



Early Childhood Development and the Next 1000 Days 1

The next 1000 days: building on early investments for the health and development of young children

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This is the first in a Series of two papers on early childhood development and the next 1000 days

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Following the first 1000 days of life that span from conception to two years of age, the next 1000 days of a child's life from 2–5 years of age offer a window of opportunity to promote nurturing and caring environments, establish healthy behaviours, and build on early gains to sustain or improve trajectories of healthy development. This Series paper, the first of a two-paper Series on early childhood development and the next 1000 days, focuses on the transition to the next 1000 days of the life course, describes why this developmental period matters, identifies the environments of care, risks, and protective factors that shape children's development, estimates the number of children who receive adequate nurturing care, and examines whether current interventions are meeting children's needs. Paper 2 focuses on the cost of inaction and the implications of not investing in the next 1000 days. In low-income and middle-income countries (LMICs), only 62 million children aged 3 and 4 years (25·4%) currently receive adequate nurturing care during the next 1000 days, leaving 181·9 million children exposed to risks that jeopardise their healthy development. Inputs across nurturing care dimensions of health, nutrition, protection, responsive care, and learning vary substantially across countries. In LMICs, although 86·2% of children have a healthy weight in this period, less than one in three children have access to developmental stimulation or are protected from physical punishment, and only 38·8% have access to early childhood care and education services. Intervention research in LMICs in the next 1000 days is scarce. The continuity of developmentally appropriate nurturing care, coordination across health, education, and protection sectors, and the implementation of interventions to support caregivers and improve the quality of education and care remain top priorities in this period. These sectors play key roles in promoting quality early care and education for this age group, which will help maximise developmental potential and opportunities of children globally and help progress towards the achievement of the Sustainable Development Goals.

Introduction

Early childhood development has received substantial attention in three previous *Lancet* Series published in 2007,^{1–3} 2011,^{4,5} and 2017.^{6–8} The 2017 Series reported that 250 million children in low-income and middle-income countries (LMICs) were at risk of not meeting their developmental potential.⁶ Although the first 1000 days (conception to two years of age) has been widely recognised in global research, policy, and practice, it is timely to consider the evidence, opportunities, and imperatives for the next 1000 days. The previous *Lancet* series recognised that building a strong foundation for healthy development begins in the first 1000 days of life and requires support as children transition into the next 1000 days. The next 1000 days refers to the period between 2 and 5 years of age, which includes the preschool and preprimary years. This period in the life course marks a substantial growth of skills and provides a sensitive window of opportunity to mitigate environmental risks, promote protective factors, and establish healthy developmental and behavioural trajectories. The next 1000 days offer chances to recalibrate children's developmental trajectories in areas where opportunities were lost in the first 1000 days, and to sustain and build upon gains achieved in the first 1000 days.

The next 1000 days refers to the period between a child's second and fifth birthdays, intending to cover the preprimary years and recognising that when children begin Grade 1 primary will differ around the world. We acknowledge that the next 1000 days lacks precision in terms of an exact time frame, in the way that the first 1000 days encompasses pregnancy and the first 2 years of life. However, like the first 1000 days, the notion of the next 1000 days is intended to draw attention to this stage of the life course, building on the investments of the first 1000 days. We expect that the simplicity of the term and the ease with which it can be remembered and translated across multiple languages and settings is more salient than the precision of the period.

In this Series paper, the first of a two paper Series on health and development in the next 1000 days, evidence is presented for why the transition to the next 1000 days matter—the environments of care, risks, and protective factors that shape young children's development in this period are described; and the nurturing care inputs young children currently receive globally are analysed. Finally, a mapping review of interventions implemented globally to promote development in the next 1000 days is presented to understand whether interventions are meeting the needs of children in this period.

Key messages

- Building on the foundation of the first 1000 days, the next 1000 days (from 2–5 years of age) is a crucial window of opportunity to extend nurturing care for contributing to optimal health, growth, and developmental trajectories.
- Environmental risks to health, nutrition, and development persist, including physical punishment of the child, suboptimal diets, poor caregiver mental health, exposure to pollution, and climate change.
- An estimated 8% of children younger than 5 years have a developmental disability and require targeted additional support to optimise health, wellbeing, and prevent further disadvantage.
- Protections that shape development in the next 1000 days expand from home, clinic, and community settings to include ECCE settings, but multisectoral strategies to promote and protect development are limited, especially in LMICs.
- ECCE for children in the next 1000 days is a key component of support for their learning and development, but less than 30% of children aged 3 and 4 years participate in ECCE in LMICs.
- Only 29.9% of children in LMICs receive adequate nurturing care in the next 1000 days. Poorer children, children in rural areas, and boys are less likely to receive adequate care.
- Children in LMICs who have received early learning support and responsive care are approximately two years ahead in their development, compared to children not receiving these supports.
- Interventions promoting healthy development in the next 1000 days are predominantly delivered in high-income countries; only 5% of published interventions have been implemented in LMICs.
- Despite their vulnerability, young children in LMICs are not adequately reached by a holistic set of interventions to promote development in the next 1000 days.
- Key interventions that are available (such as ECCE) warrant attention to quality, equity, and inclusion to ensure all children are reached and receiving programmes that support their development and learning, as well as an enabling policy environment that improves investment in ECCE systems and fosters demand for services.

ECCE=early childhood care and education. LMICs=low-income and middle-income countries.

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Paper 2⁹ addresses key strategies for supporting children's development in the next 1000 days, with particular focus on the effectiveness of global interventions, the cost of interventions against the cost of inaction in the next 1000 days, and concludes the Series with recommendations on how to best support and bolster children's healthy development in this period.

Why the next 1000 days matter

Substantial scientific advances have been made to establish how the first 1000 days of a child's life are a sensitive period for physical, neural, cognitive, and social-emotional development, and apply this knowledge to inform early childhood programmes and policies.^{6,7} However, exposure to poverty-related and other risk factors can undermine children's development in the next 1000 days, a period of heightened neural maturation supporting continued and rapid growth of motor, language, and interactive abilities, as well as the expansion of skills such as self-regulation and executive functioning.¹⁰ Young children's health, growth, and development differ across the next 1000 days, and these continue to be shaped by the quality of nurturing care. Nurturing care is defined as an enabling environment that fosters the provision of care across five dimensions: health, nutrition, responsive caregiving, safety and security, and early learning.⁷ Figure 1 shows how these dimensions relate to salient

developmental outcomes and inputs in the next 1000 days.

We adopt a comprehensive, multisectoral, and multi-level life course perspective¹¹ to emphasise that both enabling environments and development are cumulative and continuous.¹² Figure 2 shows how development across key domains of functioning during the next 1000 days can build on the early foundation of the first 1000 days to set children on optimal trajectories into middle childhood and adolescence. It also identifies various sectors that need to be better integrated across the lifespan to support development of individuals and thus of communities and nations. The first and next 1000 days must be considered as two continuous periods that build a strong foundation for lifelong wellbeing, relationships, and achievement, through increasing learning opportunities and attenuating the negative effect of adversities.¹²

With respect to health, nutrition, and growth, the next 1000 days are a window of opportunity to reduce early risks undermining physical development; to promote dietary diversity, growth, and healthy habits;¹³ and try to overcome early deficiencies. Since improvements in health and growth in the next 1000 days might not transfer to developmentally salient skills in this period,¹⁴ it is crucial to interrogate how the child's diet, illnesses, growth faltering, and psychosocial stress influence cognitive, motor, and language skills.¹⁴ The next 1000 days mark a time of rapid development of

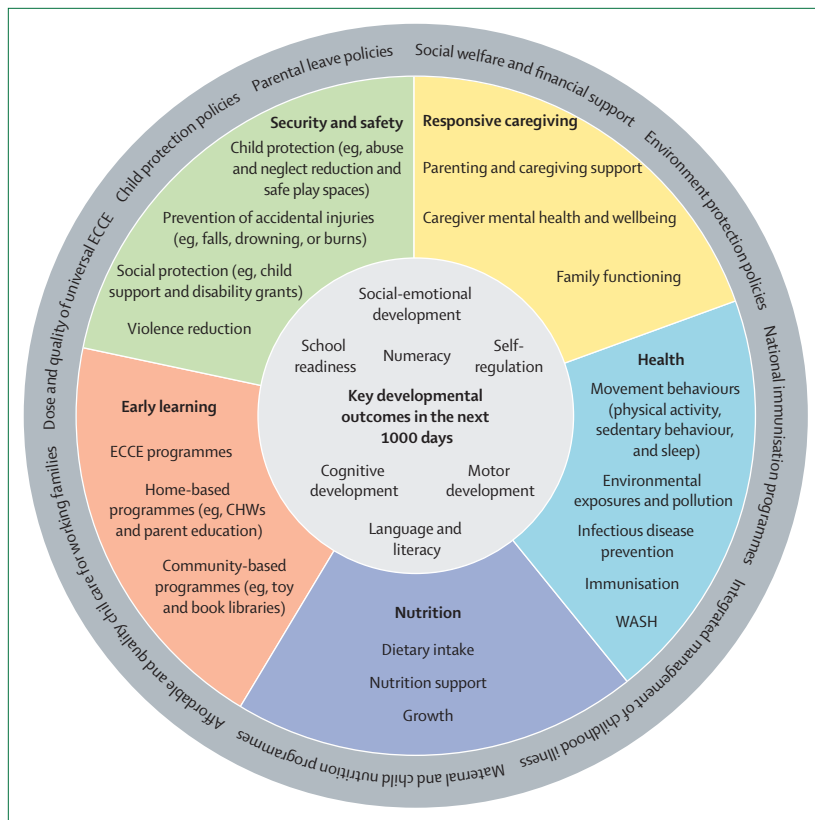


Figure 1: Developmental outcomes and inputs of nurturing care in the next 1000 days
Developmental domains in the next 1000 days are presented in the central circle, from which key developmental outcomes are derived; the dimensions of the Nurturing Care Framework are in the next layer, with components relevant to the next 1000 days; the outermost layer presents relevant policies. CHWs=community health workers. ECCE=early childhood care and education. WASH=water, sanitation, and hygiene.

fundamental motor skills, increased independence in movement and physical exploration, and an expansion and refinement of cognitive, language, and social-emotional skills. Between 24 and 36 months, basic developmental skills emerge (eg, expressive language, coordinated movements, and emotional development) followed by a refinement of these skills as children transition into the period between 36 months and 59 months (eg, communicating more clearly in sentences with people outside of the most significant familial caregivers, coordinated movements, or expressing a wider range of emotions). It is important to identify culturally-relevant stimulating activities and safe play spaces that foster fine and gross motor skills, movement behaviours, cognitive, language and social-emotional skills, and physical play in this period.

The next 1000 days offer opportunities to strengthen nurturing bonds with primary caregivers, as well as form new caregiving relationships through addressing the effects of early psychosocial adversity on brain networks involved in social information processing¹⁵ and early caregiver–child attachment security.¹⁶ Children's increased agency and capacity to regulate their own attention, behaviours, and emotions during this period

call for caregiving programmes and policies that promote culturally responsive and developmentally supportive non-violent discipline and socialisation practices,¹⁷ while also addressing caregivers' mental health and child protection needs. Since primary caregivers' inputs do not fully explain the development of children's skills during this time of increased social interactions,¹⁸ novel assessments of stimulating experiences, including studying the role of larger family dynamics (eg, fathers, siblings, grandparents) and the broader community, are needed.^{19–21} To advance the study of how peer and sibling interactions influence development in the next 1000 days across various settings, scalable and ecologically valid assessments of social-emotional skills and play behaviours in this age group are crucial.²²

The next 1000 days also marks a period of growing neurobehavioural capacity for information processing, executive functions, cognitive and language skills, and increasing exposure to environmental stimulation that enable more complex forms of communication, reasoning, and learning. These skills have implications for lifelong trajectories of health, learning, and wellbeing.²³ Although early childhood care and education (ECCE) settings take on increased salience and provide important opportunities for learning and interactions, the ECCE experience is variable both across and within countries. ECCE settings encompass a wide range of services such as formal and informal childcare²⁴ and community-based programmes²⁵ that can cater differently for younger and older children in this age group. Research is needed to identify effective ECCE pedagogies and complementary family nurturing inputs that promote play-based learning, acquisition of early literacy and numeracy skills, and school readiness. This work needs to consider both variability in development of skills and independence during this period, including cross-cultural differences, and address developmental delays and learning differences. Providing nurturing care in this period will support achieving the Sustainable Development Goals (SDGs),¹¹ especially goal 4.2, which aims to ensure quality early childhood development, care, and education for all children. Although the Nurturing Care Framework is universal,²⁶ children with the greatest vulnerabilities, including those with disabilities, need additional targeted supports to prevent further disadvantage. In summary, the next 1000 days require continuity of nurturing care and stimulation at home but afford new opportunities for promoting and supporting developmental outcomes in both ECCE and community environments that can be strengthened by supportive policies and systems (figure 3).

Environments that shape young children's development

A close examination of the environments of nurturing care, which shape child outcomes in the next 1000 days, is necessary to inform intervention and policy efforts. In



Figure 2: The next 1000 days within the life course

ECCE=early childhood care and education. WASH=water, sanitation, and hygiene. *The next 1000 days refers to the period between a child's second and fifth birthday, intending to cover the pre-primary years (generally before a child is expected to begin their first year of primary school, which may vary from setting to setting). However, like the first 1000 days, the notion of the next 1000 days is intended to draw attention to this stage of the life course, building on the foundational investments of the first 1000 days.

this period of life, children are increasingly exposed to environments outside of the home, and ECCE settings influence and shape development in addition to home and family relationships and the child's biological wellbeing.²⁷ Bronfenbrenner's social ecological model of human development²⁸ provides a framework for understanding how child development is influenced by these various environments. Sameroff has built on this social ecological perspective to propose dynamic, multilevel biopsychosocial systems that provide a more unified understanding of development over time.²⁹ Both frameworks accommodate the influence of the socioeconomic environment in which children develop, given that poverty, food insecurity, and other material deficits and insecurities contribute to inequalities in stimulation, ECCE, and supportive environments.^{4,30} Thus, the adequacy and quality of nurturing care inputs provided to support early development will be influenced by the access families have to resources (eg, financial and food security) to invest in their young children and by the available policies that can impede or facilitate access to these resources.

This section summarises our reviews of published research on risks and protections, informed by the

Nurturing Care Framework (NCF), in children's immediate biological, family, and ECCE environments during the next 1000 days, focusing on LMICs (appendix pp 2–21). Although reviews for each area took different approaches based on the state of evidence, availability of previously published reviews, and disaggregation of data for the period of the next 1000 days (eg, general literature review for climate change and young children given the dearth of evidence, original systematic review and meta-analysis for mental health of caregivers and young children's social-emotional development, and a review of reviews on quality of ECCE), all reviews examined peer-reviewed articles from LMICs with at least one early childhood development, behaviour, or mental health outcome.

