<p>Total: 388</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Public environmental occupational health - 345 • Paediatrics - 134 • Medicine general internal - 101 • Nutrition dietetics - 110 • Infectious diseases - 88 • Health care sciences - 59 • Multidisciplinary sciences - 151 • Obstetrics gynaecology - 86 • Health policy - 36 • Social sciences biomedical - 32 • Family studies - 20 • Education - 74 • Environmental sciences - 48 • Psychology education - 4. 	<p>Total: 924</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Medicine - 1,589 • Nursing - 266 • Multidisciplinary - 228 • Social science - 412 • Psychology - 126 • Environmental science - 122 	Total: 5,179

Final search string: Search string 6

Search string 5 helped limit publications to relevant ones but excluded some publications that should have been included. To address this, keywords on 'child' were expanded and combined with keywords on 'development' and 'growth' for specificity of results. Search terms on education, including 'preschool', 'early learning', and 'pre-primary' were also expanded. This search string increased publications on education. As shown in Table 8, Web of Science, for example, generated 523 education publications, with Dimension recording 145 publications on SDG 4 – quality education. This also retrieved publications on play and education that had previously been excluded.

Although no specific search terms were related to play, nutrition, health, caregiving, and environment and protection, the results generated publications across the six components (see Table 8). Significantly, there was a substantial reduction in irrelevant publications. Overall, health and nutrition had the most publications, with play and education recording the least results across all 4 databases.

A review of the search results sample revealed that publications across the six components were included. In addition, key publications for each component were cross-checked and it was observed that they were all captured in the results. Based on this, it was concluded that search string 6 was the most appropriate search string.

neonat* OR "newborn" OR new-born OR baby OR babies OR toddler* OR "Child*" OR "young child*" OR "early child*" OR infan* OR "under-five" OR "preschool" OR "pre-school" OR "preprimary" OR "pri-primary" OR "early learning" AND "development" OR "growth" OR "education" AND countries

Table 8: Number of publications identified for search string 6

Search string/stage	Dimensions	Web of Science	Scopus	PubMed
Search string 6	<p>Total: 2,072</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Health science - 1,141 • Public health - 772 • Biomedical & clinical science - 403 • Clinical science - 403 • Health services and systems 369 <p>SDGs:</p> <ul style="list-style-type: none"> • Good health & well-being - 1,318 • Zero hunger - 248 • Gender equality - 72 • Quality education -145 • Peace, justice, & strong institution - 31 • Reduced inequalities - 30 • Clean water & Sanitation -34 • No poverty - 19 • Decent work & economic growth - 16 • Affordable & clean energy - 7 • Life on land - 7 	<p>Total: 1,502</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Education - 523 • Environmental occupational health -317 • Paediatrics - 183 • Humanities multidisciplinary - 75 • Nutrition dietetics - 90 • Family studies - 67 • Psychology educational - 29 • Education special - 23 • Health policy - 40 	<p>Total: 2,438</p> <p>Research/subject categories:</p> <ul style="list-style-type: none"> • Medicine - 1,590 • Nursing - 266 • Multidisciplinary – 228 • Social Science - 410 • Psychology - 126 • Environmental science - 121 	<p>Total: 3,972</p>

Cataloguing the research and researchers information

After searching for ECD publications across the four databases, we downloaded and compiled them in a spreadsheet to catalogue information relevant to this study. This information includes:

1. Title and abstracts of the publication
2. The component(s) the study focuses on (health, learning, play, nutrition, environment and protection, and responsive caregiving)
3. Information on inequality factors (ethnicity, disability, gender, poverty, religion, and location)
4. Funding information
5. Collaboration
6. Access type (open or close)
7. Source of publication and DOI
8. Authors name, gender, and institutional affiliation
9. Country of the study
10. Publication type and language

For a full description of the cataloguing process, see Appendix A.

3. Conclusion

This protocol outlines the procedure for identifying and compiling relevant details of ECD research and researchers from SSA. It is hoped that mapping ECD research and researchers will enhance the knowledge of relevant institutions and individual practitioners and so support policy makers in making evidence-informed decisions on these issues.

