The Malawi Priorities Project

Cost-Benefit Analysis of Expanding and Improving Early Childhood Education in Malawi - Technical Report

National Planning Commission Report with technical assistance from the Copenhagen Consensus Center and the African Institute for Development Policy

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This work has been produced as a part of the Malawi Priorities project.

Malawi Priorities: Background

Malawi Priorities is a research-based collaborative project implemented by the National Planning Commission (NPC) with technical assistance from the African Institute for Development Policy (AFIDEP), and the Copenhagen Consensus Center (CCC) to identify and promote the most effective interventions that address Malawi's development challenges and support the attainment of its development aspirations. The project seeks to provide the government with a systematic process to help prioritize the most effective policy solutions so as to maximize social, environmental and economic benefits on every kwacha invested. Cost-benefit analysis is the primary analytical tool adopted by the project. Cost-benefit analysis will be applied to 20-30 research questions of national importance. Research will take place over the course of 2020 and 2021.

Research questions were drawn from the NPC's existing research agenda, developed in September 2019 after extensive consultation with academics, think tanks, the private sector and government. This sub-set was then augmented, based on input from NPC, an Academic Advisory Group (AAG) of leading scholars within Malawi, and existing literature, particularly previous cost-benefit analyses conducted by the Copenhagen Consensus Center. The research agenda was validated and prioritized by a Reference Group of 25 prominent, senior stakeholders. The selection of interventions was informed by numerous consultations across the Malawian policy space, and one academic and two sector experts provide peer review on all analyses.

Cost-benefit analyses in Malawi Priorities consider the social, economic and environmental impacts that accrue to all of Malawian society. This represents a wider scope than financial cost-benefit analysis, which considers only the flow of money, or private cost-benefit analysis, which considers the perspective of only one party. All benefit-cost ratios (BCRs) reported within the Malawi Priorities project are comparable.

The cost-benefit analysis considered in the project is premised on an injection of new money available to decision makers, that can be spent on expanding existing programs (e.g. new beneficiaries, additional program features) or implementing new programs. Results should not be interpreted as reflections on past efforts or the benefits of reallocating existing funds.

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Contents

1. Introduction

Early childhood development (ECD) refers to a person's cognitive, physical and emotional growth from the time of pregnancy to the age of entering primary school. Much evidence points to the importance of this period on overall life outcomes. For example, development and progress in cognitive, psychological, motor and language skills in early childhood, significantly contributes to adult outcomes of educational achievement, health, work productivity and earnings (Campbell et al. 2014). In the initial years of life, babies and children need nutrition, protection, and stimulation for healthy brain development. Consequently, delayed early-life growth has been observed to impede the ability of children to interact and engage with their surroundings (McCoy et al. 2015). It is also related to persistent shortfalls in overall development and growth pathways as the children grow older (Victora et al. 2010).

During these crucial years, Malawian children often experience poor health care, insufficient nutrition, little or no early stimulation and learning, and the lack of a protective setting (Gladstone et al. 2018). The Fifth Integrated Household Survey (IHS5, 2019-2020) shows that though Malawi has experienced reductions in under-nutrition over the past two decades, the country still faces a huge challenge of early childhood nutrition with high rates of stunting in children under-five (33.7%). Another significant challenge around ECD is the lack of pre-school training and stimulation for young children. Gove et al. (2018) show that students with no pre-primary experience in Malawi (along with other countries such as Nigeria, Tanzania and Uganda) had extremely low scores for pre-literacy skills such as letter sound identification skills.

Evidence points to the important role of ECD interventions on child development, particularly those that combine enhanced nutrition practices with child stimulation activities and education. Such interventions have been proposed as robust policy tools for the alleviation of disadvantages from poor settings (Britto et al. 2017). Gladstone et al (2018) collated evidence from controlled trials which demonstrates that combined interventions which include support for developmental stimulation for children aged 0–3 years and also provide advice on feeding, nutrition, and health can have substantial effects on early child development (ECD) and later life-course outcomes such as educational attainment; earnings and mental health, and that these psychosocial benefits continue into adulthood as do the substantial economic returns.

Gelli et al (2017) indicate that ECD programs are designed to improve young children's survival, growth and development. Quality ECD programs have been associated with increased literacy levels, improved school enrolment and achievement, enhanced developmental outcomes, and better adult outcomes such as improved productivity (F. E. Aboud, 2006; Melhuish, 2011; Melhuish et al., 2008; Peisner-Feinberg et al., 2001). That investment in early childhood will generate substantial benefits for society has been adequately demonstrated (Heckman, 2006; Bhutta et al. 2013; McGovern et al., 2017). The impact is two-pronged - improved nutritional status in the short term and a long-term impact on the development of future generations.

A systematic review and meta-analysis of early childhood interventions in developing countries finds that early childhood education and stimulation interventions improve cognitive development and increase primary school readiness (Rao et al, 2017). Evidence also points to the fact that appropriate pre-school enrolment can reduce grade repetition reducing costs in the education system (Weatherholt et al. 2019; Sunny et al. 2017; Garcia, Pence and Evans, 2008). Behrman et al. (2006) point out that inadequate preparation for primary school through lack of or poor quality pre-primary education is an important risk factor for poor educational performance and low grade attainment in primary school. A prevalent and widespread approach in improving outcomes in children is therefore increasing enrollment in preschool programs, as also improving the quality of existing programs.

Malawi has been one of the relative success stories when it comes to early childhood education in Africa. The main modality of early childhood education in Malawi are community - based child care centers (CBCCs) – parent and community run pre-schools for 3-5 year olds. Besides providing important early childhood education, CBCCs are motivated by a desire to free up caregiver time for economic activities (Munthali et al. 2014). CBCCs have proliferated across the country such that currently, there are 12,424 centers operational with the net pre-school enrolment rate standing at 47%. This is substantially higher than the average in Sub-Saharan Africa and higher than expected by its income per capital level (World Bank, 2020).

Nevertheless, there is ample room for both expansion and improvement of CBCCs. Although 47% net enrolment is commendable, that figure still omits more than half of the children. Consultations with in-country experts noted that certain communities lacked CBCCs due to start-up frictions, specifically: awareness, coordination and training. Most of these could be addressed by a government program to help communities initiate CBCCs.

Furthermore, there is substantial variation in quality of CBCCs both geographically and temporally. Only about 50% of caregivers have received training in providing pre-primary education and none are supported with a permanent government wage (NESIP, Malawi, 2020). Many CBCCs lack safe and nearby sources of water, indoor play materials and permanent structures for learning (Munthali et al. 2014). While there are strong economic incentives for communities to organize childcare through CBCCs, their voluntary and community-funded nature also makes them vulnerable to seasonal and idiosyncratic shocks such as the lean season or disasters meaning that they are not always open or properly functioning throughout the year.