These reviews show the importance of leveraging opportunities in the next 1000 days to optimise nurturing care inputs to achieve benefits in early childhood development alongside child health, nutrition, and protection. Several cross-cutting implications emerged: packaging multiple nurturing care inputs to mitigate risks and promote protection is important (eg, family care packages that combine mental wellbeing, violence prevention and parenting support), but requires further

See Online for appendix










Developmental domains and nurturing care dimensions	Family	ECCE services and community context	Policy and systems
Health 	 <ul style="list-style-type: none"> Promotion of developmentally appropriate self-care (eg, handwashing and dental hygiene). Use of physical and mental health care services. Regular daytime and night-time sleep. 	 <ul style="list-style-type: none"> Annual screenings (growth, anaemia, vision, hearing, developmental milestones, dental) and immunisations in ECCE programmes, community health services, primary health care, and home visits. 	 <ul style="list-style-type: none"> Universal health care and free preventive services. Free screening and interventions for developmental delays and disabilities. Protective laws and regulations to increase safety, reduce toxins, and minimise commercial harm.
Nutrition 	<ul style="list-style-type: none"> Regular meals. Balanced nutritional intake and dietary adequacy. 	<ul style="list-style-type: none"> Free meals and dietary supplements in ECCE programmes. Community-based food assistance. 	<ul style="list-style-type: none"> Nutrition education (hand washing, undernutrition, and obesity). Financial food subsidies for families.
Fundamental movement and motor skills and fine motor skills 	<ul style="list-style-type: none"> Safe home spaces for physical exploration and active play. Promotion of developmentally appropriate skills (eg, buttoning, tying shoes, brushing teeth). Inclusion in activities and chores that promote hand strength, coordination, and balance (eg, beading, cooking, drawing, carrying). Encouragement of healthy movement behaviours (physical activity and managing screen time). 	<ul style="list-style-type: none"> Access to play structures, equipment, and materials coupled with the ECCE staff. Training to effectively use the resources in scaffolding free play, physical games, and building and crafting activities. Access to age-appropriate and safe play structures and areas in the community. Infrastructure to support safe walking and active travel. 	<ul style="list-style-type: none"> Incentives for planning, building, and maintaining child-friendly and safe outdoor spaces, including for active travel. Protective laws and regulations to increase inclusion and reduce opportunity gaps for children with physical disabilities. Guidance and services to support healthy movement behaviours.
Language and literacy skills 	<ul style="list-style-type: none"> Child-directed speech and responsive conversations. Opportunities to practice expression of one's thoughts and experiences. Inclusion in family-based storytelling, singing, read aloud activities, and narrative rituals. Access to age-appropriate books and materials for drawing and writing at home. 	<ul style="list-style-type: none"> Access to play-based activities and developmentally appropriate curricula, books, and materials for drawing and writing coupled with the ECCE staff training to effectively use the resources to promote vocabulary, narrative skills, letter knowledge, and phonological and print awareness. Dissemination of culturally relevant print materials and exposure to stimulating creative activities, such as singing, storytelling, and dramatisation via community-based organisations. 	<ul style="list-style-type: none"> Universal access to high quality ECCE programmes. Policies to reduce inequity in attendance in ECCE programmes based on gender, disability status, socioeconomic status, etc. Programmes and practices (eg, teacher education and curricula development) that promote equity in child outcomes. Media programmes and educational technology that scaffold early literacy and numeracy skills (eg, Sesame Street) Policies and programmes that support caregivers' literacy, continued education, and skill building.
Cognitive and numeracy skills 	<ul style="list-style-type: none"> Promotion of understanding of physical properties (eg, colour), contrasts (eg, relative speed), quantities (eg, amounts), number knowledge, counting, and time in everyday activities (eg, sorting) and discussions. Practising executive function skills through age-appropriate multistep activities, chores, games, and rituals. 	<ul style="list-style-type: none"> Access to play-based activities and developmentally appropriate curricula, games, puzzles, and manipulative materials coupled with ECCE staff training (and support from community-based organisations where available) to effectively use the resources to promote number sense, symbolic representation, spatial awareness, understanding of measurement, estimation, and patterns. Use of child-directed pedagogical approaches that promote children's executive functions and problem-solving skills. 	<ul style="list-style-type: none"> Funding for community-based organisations that offer programming and disseminate learning materials for young children.
Social-emotional skills 	<ul style="list-style-type: none"> Sensitive and responsive caregiving behaviours that address the child's social and emotional needs and promotes self-regulation of emotions and behaviours. Age-appropriate behavioural expectations and non-violent supportive discipline practices. Family-system interventions that explicitly include male caregivers, multigenerational households, and siblings. Caregiving behaviours that promote the child's identity, sense of belonging, and agency. 	<ul style="list-style-type: none"> Access to play-based activities and developmentally appropriate curricula, positive behavioural support systems, and classroom management strategies coupled with ECCE staff training to effectively promote emotional understanding and regulation, prosocial behaviours, conflict resolution, empathy, inclusion, and a sense of belonging. Smaller student to teacher ratios. Community opportunities to participate in group-based activities with peers. Community supports for caregivers' and children's mental health and safety. 	<ul style="list-style-type: none"> Policies and programmes that support family financial and residential stability. Policies and programmes that ensure child and caregiver protection from abuse, neglect, and domestic violence. Mental health education and supports for caregivers and children. Policies and funding that support ECCE workforce's development, remuneration, retention, and stress reduction.

Figure 3: Opportunities to promote and support salient developmental outcomes in the next 1000 days
 ECCE=early childhood care and education.

evidence on effectiveness; strengthening multisectoral partnerships across health and nutrition, education, child protection, and social protection and welfare, with particular attention to ECCE settings, is imperative in the next 1000 days; identifying features of quality to strengthen protective environments necessitates shifting attention from dose alone to dose and quality of service provision; and measurement of nurturing care environments specific to the next 1000 days to assess programme progress, equity, and inclusion is essential. In addition to the immediate nurturing care environments, the panel summarises the urgent need to study the effects of pollution and climate change on early childhood development. These risks have been heightened during the COVID-19 pandemic with disruptions to child health and ECCE services, rising numbers of malnourished children, increased mental health challenges among already disadvantaged caregivers, and increased violence against women and children. The pandemic also shed light on the need for affordable quality childcare services. The World Bank defines childcare services as “any service with the primary objective of caring for children while parents are working while ensuring children are safe and have opportunities to learn and develop positive relationships with caregivers and peers”.⁶⁸ Although there is an increase in access to ECCE more generally, and an emerging need for childcare for the very youngest children (infancy through the first three years of life) is recognised, there is limited research from LMICs and there are few evidence-informed policies that could yield benefits for children’s outcomes, families’ economic security, and gender equity.⁶⁹ These gaps further underscore the urgent need for developmentally supportive policies (eg, paid parental leave) and services (eg, affordable high-quality childcare services) as well as multisectoral coordination with sectors such as social protection that more directly address poverty alleviation and food security to ensure families can invest in their children and optimise early nurturing care inputs.^{70–74}

Biological environment

Health

Despite the health sector playing a central role in reaching children during the first 1000 days due to more frequent interactions between health services and children and their caregivers, routine interactions with health services are less frequent after 2 years of age.^{75,76} Most children in the next 1000 days primarily interact with health services when sick or injured, and in LMICs, families with children in this age group might miss recommended preventive guidance and screening. Although access to health care has improved in many settings,^{77,78} the accessibility and quality of care varies substantially between and within countries.⁷⁹

Several health risks persist beyond the first 1000 days (eg, cerebral palsy, in-utero and birth-related conditions)

and new health conditions and risks emerge in the next 1000 days (including infection and injury), which contribute to developmental difficulties for children. However, evidence on the effects of specific illnesses and injuries in children from LMICs during this period is scarce.⁸⁰ For example, there are mixed findings and limited literature on the effect of viral meningitis on early childhood development.⁸¹ The negative effect on years lived with disability and disability-adjusted life-years from illnesses including malaria, pneumonia, diarrhoeal disease, and iron deficiency is captured by Global Burden of Disease estimates, but evidence on their effect on early childhood development is lacking in the literature. Some illnesses (eg, haemophilia, cystic fibrosis) do not appear to be associated with impaired later development, but there are clearer deficits with other conditions including severe end-stage renal disease and liver disease,⁸² sickle cell disease,⁸³ and epilepsy.⁸⁴ The extent to which development is related to the effect of childhood chronic illness in general, the specifics of any one disease, or factors related to treatment and management is unclear. For example, diarrhoeal disease and lack of access to water, sanitation, and hygiene (WASH) are negatively associated with child growth and motor and cognitive impairment,⁸⁵ and evidence for mass-deworming⁸⁶ and WASH interventions⁸⁷ to improve early childhood development is mixed. The effects of physical health-related factors on early childhood development are likely to exert themselves via complex pathways in association with other environmental factors, which require further analysis. The negative effect of injury, including burns,⁸⁸ falls, head injury, drowning,⁸⁹ and poisoning are clear, especially when these result in physical disability or death.

Developmental delays and disabilities

Many children with developmental delays and disabilities live in LMICs. Evidence indicates that globally, 7·5% of children under five years of age have a disability.⁹⁰ In these contexts, estimates of the prevalence of developmental delay and disability among young children historically rely on extrapolation from high-income countries (HICs) or survey data with limitations for informing contextualised interventions and policies. The Global Research on Developmental Disabilities Collaborators, using the Global Burden of Diseases data, estimated that 8·4% (7·7–9·1) or 52·9 million (95% confidence interval [CI] 48·7–57·3) of children younger than 5 years have developmental disabilities.⁹¹ A similar median pooled prevalence for any neurodevelopmental disorder in young children (7·6%, 7·5–7·7%) has been reported.⁹² The Global Research on Developmental Disabilities Collaborators further estimated that 11·2% of children aged between 1 and 4 years have epilepsy, intellectual disability, vision or hearing loss, or a combination.⁹³ The prevalence of disability in young children in LMICs is potentially

Panel: Emerging evidence on pollution, climate change, and early childhood development in the next 1000 days

UNICEF recently estimated that every child regardless of country of residence is facing at least one major climate and environment-related hazard with nearly half of the world's children living in extremely high-risk conditions.³¹ Here we focus on a few crucial climate and pollution-related health hazards facing children. Research employing multidisciplinary integrated assessments and advanced statistical methodologies are required to quantify the full impact of pollution and climate change on developmental outcomes in the next 1000 days. Greater collaboration is needed between climate science and early childhood communities.

Pollution*Air pollution*

Over 90% of the world's population live in an area where the annual average ambient fine particulate matter concentration (ie, the density of particles measuring less than 2.5 micrometers [$PM_{2.5}$]), a critical air pollutant associated with a wide range of adverse health effects, exceeds the WHO's reference standard.³² Moreover, cooking and heating with polluting fossil fuel contributes to household as well as ambient air pollution in most low-income and middle-income countries (LMICs).³³ A range of investigations, mostly from high-income countries (HICs), show associations between air pollution and early childhood development outcomes, although evidence specifically for children in the next 1000 days is limited. Birth cohort studies show associations between prenatal and concurrent exposure to air pollution and child cognitive, attention, and behavioural outcomes across childhood. These associations are likely modified by early-life stress, material deprivation, race, and child sex.³⁴⁻⁴⁰ Although identifying the crucial periods and effects of short vs long-term exposure to pollutants on early childhood development-related outcomes are active areas of research, a recent study suggests greater impairment in neurodevelopment at age 2 years was associated with early postnatal $PM_{2.5}$ exposure.³⁹ Concurrent exposure to air pollution in the next 1000 days has been associated with delays in child psychomotor, communication, and socioemotional development.^{41,42} Systematic reviews report associations between childhood exposure to $PM_{2.5}$ and other air pollutants, and cognitive functions and attention-deficit hyperactivity disorder.^{43,44} Studies from some LMICs also show weak associations between household air pollution and cognition, and slower developmental trajectories.⁴⁵⁻⁴⁷ More evidence is required from LMICs on air pollution and early childhood development outcomes in the next 1000 days.

Second-hand tobacco smoke

Prenatal exposure to tobacco smoke, without active maternal smoking, is associated with poor neurodevelopmental outcomes including increased hyperactivity and externalising behavioural problems across childhood.^{48,49} Collectively, studies suggest that environmental tobacco smoke and maternal

smoking during pregnancy are associated with decreased cognition and executive functions, and these associations are exacerbated by maternal hardship.⁵⁰⁻⁵² In contrast, studies of childhood exposure to second-hand tobacco smoke are rare, often focused on respiratory outcomes, and are methodologically challenging to conduct. Although a systematic review that included studies with a relevant population (children aged 2-5 years) reports associations of childhood exposure to second-hand tobacco smoke with poor cognitive performances, a few reports also associate child exposure to second-hand tobacco smoke with preschool behavioural outcomes after controlling for maternal smoking during pregnancy.^{53,54}

Water pollution

Aligned with *The Lancet Commission on Pollution and Health* published in 2017, two types of water pollution were considered: unsafe water sources and poor sanitary conditions of the physical environment.⁵⁵ Evidence on the effects of unsafe water and poor sanitary conditions on early childhood development is scarce. Yet, the problem of drinking water polluted with microbial and chemical contaminants across LMICs is widely known. A systematic review of five studies, including one randomised controlled trial, showed that access to household, community, or facility-based sanitation, and sanitation marketing interventions, improved cognitive ability in children (aged 3 months to 14 years).⁵⁶ However, the review acknowledged poor quality of available evidence. Pathways linking poor sanitation and early childhood development are complex, with microbial ingestion leading to infections, repeated illnesses, and poor nutritional outcomes, which are known biological risk factors for poor developmental outcomes.⁵⁷

Chemical and heavy metal pollution

The WHO's *International Program on Chemical Safety* identified ten chemicals and metals of major public health concern. Although overall toxicity of certain chemicals on children's health and development has been studied,^{4,58} many of the over 185 000 chemicals available remain mostly untested in humans. Among heavy metals, child neurodevelopmental deficits due to exposure to lead and methylmercury are well documented, resulting in a global ban on the use of leaded gasoline;⁵⁹ however, exposure to lead in particular persists in many countries.^{60,61} Similarly, direct or indirect exposure to pesticides, which are known neurotoxins, pose threats to young children both in agrarian and non-agrarian communities, particularly in LMICs where unregulated use is rampant.⁶²

Research on pollutants and early childhood development is predominantly focused on populations in HICs, and more research is needed in LMICs settings where environmental pollution is a critical threat to public health, especially during crucial developmental periods including the next 1000 days.

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Climate crisis

Globally, climate change is leading to increased temperatures, changes in precipitation patterns, and rising sea levels.⁶³ These changes provoke extreme events such as increased number and intensity of heatwaves, tropical cyclones, extreme precipitation, and droughts. Young children are especially vulnerable to climate change effects, particularly in LMICs where climate change is expected to have the largest effect and where potential mitigation strategies are already compromised.⁶⁴ Children exhibit greater sensitivity to climate risks and threats due to their biological modalities and dependence on their caregivers, compromising adaptive capacity.⁶⁵ Model-based data, primary data, or both are urgently required to understand the associations between short-term and long-term exposure to climate-related stressors on several domains of early childhood development outcomes, co-exposure to pollution,

and moderating factors that can be targeted for interventions to minimise the adverse effects.⁶⁶ Despite lacking much-needed evidence, it is postulated that climate change can potentially affect early childhood development through multiple direct and indirect pathways:⁶⁷ infrastructure damage and reduced household income and productivity directly and indirectly affecting children's access to early childhood care and education, influencing caregiving ability and caregivers' interactions with young children; increased food insecurity or poor nutrition, and increased mortality and morbidity heightening biological and psychosocial risks; climate change negatively impacting caregivers' mental health, in turn compromising nurturing care (appendix p 21); and adversely affecting active play opportunities, outdoor time and connectedness to nature, and healthy sleep hygiene.

underestimated because, for example, 55% of children with cerebral palsy without comorbid intellectual disability have been excluded.^{91,94} Barriers to diagnosis of autism spectrum disorder and attention deficit hyperactivity disorder in LMICs could also contribute to underestimation.^{94,95} Crucially, UNICEF estimates on the prevalence of disability in children aged 2–17 years suggest that, when data focus more specifically on functioning, 5% of children have difficulties in domains such as communication and behaviour, regardless of specific diagnoses.⁹⁶ Improved data related to prevalence, unmet needs, and contextually appropriate early childhood intervention strategies are needed to enhance inclusion of children with disabilities in early childhood development strategies in the next 1000 days. Children with developmental delays and disabilities have poorer health and reduced access to health, education, and protection services.⁹⁷ They are more likely to experience trauma, abuse and neglect than typically developing peers and are differentially vulnerable to risks.^{98–103} Consequently, young children with developmental delays and disabilities require targeted, often multisectoral (eg health, education, social protection), supports through inclusive interventions to reduce the potential for further disadvantage.²⁶

Early childhood intervention (in both the first and next 1000 days) is based on evidence that providing a range of supports and services to young children with developmental delays and disabilities can improve their long-term developmental trajectory and reduce their risk of secondary health, psychosocial, and educational sequelae. Some children with developmental delays and disabilities in the next 1000 days of life have clearly identifiable risk factors for developmental difficulties in earlier life. Perhaps one of the best researched examples are children who are preterm or very low birthweight or have other neonatal insults.⁹⁶ Where these children have

been identified in the first 1000 days, ensuring continuity of targeted health services and additional early childhood intervention into mid-childhood is crucial. More broadly, developmental surveillance for all children is important, including ongoing identification of and intervention for delays and impairments as well as identification and management of comorbid health and emotional-behavioural conditions. Education services can also support early recognition of learning difficulties, social communication, and emotional behavioural disorders, which might be less readily identified in the first 1000 days. Caring for a child with a disability can compromise the caregiver's physical and mental health; therefore, caregiver support is an essential component in the provision of nurturing care for children with developmental delay and disability in the next 1000 days.^{104–107}

Nutrition

Globally, micronutrient deficiencies, anaemia, and undernutrition have persisted among children younger than five years of age alongside an increase in child overweight and obesity,^{108–110} which has led to an increasing double burden of malnutrition in many LMICs.¹¹¹ Although health services are primarily responsible for nutrition interventions in the first 1000 days, ECCE services might offer an efficient platform to implement nutrition interventions at scale during the next 1000 days.⁸ Nutrition interventions that have evaluated developmental outcomes during the next 1000 days have primarily been micronutrient supplementation and parenting and home-visitation interventions that include various integrated nutrition counselling, supplementation, and growth monitoring components.^{112–114}

Suboptimal breastfeeding and linear growth faltering in the first 1000 days are associated with poorer developmental outcomes;¹¹⁵ however, evidence on the associations of a child's diet, nutritional status, and catch-up growth

with developmental outcomes during the next 1000 days is less conclusive.^{116,117} The effect of child micronutrient supplementation on developmental outcomes is limited, with most evidence from trials evaluating the effect of supplementation during the first 1000 days of life.^{118–120} Randomised trials of iron supplementation,^{118,121,122} zinc supplementation,^{118,123} or other single nutrient interventions^{119,120,124} in children have shown no or small effects on development outcomes, but greater beneficial effects might be possible for multiple micronutrient supplements.^{119,120,125,126} Combined macronutrient and micronutrient interventions during the complementary feeding period could produce greater beneficial effects on early childhood development outcomes in undernourished populations.^{119,127} However, evidence is lacking for children in the next 1000 days with more robust evaluations needed of the effect of food supplementation in existing ECCE programmes on children's development, in addition to nutrition and growth (eg, Integrated Child Development Services, India). There is very limited evidence on the effect of integrated ECCE and preschool feeding programmes on nutrition, early childhood development, and schooling outcomes.^{126,128–130} There is also no clear evidence on obesity as a risk factor for sub-optimal early childhood development,^{131,132} although negative psychosocial effects of obesity on children have been documented.^{133,134} The few studies of integrated ECCE services and school meals, which varied in terms of quality and quantity of nutrition provided, have reported mixed results on child growth and developmental outcomes.^{135–139}

Overall, more research is needed to determine the effect of nutrition interventions integrated with ECCE services on development outcomes in the next 1000 days as well as the potential for ECCE multisectoral partnerships with health, agriculture, and other sectors that support nutrition. These can inform effective and feasible integration of nutrition supplementation in ECCE services (eg, quality and adequacy of nutrition supplementation, training of ECCE workers, monitoring of nutrition inputs, and strengthening family and ECCE partnerships) without unintended negative consequences on either children's development and learning, or their nutrition and growth. Due to the importance of nutrition in health and growth of children¹⁰⁸ and the potential relation with obesity and non-communicable diseases in adulthood,^{140,141} good nutrition should remain a priority for children during the next 1000 days.