Endnotes

- i. South Africa is excluded because preliminary analysis revealed that it has a markedly different research landscape to other countries in the region, with 3.5 times more education research outputs than Nigeria, the second most prolific country (Mitchell & Rose 2017a).
- ii. Both Eswatini and Swaziland are included as Dimensions uses Eswatini, Scopus uses Swaziland. Similarly, whilst Scopus uses Cape Verde, Dimensions uses Cabo Verde.
- iii. PubMed does not provide research and SDG categories

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Appendix A

Mapping Sub-Saharan African Early Childhood Development Research and Researchers: A Coding Guide

Introduction

This document serves as a practical roadmap for coding/cataloguing - systematically identifying, classifying, arranging, and categorising research on Early Childhood Development (ECD) in sub-Saharan Africa (SSA) identified through searches in both international databases and regional and national level journals and repositories. This guide primarily gathers the meta-data of ECD publications by SSA Africa-based researchers. It aims to briefly outline the elements/columns in the coding spreadsheet and the clues to identifying the meta-data for each attribute; to profile some selected, however, a varied repertoire of coding applied to this project; and provide examples and sources of each attribute to fill the spreadsheet.

The relevance criteria, as detailed in Iddrisu *et al.* (2024), are a key part of this project. They are used to determine the suitability of research for inclusion in the coding process. Specifically, the relevance criteria include the following:

1. Research conducted by at least one SSA-based researcher in an SSA country (except South Africa).
2. Published from January 2010 (for in-country mapping) and 2020 (for international databases).
3. Addressing at least one of these components - health, nutrition, responsive caregiving, early learning/education, play, and environment and protection.
4. Focusing on children of 0-3 years but includes studies focusing on 0-8 years.
5. Empirical research studies and systematic reviews (international databases) and including also unpublished research (in-country mapping).

Cataloguing Early Childhood Development Components

In this project, ECD covers six components: education/learning, health, nutrition, environment and protection, play, and responsive caregiving. Each component is further explained below, including the clues to identifying and coding a publication under each component. Because of the interconnectedness of these components in relation to ECD, most of them overlap. So, we look out for evidence of each component in a publication, noting that there is the likelihood of having more than one component. In the following sections, we take a deep dive into the components one by one, with some examples provided to illustrate how and when they overlap and where they are unique.

General Clues to Cataloguing

The clue to identifying a component and many of the meta-data is from the following sections of the paper:

1. Title
2. Abstract,
3. Methodology
4. Results or findings

We identify keywords associated with each component that can help us determine how to catalogue them under the different components. These keywords have been collated from systematic reviews and our searches (see Iddrisu *et al.*, 2024). While not exhaustive, they provide signals for words to look out for when identifying the component. Although some keywords might be specific to a particular component, they can overlap. This means that we can code a single publication across two or more components owing to a publication being relevant to more than one focus area. We will demonstrate this later in this guide.

Early Childhood Learning/Education

Children's development also entails the acquisition of skills in the earliest years. This can take place in formal settings (daycare, kindergarten, and nursery) and informal (home) settings. For example, they learn to sing, talk, imitate, and play games at home. Parents help their children to play and teach children to learn at home and usher them into formal learning settings like daycare, kindergarten, and nursery. Both formal and informal teaching of children is important for their formative years. Beyond their mental development, it also increases their socioemotional skills and general growth.

Below is a list of keywords often used to describe ECE.

"early childhood education" OR "child learning" OR "early learning" OR "child learning stimulation" OR "pre-school" OR "preschool" OR "Kindergarten" OR "elementary school" OR "nursery" OR "home learning activities" OR "child responsive stimulation" OR "psychosocial stimulation" OR "baby school" OR "pre-primary" OR "preprimary" OR "daycare" OR "day care" OR "reading" OR "literacy" OR "numeracy" OR "preschool curriculum" OR "early cognitive stimulation" OR "home-schooling" OR "cognitive development" OR "language/linguistic development" OR "social skills" etc.