This paper focuses on preschool education in the latter half of this period in the life of the child, which in the case of Malawi is the age of 3-5 years. Two other papers in the Malawi Priorities series examine interventions aimed at improving child nutrition and health in the first 1000 days (NPC, Larsen et al. 2021a; NPC, Larsen et al. 2021b). This analysis, therefore, examines the social and

economic return on investment on two interventions targeted at 3-5 year old children, namely:

1. Expansion of CBCCs to new communities to boost enrolment from 47% to 80%
2. Improvement of existing CBCCs, through remuneration of caregivers, providing extra caregivers, provision of supplies and feeding

For both interventions, besides the direct costs, we also model the flow on costs of additional schooling, accounting for avoided repetition, and delayed labour force participation. The latter two costs comprise a substantial proportion of the overall cost envelope. Benefits are in the form of increased grade attainment as documented in Engle et al. (2011), and liberated caregiver time.

This paper makes some important contributions to the literature. First, while Engle et al. (2011) were able to identify the impacts of pre-school on grade attainment, they were not able to provide estimates into how this extra grade attainment was generated. In this analysis, we provide indicative estimates of the various pathways, noting that for Malawi, roughly 50% of the extra grade attainment is due to avoided repetition, while the remainder is due to extra time spent in school either at the beginning (due to earlier enrolment) or the end (due to finishing at a later age) of a person's educational career.

Identifying these pathways is important since avoided repetition is a pure efficiency gain from a societal perspective, while the other pathways generate flow-on costs. The second contribution to the literature is to include these flow-on costs in the analysis. The omission of these costs is a critique levelled at previous cost-benefit analyses of ECD interventions (Horton and Black, 2017).

In the base case with a discount rate of 8%, the BCR for expansion of preschools in new communities is 4.5. For improvement of existing preschools, the base case BCR is 2.1. These BCRs are in line with other cost-benefit analyses of preschool interventions (see Literature Review). Expanding pre-schools is the more cost-effective intervention because the start-up and ongoing costs of CBCCs are relatively minor, while these generate a majority of the possible education benefits (1.25 years of additional primary grade attainment out of a maximum of 2 years) and all of the caregiver benefits. Improving existing CBCCs is relatively more expensive and yields smaller marginal education benefits (0.75 years of additional primary grade attainment) and no additional caregiver benefits. Put in simple economic terms, there are diminishing marginal returns to investment in CBCCs.

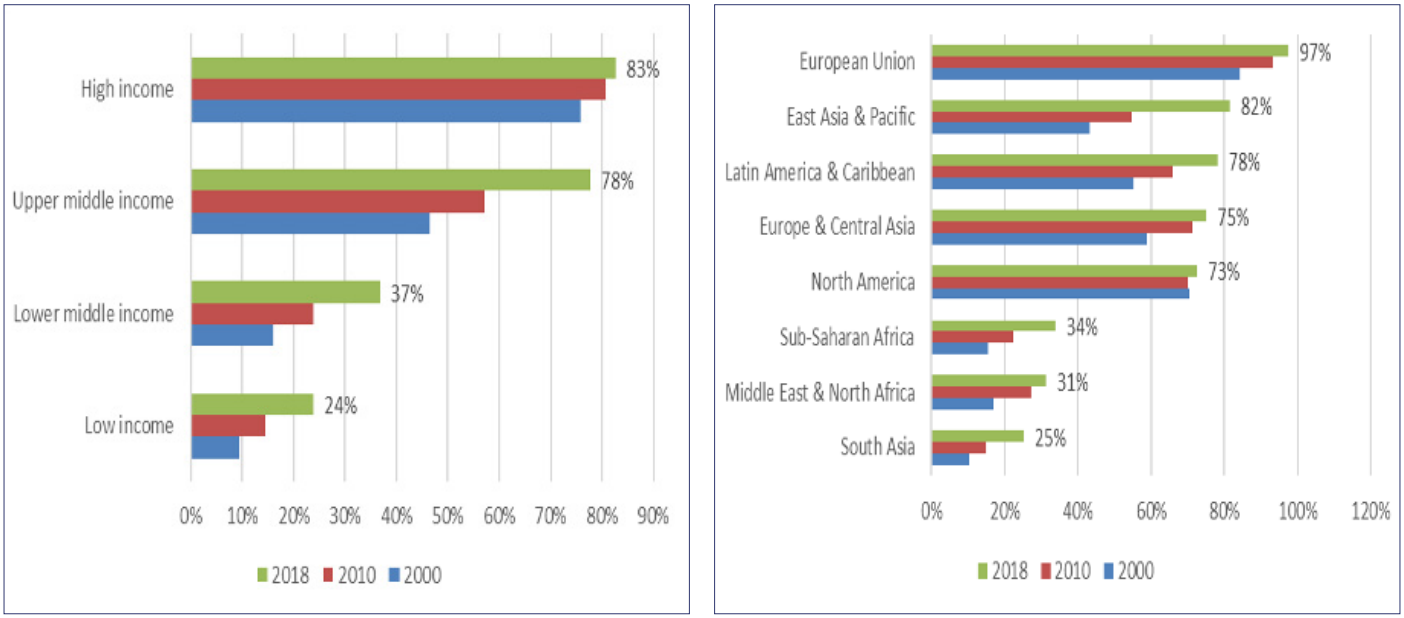
Within the broader context of the Malawi Priorities project, there are likely to be much more efficient uses of marginal resources for the education sector – notably within technology assisted learning and teacher training (NPC, Cotton et al. 2021). In sensitivity analyses, we test the impacts of assumptions on results and find that the main policy conclusion remains unaffected.

1.1 Preschool Education

Preschool enrollment, or enrollment in pre-primary school, has increased rapidly in the past two decades. Gross enrollment rates increase with country income level from 24% in low-income countries (LICs) to 83% in high-income countries (HICs) in 2018. But the increase in enrollment rates has been particularly rapid in LIC and lower middle-income countries (LMICs), with a more than doubling from 2010 to 2018. Regionally, enrollment rates reached 82% in East Asia and Pacific and as high as 97% within the European Union (Figure 1.1).

In perspective, preschool enrollment rates in Malawi are substantially higher than the average in Sub-Saharan Africa and higher than expected by its income per capital level (World Bank, 2020). There is, however, significant scope for expanding preschools to

Figure 1.1: Preprimary school enrollment (% gross)



Note: Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
Source: Produced from World Bank (2020).

unserved communities and to increase its quality.

A review of 27 studies with early childhood education and care (ECEC) interventions in developing countries, of which 20 were

preschools, found that most of the studies reported a positive impact on learning, and that several studies found durable learning outcome effects in later years (Jackson et al, 2019). Several studies have also undertaken a benefit-cost analysis of preschool programs. Studies in 6 countries (Bolivia, Guatemala, Colombia, Chile, Uruguay and Turkey), and in 73 low- and middle-income countries as a group, are reported in Horton and Black (2017) as shown in Table 1.1. The studies modeled increased lifetime income from increased learning outcomes as the main benefit of preschools. Cost is the cost of preschool while cost of additional education from increased grade attainment is only included in some of the studies. Foregone earnings from students staying longer in school is only included in the study in Turkey.