Family environment

Parenting

Parents shape their children's development through the quality of nurturing care provided.⁷ As children acquire additional skills during the next 1000 days, parents expand and use more complex caregiving behaviours (eg, verbal scaffolding, positive discipline, and promoting peer relationships and socialisation) to respond to their

children's progressive abilities and needs.^{142,143} Despite a few interventions targeting sensitive and stimulating caregiving in the first 1000 days of a child's life showing sustained effects on skills and behaviours during the next 1000 days,^{144,145} longitudinal follow-ups during this period are rare, and intervention effects tend to be diminished,¹⁴⁶ with only one study from Jamaica that has tracked children into adulthood.^{147,148} Scarce research in this area exists, but shows that the quality of home stimulation and caregivers' behaviours, cognitive skills, and caregiving knowledge contribute to child outcomes during the next 1000 days over and above indices of economic advantage.^{149–152} These data highlight the importance of continuity of parenting support, tailored to specific developmental periods, throughout the life course. Parenting interventions typically focus on promoting nurturing parenting practices and supporting children's development, learning, and behaviours. They are generally of short duration, delivered in groups, and are mostly targeted towards mothers or primary female caregivers. In contrast to parenting interventions delivered in the first 1000 days, few interventions are delivered by health providers in the next 1000 days.¹⁵³ Interventions can lead to improvements in parenting practices^{154–161} and parent-child interactions.^{155,160,161} Benefits to children include reductions in child behavioural problems,^{154,159,160} improvements in cognitive and language development,^{155,157,161} and improvements in working memory.¹⁶¹ Parents play an important role in supporting their children in the next 1000 days including supporting successful transition to ECCE services. There is some evidence from LMICs, for example from Malawi, that packaging a parenting intervention with an ECCE quality improvement intervention is beneficial,¹⁵⁷ which is also observed from meta-analyses of parenting integrated with ECCE in the US.¹⁶² Aligning parent and teacher expectations can optimise this approach.^{163,164}

In LMICs, there are fewer parenting interventions for the next 1000 days compared with the previous period.⁷ Interventions tend to be child-focused, with less attention to the enabling environment of care as recommended in the NCF (eg, resource availability, social protection, and safety nets), the needs of caregivers (eg, mental health support), the engagement of other caregivers in addition to mothers, and child and family friendly policies (eg, affordable, accessible, and quality childcare, child benefits, and banning of physical punishment of children).⁸ These warrant greater attention.

Violence in children's environments

Violence against children, including psychosocial neglect and deprivation (eg, some forms of institutionalisation), psychological aggression, physical maltreatment, sexual abuse, witnessing parental intimate partner violence, direct and indirect exposure to community violence, or geopolitical crises and civil conflict¹⁶⁵ is prevalent around the world.^{166,167} During the

next 1000 days children are at risk of experiencing deprivation and other forms of violence that are also common in this period, and are at higher risk of experiencing physical maltreatment in the form of physical punishment.¹⁶⁸ Violence can be particularly detrimental in these early years due to the rapid and context-dependent development of the brain and key skills, including executive function and self-regulation.¹⁰

All forms of violence are associated with adverse child outcomes. Neglect and early deprivation are associated with delayed physical growth,^{169,170} impaired language,^{171–173} cognition,¹⁷⁴ executive function,^{175,176} and social-emotional^{177–182} skills; and higher internalising and externalising symptoms throughout the lifespan.^{183–189} Physical maltreatment, including physical punishment in the next 1000 days,^{166,190} is associated with problems in social-emotional development,^{191–193} emotion regulation,¹⁹⁴ increased aggression and behaviour problems,^{195–200} slower cognitive growth,^{201–203} and increased mental health problems.^{201–203} Children exposed to intimate partner violence have a higher morbidity rate,^{204–209} worse nutritional status,^{210,211} and mortality^{212–215} compared to unexposed children. Exposure to geopolitical crises is linked to delayed physical growth and worse nutritional status,^{216–219} mental health disorders and trauma symptoms,^{220–225} and a higher probability of mortality before five years of age.^{226–228}

The timing of exposure to violence affects health and developmental outcomes.^{173,181,187,229} Early intervention to guarantee children's safety and protection is fundamental to promoting resilience and positive adaptation and there is evidence to show that parenting programmes with a focus on prevention of violence are an effective strategy to reduce violence against children, although more research is needed from LMIC settings.^{230,231} Further research is also needed in two related areas. First, while institutionalisation, physical punishment, and civil conflict might be more predictive of behaviour and health problems for boys than girls,^{186,195,217,232} further research is needed to understand specific gender differences. Second, although children are more likely to experience physical punishment in the home, more experimental evidence on the effectiveness of parenting interventions aimed at reducing physical punishment in LMICs is needed.^{230,233} Identifying effective interventions to reduce all forms of violence against children and to promote resilience is more urgent than ever, considering that children's exposure and vulnerability to violence has increased during the COVID-19 pandemic.^{234,235}

Mental health of parents and the social-emotional development of children

Children's social-emotional development is indicated by capacities to express and manage emotions and to develop affiliations,²³⁶ and is shaped by the social-emotional qualities of relationships with adult caregivers and primary caregivers' mental health in the next

1000 days. A systematic review²³⁷ found exposure to maternal mental disorders (postnatal) is most frequently assessed, with the most common exposure being depression, although studies have also assessed maternal anxiety, other common mental disorders, and stress. Child outcomes assessed include internalising and externalising problems, emotionality and temperament, and personal-social skills. The timing of exposure to maternal mental health problems and child social-emotional development has been specifically examined during pregnancy and the postpartum period, mostly finding that early exposure to maternal depression, anxiety, stress, and mood symptoms results in a significant association with higher rates of later childhood emotional and behavioural problems.

Experience of parental mental disorders, predominantly maternal depression, is frequently associated with adverse child social-emotional development, including negative associations between prenatal and postnatal depression experienced by either parent and child social-emotional development.^{238–252} Stress experienced by either parent^{238,253–258} and parental anxiety²⁵⁹ are negatively associated with this outcome. Common mental disorders experienced by mothers and grandmothers is negatively associated with emotion regulation and prosocial behaviours in children,^{260–263} although parental anxiety and depression and child social-emotional development are not consistently associated.²⁴⁹ Evidence suggests that maternal depression, anxiety, or stress during pregnancy or the postpartum year are associated with higher rates of later child emotional and behavioural problems.^{243,244,246,247,252,257,259} Mediating factors (eg, negative parenting, parental conflicts, harsh discipline, intimate partner violence), which could be modifiable, can have adverse effects on children's social-emotional development.^{238,239,242,253–256,259,263} In contrast, parental warmth and understanding are protective.²⁴² Severity and persistence of the mental disorder, low socioeconomic position, lack of social and partner support, and intimate partner violence increase the risk of adverse child outcomes.^{240,244,246,248,251,252}

Evidence shows there is a disproportionate focus on the mental health of mothers, with only one investigation on the effect of paternal mental disorders;²⁵⁸ therefore, more research on paternal mental health is needed. Little is known about potentially beneficial interventions to promote caregivers' mental health in the next 1000 days, and establishing whether assistance for caregiver mental health problems, with or without education, improves children's social-emotional development is needed. In addition, a growing body of research has shown that besides other contextual adversities like poverty and violence, racism and ethnic-based and gender-based discrimination can affect children's mental health and developmental trajectories.^{264,265} Studies from HIC settings report maternal perception and exposure to racism is associated with detrimental effects on child outcomes, including mental health, as well as parenting practices and caregiver-child relationships.^{266–268} However, more research

is needed to understand the specific developmental and health consequences of racism and discrimination in the next 1000 days, with conceptual frameworks that include a recognition of the effects of colonisation, and more policy efforts are warranted to protect children from racism and discrimination and its detrimental effects.

Father involvement

Approximately 70% of children co-reside with their fathers;²⁶⁹ however, the global fatherhood literature has focused on expectant fathers or fathers of infants during the first 1000 days and with respect to maternal, newborn, and child health and nutrition.^{270,271} In households where fathers are present, their traditional roles are typically characterised as financial providers and decision makers who may positively influence child outcomes through supporting their partners.^{271,272} Fathers also directly influence early childhood development through dyadic father-child relationships, particularly in the first 1000 days,^{273,274} but continuity during the next 1000 days remains important. Studies suggest that fathers may even be more willing to care for older children during the next 1000 days than infancy, when cultural and gender norms shape care as primarily women's responsibilities.^{275,276} Also, frequency of paternal harsh discipline markedly increases during the next 1000 days, highlighting a time-sensitive window for engaging fathers in violence prevention.²⁷⁷ Fathers' roles as decision makers and their aspirations for children's early education also manifests during the next 1000 days.²⁷⁸

Few parenting interventions in LMICs have included fathers to promote nurturing care during the next 1000 days. Parenting interventions in Colombia and among Syrian refugees in Lebanon and Jordan found that participating fathers reported reduced intimate partner violence, physical punishment, and parental mental health problems,²⁷⁹ as well as improvements in mental health and parenting behaviours, and reductions in parenting stress and children's behavioural problems.²⁸⁰ Despite these examples of father-inclusive interventions during the next 1000 days, gaps remain. For example, few interventions in LMICs have actively engaged fathers in ECCE.^{278,281} In addition, evidence from HICs has supported associations between fathers' healthy lifestyle behaviours and diets and children's healthy behaviours and nutrition outcomes,^{282–284} but there is a dearth of father-inclusive interventions for promoting healthy behaviours in young children in LMICs.

Early childhood care and education environments

Global rates of ECCE participation are rising, with 157 million (54%) preprimary age children in 196 countries enrolled before the COVID-19 pandemic.²⁸⁵ Loss of ECCE opportunities during the pandemic has exacerbated an already challenging situation in ECCE access in the short and possibly longer term.²⁸⁵ Participation in ECCE is associated with positive

short-term developmental and physical benefits for children.^{5,7,286–302} Generally larger effects on children's cognitive skills relative to social-emotional or health and nutritional outcomes are reported.^{7,297,298} Although long-term effects are more mixed, durable positive effects on schooling outcomes (eg, academic achievement) have been found,^{297,299,300,302} including positive effects on criminal behaviour, early pregnancy, and earnings into adulthood.³⁰² In general, larger effects are observed for children from low-income or disadvantaged households,^{5,299,300,302} although equal benefits have been found for girls and boys.²⁹⁹

Formal ECCE services that include structured curricula, learning materials, and well-compensated staff tend to outperform programmes that do not.^{5,289} Relatedly, programme quality features (eg, high-quality learning materials, positive and warm classroom environment, developmentally-appropriate and interactive instructional methods) are key determinants of ECCE effects.^{5,7,287,289,302} Although ECCE quality improvement interventions generally benefit child outcomes,^{5,294} the specific features most strongly tied to child development across LMICs have not been systematically reviewed. There is also a need for better measures of ECCE programme quality and pedagogical practices that reliably translate into gains in school readiness.^{157,303} Children's duration of participation in ECCE is positively associated with developmental outcomes, but it is likely that dose and quality are interdependent (eg, regular attendance might only be beneficial in the context of high-quality programming).²⁹⁴ Although most ECCE evidence focuses on older children participating in centre-based models, more research is needed on access and quality of group-based childcare services that reach the very youngest children. Additionally, there is evidence of the positive effects of *Sesame Street*, a culturally tailored educational television programme.²⁹⁶ Although not a replacement for high-quality centre-based programming, this evidence highlights the potential of technology-based ECCE content in the absence of or as a supplement to face-to-face opportunities. Collectively, these findings suggest the need for research exploring the quality features and dose of ECCE in LMICs, to support equitable and sustained effects at scale.

Estimates of young children's access to nurturing care and development in the next 1000 days

The biological and environmental contributors to nurturing care, that in turn shape developmental outcomes, are multidimensional. This section summarises analyses estimating children's access to nurturing care, and the implications of access on children's developmental outcomes in the next 1000 days.³⁰⁴ First, to estimate children's access to care, we used multiple imputation, and predictive modelling approaches were applied to nationally representative data from

426 349 children aged 3 and 4 years in 104 LMICs participating in UNICEF's Multiple Indicator Cluster Surveys (MICS) or the Demographic and Health Surveys.³⁰⁵ Detailed methods for these analyses are provided elsewhere.³⁰⁴ Based on the SDG targets and best available data, receiving minimally adequate nurturing care was defined as access to at least one of two supports in each of the five dimensions of nurturing care (table).⁷ Although this definition of minimally adequate care is somewhat arbitrary and likely does not fully capture the level of care needed by children to reach their developmental potential, it still allows us to identify key gaps in children's current environments.³⁰⁶

It is estimated that only 25.4% (90% credible interval [CrI] 21.2–29.4) of 3 and 4-year-olds in LMICs are receiving minimally adequate nurturing care (table), leaving nearly three quarters of children (181.9 million, 172.2–192.3) behind. The percentage of children receiving adequate nurturing care varied substantially across 10 selected indicators, ranging from 86.2% (84.2–88.2) of children having a healthy weight, 71.9% (66.7–75.5) of children not having indicators of neglect

or inadequate care, and 67.3% (64.4–70.3) of children not being, to just 29.3% (21.5–39.6) of children participating in ECCE, 29.7% (25.6–34.9) having received stimulation from a non-maternal caregiver (father, other adult relative), and 32.3% (28.3–36.7) not having had physical punishment.