Some keywords, such as preschool, can be used to identify who the participants are, but the focus of the study is actually on different components. For example, a study may be conducted among preschool children to examine their health or nutrition status. In this case, the use of 'pre-school' does not qualify it as an ECE publication but does for health. For example, Nyamasege *et al.*, (2021), *"Risks of Anaemia Among Pre-School Children Following Maternal Nutrition Education and Counselling in Urban Informal Settlements of Nairobi, Kenya"*. In this study, the researchers investigate anaemia (health) among "pre-school/preschool" children. In this publication, Nyamasege and his co-researchers do not study the learning or education of the children, but rather as participants, and so this publication would be classified under health and nutrition and not learning/education.

Also, some studies examine more than two components. This may, for example, examine the health of preschool children and their learning. In such a context, the paper is relevant for education and health. For example, Seidu *et al.* (2021) *"Determinants of Multidimensional Poverty among the Under-Five: Illustration Based on Data from the Congo Multiple Indicator Cluster Survey"* exemplifies publications that are relevant for education, health, nutrition, and environment and protection.

Another overlapping instance could be a study that investigates how nutrition improves children's communication and gross motor skills, covering different variables. For example, a study by Addo, O. Y., *et al.* (2020). *An Integrated Infant and Young Child Feeding and Small-Quantity Lipid-based Nutrient Supplementation Program Is Associated with Improved Gross Motor and Communication Scores of Children 6-18 Months in the Democratic Republic of Congo*. This implies that we code this publication in all the components it addresses.

Health

Good health begins at conception and carries on throughout life. More importantly, children's health at the early stage of life significantly determines their emotional, physical, intellectual, and psychological development. For children to grow and develop rightly, it is incumbent on their parents and caregivers to safeguard them from diseases and seek the right care when they are in need. So, caring for children's health is a game changer that needs to be studied.

Publications related to children's parents/caregivers are included as long as there is a link to early childhood outcomes. For example, research on pregnant mothers was only included if it explored how events/activities during pregnancy affected the child. For example, mother-to-child transmission of HIV

Below are some keywords to guide us in identifying a publication as a health component.

The keywords include:

"child health" OR "child wellbeing" OR "child well-being" OR "Malaria" OR "Vaccin" OR "immunisation" OR "mother-to-child transmission" OR "HIV" etc.*

An example of a health publication includes Ihedimma, G. I., & Opara, G. I. (2021), *"An account of disproportionate child healthcare utilization in Nigeria"*.

Nutrition

Like all other components, nutrition is also a building block for children's growth and development. It starts with the mother's nutrition, which affects the child's development during pregnancy through childbirth. Studies on the nutrition of pregnant mothers, for example, with no link to pregnancy outcomes, are therefore excluded. This means that food security and its richness in all the essentials are vital for the survival and healthy growth of the child. After birth, children receive breastmilk from their mothers and are complemented with other age-appropriate food. Food and nutrition, in general, are of high essence to all domains of children's development.

This component can also be determined, first, with **keywords** including but not limited to:

"nutrition" OR "supplement" OR "food supplements" OR "nutrient" OR "micronutrient" OR "dietary supplement" OR "micronutrient supplementation" OR "macronutrient supplementation" OR "nutritional supplementation" OR "infant food" OR "diet" OR "feeding" OR "iron" OR "iodine" OR "breastfeeding" OR "food and nutrition security" OR "food supply" OR "food security" OR "food insecurity" "stunted" OR "stunting" OR "height" OR "length" OR "growth" OR "length-for-age" OR "length for age" OR "weight-for-height" OR "weight for height" OR "underweight" OR "under-weight" OR "wasting" OR "malnutrition" OR "malnourish*" OR "undernourish*":*

An example of a nutrition publication is Worku *et al.*, (2021). *"Under **nutrition** and Associated factors among infants and young children age 6-23 months attending Minilik II Hospital, Ethiopia"*.

As said earlier, components overlap. An example of nutrition overlapping health is Sanoussi, Y. *et al.* (2020). *Assessing and decomposing inequality of opportunity in access to child health and nutrition in sub-Saharan Africa: evidence from three countries with low human development index*.