Benefit-cost ratios (BCRs) are highly sensitive to the discount rate. This is as expected as the incremental income benefit occurs far into the future. BCRs with 3% discount rate are in the range of 2.3 – 19.1, and in the range of 1.4 – 7.8 for discount rates of 5-10% (Table 1.1).

Table 1.1: Benefit and costs of preschool programs for 3-5 year old children

	BCR	Discount rate	Reference
Bolivia	2.3 - 3.7	3%	Behrman, Cheng, Todd (2004)
	1.4 - 2.5	5%	
Guatemala	5.1	3%	Berlinski and Schady (2015)
Colombia	3.4	3%	
Chile	4.3	3%	
Uruguay	19.1	3%	Berlinski, Galiani, Manacorda (2008)
	3.2	10%	
Turkey	2.2 - 3.4	6%	Kaytaz (2004)
73 low- and middle-income countries	1.1 - 1.7	10%	Engle et al (2011)
	14.3 - 17.6	3%	
	6.4 - 7.8	6%	

Source: Reproduced from Horton and Black (2017

The study of 73 low- and middle-income countries estimates that preschool enrollment is associated with 1.25 -2.0 years of additional schooling or grade attainment.[1] This result is applied in the benefit-cost analysis of the selected interventions assessed in this paper.

Martinez et al. (2017) analyze a World Bank experiment with CBCCs in Mozambique - the effects of a community based preschool intervention randomly assigned to 30 of 76 eligible rural communities in the Gaza province. At a cost of US$3.09 per child per month, the program provided up to three preschool classrooms per community, community mobilization activities, learning materials, instructor training, and monthly parenting meetings. With a baseline of 2,000 households, they measured primary school performance on a sample of first graders and interviewed local community leaders. Two years later, they also conducted a follow-up survey on the original sample of children plus cross sections of first graders and community leaders in the 76 evaluation communities. Children who enrolled in preschool had an increased likelihood of being enrolled in primary school at the time of the survey of 21.2 percentage points and an increased probability of ever enrolling of 18.2 percentage points. Children who attended preschool were 14.9 percentage points more likely to enroll in school at the appropriate age, a relative increase of 44.3% compared to the control. Finally, they explored the effects of preschool on adult labor supply. While there is no effect on aggregate for adult household members, they found a 7.1 percentage point increase in labor supply for the primary caregiver (significant at the 10% level), representing an almost 30% increase relative to the control.

1.2 Context of ECD in Malawi

The Government of Malawi has recognized the necessity of both adequate early childhood development programs and adequate nutrition for human development and growth. The Early Childhood Development (ECD) and food and nutrition security are key priority areas of the National Agriculture Policy (2016-2021). Malawi was one of the first African countries to have ECD support through Community-Based Child Care Centers for 3–5 years old supported by Ministry of Gender, Children, Disability and Social Welfare. (Munthali et al, 2014). The Malawi Vision 2063 document clearly outlines the importance of early childhood development aligning it with one of the 3 key pillars – Urbanization, proposing that all constituencies across the country shall be assured of a bare minimum level of socio- economic amenities aimed at promoting good quality of life for all, including well-equipped and staffed early childhood development (ECD) centers. ECD also finds mention as an enabler of human capital development prioritizing the need for every child to go through early childhood development. Malawi's Parliament also recently approved the government's budget which includes stipends for ECD trained caregivers of MWK 15,000 per month.

The national ECD programme, led by the Ministry of Gender, Community Development and Social Welfare (MoGCDSW) targets all children aged 0–8 years. Preschools (known as community-based childcare centres (CBCCs) and parenting groups are the two main components of the government ECD programme. CBCCs are community-initiated and community-owned childcare centres which aim to promote holistic child development by providing safe, stimulating environments, access to health and nutritional services, and training for parents and caregivers.

[1] Derived here from Table 3 in Engle et al (2011).

ECD includes nutrition, education, psychosocial support and development, water and environmental sanitation in the homes and institutions with a focus on promoting and protecting the rights of the child for survival, growth and development. ECD services in Malawi are provided through antenatal clinics, baby-friendly hospitals, under-five clinics, Community-based childcare centres, preschools, daycare centres, private kindergartens. ECD services are also offered through Nutritional Rehabilitation units, faith-based classes for children, PMTCT clinics and orphanages.

The Community-based childcare centers (CBCCs), coordinated by the Ministry of Gender, Community Development and Social Welfare (MoGCDSW), are preschools that serve children ages 3 to 5 years old, helping develop cognitive and socio-emotional skills along with provision of health and WASH education and meals. Community participation is integral for the operation of CBCCs; parents are expected to contribute food and manual labor for the infrastructure and operation of CBCCs (Results for Development, 2016).

ECDs work in the day from 7:30 am to 11:30 am, with caregivers spending anywhere between 4 to 5 hours at the CBCC which would have ideally been the time used to carry out income generating activities in their homes. The voluntary nature of work as also the high child to caregiver ratio often demotivates the caregivers which results in high levels of absenteeism. In Malawi, most rural communities are highly food insecure, especially during lean periods. Only a few CBCCs have gardens on the premises which can therefore provide food for the children, a huge enabling factor for children to attend CBCCs.

The Ministry of Education (2020) reports that there are approximately 12,424 ECD centres operating in Malawi, covering 47.1% of the preschool population. Of the 34,774 caregivers, 19,451 are actual caregivers and 14,353 are helpers. Training and qualification to serve as caregivers is a concern however with only 53% (about 17,018 caregivers) trained. (Ministry of Education, 2020) Parenting groups are typically linked to the CBCC and aim to reach parents of children aged 0–8 years, as well as parents to be (newly married and pregnant women).

1.3 Constraints to Improved ECD in Malawi

Malawi is ranked 171st out of 189 countries on the 2017 Human Development Index (UNDP, 2018). With a gross national income per capita of $380 USD (World Bank, 2019), the level of poverty and food insecurity in the country is extremely high. An estimated 85 % of the population rely on subsistence farming for their livelihoods with 71.4% of the population living under the poverty line of 1.90 USD (purchasing power parity) per day (World Bank, 2018).

While Malawi has generally attained universal access to primary education, a major challenge the country faces is that of school retention: only 41% of the children who start Standard 1 reach Standard 8, the last class in primary school before going into secondary school. The survival rate is even lower for girls (38%) as compared to boys (44%) (NESIP, 2020). Within such a context where school retention is a challenge, increasing access to ECD programs would help in terms of creating interest in school and ensuring school retention among the school going age children.

Despite the evidence that ECD programs have significant positive impacts on children's later life and on the wider society, government investments in such programs, especially in resource-poor countries where there is a huge number of vulnerable children who would benefit from them the most, have been low. In Malawi, the budget for pre-primary education represents 0.2% of the national budget and less than 10% of public education expenditure (NESIP, 2020). Warne (2017) shows that a significant challenge that CBCCs in Malawi face therefore are the inadequate resources at their disposal due to limited investments from the government added to which is the high level of poverty that exists at the community level. Consultations with experts noted that other prominent constraint to increasing the scale of pre-school relate to start up frictions such as awareness and coordination.