Access to nurturing care varied systematically across regions, with 68.0% (56.9–76.6) of children receiving adequate care in LMICs in Europe and central Asia, compared to only 7.9% (6.8–9.2) of children in sub-Saharan Africa (figure 4). Similar disparities existed by country income status, with 50.8% (38.3–60.7) of children receiving adequate care in upper-middle-income countries compared to just 5.6% (4.8–6.4) in low-income countries (figure 4). In a subset of 54 countries with available child-level data, children from households in the top 20% of the within-country wealth distribution were more than 30% more likely, on average, to receive minimally adequate nurturing care than those from the bottom quintile. Gaps were smaller, but still apparent, by urbanicity and gender—children from urban areas were more than 14% more likely, on average, to receive

	Definition	Estimated percentage of children (90% CrI)	Estimated number of children, millions (90% CrI)
Responsive care (SDG target 4.2)			
Adequate maternal stimulation	Mother engaged child in at least four of six activities (eg, reading and playing) in the past 3 days	32.9% (28.7–38.5)	80.2 (70.1–93.9)
Adequate stimulation from other caregivers	Father, other caregiver, or both, engaged child in at least four of six activities (eg, reading and playing) in the past 3 days	29.7% (25.6–34.9)	72.4 (62.4–85.0)
At least one indicator met	..	48.2% (42.9–54.2)	117.7 (104.6–132.2)
Early learning (SDG target 4.2.2)			
Early childhood care and education participation	Child attends an organised learning or early educational programme	29.3% (21.5–39.6)	71.5 (52.5–96.6)
Learning materials in the home	Child's household has at least one book and at least one toy	33.2% (27.5–38.3)	81.0 (67.1–93.5)
At least one indicator met	..	43.8% (36.5–50.5)	106.8 (89.0–123.3)
Safety and security (SDG target 16.2.1)			
Absence of physical punishment	Child not exposed to any of six physical forms of punishment (eg, spanking) in the past month	32.3% (28.3–36.7)	78.7 (68.9–89.5)
Absence of neglect or inadequate care	Child not left alone or unattended or in the care of another child in the past week	71.9% (66.7–75.5)	175.4 (162.6–184.1)
At least one indicator met	..	78.1% (74.0–81.7)	190.5 (180.5–199.3)
Nutrition (SDG targets 2.2.1 and 2.2.2)			
Absence of stunting (2.2.1)	Child has height-for-age Z score of ≥ -2	67.3% (64.4–70.3)	164.1 (157.1–171.5)
Healthy weight (absence of wasting or overweight; 2.2.2)	Child has weight-for-height Z score of ≥ -2 and ≤ 2	86.2% (84.2–88.2)	210.3 (205.4–215.1)
At least one indicator met	..	80.8% (78.5–83.4)	232.2 (232.2–234.4)
Health (SDG target 6.1.1)			
Adequate water, sanitation, and hygiene	Child's home has an improved drinking water source and an improved sanitation facility	58.3% (54.8–61.8)	142.3 (133.7–150.8)
Absence of infection	Child was not sometimes too sick to play	61.4% (54.5–66.3)	149.7 (133–161.7)
At least one indicator met	..	95.2% (94.3–96.1)	197.1 (191.4–203.3)
Overall minimally adequate nurturing care			
Access to at least one indicator in each of the five dimensions of nurturing care	..	25.4% (21.2–29.4)	62.0 (51.6–71.7)

See McCoy et al (2022)³⁰⁴ for details of data and methods used. CrI=credible interval. SDG=Sustainable Development Goals.

Table: Estimates of the percentage and number of children with access to indicators of nurturing care in the next 1000 days

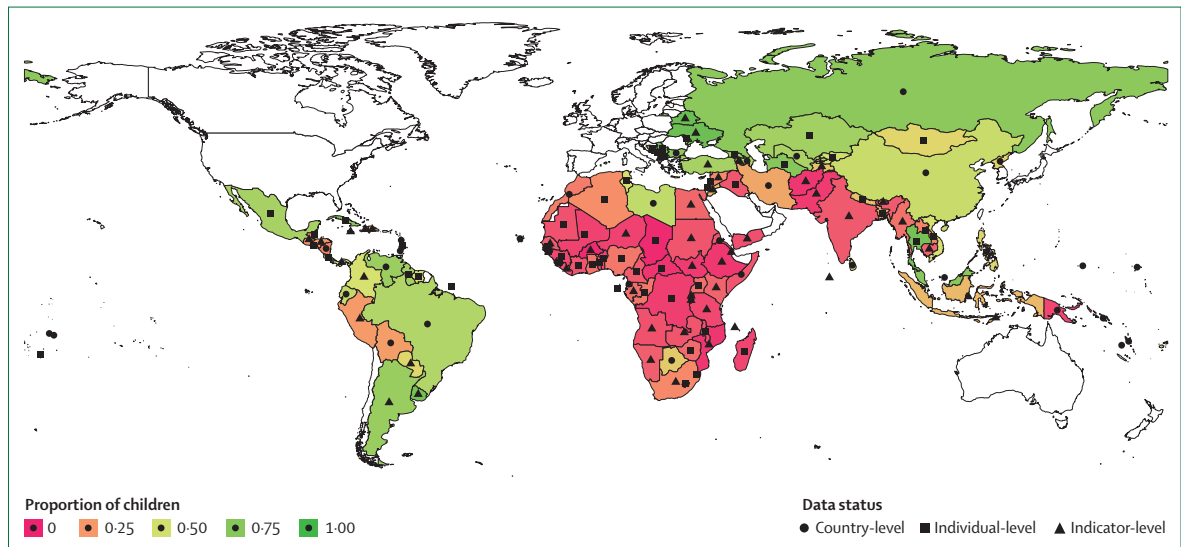


Figure 4: Estimates of the proportion of children receiving adequate nurturing care, by country

Data status shows missing data at the country, individual, and indicator levels. For details of data and methods used, see McCoy et al (2022).³⁰⁴

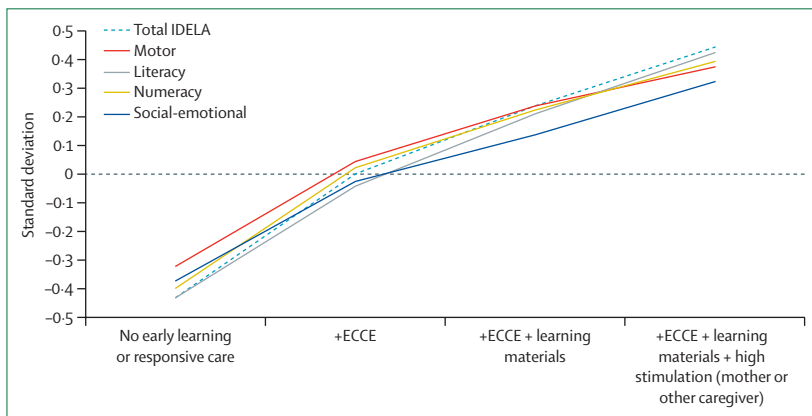


Figure 5: Associations between selected nurturing care dimensions and child development

ECCE=early childhood care and education. IDELA=International Development and Early Learning Assessment.

minimally adequate care than those from rural areas, and girls less than 2% more likely, on average, to receive minimally adequate care than boys.

Next, using data from a convenience sample of 18 373 children aged between 3 and 7 years (51·0% girls) from 25 LMICs in Save the Children's International Development and Early Learning Assessment (IDELA) database (appendix p 22),^{307–310} positive associations were identified between indicators of early learning and responsive care (ie, access to ECCE, presence of learning materials in the home, high stimulation from mothers or others) and multiple child outcomes (ie, literacy, motor skills, numeracy, and social-emotional development). Considering the holistic total IDELA score, this analysis found that by age 5 years, children who had received support in both early learning and responsive care were 0·87 standard deviations ahead of their peers who lived without these supports (figure 5)—a difference

equivalent to approximately two years of developmental progress. The strongest associations emerged for access to ECCE and presence of learning materials in the home, supporting the idea that children require stimulating early learning environments for optimal development in the next 1000 days.^{311,312} However, the strength of the associations between different indicators of nurturing care and developmental domains varied considerably, reinforcing the unique role that particular dimensions of care might play in shaping different developmental skills, and that some dimensions remain to be explored fully.

These findings highlight the inequities across settings, family circumstances and nurturing care dimensions, and support the multidimensionality of nurturing care and children's development in the next 1000 days. Work is needed to monitor these developmental inputs and outputs on a global scale, including in HICs as well as for relevant subpopulations (eg, children living with disabilities). Instruments such as UNICEF's new Early Childhood Development Index 2030, which aligns more completely with the next 1000 days period of development compared with either the older version of the MICS or IDELA, will support such efforts, being incorporated into future rounds of the MICS and under consideration as the indicator for SDG 4.2.1 (ie, the proportion of children aged 24–59 months who are developmentally on track in health, learning, and psychosocial wellbeing, by sex). In addition, more emphasis on the depth, breadth, harmonisation, validation, and cultural relevance of measures of nurturing care is warranted, particularly in the areas of responsive caregiving and the quality of ECCE environments. When collecting data on early childhood development for national monitoring or research purposes, inclusion of measures that capture

the status of relevant nurturing care indicators as well as child development outcomes is paramount to understanding what levels and kinds of supports are needed for children living in different contexts. Although population level measures such as the MICS are useful in tracking national and global progress in child and care outcomes, in turn informing policy and programme investments, these data should be supplemented by ethnographic qualitative and observational studies, since population level measures are less capable of capturing mechanisms of change within or across cultures.³¹³ Such studies can provide valuable information on cultural variability across settings that support the content development of interventions and inform improvements in how we measure nurturing care outcomes. For example, Mesman and colleagues³¹⁴ explored responsive care in different LMIC settings, concluding that maternal responsiveness was observed, but the expression of responsiveness varied by context and cultural beliefs.

Interventions promoting development in the next 1000 days: a mapping review

This final section turns attention to the global landscape of interventions to protect, preserve and promote healthy development during this sensitive period, and presents findings from a mapping review³¹⁵ of published literature on the evaluation of developmental interventions (n=593, January, 1990–July, 2020, with typically developing children [ie, those without identified developmental delay, disability, or disorder]) in the next 1000 days. The aim of this review was to map published interventions that promote key developmental outcomes in the next 1000 days (figure 1), to identify possible gaps in intervention efforts and related research (particularly in LMICs), and highlight imperatives for addressing inequities in children not receiving

adequate nurturing care to optimise development in the next 1000 days. Details of the review methodology are available in the appendix (pp 23–26) and published elsewhere.³¹⁵

The number of published interventions increased substantially from 2010 (79% published from 2010 onwards). Across the full period, the number of published interventions was largely driven by research in high-income westernised countries (as previously defined by WHO;³¹⁶ 70%, n=416) with 44% (n=258) of all interventions from the USA. Only 5% (n=32) of interventions were conducted in LMICs, although 49% of the total number of interventions targeted low-income or vulnerable populations in all countries; only five interventions targeted children in emergency and humanitarian settings. There have been some published interventions from LMICs in the years subsequent to the period covered in the review (eg, Ghana,³¹⁷ Rwanda,³¹⁸ Peru,³¹⁹ and South Africa³²⁰), but the gap in research remains, and has been highlighted in child development research more generally.³²¹ The uneven geographical distribution of these interventions (figure 6) shows the gaps between children benefiting from interventions to promote development (mostly in HICs), and those who are exposed to inadequate nurturing care (mostly in LMICs). Many interventions (80%) took place in ECCE settings (70% in LMICs). ECCE curricula and activities, teacher training and support, and other forms of ECCE delivery (eg, intervention delivered by specialists) were the main mode of intervention delivery (72%). Children's literacy and language outcomes were the target of 27% of interventions, and 25% of interventions targeted early childhood development more holistically (eg, school readiness) or multiple developmental domains (eg, literacy and numeracy).

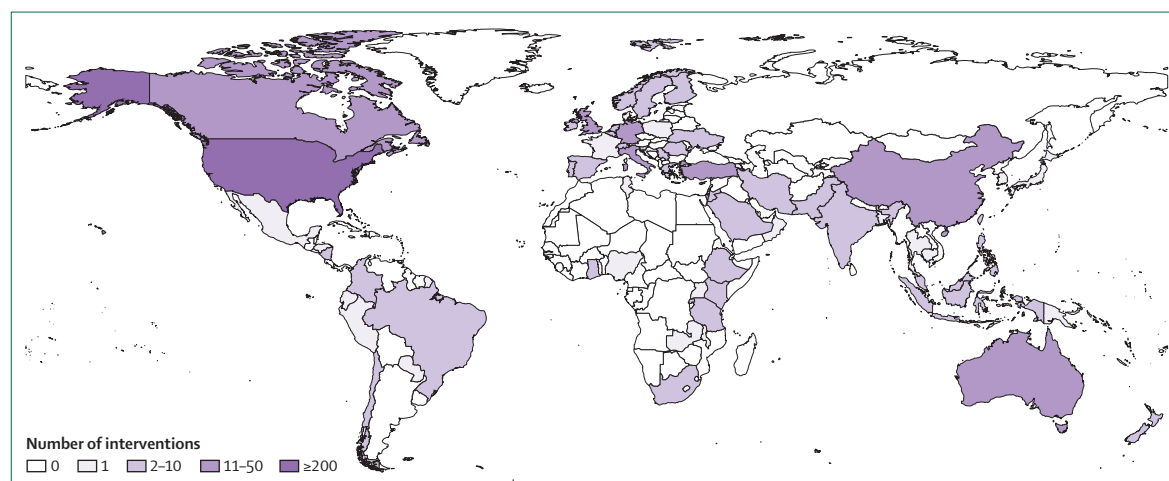


Figure 6: Number of published interventions promoting healthy development during the next 1000 days, by country

No country had more than 50 interventions published except for the USA, which was the only country to have more than 200 interventions published.

These findings highlight the mismatch between the global regions where interventions are most needed and the areas where interventions are being implemented, evaluated, and published. Based on these review findings, and data presented on protective environments, gaps need to be addressed in terms of parenting, family mental health, violence prevention, and nutrition interventions to promote and support development in this age group. These findings suggest that ECCE settings can offer a protective environment for promoting child development and highlight the substantial shift from positioning interventions within health platforms in the first 1000 days. This shift is accompanied by a shift in stakeholders from the health to education sector, which contributes to a disconnect in policy and practice, and might not integrate well with social protection. These shifts point to the importance of transition from the first to the next 1000 days, in terms of systems and interventions, as well as developmental outcomes and risks. Despite calls for integrated systems of care and education,^{6,322} the potential for multisector support in the next 1000 days has yet to be achieved, as seen by the low number (8%) of multicomponent interventions. It would be valuable for future reviews of interventions to promote development in the next 1000 days to not only evaluate the effectiveness of interventions, but to also evaluate the quality of studies and explain in depth the mechanisms of change in interventions.

Conclusion

A range of inputs and outputs are essential to capture the multidimensionality of development in the next 1000 days, and to understand the cumulative and continuous nature of this development from a life-course perspective. It is noteworthy that some areas of evidence are more limited than others, as shown by the range of review methodologies undertaken on environments of care based on the availability of evidence. However, all inputs in the early childhood period require more disaggregation of findings salient to the next 1000 days. Attention is warranted on how to effectively leverage partnerships across health, nutrition, ECCE, and protection platforms, informed by relevant data in key areas including: multidimensional and nationally representative child outcome data (ie, data that break down development into subdomains and recognise the differentiation in skills happening in this period); data on vulnerable subpopulations (eg, children with disabilities, children in humanitarian response settings); and data on culturally and contextually specific early childhood development skills (eg, self-discipline). Opportunities to leverage ECCE to promote development across multiple dimensions could include ECCE plus parenting, school feeding, or health screening for vision, hearing, or growth. Nuanced data on the environments that support children are needed, including: the quality of children's early learning environments, and the quantity, quality

and responsiveness of interactions in children's ECCE settings and at home; behaviours, mental health, and beliefs of caregivers (including educators, fathers, and other adult caregivers); and community-level processes, such as social support for caregiving. A key consideration is how these environments might be drivers of inequalities in specific settings. For example, while improving access to ECCE is essential, the quality of ECCE must be considered so that the most vulnerable children are not provided with the lowest quality ECCE programmes. The environmental effects of climate change, or periodic pandemics, and the extent to which they could disproportionately disadvantage early childhood development in LMICs, are important emerging policy areas that will require further research in coming years.

Contributors

CED conceptualised and coordinated the series with inputs from the Series Steering Committee members (AKY, GF, MN, ADO, MST). CED and AKY conceptualised this paper in consultation with the Series Steering Committee members (GF, MN, ADO, MST) and advisory group. JO led the review on why the next 1000 days matter, SB led the review on health, KM led the review on developmental delays and disability, CRS led the review on nutrition, AKY led the review on parenting, JF led the review on mental health, JC led the review on violence, JJ led the review on fatherhood, DCM led the review on ECCE, and AR led the review on pollution and climate change. DCM, JC, LP, and JS analysed data on nurturing care inputs and child development. CED, SK, and SVW led the mapping review of interventions. All authors contributed to key messages and critically reviewed drafts of the manuscript. CED and AKY prepared the final draft of the manuscript for the Series, which all authors approved. CED and AKY had final responsibility for the decision to submit for publication.

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References

- 1 Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B. Developmental potential in the first 5 years for children in developing countries. *Lancet* 2007; **369**: 60–70.
- 2 Walker SP, Wachs TD, Gardner JM, et al. Child development: risk factors for adverse outcomes in developing countries. *Lancet* 2007; **369**: 145–57.
- 3 Engle PL, Black MM, Behrman JR, et al. Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *Lancet* 2007; **369**: 229–42.
- 4 Walker SP, Wachs TD, Grantham-McGregor S, et al. Inequality in early childhood: risk and protective factors for early child development. *Lancet* 2011; **378**: 1325–38.