Play

For the purposes of this project, publications on play are identified separately from early learning/education. Play could be children's physical activities, structured or unstructured, and taking place in formal or informal settings. Play contributes to children's social, emotional, physical, motor, language, creativity, and intellectual development. Using the keywords below, we can identify and classify a publication as having a play component.

"play" OR "early play" OR "child outdoor play" OR "environmental play" OR "playthings" OR "nature space" OR "children space*" OR "children place*" OR "child physical activity" OR "child motor activity" OR "physical exertion" OR "locomotor activity" etc.*

Examples of publications on play include Madondo, F., & Tsikira, J. (2022). *Traditional children's games: their relevance on skills development among rural Zimbabwean children age 3–8 years*, Avornyo, E. A., & Baker, S. (2022). *'He will play because it is play': Exploring Ghanaian early years parents' ethno-theories about play and learning*". In these two studies, the researchers use words like **play and children's games**, depicting the focus of the study. Both of these studies also overlap with education/early learning.

Responsive Caregiving

Responsive caregiving entails parents or caregivers being able to pay attention, care for, protect, and maintain a hygienic environment, respond to children's needs to protect them from injury and illness, enhance their learning, and establish good relationships and trust with their children. Caregivers feed on demand and cuddle children to stimulate and develop them.

Below are some keywords to rely on as a guide:

parenting OR "child rearing" OR child-rearing OR caregiving OR mothering OR fathering OR caregiv OR care giv* OR attachment OR attention OR "parent-child relations" OR "maternal behav*" OR "parental behav*" OR "paternal behav*" OR "parent-child relationships" OR "maternal behav*" OR "paternal behav*" OR "early childhood care" OR "parent* support"*

An example of responsive caregiving research is by Bornstein, M. H., *et al.* (2022). *'Mixed blessings': parental religiousness, parenting, and child adjustment in global perspective. In Parenting: Selected Writings of Marc H. Bornstein* and Hollowell, J., *et al.* (2020). *"Age-related patterns of early childhood development practices amongst rural families in Burkina Faso: findings from a nationwide survey of mothers of children aged 0-3 years"*

Environment and Protection

Children's safety and security are dependent on their environment and caregivers. They need protection by their parents, caregivers, and all adults against illness, injury, physical violence or harm, and emotional stress. Children's safety and security are essential to guard them from physical, emotional, mental, economic (lack of resources to meet their needs) and social pain. Providing clean water and sanitation and ensuring a safe environment are part of a child's protection. In addition, birth registration provides legal proof of identity, which can protect children from violence, abuse and exploitation. For example, a birth certificate shows the age of a child and can protect her from early marriage.

Below is the list of keywords to guide us to catalogue meta-data for this component:

"water, sanitation and hygiene" OR "WASH" OR "water and sanitation" OR hygiene OR "child safety" OR "child protection" OR "environmental safety" OR "cash transfer" OR "birth registration" etc.

An example of an **environment and protection** publication is *"Water, sanitation, and hygiene as a priority intervention for stunting in under-five children in northwest Ethiopia: a community-based cross-sectional study"* by Ademas *et al.*, (2021).

Identifying Inequality variables

Inequality variables or themes—gender, poverty, location, ethnicity, and religion—are important parts of this mapping exercise. Our rationale for considering these variables is to understand the extent to which inequality factors are studied in early childhood development.

1. Ethnicity: Ethnicity as an inequality factor focuses on studies that examine children's differences across two or more ethnic groups. It entails more than just statistical differences but a deeper interrogation of how children's development varies across ethnicities. (See Allan *et al.*, (2021). *Inequities in childhood immunisation coverage associated with socioeconomic, geographic, maternal, child, and place of birth characteristics in Kenya*).

2. Disability: Does the study focus on children with disability? Or does the study highlight differences among participants with and without disability and discusses this issue in-depth? (See Olusanya, B. O., *et al.* (2022). *Cerebral palsy and developmental intellectual disability in children younger than 5 years: Findings from the GBD-WHO Rehabilitation Database 2019*).