Constraints most often seen at the CBCC include the high dependence on volunteer caregivers – since the work is purely voluntary caregiver absenteeism is common with CBCCs often shut for a month and more especially during the planting and harvesting seasons. The lack of pay is demotivating leading the caregivers to not perform their duties with responsibility translating into reduced attendance, motivation and retention of the caregivers. Their engagement with children at the CBCCs is therefore impacted. Studies also show that less than half of all caregivers have received training and only about a third have worked at their centres for over 12 months (Fisher et al, 2009).

The lack of trained caregivers is a hindrance to the provision of quality education with most caregivers having little or no training in teaching young children. This results in a lack of competence and skills, knowledge and strategies among the caregivers to provide effective early childhood care and education for young children.

School facilities range from permanent structures including homes, churches, community centers to open air spaces, shelters and thatch structures (Munthali et al. 2014). The makeshift and temporary arrangements often lead to a dearth of adequate teaching and learning material which is another issue seen to contribute to poor educational outcomes. Given the shortage of equipment, caregivers are encouraged to make their own locally sourced and low cost play material which is often not very durable. A significant reason for parents to send their children to the CBCCs is the provision of food, and often when there is no such provision, the number of children attending school drops drastically.

While literacy rates are high with 75.5 percent of the population literate, the levels of food insecurity are extremely poor – with 63% of households categorized with extremely poor levels of food security (IHS5, 2019-2020). The high prevalence of poverty is one of the major factors behind the inadequate dietary intake and poor hygiene and sanitation which subsequently increases the susceptibility of children to malnutrition and related disorders. The correlation between malnutrition and school performance is well proven. But with most households and communities unable to access timely and quality ECD services, this proves to be a huge challenge in helping young children reach their complete potential. Further limited and poor access to responsive parenting education and counselling, early stimulation, and early learning contributes to poor education outcomes.

2. Research Context

The National Planning Commission (NPC), with technical support from the African Institute for Development Policy (AFIDEP) and the Copenhagen Consensus Center (CCC) are implementing the Malawi Priorities project over 2020 and 2021. Malawi Priorities is a research and advocacy exercise to identify the most effective ways to address the nation's challenges using the framework of cost-benefit analysis. The aim is to inform both short and long-term development priorities for the country, acknowledging that there are insufficient resources to address all of Malawi's challenges and that maximizing outcomes requires careful, evidence-based consideration of the costs and benefits of all policies.

The starting point of all research questions is the NPC's existing research agenda, structured around the six thematic areas of Sustainable Agriculture, Sustainable Economic Development, Human Capital and Social Development, Sustainable Environment, Demography, Governance, Peace, and Security, and Human Capital and Social Development.

NPC's research agenda was developed by the commission in September 2019 after extensive consultation with academics, think tanks, the private sector and government. Consequently, the commission's research agenda, prima facie, contains questions of national importance. As a first step, Malawi Priorities drew questions from the NPC research agenda that could be answered by CBA. Then, additional research questions were added based on input from NPC, an Academic Advisory Group (AAG) of leading scholars within Malawi, and existing literature, particularly previous cost-benefit analyses conducted by the Copenhagen Consensus Center. This process of identifying research questions for investigation generated a total of 38 potential research questions across all 6 thematic areas.

The research agenda was validated and prioritized by a Reference Group of 25 prominent, senior stakeholders from government, civil society and the private sector. The outcomes of the Reference Group exercise were used to inform which research questions to prioritize and which interventions to focus on within those research questions. The validation process finished in July 2020.

2.1 Research Process

The project team completed a scan of all potential interventions which were beneficial in improving early childhood development, with a focus on pre-school, as part of the process of narrowing down on interventions for cost-benefit analysis. A thorough literature review of ECD interventions was undertaken in order to ascertain the extent to which Malawi had integrated the intervention in its strategic plan; based on previous Copenhagen Consensus research, whether the interventions were considered high social return on investment, and whether there were similar country examples, pilot/demonstration projects, and/or the results of randomized trials that could inform the selection and design of the interventions to be analyzed. We also interviewed several experts with experience in Malawi, including:

- ***Dr. Aulo Gelli,*** *Senior Research Fellow, International Food Policy Research Institute (IFPRI)*
- ***Dr. Amy Margolies,*** *Public Health Specialist, John Hopkins University*
- ***Grace Khanyepa,*** *ECD Consultant, World Bank*
- ***Aisha Twalibu, Consultant,*** *International Food Policy Research Institute (IFPRI)*
- ***Chikondi Chiumboza,*** *ECD Specialist, Ministry of Education, Government of Malawi*
- ***Malawi Priorities Reference Group***

2.2 Intervention Selection

The intervention selection process starts with a wide universe of potential interventions drawing from literature, stakeholder interviews and advisor input. From here, the prioritization of interventions takes in a number of considerations. Though there is no mechanical formula for selecting interventions, several important factors include:

1. **Sector expert priority –** An intervention is accorded higher priority if sector experts note that it is important. There are several avenues from which experts provide input into our process such as the Reference Group questionnaire, direct interview, inferences from the NPC research agenda, and via our academic advisory group.
2. **High benefit-cost ratio or cost-effectiveness in similar previous research –** The purpose of the Malawi Priorities project is ultimately to identify interventions of out-sized benefits relative to costs. Input into this factor is determined from the economics literature, particularly previous research conducted by the Copenhagen Consensus Center. In the Center's experience BCRs above 15 are among the highest across all interventions. Due consideration is given to contextual differences between previous research and the current situation in Malawi in determining the effect of this criterion.
3. **Addresses a problem of sufficient size –** some interventions could be considered highly effective but only address a small percentage of a given problem, limiting the overall net benefits of the approach. To avoid focusing on solutions that are too small, each intervention must have the potential to address a problem that is significant.

4. **Significant gap in current coverage levels of intervention** – all analysis conducted in Malawi Priorities focuses on marginal benefits and costs. Therefore if an intervention already has high coverage rates, then additional resources provided towards that intervention are unlikely to be effective, or will suffer from the 'small-size' problem.
5. **Availability of crucial data or credible knowledge of impact** – due to time and resource constraints, all analyses conducted by Malawi Priorities are based on secondary data. No primary research is conducted, such as field experiments or trials. Therefore, each intervention is constrained by the availability of data. In many cases, one key constraint is knowledge concerning the impact of a given intervention. It is typical to formally deal with uncertainty via sensitivity analyses. However, in some cases the uncertainty is so great that it precludes even researching the intervention at all.

The universe of potential ECD interventions also draws from previous Copenhagen Consensus projects conducted in other developing countries. The process of screening and prioritizing interventions is summarized in Table 2, drawing on the factors described above.