- 5 Engle PL, Fernald LC, Alderman H, et al. Strategies for reducing inequalities and improving developmental outcomes for young children in low-income and middle-income countries. *Lancet* 2011; **378**: 1339–53.
- 6 Black MM, Walker SP, Fernald LCH, et al. Early childhood development coming of age: science through the life course. *Lancet* 2017; **389**: 77–90.
- 7 Britto PR, Lye SJ, Proulx K, et al. Nurturing care: promoting early childhood development. *Lancet* 2017; **389**: 91–102.
- 8 Richter LM, Daelmans B, Lombardi J, et al. Investing in the foundation of sustainable development: pathways to scale up for early childhood development. *Lancet* 2017; **389**: 103–18.
- 9 Nores M, Fink G, Behrman JR, et al. The cost of not investing in the next 1000 days: implications for policy and practice. *Lancet* 2024; published online Nov 18. [https://doi.org/10.1016/S0140-6736\(24\)01390-4](https://doi.org/10.1016/S0140-6736(24)01390-4).
- 10 Nelson CA 3rd, Gabard-Durnam LJ. Early adversity and critical periods: neurodevelopmental consequences of violating the expectable environment. *Trends Neurosci* 2020; **43**: 133–43.
- 11 Black MM, Behrman JR, Daelmans B, et al. The principles of nurturing care promote human capital and mitigate adversities from preconception through adolescence. *BMJ Glob Health* 2021; **6**: e004436.
- 12 Tomlinson M, Hunt X, Daelmans B, Rollins N, Ross D, Oberklaid F. Optimising child and adolescent health and development through an integrated ecological life course approach. *BMJ* 2021; **372**: m4784.
- 13 Roberts JL, Stein AD. The impact of nutritional interventions beyond the first 2 years of life on linear growth: a systematic review and meta-analysis. *Adv Nutr* 2017; **8**: 323–36.
- 14 Perkins JM, Kim R, Krishna A, McGovern M, Aguayo VM, Subramanian SV. Understanding the association between stunting and child development in low- and middle-income countries: next steps for research and intervention. *Soc Sci Med* 2017; **193**: 101–09.
- 15 Perdue KL, Jensen SKG, Kumar S, et al. Using functional near-infrared spectroscopy to assess social information processing in poor urban Bangladeshi infants and toddlers. *Dev Sci* 2019; **22**: e12839.
- 16 Groh AM, Fearon RMP, van IJzendoorn MH, Bakermans-Kranenburg MJ, Roisman GI. Attachment in the early life course: meta-analytic evidence for its role in socioemotional development. *Child Dev Perspect* 2017; **11**: 70–76.
- 17 Cuartas J, McCoy DC, Grogan-Kaylor A, Gershoff E. Physical punishment as a predictor of early cognitive development: evidence from econometric approaches. *Dev Psychol* 2020; **56**: 2013–26.
- 18 Black MM, Yimgang DP, Hurley KM, et al. Mechanisms linking height to early child development among infants and preschoolers in rural India. *Dev Sci* 2019; **22**: e12806.
- 19 Valadi S, Gabbard C. The effect of affordances in the home environment on children's fine- and gross motor skills. *Early Child Dev Care* 2020; **190**: 1225–32.
- 20 Jeong J, Obradović J, Rasheed M, McCoy DC, Fink G, Yousafzai AK. Maternal and paternal stimulation: mediators of parenting intervention effects on preschoolers' development. *J Appl Dev Psychol* 2019; **60**: 105–18.
- 21 Cuartas J, Jeong J, Rey-Guerra C, McCoy DC, Yoshikawa H. Maternal, paternal, and other caregivers' stimulation in low- and middle-income countries. *PLoS One* 2020; **15**: e0236107.
- 22 Pisani L, Borisova I, Dowd AJ. Developing and validating the International Development and Early Learning Assessment (IDELA). *Int J Educ Res* 2018; **91**: 1–15.
- 23 Moffitt TE, Arseneault L, Belsky D, et al. A gradient of childhood self-control predicts health, wealth, and public safety. *Proc Natl Acad Sci USA* 2011; **108**: 2693–98.
- 24 Loeb S. Missing the target: We need to focus on informal care rather than preschool. *Evid Speaks Rep* 2016; **1**: 1–5.
- 25 Dawes A, Biersteker L, Snelling M, Horler J, Girdwood E. To what extent can community-based playgroup programmes targeting low-income children improve learning outcomes prior to entering the reception year in South Africa? A quasi-experimental field study. *Early Educ Dev* 2021; **34**: 1–18.
- 26 WHO. Nurturing care for early childhood development. May 18, 2018. <https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/child-health/nurturing-care#:~:text=The%20Nurturing%20Care%20Framework%20is, support%20the%20nurturing%20care%20agenda> (accessed Aug 6, 2021).
- 27 Britto PR, Yoshikawa H, Boller K. Quality of early childhood development programs in global contexts: rationale for investment, conceptual framework and implications for equity. *Soc Res Child Dev* 2011; **25**: 1–26.
- 28 Bronfenbrenner U. Toward an experimental ecology of human development. *Am Psychol* 1977; **32**: 513–31.
- 29 Sameroff A. A unified theory of development: a dialectic integration of nature and nurture. *Child Dev* 2010; **81**: 6–22.
- 30 Black MM, Walker SP, Fernald LCH, et al. Early childhood development coming of age: science through the life course. *Lancet* 2017; **389**: 77–90.
- 31 UNICEF. The climate crisis is a child rights crisis: Introducing the Children's Climate Risk Index. New York, NY: United Nations Children's Fund, 2021.
- 32 Health Effects Institute. State of global air 2020. Special report. Boston, MA: Health Effects Institute, 2020.
- 33 WHO. Global Health Observatory: data repository. 2018. <https://www.who.int/data/gho/> (accessed Aug 6, 2021).
- 34 Volk HE, Perera F, Braun JM, et al. Prenatal air pollution exposure and neurodevelopment: A review and blueprint for a harmonized approach within ECHO. *Environ Res* 2021; **196**: 110320.
- 35 Pagliaccio D, Herbstman JB, Perera F, et al. Prenatal exposure to polycyclic aromatic hydrocarbons modifies the effects of early life stress on attention and thought problems in late childhood. *J Child Psychol Psychiatry* 2020; **61**: 1253–65.
- 36 Perera FP, Tang D, Rauh V, et al. Relationship between polycyclic aromatic hydrocarbon-DNA adducts, environmental tobacco smoke, and child development in the World Trade Center cohort. *Environ Health Perspect* 2007; **115**: 1497–502.
- 37 McGuinn LA, Bellinger DC, Colicino E, et al. Prenatal PM_{2.5} exposure and behavioral development in children from Mexico City. *Neurotoxicology* 2020; **81**: 109–15.
- 38 Lertxundi A, Andiaarena A, Martínez MD, et al. Prenatal exposure to PM_{2.5} and NO₂ and sex-dependent infant cognitive and motor development. *Environ Res* 2019; **174**: 114–21.
- 39 Wang H, Zhang H, Li J, et al. Prenatal and early postnatal exposure to ambient particulate matter and early childhood neurodevelopment: a birth cohort study. *Environ Res* 2022; **210**: 112946.
- 40 Loftus CT, Ni Y, Szpiro AA, et al. Exposure to ambient air pollution and early childhood behavior: a longitudinal cohort study. *Environ Res* 2020; **183**: 109075.
- 41 Ahmed SM, Mishra GD, Moss KM, Yang IA, Lycett K, Knibbs LD. Maternal and childhood ambient air pollution exposure and mental health symptoms and psychomotor development in children: an Australian population-based longitudinal study. *Environ Int* 2022; **158**: 107003.
- 42 Madaniyazi L, Jung C-R, Fook Sheng Ng C, Seposo X, Hashizume M, Nakayama SF. Early life exposure to indoor air pollutants and the risk of neurodevelopmental delays: the Japan environment and children's study. *Environ Int* 2022; **158**: 107004.
- 43 Lopuzanska U, Samardakiewicz M. The relationship between air pollution and cognitive functions in children and adolescents: a systematic review. *Cogn Behav Neurol* 2020; **33**: 157–78.
- 44 Donzelli G, Llopis-Gonzalez A, Llopis-Morales A, Cioni L, Morales-Suárez-Varela M. Particulate matter exposure and attention-deficit/hyperactivity disorder in children: a systematic review of epidemiological studies. *Int J Environ Res Public Health* 2019; **17**: 67.
- 45 Gonzalez-Casanova I, Stein AD, Barraza-Villarreal A, et al. Prenatal exposure to environmental pollutants and child development trajectories through 7 years. *Int J Hyg Environ Health* 2018; **221**: 616–22.
- 46 Morales E, Julvez J, Torrent M, et al. Association of early-life exposure to household gas appliances and indoor nitrogen dioxide with cognition and attention behavior in preschoolers. *Am J Epidemiol* 2009; **169**: 1327–36.
- 47 Brabhukumr A, Malhi P, Ravindra K, Lakshmi PVM. Exposure to household air pollution during first 3 years of life and IQ level among 6–8-year-old children in India—a cross-sectional study. *Sci Total Environ* 2020; **709**: 135110.
- 48 Lin Q, Hou X-Y, Yin X-N, et al. Prenatal exposure to environmental tobacco smoke and hyperactivity behavior in Chinese young children. *Int J Environ Res Public Health* 2017; **14**: 1132.

- 49 Liu J, Leung PWL, McCauley L, Ai Y, Pinto-Martin J. Mother's environmental tobacco smoke exposure during pregnancy and externalizing behavior problems in children. *Neurotoxicology* 2013; **34**: 167–74.
- 50 Julvez J, Ribas-Fitó N, Torrent M, Forns M, García-Esteban R, Sunyer J. Maternal smoking habits and cognitive development of children at age 4 years in a population-based birth cohort. *Int J Epidemiol* 2007; **36**: 825–32.
- 51 Perera FP, Rauh V, Whyatt RM, et al. A summary of recent findings on birth outcomes and developmental effects of prenatal ETS, PAH, and pesticide exposures. *Neurotoxicology* 2005; **26**: 573–87.
- 52 Rauh VA, Whyatt RM, Garfinkel R, et al. Developmental effects of exposure to environmental tobacco smoke and material hardship among inner-city children. *Neurotoxicol Teratol* 2004; **26**: 373–85.
- 53 Chen R, Clifford A, Lang L, Anstey KJ. Is exposure to secondhand smoke associated with cognitive parameters of children and adolescents?—a systematic literature review. *Ann Epidemiol* 2013; **23**: 652–61.
- 54 Luk TT, Wang MP, Suen YN, Koh DS, Lam TH, Chan SS. Early childhood exposure to secondhand smoke and behavioural problems in preschoolers. *Sci Rep* 2018; **8**: 15434.
- 55 Landrigan PJ, Fuller R, Acosta NJR, et al. The Lancet Commission on pollution and health. *Lancet* 2018; **391**: 462–512.
- 56 Sclar GD, Garn JV, Penakalapati G, et al. Effects of sanitation on cognitive development and school absence: a systematic review. *Int J Hyg Environ Health* 2017; **220**: 917–27.
- 57 Ngure FM, Reid BM, Humphrey JH, Mbuya MN, Pelto G, Stoltzfus RJ. Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Ann N Y Acad Sci* 2014; **1308**: 118–28.
- 58 Vrijheid M, Casas M, Gascon M, Valvi D, Nieuwenhuijsen M. Environmental pollutants and child health—a review of recent concerns. *Int J Hyg Environ Health* 2016; **219**: 331–42.
- 59 Tsai PL, Hatfield TH. Global benefits from the phaseout of leaded fuel. *J Environ Health* 2011; **74**: 8–15.
- 60 Ikegami A, Ohtsu M, Sahito A, et al. Contribution of house dust contamination towards lead exposure among children in Karachi, Pakistan. *Rev Environ Health* 2020; **35**: 271–75.
- 61 Ericson B, Landrigan P, Taylor MP, Frostad J, Caravanos J. The global burden of lead toxicity attributable to informal used lead-acid battery sites. *Ann Glob Health* 2016; **82**: 686–99.
- 62 Hertz-Picciotto I, Sass JB, Engel S, et al. Organophosphate exposures during pregnancy and child neurodevelopment: recommendations for essential policy reforms. *PLoS Med* 2018; **15**: e1002671.
- 63 Intergovernmental Panel of Climate Change. AR5 climate change 2014: impacts, adaptation, and vulnerability. Cambridge: Cambridge University Press, 2014.
- 64 King AD, Harrington LJ. The inequality of climate change from 1.5 to 2°C of global warming. *Geophys Res Lett* 2018; **45**: 5030–33.
- 65 Hellén D, Andersson C, Nilsson M, Ebi KL, Friberg P, Alfvén T. Climate change and child health: a scoping review and an expanded conceptual framework. *Lancet Planet Health* 2021; **5**: e164–75.
- 66 van den Bosch M, Basagaña X, Mudu P, et al. Green CURIOCITY: a study protocol for a European birth cohort study analysing childhood heat-related health impacts and protective effects of urban natural environments. *BMJ Open* 2022; **12**: e052537.
- 67 Randell H, Gray C. Climate change and educational attainment in the global tropics. *Proc Natl Acad Sci USA* 2019; **116**: 8840–45.
- 68 Devercelli AE, Beaton-Day F. Better jobs and brighter futures: investing in childcare to build human capital. Washington, DC: World Bank, 2020.
- 69 Hentschel E, Tran HTT, Ha Nguyen V, Tran T, Yousafzai AK. The effects of a childcare training program on childcare quality and child development: evidence from a quasi-experimental study in Vietnam. *Child Youth Serv Rev* 2023; **147**: 106844.
- 70 Akseer N, Kandru G, Keats EC, Bhutta ZA. COVID-19 pandemic and mitigation strategies: implications for maternal and child health and nutrition. *Am J Clin Nutr* 2020; **112**: 251–56.
- 71 Headey D, Heidkamp R, Osendarp S, et al. Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. *Lancet* 2020; **396**: 519–21.
- 72 Moya A, Serneels P, Desrosiers A, Reyes V, Torres MJ, Lieberman A. The COVID-19 pandemic and maternal mental health in a fragile and conflict-affected setting in Tumaco, Colombia: a cohort study. *Lancet Glob Health* 2021; **9**: e1068–76.
- 73 Bourgault S, Peterman A, O'Donnell M. Violence against women and children during COVID-19—one year on and 100 papers in. 2021. <https://www.genderandcovid-19.org/resources/violence-against-women-and-children-during-covid-19-one-year-on-and-100-papers-in-a-fourth-research-round-up/> (accessed Aug 23, 2021).
- 74 National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Children, Youth, and Families; Committee on Exploring the Opportunity Gap for Young Children from Birth to Age Eight. Closing the opportunity gap for young children. Washington, DC: National Academies Press (US), 2023.
- 75 de Onis M, Wijnhoven TMA, Onyango AW. Worldwide practices in child growth monitoring. *J Pediatr* 2004; **144**: 461–65.
- 76 Fink G, Levenson R, Tembo S, Rockers PC. Home- and community-based growth monitoring to reduce early life growth faltering: an open-label, cluster-randomized controlled trial. *Am J Clin Nutr* 2017; **106**: 1070–77.
- 77 Akachi Y, Steenland M, Fink G. Associations between key intervention coverage and child mortality: an analysis of 241 sub-national regions of sub-Saharan Africa. *Int J Epidemiol* 2018; **47**: 740–51.
- 78 Quattrochi JP, Hill K, Salomon JA, Castro MC. The effects of changes in distance to nearest health facility on under-5 mortality and health care utilization in rural Malawi, 1980–1998. *BMC Health Serv Res* 2020; **20**: 899.
- 79 Kruk ME, Lewis TP, Arsenault C, et al. Improving health and social systems for all children in LMICs: structural innovations to deliver high-quality services. *Lancet* 2022; **399**: 1830–44.
- 80 Vaivada T, Gaffey MF, Bhutta ZA. Promoting early child development with interventions in health and nutrition: a systematic review. *Pediatrics* 2017; **140**: e20164308.
- 81 Hudson JA, Broad J, Martin NG, et al. Outcomes beyond hospital discharge in infants and children with viral meningitis: a systematic review. *Rev Med Virol* 2020; **30**: e2083.
- 82 Moser JJ, Veale PM, McAllister DL, Archer DP. A systematic review and quantitative analysis of neurocognitive outcomes in children with four chronic illnesses. *Paediatr Anaesth* 2013; **23**: 1084–96.
- 83 Schatz J, Finke RL, Kellett JM, Kramer JH. Cognitive functioning in children with sickle cell disease: a meta-analysis. *J Pediatr Psychol* 2002; **27**: 739–48.
- 84 Wo SW, Ong LC, Low WY, Lai PSM. The impact of epilepsy on academic achievement in children with normal intelligence and without major comorbidities: a systematic review. *Epilepsy Res* 2017; **136**: 35–45.
- 85 Sania A, Sudfeld CR, Danaei G, et al. Early life risk factors of motor, cognitive and language development: a pooled analysis of studies from low/middle-income countries. *BMJ Open* 2019; **9**: e026449.
- 86 Welch VA, Ghogomu E, Hossain A, et al. Mass deworming to improve developmental health and wellbeing of children in low-income and middle-income countries: a systematic review and network meta-analysis. *Lancet Glob Health* 2017; **5**: e40–50.
- 87 Rogawski McQuade ET, Platts-Mills JA, Gratz J, et al. Impact of water quality, sanitation, handwashing, and nutritional interventions on enteric infections in rural Zimbabwe: the sanitation hygiene infant nutrition efficacy (SHINE) trial. *J Infect Dis* 2020; **221**: 1379–86.
- 88 Sun Y, Wang Y, Jiang YJ, Sun Y, Zhang J. Systematic review of physical and psychosocial problems of burned children aged 5 years and below after discharge. *Zhonghua Shao Shang Za Zhi* 2019; **35**: 731–78 (in Chinese).
- 89 WHO. Global report on drowning: preventing a leading killer. Geneva: World Health Organization, 2014.
- 90 WHO, UNICEF. Global report on children with developmental disabilities: from the margins to the mainstream. Geneva: World Health Organization and the United Nations Children's Fund, 2023.
- 91 Global Research on Developmental Disabilities Collaborators. Developmental disabilities among children younger than 5 years in 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet Glob Health*; **6**: e1100–21.