3. Poverty, a significant inequality variable, has a special role in our analysis. It is composed of household income and household wealth index. (Example, Nampijja, M., *et al.* (2021). *Community perceptions and practices of early childhood development in an urban-poor setting in Nairobi: Uncovering contextual drivers beneath poverty*).

4. Gender herein refers to the gender differences of the participants in a study. It connotes the extent to which researchers report and discuss the variation between male and female children's development. This is in line with SDG 4, which openly asks for "all **girls and boys** to have access to quality early childhood development, care and pre-primary education..." It is, therefore, imperative to assess the extent to which ECD research takes gender differences into account. An example could be the examination of boys and girls' participation in early reading or play. Example, Musa *et al.*, (2021). *The impact of gender on the semantic skills of arabic speaking Sudanese children*. Note: This does not refer to the gender of the authors.

5. The location here refers to the setting of the study - rural, urban, or both. If the study does not explicitly identify the location, the code should be 'not indicated'.

6. Religion – where studies examine children's development and how they differ based on religious grounds. (See Bornstein, M. H., *et al.* (2022). *'Mixed blessings': parental religiousness, parenting, and child adjustment in global perspective. In Parenting: Selected Writings of Marc H. Bornstein*).

Research Methods

This column captures the research method (qualitative, quantitative, mixed-method, review, etc) used for the study.

Funding type and Funder

Another significant category of the cataloguing is the funding type and funder. **Funding type** refers to the source of funding for the research. This has nine columns in the spreadsheet. The types of funding here include internal institutions, government, external philanthropy, Self-funding, local organisations, and international institutions.

- 1. Internal institution:** This refers to the institution(s) where the researcher(s) are based in in SSA. This does not include institutions outside SSA funding the study. For example, if a researcher in the University of Nairobi receives funding from a department or a broad university funding.
- 2. Government funding:** funding by an SSA government agency, such as ministries or departments, or higher education loans from government.
- 3. External philanthropy:** Any philanthropic organisation outside SSA. For example, the Bill and Melinda Gates Foundation, Conrad Hilton Foundation, etc.
- 4. Self-funding:** In this case, the researcher(s) are reported to fund the study.
- 5. International institution:** Any non-philanthropic institution funding the study. Examples include UKAID, USAID, etc. It also includes universities outside SSA sponsoring research in SSA.
- 6. Local organisations:** This refers to any non-governmental organisation within SSA (NGOs, SSA-based foundations, etc.).

It is important to note that the type or source of funding depends on the funder. Depending on the journal or publisher, the clue to finding the funder is located in the acknowledgement, funding source, notes, and sometimes immediately after the abstract. These sections are predominantly found after the concluding section of the paper. If the funder is not mentioned, select "no information" and "none" in the funding type column, as some journals may not request funding information.

Country of Study

This project focuses on 48 SSA countries (excluding South Africa). The countries include the following:

"Angola" OR "Benin" OR "Botswana" OR "Cameroon" OR "Burundi" OR "Burkina Faso" OR "Cape Verde" OR "Central African Republic" OR "Cote D'Ivoire" OR "Chad" OR "Comoros" OR "Democratic Republic of Congo" OR "Djibouti" OR "Equatorial Guinea" OR "Eritrea" OR "Eswatini" OR "Ethiopia" OR "Gabon" OR "Ghana" OR "Guinea-Bissau" OR "Guinea" OR "Ivory Coast" OR "Kenya" OR "Lesotho" OR "Liberia" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritius" OR "Mauritania" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "República de Cabo Verde" OR "Republic of Congo" OR "Rwanda" OR "Sao Tome and Principe" OR "Senegal" OR "Seychelles" OR "Sierra Leone" OR "Somalia" OR "South Sudan" OR "Sudan" OR "Swaziland" OR "Tanzania" OR "The Gambia" OR "Togo" OR "Uganda" OR "Zambia" OR "Zimbabwe"

This implies that a study/publication must have its setting in one or more of the 48 SSA countries. For example, the study could be conducted in Madagascar and/or Central African Republic (See Vonaesch *et al.*, (2021) "*Factors Associated with Stunted Growth in Children Under Five Years in Antananarivo, Madagascar and Bangui, Central African Republic*"). Another scenario is that one SSA country could be part of a large-scale country study and must have one or more researchers based in SSA. For example, Allen *et al.* (2021), "*The Mothers, Infants, and Lactation Quality (MILQ) Study: A Multi-Center Collaboration*", the study focuses on Brazil, Bangladesh, Denmark, and The Gambia.