Based on the selection criteria summarized in Table 2 above, the research team identified 2 programs as priority interventions for further

Table 2.1: Intervention Screening Process

Intervention considered	Sector expert priority	High BCR or cost-effectiveness	Addresses a problem of sufficient size	Significant gap in current coverage of intervention	Availability of data	Overall
Expanding the number of CBCCs	Yes, noted by sector experts.	Literature review suggests BCRs between 6.4 to 17.6. (Engle et al. 2011)	Yes, there are approximately 12,424 ECD centres operating in Malawi against a target of 15,000 in 2017.	Yes, only 68% of pre-school children currently have access to ECD services.	Yes	High
Capacity Building of caregivers in CBCCs	Yes, lack of qualified and trained caregivers providing ECD services was noted by sector experts.	Uncertain, however one study shows no improvement in child learning outcomes from training alone (Ozler et al. 2016)	Yes, untrained and unqualified caregivers at the ECD centres are unable to provide quality ECD services which is an impediment for improving early childhood development.	Yes, only 53% of caregivers (17,018 in total) have been trained on ECD practices.	Yes	High
Monetary remuneration package for caregivers to incentivize them	Yes, the need to encourage and support voluntary caregivers who spend a minimum of 4-5 hours daily in providing ECD services was acknowledged by sector experts.	Literature review suggests poor cost effectiveness with no improvement in retention or learning outcomes (Gustaffson-Wright et al. 2017)	The absence of salary/ wages for work done by caregivers is often cited as reason for lack of interest and enthusiasm in providing high quality ECD services by them.	Currently, less than 1500 caregivers receive monetary remuneration from either NGOs and other agencies. (National Policy on ECD, 2017)	Yes	Low
Nutrition and IYCF counseling of parents at CBCCs	Yes, counselling of parents for improved dietary practices, child care development was noted by sector experts.	Literature review suggests a BCR of 1.5 for an integrated nutrition and ECD program (Lopez Boo et al 2014).	Yes, less than five percent of parents have access to systematic parenting education and support in Malawi (National Policy on ECD, 2017). The situation is worsened by the high number of adolescents who become parents without prior counseling and training in parenting education.	Yes, less than 30% of ECD centres had CCD, nutrition and parenting education activities conducted with only 360 parenting educators trained (National Policy on ECD, 2017)	Yes	High
Home gardening support/ nutrition sensitive agriculture support delivered via CBCCs	Yes, promotion of nutrition sensitive agriculture was noted as useful by sector experts in providing nutritious foods to women and children.	Gelli et al, (2021) estimate BCR of between 3.6, while previous research by CCC from Ghana indicates BCR between 1.3 and 1.6.	Food insecurity is associated with unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food, all linked to poverty.	Yes, only 22% households have backyard gardens established and only 39% of households practice integrated household farming.	Yes	Medium

cost-benefit analysis. These are:

1. Expansion of CBCCs to new communities
2. Improvement of existing CBCCs, through remuneration of caregivers and helpers, providing extra caregivers and helpers, improving infrastructure and provision of supplies, and feeding program

The 2 selected interventions address the priorities of sector experts in Malawi, have adequate data availability, and address significant gaps in the existing coverage so they have the largest potential for impact. Expansion of preschools to new communities was noted by sector experts as a priority in improving ECD services in the country with a large number of preschool children lacking any ECD facilities. Improvement of existing preschools encompasses a range of inputs seeking to address issues of inadequate infrastructure, lack of learning and play material and food provision at the centres. Capacity building of caregivers was also noted by the sector experts as only around 50% of caregivers are trained in pre-primary education practices.

While there is some evidence on the effectiveness of preschool teacher training (Wolf et al, 2019), research in Malawi (Ozler et al. 2016) shows that incentivizing and training CBCC caregivers did not yield benefits in terms of improved child outcomes. The study tested the effectiveness of teacher training at informal schools to assess whether such school-based interventions are more effective when combined with group-based parenting training. At the 18-month follow-up, when the child was 5.5 years old, they found that child outcomes improved but only in the treatment group that received the integrated intervention (teacher training + parenting education). Teacher training alone (or with monthly stipends for retention) did not improve children's outcomes, despite significant improvements classroom behaviour. Furthermore, at the 36 months follow-up, when the students were 7 years old, child assessments showed no treatment effects, in any treatment arm, indicating a substantial fade-out of program impacts in the integrated intervention arm. The study suggests that programs that integrate parenting support within preschools would be more effective than simply improving classroom quality through teacher training. To that end, capacity building for the purpose of this analysis has been taken as increasing the number of caregivers. Nutrition and IYCF counselling of parents which was also suggested by sector experts as improving ECD was built into the second selected intervention adding to the range of inputs looking to improve existing preschools. The provision of one free meal at the CBCC (as integrated with the second intervention) would incorporate better nutritional practices and help facilitate better dietary diversity in the preschoolers to some extent.

A rigorous RCT evaluation and cost-benefit analysis has already been conducted for an integrated package of nutrition counseling, school feeding and home garden / livestock support. The randomized trial in Malawi is a change communication intervention on nutrition tested in 60 CBCCs. The nutrition component of the intervention included behavior change activities to involve parents and community caregivers in the preparation and planning of meals in the CBCCs, and to promote optimal household feeding and caring practices through parenting groups. Nutrition activities included providing information on topics such as the nutrition needs of infants and young children, food selection and preparation, safety, storage, and preservation, meal planning and monitoring, as well as hygiene. The agriculture activities focused on improving nutritious food production and on promoting food diversification through use of CBCC gardens as demonstration plots. Agricultural support activities included input provision (i.e., 10 chicks/household and seeds) and training on production of nutritious food (animal-source foods, vitamin A-rich staples such as orange maize and bio-fortified orange-fleshed sweet potato, legumes and nuts, and green leafy vegetables). Agriculture Extension Development Officers visited the community monthly to check progress and address problems. Only 26% of children reported receiving meals in the CBCCs, although the meals were provided on average for only 1 day out of 5. This non-monetary intervention substantively improved the adequacy of intake of preschool children for 11 micro-nutrients. The RCT results showed that the intervention increased the number of days CBCCs provided meals by 0.5 days per week and the number of days the CBCC was open increased by 0.3 days (Gelli et al. 2018). This did not lead to substantial benefits for 3-5 year olds in terms of enrolment or anthropometric outcomes. However, the younger siblings of the pre-schoolers did experience a substantial decrease in stunting, equivalent to 17 percentage points. A cost-benefit analysis of this RCT showed that the BCR of this intervention is 3.6, at a 10% discount rate (Gelli et al., forthcoming). Since this has already been comprehensively analyzed, we do not research it further in this study.

3. Cost-benefit Analysis – General Principles & Assumptions

As noted above, we examine two interventions:

1. Expansion of CBCCs to new communities to boost enrolment from 47% to 80%
2. Improvement of existing CBCCs, through remuneration of caregivers and helpers, providing extra caregivers and helper, improving infrastructure and provision of supplies, and feeding program.