- 92 Bitta M, Kariuki SM, Abubakar A, Newton CR. Burden of neurodevelopmental disorders in low and middle-income countries: a systematic review and meta-analysis. *Wellcome Open Research* 2018; **2**: 121.
- 93 Olusanya BO, Wright SM, Nair MKC, et al. Global burden of childhood epilepsy, intellectual disability, and sensory impairments. *Pediatrics* 2020; **146**: 146.
- 94 Black MM, Lawn JE. Early childhood developmental disabilities-data still needed. *Lancet Glob Health* 2018; **6**: e1050–51.
- 95 Damiano D, Forsberg H. Poor data produce poor models: children with developmental disabilities deserve better. *Lancet Glob Health* 2019; **7**: e188.
- 96 UNICEF. Seen, counted, included: using data to shed light on the well-being of children with disabilities. New York, NY: United Nations Children's Fund, 2021.
- 97 Yousafzai AK, Lynch P, Gladstone M. Moving beyond prevalence studies: screening and interventions for children with disabilities in low-income and middle-income countries. *Arch Dis Child* 2014; **99**: 840–48.
- 98 WHO. Developmental difficulties in early childhood: prevention, early identification, assessment and intervention in low-and middle-income countries: a review. Geneva: World Health Organization, 2012.
- 99 UNICEF. The state of the world's children 2013: children with disabilities. New York, NY: United Nations Children's Fund, 2013.
- 100 Olusanya BO, Nair MKC. Premature mortality in children with developmental disabilities. *Lancet Glob Health* 2019; **7**: e1601–02.
- 101 Stalker K, McArthur K. Child abuse, child protection and disabled children: a review of recent research. *Child Abuse Rev* 2012; **21**: 24–40.
- 102 Yoshikawa H, Wuermli AJ, Britto PR, et al. Effects of the global coronavirus disease-2019 pandemic on early childhood development: short-and long-term risks and mitigating program and policy actions. *J Pediatr* 2020; **223**: 188–93.
- 103 Jones L, Bellis MA, Wood S, et al. Prevalence and risk of violence against children with disabilities: a systematic review and meta-analysis of observational studies. *Lancet* 2012; **380**: 899–907.
- 104 Rosenbaum P. Family and quality of life: key elements in intervention in children with cerebral palsy. *Dev Med Child Neurol* 2011; **53** (suppl 4): 68–70.
- 105 Raina P, O'Donnell M, Rosenbaum P, et al. The health and well-being of caregivers of children with cerebral palsy. *Pediatrics* 2005; **115**: e626–36.
- 106 Nakamanya S, Siu GE, Lassman R, Seeley J, Tann CJ. Maternal experiences of caring for an infant with neurological impairment after neonatal encephalopathy in Uganda: a qualitative study. *Disabil Rehabil* 2015; **37**: 1470–76.
- 107 Mobarak R, Khan NZ, Munir S, Zaman SS, McConachie H. Predictors of stress in mothers of children with cerebral palsy in Bangladesh. *J Pediatr Psychol* 2000; **25**: 427–33.
- 108 Victora CG, Christian P, Vidaletti LP, Gatica-Domínguez G, Menon P, Black RE. Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. *Lancet* 2021; **397**: 1388–99.
- 109 Kassebaum NJ. The global burden of anemia. *Hematol Oncol Clin North Am* 2016; **30**: 247–308.
- 110 UNICEF. The State of the World's Children 2019. Children, food and nutrition: growing well in a changing world. New York, NY: United Nations Children's Fund, 2019.
- 111 Popkin BM, Corvalan C, Grummer-Strawn LM. Dynamics of the double burden of malnutrition and the changing nutrition reality. *Lancet* 2020; **395**: 65–74.
- 112 Hurley KM, Yousafzai AK, Lopez-Boo F. Early child development and nutrition: a review of the benefits and challenges of implementing integrated interventions. *Adv Nutr* 2016; **7**: 357–63.
- 113 Black MM, Pérez-Escamilla R, Rao SF. Integrating nutrition and child development interventions: scientific basis, evidence of impact, and implementation considerations. *Adv Nutr* 2015; **6**: 852–59.
- 114 Black AP, D'Onise K, McDermott R, Vally H, O'Dea K. How effective are family-based and institutional nutrition interventions in improving children's diet and health? A systematic review. *BMC Public Health* 2017; **17**: 818.
- 115 Horta BL, Loret de Mola C, Victora CG. Breastfeeding and intelligence: a systematic review and meta-analysis. *Acta Paediatr* 2015; **104**: 14–19.
- 116 Leroy JL, Frongillo EA, Dewan P, Black MM, Waterland RA. Can children catch up from the consequences of undernourishment? Evidence from child linear growth, developmental epigenetics, and brain and neurocognitive development. *Adv Nutr* 2020; **11**: 1032–41.
- 117 Tandon PS, Tovar A, Jayasuriya AT, et al. The relationship between physical activity and diet and young children's cognitive development: a systematic review. *Prev Med Rep* 2016; **3**: 379–90.
- 118 Keats EC, Das JK, Salam RA, et al. Effective interventions to address maternal and child malnutrition: an update of the evidence. *Lancet Child Adolesc Health* 2021; **5**: 367–84.
- 119 Prado EL, Larson LM, Cox K, Bettencourt K, Kubes JN, Shankar AH. Do effects of early life interventions on linear growth correspond to effects on neurobehavioural development? A systematic review and meta-analysis. *Lancet Glob Health* 2019; **7**: e1398–413.
- 120 Ip P, Ho FKW, Rao N, et al. Impact of nutritional supplements on cognitive development of children in developing countries: a meta-analysis. *Sci Rep* 2017; **7**: 10611.
- 121 Thompson J, Biggs B-A, Pasricha S-R. Effects of daily iron supplementation in 2- to 5-year-old children: systematic review and meta-analysis. *Pediatrics* 2013; **131**: 739–53.
- 122 Larson LM, Kubes JN, Ramirez-Luzuriaga MJ, Khishen S, Shankar AH, Prado EL. Effects of increased hemoglobin on child growth, development, and disease: a systematic review and meta-analysis. *Ann N Y Acad Sci* 2019; **1450**: 83–104.
- 123 Sajedi F, Shahshahani S, Ghiasvand H, Mosallanezhad Z, Fatollahierad S. Does zinc with and without iron co-supplementation have effect on motor and mental development of children? A systematic review and meta-analysis. *BMC Pediatr* 2020; **20**: 451.
- 124 Jiao J, Li Q, Chu J, Zeng W, Yang M, Zhu S. Effect of n-3 PUFA supplementation on cognitive function throughout the life span from infancy to old age: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr* 2014; **100**: 1422–36.
- 125 Eilander A, Gera T, Sachdev HS, et al. Multiple micronutrient supplementation for improving cognitive performance in children: systematic review of randomized controlled trials. *Am J Clin Nutr* 2010; **91**: 115–30.
- 126 Black MM, Fernandez-Rao S, Nair KM, et al. A randomized multiple micronutrient powder point-of-use fortification trial implemented in Indian preschools increases expressive language and reduces anemia and iron deficiency. *J Nutr* 2021; **151**: 2029–42.
- 127 Prado EL, Arnold CD, Wessells KR, et al. Small-quantity lipid-based nutrient supplements for children age 6–24 months: a systematic review and individual participant data meta-analysis of effects on developmental outcomes and effect modifiers. *Am J Clin Nutr* 2021; **114** (suppl 1): 43–67S.
- 128 Jomaa LH, McDonnell E, Probart C. School feeding programs in developing countries: impacts on children's health and educational outcomes. *Nutr Rev* 2011; **69**: 83–98.
- 129 Vermeersch C, Kremer M. School meals, educational achievement and school competition: evidence from a randomized evaluation. Feb 11, 2005. <https://documents1.worldbank.org/curated/en/916251468779432373/pdf/wps3523.pdf> (accessed Aug 9, 2021).
- 130 Els A, Walsh C. The impact of preschool feeding programmes on the growth of disadvantaged young children in developing countries: a systematic review of randomised trials. *South Afr J Clin Nutr* 2013; **26**: 33–40.
- 131 Martin A, Booth JN, McGeown S, et al. Longitudinal associations between childhood obesity and academic achievement: systematic review with focus group data. *Curr Obes Rep* 2017; **6**: 297–313.
- 132 Santana CCA, Hill JO, Azevedo LB, Gunnarsdottir T, Prado WL. The association between obesity and academic performance in youth: a systematic review. *Obes Rev* 2017; **18**: 1191–99.
- 133 Sagar R, Gupta T. Psychological aspects of obesity in children and adolescents. *Indian J Pediatr* 2018; **85**: 554–59.
- 134 Rankin J, Matthews L, Cobley S, et al. Psychological consequences of childhood obesity: psychiatric comorbidity and prevention. *Adolesc Health Med Ther* 2016; **7**: 125–46.

- 135 Knauer HA, Balasanyan S, Bakhshinyan E, Alderman H. Promoting school readiness through a preschool feeding program: a nutritional nudge to improve at-risk preschooler's cognitive development in Armenia. Washington, DC: International Food Policy Research Institute, 2021.
- 136 Attanasio O, Di Maro V, Vera-Hernández M. Community nurseries and the nutritional status of poor children. Evidence from Colombia. *Econ J* 2013; **123**: 1025–58.
- 137 Bernal R, Fernández C. Subsidized childcare and child development in Colombia: effects of Hogares Comunitarios de Bienestar as a function of timing and length of exposure. *Soc Sci Med* 2013; **97**: 241–49.
- 138 Nores M, Bernal R, Barnett WS. Center-based care for infants and toddlers: The aeioTU randomized trial. *Econ Educ Rev* 2019; **72**: 30–43.
- 139 Ruel MT, Quisumbing MAR. The Guatemala community day care program: An example of effective urban programming. Washington, DC: International Food Policy Research Institute, 2006.
- 140 Lloyd LJ, Langley-Evans SC, McMullen S. Childhood obesity and risk of the adult metabolic syndrome: a systematic review. *Int J Obes* 2012; **36**: 1–11.
- 141 Mikkelsen B, Williams J, Rakovac I, et al. Life course approach to prevention and control of non-communicable diseases. *BMJ* 2019; **364**: 1257.
- 142 Valloton C, Mastergeorge A, Foster T, Decker KB, Ayoub C. Parenting supports for early vocabulary development: specific effects of sensitivity and stimulation through infancy. *Infancy* 2017; **22**: 78–107.
- 143 National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Children, Youth, and Families; Committee on Supporting the Parents of Young Children. Parenting knowledge, attitudes, and practices. Washington, DC: National Academies Press (US), 2016.
- 144 Yousafzai AK, Obradović J, Rasheed MA, et al. Effects of responsive stimulation and nutrition interventions on children's development and growth at age 4 years in a disadvantaged population in Pakistan: a longitudinal follow-up of a cluster-randomised factorial effectiveness trial. *Lancet Glob Health* 2016; **4**: e548–58.
- 145 Atukunda P, Muhoozi GKM, van den Broek TJ, et al. Child development, growth and microbiota: follow-up of a randomized education trial in Uganda. *J Glob Health* 2019; **9**: 010431.
- 146 Jeong J, Pitchik HO, Fink G. Short-term, medium-term and long-term effects of early parenting interventions in low- and middle-income countries: a systematic review. *BMJ Glob Health* 2021; **6**: e004067.
- 147 Walker SP, Chang SM, Vera-Hernández M, Grantham-McGregor S. Early childhood stimulation benefits adult competence and reduces violent behavior. *Pediatrics* 2011; **127**: 849–57.
- 148 Gertler P, Heckman J, Pinto R, et al. Labor market returns to an early childhood stimulation intervention in Jamaica. *Science* 2014; **344**: 998–1001.
- 149 Obradović J, Portilla XA, Tirado-Strayer N, Siyal S, Rasheed MA, Yousafzai AK. Maternal scaffolding in a disadvantaged global context: the influence of working memory and cognitive capacities. *J Fam Psychol* 2017; **31**: 139–49.
- 150 Obradović J, Finch JE, Portilla XA, Rasheed MA, Tirado-Strayer N, Yousafzai AK. Early executive functioning in a global context: developmental continuity and family protective factors. *Dev Sci* 2019; **22**: e12795.
- 151 Dulay KM, Cheung SK, McBride C. Intergenerational transmission of literacy skills among Filipino families. *Dev Sci* 2019; **22**: e12859.
- 152 Cuartas J, Rey-Guerra C, McCoy DC, Hanno E. Maternal knowledge, stimulation, and early childhood development in low-income families in Colombia. *Infancy* 2020; **25**: 526–34.
- 153 Jeong J, Franchett EE, Ramos de Oliveira CV, Rehmani K, Yousafzai AK. Parenting interventions to promote early child development in the first three years of life: a global systematic review and meta-analysis. *PLoS Med* 2021; **18**: e1003602.
- 154 Altafim ERP, Linhares MBM. Preventive intervention for strengthening effective parenting practices: a randomized controlled trial. *J Appl Dev Psychol* 2019; **62**: 160–72.
- 155 Boivin MJ, Bangirana P, Nakasujja N, et al. A year-long caregiver training program to improve neurocognition in preschool Ugandan HIV-exposed children. *J Dev Behav Pediatr* 2013; **34**: 269–78.
- 156 Knauer HA, Jakiela P, Ozier O, Aboud F, Fernald LCH. Enhancing young children's language acquisition through parent-child book-sharing: a randomized trial in rural Kenya. *Early Child Res Q* 2020; **50**: 179–90.
- 157 Özler B, Fernald LCH, Kariger P, McConnell C, Neuman M, Fraga E. Combining pre-school teacher training with parenting education: a cluster-randomized controlled trial. *J Dev Econ* 2018; **133**: 448–67.
- 158 Puffer ES, Green EP, Chase RM, et al. Parents make the difference: a randomized-controlled trial of a parenting intervention in Liberia. *Glob Ment Health* 2015; **2**: e15.
- 159 Rincón P, Cova F, Saldivia S, et al. Effectiveness of a positive parental practices training program for Chilean preschoolers' families: a randomized controlled trial. *Front Psychol* 2018; **9**: 1751.
- 160 Ward CL, Wessels IM, Lachman JM, et al. Parenting for lifelong health for young children: a randomized controlled trial of a parenting program in South Africa to prevent harsh parenting and child conduct problems. *J Child Psychol Psychiatry* 2020; **61**: 503–12.
- 161 Weisleder A, Mazzuchelli DSR, Lopez AS, et al. Reading aloud and child development: a cluster-randomized trial in Brazil. *Pediatrics* 2018; **141**: e20170723.
- 162 Joo YS, Magnuson K, Duncan GJ, Schindler HS, Yoshikawa H, Ziol-Guest KM. What works in early childhood education programs?: a meta-analysis of preschool enhancement programs. *Early Educ Dev* 2020; **31**: 1–26.
- 163 Wolf S. "Me I don't really discuss anything with them": Parent and teacher perceptions of early childhood education and parent-teacher relationships in Ghana. *Int J Educ Res* 2020; **99**: 101525.
- 164 Wolf S, Aber JL, Behrman JR, Peele M. Longitudinal causal impacts of preschool teacher training on Ghanaian children's school readiness: evidence for persistence and fade-out. *Dev Sci* 2019; **22**: e12878.
- 165 WHO. INSPIRE Handbook: action for implementing the seven strategies for ending violence against children. Geneva: World Health Organization, 2019.
- 166 Cuartas J, McCoy DC, Rey-Guerra C, Britto PR, Beatriz E, Salhi C. Early childhood exposure to non-violent discipline and physical and psychological aggression in low- and middle-income countries: national, regional, and global prevalence estimates. *Child Abuse Negl* 2019; **92**: 93–105.
- 167 Hillis S, Mercy J, Amobi A, Kress H. Global prevalence of past-year violence against children: a systematic review and minimum estimates. *Pediatrics* 2016; **137**: e20154079.
- 168 Ward KP, Grogan-Kaylor A, Pace GT, Cuartas J, Lee S. Multilevel ecological analysis of the predictors of spanking across 65 countries. *BMJ Open* 2021; **11**: e046075.
- 169 Dobrova-Krol NA, van Ijzendoorn MH, Bakermans-Kranenburg MJ, Juffer F. Effects of perinatal HIV infection and early institutional rearing on physical and cognitive development of children in Ukraine. *Child Dev* 2010; **81**: 237–51.
- 170 Dobrova-Krol NA, van Ijzendoorn MH, Bakermans-Kranenburg MJ, Cyr C, Juffer F. Physical growth delays and stress dysregulation in stunted and non-stunted Ukrainian institution-reared children. *Infant Behav Dev* 2008; **31**: 539–53.
- 171 Zhukova MA, Kornilov SA, Tseitlin SN, et al. Early lexical development of children raised in institutional care in Russia. *Br J Dev Psychol* 2020; **38**: 239–54.
- 172 Zhukova MA, Ovchinnikova I, Logvinenko TI, Grigorenko EL. Language development of children raised in institutional settings: behavioral and neurophysiological findings. *New Dir Child Adolesc Dev* 2020; **2020**: 75–96.
- 173 Rakhlin N, Hein S, Doyle N, et al. Sources of heterogeneity in developmental outcomes of children with past and current experiences of institutionalization in Russia: a four-group comparison. *Am J Orthopsychiatry* 2017; **87**: 242–55.
- 174 Yagmurlu B, Berument SK, Celimli S. The role of institution and home contexts in theory of mind development. *J Appl Dev Psychol* 2005; **26**: 521–37.