Citation/Reference

The citation column is designated for the paper's reference. We use the latest APA referencing style, which can be accessed through Google Scholar, iDiscover, or the citation provided in the study. We double-check citations for accuracy before including them in the spreadsheet.

Authors/Researchers and Affiliations

In addition to the setting of the country, one or more authors must be affiliated with an institution in any of the 48 countries. For example, a study could contain at least one author based in sub-Saharan Africa affiliated with the University of Rwanda (located in Rwanda) or the Institute National de Sante Publique, Abidjan (located in Ivory Coast) or the African Population and Health Research Centre (located in Kenya) etc. They could also be independent researchers based in sub-Saharan Africa (unrelated to any institution). They will not be included if they are an international consultant or ex-pats working with an international organisation in an SSA country.

When this criterion has been satisfied, in addition to all the required criteria, the next thing is to fill the author's column. One must note that we are only interested in SSA-based authors for the spreadsheet. If a publication contains 10 collaborated authors and the study includes one of the 48 countries, we list only the SSA-based author or authors and their affiliations.

To identify the author's affiliation, look out for the following aspect or part of the publication (depending on the journal):

1. before or after the abstract.
2. after the conclusion section but before the references.
3. hover the cursor on the author's name if it has a hyperlink for the affiliations to pop up.

Gender of the Author(s)

The gender of the authors of each study is essential to this study. Though it can sometimes be challenging to identify the gender of the author, we encourage that extra effort should be made to fill these columns.

The gender of the authors can be determined, mostly by their names, and through Google search and LinkedIn, with images to help us identify.

Collaboration

Collaborations have three columns: Collaboration within the country, within SSA, and outside SSA.

1. Collaboration **within a country** means two or more researchers in the same country but in different institutions. For example, two or more researchers at Kyambogo University (Uganda) and Makerere University (Uganda) authoring a publication.
2. Collaboration **within SSA** means a paper with two or more researchers/authors located in different countries within SSA. For example, an author at Addis Ababa University (Ethiopia) co-authors a paper with a researcher(s) at the University of Ibadan (Nigeria).
3. Collaboration **outside SSA** connotes a researcher(s) in SSA countries featuring authors outside SSA. For example, an author at Addis Ababa University co-authored a study with a researcher(s) at the University of Cambridge.

Source link, DOI, and Access/Open Access

These columns are automatically filled when downloaded from the database. However, there are instances where they are not filled, requiring our effort to at least provide for one of the links, i.e., the DOI or the source link.

Clue: These are generally available towards the beginning of the article.

Authors Email

To establish a community of practice or be able to reach out to the authors in our study, we include their contact details, such as their emails or LinkedIn details or ResearchGate link/profile, where available. In most cases, only the first or lead author's email is available in the article. However, some journals provide emails from all the authors. Hence, all non-SSA-based researchers will not be listed, as we are only interested in the SSA author's contact details.

Clue: This can be located by hovering the cursor on a hyperlinked name, google, other articles written by the same author, their institutional profile, LinkedIn, etc.

Publication Type

The type of publication includes a list of drop-downs to choose from. The list includes a peer-reviewed article, book or chapter, working paper, and conference proceedings. Pre-prints are not included.

Language of the Publication

This column connotes the language in which the study or publication is published. It can be in any language. However, the drop-down contains English, French, Swahili, and Portuguese. That notwithstanding, we can always update the language if the language of the publication does not fall within the list above.

Conclusion

In brief, this document has set the guidelines for understanding the coding/cataloguing process, the clues to identifying meta-data, and where to locate them.

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