The time period of analysis for both interventions is 2020 to 2030. The target of the first intervention is to reach an enrolment rate of 80% of 3 year old children by 2030. This implies establishing preschools for an additional 19,000 children in 2021, increasing to an additional 206,500 children in 2030 (Table 3.1). These figures account for increased coverage as well as population growth.

Table 3.1: Expansion intervention enrolment target

	2020	2030
Current and baseline preschool enrolment rate	47%	47%
Target preschool enrolment rate	-	80%
Incremental enrolment (each year 2020-2030)	**0**	**206,500**

The second intervention assumes net enrolment rates stay at 47%, but with improvements to the existing pre-schools. The intervention reaches 10% of schools each year, rising to all schools by 2030. The number of 3 year old children (first year in pre-school) benefiting from the intervention rises from 27,000 in 2021 to 294,000 in 2030 (Table 3.2).

Table 3.2: Improvement intervention target

	2020	2030
Current and baseline preschool enrolment rate	47%	47%
Target preschool enrolment rate	**-**	**80%**
Incremental enrolment (each year 2020-2030)	**0**	**206,500**

Before turning to the cost-benefit analysis, it is useful to examine the education attainment assumptions for each intervention, and the pathways by which this is attained. Engle et al. (2011), studied relationships between pre-school enrolment and education attainment across 73 low-and-middle income countries. Their results imply that the boost to grade attainment of total schooling is between 1.25 to 2.0 years. We take the low end as the boost from pre-school enrolment relative to non-enrolment, and the difference between the upper and lower bound (0.75 years) as the boost from improved pre-schools relative to non-improved pre-schools.

The increase in grade attainment arises from a combination of one or more of the following:

a. Reduction in late primary school enrolment (implying a higher grade attainment for any given age of leaving school);
b. Reduction in primary school grade repetition (also implying a higher grade attainment for any given age of leaving school); and
c. Staying in school to a higher age (with no change in primary school enrolment age and no change in grade repetition).

Determining the likely contribution of each pathway is important since each has different impacts on flow-on costs. Specifically: pathway (a) increases schooling costs but not schooling opportunity costs; pathway (b) attracts no additional costs, it is a pure efficiency gain; pathway (c) attracts additional schooling costs and additional opportunity costs.

Reduction in late primary school enrolment

According to the Malawi MICS 2014 survey, 80% of children entered primary school at the appropriate age of six years (NSO, 2015) while some entered at an early age. Thus a non-trivial percentage entered late, around 15% of children. We assume that moving from no pre-school to pre-school would ensure on time primary school initiation. This implies that approximately 0.1 years of additional grade attainment arises due to avoided late primary school enrolment. We assume that there is no impact on this metric for those going from non-improved to improved pre-schools.

Reduction in primary school grade repetition

Malawi has one of the highest levels of grade repetition in Africa, estimated at 24% (Minardi, Rossiter and Harris, 2020; UNICEF, 2020). This implies that to reach Grade 8 – the terminal year of primary schooling – requires 9.6 years instead of an optimized 8 years. While precise impacts of the effect of pre-schooling on grade repetition are lacking in the literature, there is evidence pointing towards

a positive impact of ECE (Sunny et al. 2017). Essentially, by improving school readiness, children are less likely to repeat particularly in earlier years. Since repeating is a risk factor for more repetition, pre-school may generate a virtuous cycle that depresses repetition rates substantially.

To estimate this effect for this analysis, we draw on a study that demonstrates that for each unit percentage point increase in pre-school enrolment, repetition rates fall by 0.12 percentage points in 24 Sub-Saharan African countries (Jaramillo and Mingat, 2008). Based on this association, exposure to an African pre-school reduces repetition rates by 12.3 percentage points relative to no pre-school, implying a reduction in years at schooling of 0.98 years, without any loss of grade attainment. For this analysis, we assume that 0.98 year of avoided repetition is the maximum improvement attributable to pre-school and distribute the impact to the interventions in the same ratio as the impact on grade attainment. This implies 0.62 years of avoided repetition for the first intervention, and an additional 0.37 for improved pre-schools (see Table 3.3).

Staying in school to a higher age

Estimates of the final pathway is simply the residual years after subtracting impacts associated with reduction in late enrolment and avoided repetition. As can be seen in Table 3.3. this pathway has a non-trivial impact. While there are opportunity costs of staying in school beyond a certain age that put pressure to leave school, recent statistics show that 23% of primary school students are above the age of 14, and 56% of secondary students are above the age of 18 (NSO, 2020).

Table 3.3: *Impacts of interventions (average years)*

	Impact of (unimproved) pre-school relative to no pre-school	Impact of improved pre-school relative to unimproved pre-school
Reduction in late enrolment	0.10	0.00
Avoided repetition	0.62	0.37
Staying in school to a higher age	0.53	0.38
Total additional grade attainment	***1.25***	***0.75***

4. Intervention 1: Expansion of Preschools to New Communities

There are over 12,400 preschools or community-based childcare centers (CBCCs) in Malawi with nearly 35,000 with non-salaried volunteer caretakers and helpers. At the current preschool enrolment rate, there are an estimated 66 children per preschool and 23.5 children enrolled per caregiver and helper (Table 4.1). These figures serve as a basis for calculating intervention targets but have minimal influence on the benefit-cost ratios of the interventions.

Table 4.1: Preschool statistics

Children in Malawi 3-5 years of age (2020)	1,735,351
Preschool enrollment rate (% of 3-5 year olds)	47%
Children enrolled in preschool	815,615
Number of preschools	12,424
Children per preschool	66
Number of caregivers and helpers	34,774
Children per caregiver and helper	23.5

Source: Malawi Population Census 2018; Ministry of Education, Malawi, 2020

The intervention of expanding preschools to new communities involves replication of existing preschools to new communities that currently do not have a preschool. As discussed above, this implies establishing preschools for an additional 19,000 children in 2021, increasing to an additional 206,500 children in 2030 (Table 3.2).

4.1. Cost of Intervention

The intervention is simply a replication of existing preschools. Costs are therefore the same as for existing preschools. They include the following:

i. Cost of preschool promotion and establishment;

ii. Cost of preschool caretakers and helpers;

iii. Cost of incremental education provision from increased grade attainment resulting from preschool enrolment; and

iv. Cost of delayed labor force participation from higher grade attainment, also known as the opportunity cost of education.

It is assumed that preschool promotion and establishment is undertaken by a salaried team while preschool caretakers and helpers are non-salaried volunteers. The main benefit of preschool enrolment is increased grade attainment (see benefit section) which implies incremental education provision.

The increase in grade attainment arises from a combination of one or more of the following:

a. Reduction in late primary school enrolment (implying a higher grade attainment for any given age of leaving school);

b. Reduction in primary school grade repetition (also implying a higher grade attainment for any given age of leaving school); and

c. Staying in school to a higher age (with no change in primary school enrolment age and no change in grade repetition).