- 175 Merz EC, McCall RB. Parent ratings of executive functioning in children adopted from psychosocially depriving institutions. *J Child Psychol Psychiatry* 2011; **52**: 537–46.
- 176 Merz EC, McCall RB, Groza V. Parent-reported executive functioning in postinstitutionalized children: a follow-up study. *J Clin Child Adolesc Psychol* 2013; **42**: 726–33.
- 177 McCall RB, Muhamedrahimov RJ, Groark CJ, et al. The development of postinstitutionalized versus parent-reared Russian children as a function of age at placement and family type. *Dev Psychopathol* 2016; **28**: 251–64.
- 178 McCall RB, Muhamedrahimov RJ, Groark CJ, et al. The development of children placed into different types of Russian families following an institutional intervention. *Int Perspect Psychol* 2016; **5**: 255–70.
- 179 Parker SW, Nelson CA, Bucharest Early Intervention Project Core Group. The impact of early institutional rearing on the ability to discriminate facial expressions of emotion: an event-related potential study. *Child Dev* 2005; **76**: 54–72.
- 180 Palacios J, Moreno C, Roman M. Social competence in internationally adopted and institutionalized children. *Early Child Res Q* 2013; **28**: 357–65.
- 181 Camras LA, Perlman SB, Fries ABW, Pollak SD. Post-institutionalized Chinese and eastern European children: heterogeneity in the development of emotion understanding. *Int J Behav Dev* 2006; **30**: 193–99.
- 182 Julian MM, McCall RB. Social skills in children adopted from socially-emotionally depriving institutions. *Adoption Q* 2016; **19**: 44–62.
- 183 Tan TX, Camras LA, Kim ES. Preadoption adversity and long-term clinical-range behavior problems in adopted Chinese girls. *J Couns Psychol* 2016; **63**: 319–30.
- 184 Hermenau K, Hecker T, Elbert T, Ruf-Leuschner M. Maltreatment and mental health in institutional care—comparing early and late institutionalized children in Tanzania. *Infant Ment Health J* 2014; **35**: 102–10.
- 185 Wiik KL, Loman MM, Van Ryzin MJ, et al. Behavioral and emotional symptoms of post-institutionalized children in middle childhood. *J Child Psychol Psychiatry* 2011; **52**: 56–63.
- 186 Zeanah CH, Egger HL, Smyke AT, et al. Institutional rearing and psychiatric disorders in Romanian preschool children. *Am J Psychiatry* 2009; **166**: 777–85.
- 187 Nielsen A, Coleman PK, Guinn M, Robb C. Length of institutionalization, contact with relatives and previous hospitalizations as predictors of social and emotional behavior in young Ugandan orphans. *Childhood* 2004; **11**: 94–116.
- 188 Gunnar MR, van Dulmen MHM. Behavior problems in postinstitutionalized internationally adopted children. *Dev Psychopathol* 2007; **19**: 129–48.
- 189 Gunnar M, Quevedo K. The neurobiology of stress and development. *Annu Rev Psychol* 2007; **58**: 145–73.
- 190 UNICEF. A familiar face: violence in the lives of children and adolescents. New York, NY: United Nations Children's Fund, 2017.
- 191 Duc NHC. Developmental risk factors in Vietnamese preschool-age children: cross-sectional survey. *Pediatr Int* 2016; **58**: 14–21.
- 192 Roopnarine JL, Jin B, Krishnakumar A. Do Guyanese mothers' levels of warmth moderate the association between harshness and justness of physical punishment and preschoolers' prosocial behaviours and anger? *Int J Psychol* 2014; **49**: 271–79.
- 193 Pace GT, Lee SJ, Grogan-Kaylor A. Spanking and young children's socioemotional development in low- and middle-income countries. *Child Abuse Negl* 2019; **88**: 84–95.
- 194 Chang L, Schwartz D, Dodge KA, McBride-Chang C. Harsh parenting in relation to child emotion regulation and aggression. *J Fam Psychol* 2003; **17**: 598–606.
- 195 Nelson DA, Hart CH, Yang C, Olsen JA, Jin S. Aversive parenting in China: associations with child physical and relational aggression. *Child Dev* 2006; **77**: 554–72.
- 196 Nelson LJ, Hart CH, Wu B, Yang C, Roper SO, Jin S. Relations between Chinese mothers' parenting practices and social withdrawal in early childhood. *Int J Behav Dev* 2006; **30**: 261–71.
- 197 Xing X, Wang M. Gender differences in the moderating effects of parental warmth and hostility on the association between corporal punishment and child externalizing behaviors in China. *J Child Fam Stud* 2017; **26**: 928–38.
- 198 Baydar N, Akcinar B. Reciprocal relations between the trajectories of mothers' harsh discipline, responsiveness and aggression in early childhood. *J Abnorm Child Psychol* 2018; **46**: 83–97.
- 199 Li Y, Shi A, Wan Y, Hotta M, Ushijima H. Child behavior problems: prevalence and correlates in rural minority areas of China. *Pediatr Int* 2001; **43**: 651–61.
- 200 Baker-Henningham H, Francis T. Parents' use of harsh punishment and young children's behaviour and achievement: a longitudinal study of Jamaican children with conduct problems. *Glob Ment Health* 2018; **5**: e32.
- 201 Yüce M, Karabekiroğlu K, Yildirim Z, et al. The psychiatric consequences of child and adolescent sexual abuse. *Noro Psikiyatri Arsivi* 2015; **52**: 393–99.
- 202 Srinath S, Girimaji SC, Gururaj G, et al. Epidemiological study of child & adolescent psychiatric disorders in urban & rural areas of Bangalore, India. *Indian J Med Res* 2005; **122**: 67–79.
- 203 Skeen S, Macedo A, Tomlinson M, Hensels IS, Sherr L. Exposure to violence and psychological well-being over time in children affected by HIV/AIDS in South Africa and Malawi. *AIDS Care* 2016; **28** (suppl 1): 16–25.
- 204 Ferdousy EZ, Matin MA. Association between intimate partner violence and child morbidity in South Asia. *J Health Popul Nutr* 2015; **33**: 16.
- 205 Urke HB, Mittelmark MB. Associations between intimate partner violence, childcare practices and infant health: findings from demographic and health surveys in Bolivia, Colombia and Peru. *BMC Public Health* 2015; **15**: 819.
- 206 Subramanian SV, Ackerson LK, Subramanyam MA, Wright RJ. Domestic violence is associated with adult and childhood asthma prevalence in India. *Int J Epidemiol* 2007; **36**: 569–79.
- 207 Ackerson LK, Subramanian SV. Domestic violence and chronic malnutrition among women and children in India. *Am J Epidemiol* 2008; **167**: 1188–96.
- 208 Silverman JG, Decker MR, Gupta J, Kapur N, Raj A, Naved RT. Maternal experiences of intimate partner violence and child morbidity in Bangladesh: evidence from a national Bangladeshi sample. *Arch Pediatr Adolesc Med* 2009; **163**: 700–05.
- 209 Bintabara D, Kibusi SM. Intimate partner violence victimization increases the risk of under-five morbidity: a stratified multilevel analysis of pooled Tanzania demographic health surveys, 2010–2016. *PLoS One* 2018; **13**: e0201814.
- 210 Rahman M, Poudel KC, Yasuoka J, Otsuka K, Yoshikawa K, Jimba M. Maternal exposure to intimate partner violence and the risk of undernutrition among children younger than 5 years in Bangladesh. *Am J Public Health* 2012; **102**: 1336–45.
- 211 Sobkoviak RM, Yount KM, Halim N. Domestic violence and child nutrition in Liberia. *Soc Sci Med* 2012; **74**: 103–11.
- 212 Memiah P, Bond T, Opanga Y, et al. Neonatal, infant, and child mortality among women exposed to intimate partner violence in East Africa: a multi-country analysis. *BMC Womens Health* 2020; **20**: 10.
- 213 Titilayo A, Anuodo OO, Palamuleni ME. Family type, domestic violence and under-five mortality in Nigeria. *Afr Health Sci* 2017; **17**: 538–48.
- 214 Hossain MA, Sumi NS, Haque ME, Bari W. Consequences of intimate partner violence against women on under-five child mortality in Bangladesh. *J Interpers Violence* 2014; **29**: 1402–17.
- 215 Pandey S, Lin Y. Adjusted effects of domestic violence, tobacco use, and indoor air pollution from use of solid fuel on child mortality. *Matern Child Health J* 2013; **17**: 1499–507.
- 216 Minoiu C, Shemyakina O. Child health and conflict in Côte d'Ivoire. *Am Econ Rev* 2012; **102**: 294–99.
- 217 Verwimp P. Undernutrition, subsequent risk of mortality and civil war in Burundi. *Econ Hum Biol* 2012; **10**: 221–31.
- 218 Dahab R, Bécares L, Brown M. Armed conflict as a determinant of children malnourishment: a cross-sectional study in the Sudan. *BMC Public Health* 2020; **20**: 532.
- 219 Grossman D, Khalil U, Ray A. Terrorism and early childhood health outcomes: evidence from Pakistan. *Soc Sci Med* 2019; **237**: 112453.
- 220 Flink IJ, Restrepo MH, Blanco DP, et al. Mental health of internally displaced preschool children: a cross-sectional study conducted in Bogotá, Colombia. *Soc Psychiatry Psychiatr Epidemiol* 2013; **48**: 917–26.

- 221 Basu B, Dutta N. Psychological changes of children surviving terrorist shock in Indian Kashmir. *J Child Neurol* 2010; **25**: 1331–34.
- 222 Massad S, Khammash U, Shute R. Political violence and mental health of Bedouin children in the West Bank, Palestine: a cross-sectional study. *Med Confl Surviv* 2017; **33**: 188–206.
- 223 Abbo C, Kinyanda E, Kizza RB, Levin J, Ndyabangi S, Stein DJ. Prevalence, comorbidity and predictors of anxiety disorders in children and adolescents in rural north-eastern Uganda. *Child Adolesc Psychiatry Ment Health* 2013; **7**: 21.
- 224 Thabet AA, Karim K, Vostanis P. Trauma exposure in pre-school children in a war zone. *Br J Psychiatry* 2006; **188**: 154–58.
- 225 Erol N, Simşek Z, Oner O, Munir K. Effects of internal displacement and resettlement on the mental health of Turkish children and adolescents. *Eur Psychiatry* 2005; **20**: 152–57.
- 226 O'Hare BA, Southall DP. First do no harm: the impact of recent armed conflict on maternal and child health in Sub-Saharan Africa. *J R Soc Med* 2007; **100**: 564–70.
- 227 Musafli A, Essén B, Baribwira C, Binagwaho A, Persson LÅ, Selling KE. Trends and social differentials in child mortality in Rwanda 1990–2010: results from three demographic and health surveys. *J Epidemiol Community Health* 2015; **69**: 834–40.
- 228 Avogo WA, Agadjanian V. Forced migration and child health and mortality in Angola. *Soc Sci Med* 2010; **70**: 53–60.
- 229 Lassi ZS, Mahmud S, Syed EU, Janjua NZ. Behavioral problems among children living in orphanage facilities of Karachi, Pakistan: comparison of children in an SOS Village with those in conventional orphanages. *Soc Psychiatry Psychiatr Epidemiol* 2011; **46**: 787–96.
- 230 Coore Desai C, Reece J-A, Shakespeare-Pellington S. The prevention of violence in childhood through parenting programmes: a global review. *Psychol Health Med* 2017; **22**: 166–86.
- 231 Francis T, Baker-Henningham H. The Irie Homes toolbox: a cluster randomized controlled trial of an early childhood parenting program to prevent violence against children in Jamaica. *Child Youth Serv Rev* 2021; **126**: 106060.
- 232 Barbarin OA, Richter L, deWet T. Exposure to violence, coping resources, and psychological adjustment of South African children. *Am J Orthopsychiatry* 2001; **71**: 16–25.
- 233 Gershoff ET, Lee SJ, Durrant JE. Promising intervention strategies to reduce parents' use of physical punishment. *Child Abuse Negl* 2017; **71**: 9–23.
- 234 Cuartas J. Heightened risk of child maltreatment amid the COVID-19 pandemic can exacerbate mental health problems for the next generation. *Psychol Trauma* 2020; **12**: S195–96.
- 235 Fabbri C, Bhattia A, Petzold M, et al. Modelling the effect of the COVID-19 pandemic on violent discipline against children. *Child Abuse Negl* 2021; **116**: 104897.
- 236 Cohen J, Clothier S, Poppe J, Omonaku N. Helping young children succeed: strategies to promote early childhood social and emotional development. September, 2005. <https://edn.ne.gov/cms/sites/default/files/u1/pdf/se18Helping%20Young%20Children%20Succeed.pdf> (accessed Aug 9, 2021).
- 237 Honda T, Tran T, Poppstone S, et al. Parents' mental health and the social-emotional development of their children aged between 24 and 59 months in low-and middle-income countries: a systematic review and meta-analyses. *SSM Ment Health* 2023; **3**: 100197.
- 238 Kmet LM, Lee RC, Cook LS. Standard quality assessment criteria for evaluating primary research papers from a variety of fields. Edmonton: Alberta Heritage Foundation for Medical Research, 2004.
- 239 Yurduşen S, Erol N, Gençöz T. The effects of parental attitudes and mothers' psychological well-being on the emotional and behavioral problems of their preschool children. *Matern Child Health J* 2013; **17**: 68–75.
- 240 Gündüz G, Yagmurlu B, Harma M. Self-regulation mediates the link between family context and socioemotional competence in Turkish preschoolers. *Early Educ Dev* 2015; **26**: 729–48.
- 241 Alenko A, Girma S, Abera M, Workicho A. Children emotional and behavioural problems and its association with maternal depression in Jimma town, southwest Ethiopia. *Gen Psychiatr* 2020; **33**: e100211.
- 242 Flynn EP, Chung EO, Ozer EJ, Fernald LCH. Maternal depressive symptoms and child behavior among Mexican women and their children. *Int J Environ Res Public Health* 2017; **14**: 18.
- 243 Nguyen PH, Friedman J, Kak M, Menon P, Alderman H. Maternal depressive symptoms are negatively associated with child growth and development: Evidence from rural India. *Matern Child Nutr* 2018; **14**: e12621.
- 244 Karabekiroglu K, Uslu R, Kapci-Seyitoglu EG, et al. A nationwide study of social-emotional problems in young children in Turkey. *Infant Behav Dev* 2013; **36**: 162–70.
- 245 Garman EC, Cois A, Tomlinson M, Rotheram-Borus MJ, Lund C. Course of perinatal depressive symptoms among South African women: associations with child outcomes at 18 and 36 months. *Soc Psychiatry Psychiatr Epidemiol* 2019; **54**: 1111–23.
- 246 Bao P, Jing J, Jin Y, Hu X, Liu B, Hu M. Trajectories and the influencing factors of behavior problems in preschool children: a longitudinal study in Guangzhou, China. *BMC Psychiatry* 2016; **16**: 178.
- 247 Ma SS, Zhu DM, Yin WJ, et al. The role of neonatal vitamin D in the association of prenatal depression with toddlers ADHD symptoms: a birth cohort study. *J Affect Disord* 2021; **281**: 390–96.
- 248 Finch JE, Yousafzai AK, Rasheed M, Obradović J. Measuring and understanding social-emotional behaviors in preschoolers from rural Pakistan. *PLoS One* 2018; **13**: e0207807.
- 249 Dora B, Baydar N. Transactional associations of maternal depressive symptoms with child externalizing behaviors are small after age 3. *Dev Psychopathol* 2020; **32**: 293–308.
- 250 Ramchandani PG, Richter LM, Norris SA, Stein A. Maternal prenatal stress and later child behavioral problems in an urban South African setting. *J Am Acad Child Adolesc Psychiatry* 2010; **49**: 239–47.
- 251 Santos IS, Matijasevich A, Barros AJ, Barros FC. Antenatal and postnatal maternal mood symptoms and psychiatric disorders in pre-school children from the 2004 Pelotas Birth Cohort. *J Affect Disord* 2014; **164**: 112–17.
- 252 Caetano SC, Ribeiro MVV, Askari MS, et al. An epidemiological study of childhood development in an urban setting in Brazil. *Br J Psychiatry* 2021; **43**: 43–54.
- 253 Xing X, Zhang H, Shao S, Wang M. Child negative emotionality and parental harsh discipline in Chinese preschoolers: the different mediating roles of maternal and paternal anxiety. *Front Psychol* 2017; **8**: 339.
- 254 Wang X, Xie J, Wu Y, et al. Gender-specific effect of pregnancy-related anxiety on preschooler's emotional and behavioral development: a population-based cohort study. *J Affect Disord* 2021; **279**: 368–76.
- 255 Arguz Cildir D, Ozbek A, Topuzoglu A, Orcin E, Janbakhishov CE. Association of prenatal attachment and early childhood emotional, behavioral, and developmental characteristics: a longitudinal study. *Infant Ment Health J* 2020; **41**: 517–29.
- 256 Mak MCK, Yin L, Li M, Cheung RYH, Oon PT. The relation between parenting stress and child behavior problems: negative parenting styles as mediator. *J Child Fam Stud* 2020; **29**: 2993–3003.
- 257 Xuan X, Chen F, Yuan C, et al. The relationship between parental conflict and preschool children's behavior problems: a moderated mediation model of parenting stress and child emotionality. *Child Youth Serv Rev* 2018; **95**: 209–16.
- 258 Melis Yavuz H, Selcuk B, Corapci F, Aksan N. Role of temperament, parenting behaviors, and stress on Turkish preschoolers' internalizing symptoms. *Soc Dev* 2017; **26**: 109–28.
- 259 Liu L, Wang M. Parenting stress and children's problem behavior in China: the mediating role of parental psychological aggression. *J Fam Psychol* 2015; **29**: 20–28.
- 260 Lin Y, Xu J, Huang J, et al. Effects of prenatal and postnatal maternal emotional stress on toddlers' cognitive and temperamental development. *J Affect Disord* 2017; **207**: 9–17.
- 261 Caliskan Z, Özyurt G. Evaluation of the emotion regulation skill of overweight-obese preschool children and maternal mental well-being. *Erciyes Med J* 2020; **42**: 84–88.
- 262 Rocha HAL, Sudfeld CR, Leite AJM, et al. Adverse childhood experiences and child development outcomes in Ceara, Brazil: a population-based study. *Am J Prev Med* 2020; **4**: 579–86.
- 263 Santos LM, Queirós FC, Barreto ML, Santos DN. Prevalence of behavior problems and associated factors in preschool children from the city of Salvador, state of Bahia, Brazil. *Br J Psychiatry* 2016; **38**: 46–52.