4.1.1 Cost of preschool promotion and establishment

It is assumed that a team of three persons spends one month on promoting and establishing a new preschool. The team is salaried at the average monthly income in Malawi, estimated at nearly MWK 38,000 in 2020, and increasing annually at the rate of projected increase in GDP per capita from 2020 to 2030 (Riahi et al. 2017). The salary cost of the team is divided by the average number of children per preschool to arrive at cost per child. The average number of children per preschool in Malawi is currently about 66 based on the current total number of preschools and enrolment. Cost of supplies for activities and play is budgeted at MWK 4,000 per child (Table 4.2). No cost is allocated for buildings, as it is assumed that the community preschools utilize existing facilities in the communities for the preschools' half day operation.

Table 4.2: Cost or preschool promotion and establishment

Promotion & establishment team (persons per preschool)	3
Promotion & establishment (months)	1
Team salary (MWK/person/month)	37,688
Cost of team (MWK per preschool)	113,065
Children enrolled per preschool	66
Cost of team per child (MWK)	1,722
Cost of supplies per child (MWK)	4,000
Cost per child enrolled (MWK)	***5,722***

Source: Estimates by authors.

4.1.2 Cost of preschool caretakers and helpers

Preschools in Malawi are largely community based with non-salaried volunteer caretakers and helpers. The services of caretakers and helpers nevertheless involve a cost in terms of the time committed to the preschools. The cost of time is estimated at a rate of 50% of average hourly income in Malawi, for a period of 4 hours per weekday, five days a week, and 10 months per year. This brings annual cost to over MWK 94,000 per caretaker or helper, or a bit over MWK 4,000 per child based on an average of 23.5 enrolled children per caretaker and helper. Cost per child then reaches MWK 10,700 – 11.565 for three years of preschool, with annual cost discounted at 5-14% (Table 4.3). The cost of time, and thus cost of caregivers and helpers is assumed to increase annually at the rate of projected increase in GDP per capita from 2020 to 2030.

Table 4.3: Cost of preschool caregiver and helpers

Cost of time @50% of average income (MWK/hour)	113
Preschool: Hours per day	4
Preschool operations: Months per year	10
Cost of caretaker & helper's time (MWK/year)	94,221
Number of children per caretaker & helper	23.5
Cost of caretaker & helper per child per year (MWK)	4,017
Cost for 3 years of preschool:	
Cost of caretaker & helper per child (MWK) @ 5% discount rate	**11,565**
Cost of caretaker & helper per child (MWK) @ 8% discount rate	**11,255**
Cost of caretaker & helper per child (MWK) @ 14% discount rate	**10,700**

Source: Estimates by authors.

4.1.3 Cost of incremental education provision

The main benefit of preschool enrolment, as assessed in the benefit section, is increased grade attainment. Increased grade attainment implies an increased number of years in school, which has a cost of provision.

Additional years of education from increased grade attainment may occur in primary or secondary school, depending on the particular student's grade attainment. The cost is presented in table (3.5). For students that leave school while in primary, the effect of an incremental grade attainment of 1.25 years as a result of attending preschool (see benefit section) is an additional 0.63 years in primary school, as avoided grade repetition is 0.62 years (see Table 3.3). Students that leave school while in secondary school save 0.62 years in primary school (due to reduced grade repetition) and stay 1.25 years longer in secondary school. So for students reaching secondary school, there is a cost saving in primary school and increased cost in secondary school. The cost of a year in school per student is estimated at about MWK 50,000 for primary school and MWK 100,000 for secondary school, based on inflation adjusted data from Malawi's 2019/20 education budget (UNICEF, 2020) and UNICEF's estimate of cost of secondary education in Malawi (UNICEF, 2018). We assume that 50% of the incremental years in school is in primary and 50% is in secondary. This is based on a 40% gross enrolment rate in secondary school, that may increase to about 50% for children attending preschool.

For a child entering preschool, the additional cost of education from higher grade attainment will for most children take place in about 12 years, Annual cost of education is assumed to increase at the rate of growth in wages or GDP per capita. The present value of the cost of additional years of education is MWK 19,406-52,063 per child enrolling in preschool (Table 4.4).

Table 4.4: Cost of additional years of education

	Primary school	Secondary school
Current cost of a year of education (MWK per student)	50,000	100,000
Incremental grade attainment (years)	1.25	1.25
Avoided grade repetition in primary school (years)	-0.62	-0.62
Incremental years in primary school	0.63	-0.62
Incremental years in secondary school		1.25
Cost of incremental education (MWK per child)	31,750	94,250
Share of students leaving school (level of schooling)	50%	50%
Cost of incremental education (MWK per child)	**63,000**	
Present value of the cost of additional years of education (MWK per student)		
@ 5% discount rate	52,063	
@ 8% discount rate	37,129	
@ 14% discount rate	19,406	

Source: Estimates by authors.

4.1.4 Cost of delayed labor force participation

Increased grade attainment may result in delayed labor force participation and thus foregone income for the period of delay. The extent of delayed labor force participation depends on how increased grade attainment is achieved. If it is achieved through reduction in late primary school enrolment and/or reduced grade repetition, there may be no delayed labor force participation. According to the Malawi MICS 2014 survey, 80% of children entered primary school at the appropriate age of six years (NSO, 2015) while some entered at an early age. Thus a significant percentage entered late. Moreover, grade repetition rate in primary school is 24% (UNICEF, 2020). A rural community-driven preschool project in Mozambique found that children who attended preschool were more likely to enrol in primary school and more likely to enrol at the appropriate age (World Bank, 2012). We assume that enrolment in preschool will reduce late enrolment in primary school by about 50%, or on the order of 0.1 years on average. Therefore, with the avoided grade repetition of 0.62 years, labor force participation is delayed by 0.53 years on average due to the increased grade attainment of 1.25 years. The present value of foregone income from the delayed labor force participation is MWK 74,532-199,955 per child (table 4.5).

Table 4.5: Cost of delayed labor force participation

Incremental grade attainment (years)	1.25
Avoided grade repetition in primary school (years)	-0.62
Avoided delayed primary school enrolment (years)	-0.10
Delayed labor force participation (years)	**0.53**
Present value of foregone income (MWK per child)	
@ 5% discount rate	**199,955**
@ 8% discount rate	**142,600**
@ 14% discount rate	**74,532**

Source: Estimates by authors.

4.1.5 Total cost of intervention per child

A summary of the cost per child from the preceding sections is presented in Table 4.6 in 2020 prices. The cost totals MWK 196,706. The cost of delayed LFP is as much as 72% of total cost.

Table 4.6: Total cost of intervention 2020 prices (MWK per child)

Cost of preschool promotion and establishment	5,722
Cost of caretaker & helper	11,255
Cost of additional education provision from increased grade attainment	37,129
Cost of delayed labor force participation	142,600
Total cost	196,706

Note: Present value of cost at 8% discount rate. Source: Estimates by authors.

4.2 Benefit of Intervention

The benefit of the intervention is twofold:

i) Educational benefit resulting in increased lifetime income; and

ii) Parents' time savings from reduced childcare.