- 264 Hou Y, Kim SY, Hazen N, Benner AD. Parents' perceived discrimination and adolescent adjustment in Chinese American families: mediating family processes. *Child Dev* 2017; **88**: 317–31.
- 265 Stepanikova I, Acharya S, Abdalla S, Baker E, Klanova J, Darmstadt GL. Gender discrimination and depressive symptoms among child-bearing women: ELSPEC-CZ cohort study. *EClinicalMedicine* 2020; **20**: 100297.
- 266 Berry OO, Londoño Tobón A, Njoroge WFM. Social determinants of health: the impact of racism on early childhood mental health. *Curr Psychiatry Rep* 2021; **23**: 23.
- 267 Kelly Y, Becares L, Nazroo J. Associations between maternal experiences of racism and early child health and development: findings from the UK Millennium Cohort Study. *J Epidemiol Community Health* 2013; **67**: 35–41.
- 268 Stepanikova I, Acharya S, Colón-López A, Abdalla S, Klanova J, Darmstadt GL. Maternal gender discrimination and child emotional and behavioural problems: a population-based, longitudinal cohort study in the Czech Republic. *EClinicalMedicine* 2022; **53**: 101627.
- 269 Martin FS, Zulaika G. Who cares for children? A descriptive study of care-related data available through global household surveys and how these could be better mined to inform policies and services to strengthen family care. *Glob Soc Welf* 2016; **3**: 51–74.
- 270 Aguiar C, Jennings L. Impact of male partner antenatal accompaniment on perinatal health outcomes in developing countries: a systematic literature review. *Matern Child Health J* 2015; **19**: 2012–19.
- 271 Tokhi M, Comrie-Thomson L, Davis J, Portela A, Chersich M, Luchters S. Involving men to improve maternal and newborn health: a systematic review of the effectiveness of interventions. *PLoS One* 2018; **13**: e0191620.
- 272 Martin SL, McCann JK, Gascoigne E, Allotey D, Fundira D, Dickin KL. mixed-methods systematic review of behavioral interventions in low- and middle-income countries to increase family support for maternal, infant, and young child nutrition during the first 1000 days. *Curr Dev Nutr* 2020; **4**: nzaa085.
- 273 Singla DR, Kumbakumba E, Aboud FE. Effects of a parenting intervention to address maternal psychological wellbeing and child development and growth in rural Uganda: a community-based, cluster randomised trial. *Lancet Glob Health* 2015; **3**: e458–69.
- 274 Husain MI, Chaudhry IB, Khoso AB, et al. A group parenting intervention for depressed fathers (LTP + Dads): a feasibility study from Pakistan. *Children* 2021; **8**: 26.
- 275 Jeong J, Siyal S, Fink G, McCoy DC, Yousafzai AK. "His mind will work better with both of us": a qualitative study on fathers' roles and coparenting of young children in rural Pakistan. *BMC Public Health* 2018; **18**: 1274.
- 276 Nsamenang AB. Fathers, families, and children's well-becoming in Africa. In: Lamb E, ed. *The role of the father in child development*, 5th edn. Hoboken, NJ: John Wiley & Sons Inc, 2010: 388–412.
- 277 Wang M, Liu L. Parental harsh discipline in mainland China: prevalence, frequency, and coexistence. *Child Abuse Negl* 2014; **38**: 1128–37.
- 278 Mncanca M, Okeke CIO. Positive fatherhood: a key synergy for functional early childhood education in South Africa. *J Sociol Soc Anthropol* 2016; **7**: 221–32.
- 279 Skar AS, Sherr L, Macedo A, Tetzchner SV, Fostervold KI. Evaluation of parenting interventions to prevent violence against children in Colombia: a randomized controlled trial. *J Interpers Violence* 2021; **36**: NP1098–126.
- 280 Lakkis NA, Osman MH, Aoude LC, Maalouf CJ, Issa HG, Issa GM. A pilot intervention to promote positive parenting in refugees from Syria in Lebanon and Jordan. *Front Psychiatry* 2020; **11**: 257.
- 281 Mathwasa J, Okeke CIO. Educators' perspectives on fathers' participation in the early childhood education of their children. *Int J Educ Sci* 2016; **13**: 172–85.
- 282 Litchford A, Savoie Roskos MR, Wengreen H. Influence of fathers on the feeding practices and behaviors of children: a systematic review. *Appetite* 2020; **147**: 104558.
- 283 Vollmer RL, Adamsons K, Gorin A, Foster JS, Mobley AR. Investigating the relationship of body mass index, diet quality, and physical activity level between fathers and their preschool-aged children. *J Acad Nutr Diet* 2015; **115**: 919–26.
- 284 Morgan PJ, Collins CE, Barnes AT, et al. Engaging fathers to improve physical activity and nutrition in themselves and in their preschool-aged children: the "Healthy Youngsters, Healthy Dads" feasibility trial. *J Phys Act Health* 2021; **18**: 175–84.
- 285 McCoy DC, Cuartas J, Behrman JR, et al. Global estimates of the implications of COVID-19-related preschool closures for children's instructional access, development, learning, and economic wellbeing. *Child Dev* 2021; **92**: e883–99.
- 286 Araujo M. Caridad, Lopez Boo F. Overview of early childhood development services in Latin America and the Caribbean. July, 2013. <https://publications.iadb.org/en/overview-early-childhood-development-services-latin-america-and-caribbean> (accessed Aug 9, 2021).
- 287 Baker-Henningham H. The role of early childhood education programmes in the promotion of child and adolescent mental health in low- and middle-income countries. *Int J Epidemiol* 2014; **43**: 407–33.
- 288 Barnett WS. Effectiveness of early educational intervention. *Science* 2011; **333**: 975–78.
- 289 Inter-American Development Bank. *The early years: child wellbeing and the role of public policy*. Basingstoke: Palgrave Macmillan, 2015.
- 290 Boocock SS, Barnett WS, Frede E. Long-term outcomes of early childhood programs in other nations: lessons for americans. *Young Child* 2001; **56**: 43–50.
- 291 Brown TW, van Urk FC, Waller R, Mayo-Wilson E. Centre-based day care for children younger than five years of age in low- and middle-income countries. *Cochrane Database Syst Rev* 2014; **9**: CD010543.
- 292 Burger K. How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. *Early Child Res Q* 2010; **25**: 140–65.
- 293 Grantham-McGregor SM, Fernald LCH, Kagawa RMC, Walker S. Effects of integrated child development and nutrition interventions on child development and nutritional status. *Ann N Y Acad Sci* 2014; **1308**: 11–32.
- 294 Jackson J, Ahmed SK, Carslake T, Lietz P. Improving young children's learning in economically developing countries: what works, why, and where? Scoping review. August, 2019. https://research.acer.edu.au/cgi/viewcontent.cgi?article=1038&context=monitoring_learning (accessed Aug 9, 2021).
- 295 Leroy J, Gadsden P, Guijarro M. The impact of daycare programmes on child health, nutrition and development in developing countries: a systematic review. *J Dev Effect* 2012; **4**: 472–96.
- 296 Mares M-L, Pan Z. Effects of Sesame Street: a meta-analysis of children's learning in 15 countries. *J Appl Dev Psychol* 2013; **34**: 140–51.
- 297 Nores M, Barnett W. Benefits of early childhood interventions across the world: (under) investing in the very young. *Econ Educ Rev* 2010; **29**: 271–82.
- 298 Rao N, Sun J, Chen EE, Ip P. Effectiveness of early childhood interventions in promoting cognitive development in developing countries: a systematic review and meta-analysis. *Hong Kong J Paediatr* 2017; **22**: 14–25.
- 299 Tanner J, Candland T, Odden W. Later impacts of early childhood interventions: a systematic review. March 31, 2015. <http://documents.worldbank.org/curated/en/646221468186256866/Later-impacts-of-early-childhood-interventions-a-systematic-review> (accessed Sept 20, 2022).
- 300 Vegas E, Santibanez L. The promise of early childhood development in Latin America. Dec 12, 2009. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/460051468048529751/the-promise-of-early-childhood-development-in-latin-america-and-the-caribbean> (accessed Aug 9, 2021).
- 301 Werner CD, Linting M, Vermeer HJ, Van IJzendoorn MH. Do intervention programs in child care promote the quality of caregiver-child interactions? A meta-analysis of randomized controlled trials. *Prev Sci* 2016; **17**: 259–73.
- 302 Yoshikawa H, Kabay S. The evidence base on early childhood care and education in global contexts. 2015. <https://unesdoc.unesco.org/ark:/48223/pf0000232456> (accessed Sept 12, 2024).

- 303 Hanno EC, Gonzalez KE, Lebowitz RB, McCoy DC, Lizárraga A, Korder Fort C. Structural and process quality features in Peruvian early childhood education settings. *J Appl Dev Psychol* 2020; **67**: 101105.
- 304 McCoy DC, Seiden J, Cuartas J, Pisani L, Waldman M. Estimates of a multidimensional index of nurturing care in the next 1000 days of life for children in low-income and middle-income countries: a modelling study. *Lancet Child Adolesc Health* 2022; **6**: 324–34.
- 305 UNICEF. The formative years: UNICEF's work on measuring ECD. Sept 22, 2019. <https://data.unicef.org/resources/the-formative-years-unicefs-work-on-measuring-ecd/> (accessed Aug 9, 2021).
- 306 McCoy DC, Cuartas J, Seiden J. Country-level improvements in nurturing care and child development. *JAMA Pediatr* 2024; **178**: 84–86.
- 307 Pisani L, Borisova I, Dowd AJ. Developing and validating the International Development and Early Learning Assessment (IDELA). *Int J Educ Res* 2018; **91**: 1–15.
- 308 Halpin PF, Wolf S, Yoshikawa H, et al. Measuring early learning and development across cultures: invariance of the IDELA across five countries. *Dev Psychol* 2019; **55**: 23–37.
- 309 Wolf S, Halpin P, Yoshikawa H, Dowd AJ, Pisani L, Borisova I. Measuring school readiness globally: assessing the construct validity and measurement invariance of the International Development and Early Learning Assessment (IDELA) in Ethiopia. *Early Child Res Q* 2017; **41**: 21–36.
- 310 Pisani L, Seiden J, Wolf S. Longitudinal evidence on the predictive validity of the International Development and Early Learning Assessment (IDELA). *Educ Assess, Eval Account* 2022; **34**: 173–94.
- 311 UNICEF. A world ready to learn: prioritizing quality early childhood education. New York, NY: United Nations Children's Fund, 2019.
- 312 Sénéchal M, LeFevre J-A. Parental involvement in the development of children's reading skill: a five-year longitudinal study. *Child Dev* 2002; **73**: 445–60.
- 313 McCoy DC. Building a model of cultural universality with specificity for global early childhood development. *Child Dev Perspect* 2022; **16**: 27–33.
- 314 Mesman J, Minter T, Angnged A, Cissé IAH, Salali GD, Migliano AB. Universality without uniformity: a culturally inclusive approach to sensitive responsiveness in infant caregiving. *Child Dev* 2018; **89**: 837–50.
- 315 Draper CE, Klingberg S, Wrottesley SV, et al. Interventions to promote development in the next 1000 days: a mapping review. *Child Care Health Dev* 2023; **49**: 617–29.
- 316 Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. *Lancet Glob Health* 2018; **6**: e1077–86.
- 317 Augsburg B, Attanasio OP, Dreibelbis R, et al. Lively minds: improving health and development through play-a randomised controlled trial evaluation of a comprehensive ECCE programme at scale in Ghana. *BMJ Open* 2022; **12**: e061571.
- 318 Dusabe C, Abimpaye M, Kabarungi N, Uwamahoro MD. Monitoring, evaluation and accountability evidence use for design, adaptation, and scale-up of an early childhood development program in Rwanda. *Front Public Health* 2023; **11**: 1165353.
- 319 Nuño N, Mäusezahl D, Hattendorf J, Verastegui H, Ortiz M, Hartinger SM. Effectiveness of a home-environmental intervention package and an early child development intervention on child health and development in high-altitude rural communities in the Peruvian Andes: a cluster-randomised controlled trial. *Infect Dis Poverty* 2022; **11**: 66.
- 320 Koopowitz S-M, Maré KT, Lake M, et al. Efficacy of a dialogic book-sharing intervention in a South African birth cohort: a randomized controlled trial. *Compr Psychiatry* 2024; **128**: 152436.
- 321 Draper CE, Barnett LM, Cook CJ, et al. Publishing child development research from around the world: an unfair playing field resulting in most of the world's child population underrepresented in research. *Infant Child Dev* 2022; **32**: e2375.
- 322 Raikes A, Yoshikawa H, Britto PR, Iruka IU. Children, youth and developmental science in the 2015–2030 global sustainable development goals. *Soc Res Child Dev* 2017; **30**: 1–23.

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