4.2.1 Educational benefit

The educational benefit is expressed as years of increase in grade attainment. The lower bound of 1.25 years increase in grade attainment per child enrolling in preschool estimated from Engle et al (2011) is applied to this intervention, as the intervention is simply a replication of existing preschools with no further improvements.

Higher grade attainment is assumed to increase annual and lifetime income by 11.1% per year of attainment (Turkson, Wong and Dubosse, 2020) or in this case by 13.9% for 1.25 years of higher grade attainment. Income is earned from the age of leaving school to the age of 60 years. Income is projected to grow at the annual rate of growth in GDP per capita (Table 3.8).

So on the one hand, increased grade attainment results in higher annual and lifetime income. On the other hand, increased grade attainment results in delayed labor force participation that means the student will start earning income from a somewhat later date. The net effect is positive. The increase in annual and lifetime income is substantially larger than the loss resulting from delayed labor force participation, as seen below.

4.2.2. Parents' time savings

Parents are likely to realize less time spent on care-giving when children attend preschool. The study of a community driven preschool project in Mozambique found that parents or caregivers saved over 15 hours per week for a preschool with similar daily hours as in Malawi. However, parents are able to conduct some activities while providing caregiving, so the gain in productive time is likely less than 15 hours. Productive time savings are here assumed to be half of total time savings, or 7.5 hours per week. These time savings, for a period of 10 months per year, is valued at 50% of estimated average hourly rural income in Malawi. Rural income is applied because the preschool expansion intervention will mostly be in rural areas, as the majority of urban areas are already served. The value of the time savings amounts to MWK 22,786 per year per child and MWK 60,320-65,174 over three years of preschool (Table 3.8).

4.2.3 Total benefit of intervention per child

Total benefit per child in 2020 prices is presented in Table 4.7. For the base-case discount rate of 8%, incremental lifetime income accounts for over 90% of total benefit.

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Total benefit per child in 2020 prices is presented in Table 4.7. For the base-case discount rate of 8%, incremental lifetime income accounts for over 90% of total benefit.

Table 4.7: Total benefit of intervention, 2020 prices (MWK per child)

	Increase in lifetime income	Parents' time savings	Total benefit
@ 5% discount rate	1,980,015	65,174	2,045,189
@ 8% discount rate	801,569	63,437	865,006
@ 14% discount rate	195,588	60,320	255,908

Note: Present values at discount rates of 5-14%. Source: Estimates by authors.

4.3 Benefit-Cost Ratios

Total present value of benefit and cost of the intervention for the entire period of 2020 to 2030 is presented in Table 4.8. This reflects an additional enrolment of 19,000 children in 2021, increasing to an additional 206,500 children in 2030. The benefit-cost ratio (BCR) is 4.5 in the base case with a discount rate of 8%.

The BCRs is sensitive to discount rates, ranging from 2.3 to 7.7. The BCR is also sensitive to the magnitude of avoided grade repetition in primary school resulting from attending preschool. The BCR is 3.0 (instead of 4.5) if avoided grade repetition is only half of what is applied in the base case. The BCR is 2.3 if there is no reduction in grade repetition.

Table 4.8: Benefit and cost of intervention (MWK million)

	Benefit	Cost	BCR
@ 5% discount rate	2,168,628	280,820	7.7
@ 8% discount rate	750,082	168,398	4.5
@ 14% discount rate	151,597	65,479	2.3

Source: Estimates by authors.

5. Interventiion 2: Improvement of Existing Preschools

Improvement of existing preschools involves the following:

a. Improve preschool infrastructure and supplies;

b. Provide salaries for caretakers and helpers;

c. Hire additional caretakers and helpers to reduce the child-to caretaker and helper ratio; and

d. Provide one free meal per day;

These improvements are intended to provide a better environment for learning and stimulation; ensure that caretakers and helpers stay longer in their jobs, will provide increased benefits to children from their accumulated experience and skills, and have more time available for each child; and increase enrollment and reduce drop-out rates especially among children from food insecure and poorer households who especially will benefit from free meal provision.

The intervention period is 2020 to 2030. The target of the intervention is to improve all existing preschools by 2030. This implies improving nearly 1,200 preschools each year.

5.1. Cost of Intervention

The cost of the intervention includes the cost of the four components of the preschool improvements. As the main benefit of preschool improvement is increased grade attainment (see benefit section), there will also be a cost of incremental education provision as in the first intervention. Increased grade attainment may result in delayed labor force participation and thus foregone income for the period of delay, as in the first intervention. So the cost of the intervention includes six components:

i. Cost of improved preschool infrastructure and supplies;

ii. Cost of salaries for caretakers and helpers;

iii. Cost of salaries from hiring additional caretakers and helpers to reduce the child-to caretaker and helper ratio;

iv. Cost of providing one free meal per day;

v. Cost of incremental education provision from increased grade attainment resulting from improved preschools; and

vi. Cost of delayed labor force participation from higher grade attainment.

It is important to note that only incremental cost of improvement of preschools are included in the benefit-cost analysis. This means that the cost of time of currently unsalaried caretakers and helpers is deducted from the cost of salaries. It also means that the cost of meals that otherwise would be provided at home if not provided at preschool is deducted from the cost of preschool meal provision. As for incremental education provision and delayed labor force participation, the cost is calculated based on the incremental grade attainment above the increase in grade attainment from existing preschools (see benefit section).

5.1.1. Cost of improved preschool infrastructure and supplies

An amount of MWK 8,000 per child per year is assigned for improved preschool infrastructure and supplies. With an average of 66 children per preschool, this amounts to MWK 525,000 per preschool per year. The cost is equivalent to MWK 21,300 – 23,030 per child for the three years of preschool, using a discount rate of 5-14%.

5.1.2. Cost of salaries for caretakers and helpers

Cost of salary for caregivers and helpers is based on estimated average income in Malawi, for a period of 4 hours per weekday, five days a week, and 10 months per year. This brings annual cost to MWK 8,034 per child. Subtracted from this amount is the cost of time of currently unsalaried caretakers and helpers, estimated at MWK 4,017 per child per year in the Intervention 1 section. This brings net or incremental cost to a bit over MWK 4,000 per child per year, or MWK 10,700 – 11,565 per child for the three years of preschool (Table 5.1).

5.1.3. Cost of salaries from hiring additional caretakers and helpers

The number of preschool children per caretaker and helper is currently about 23.5. Reducing this ratio will allow caretakers and helpers to have more time available for each child. The targeted ratio of the intervention is 15 children per caretaker and helper. With the same salaries per caretaker and helper as above, cost of salaries per child increases from MWK 8,034 to MWK 12,563 per child per year, or incrementally by MWK 4,529 per child per year. This is MWK 12,062 – 13,037 per child for the three years of preschool (Table 5.2).

Table 5.1: Incremental cost of salaries for preschool caregivers and helpers

Salary for caregivers and helpers: 4 hours/day for 10 months/year (MWK per person year)	188,442
Number of children per caretaker & helper	23.5
Cost of salaries per child (MWK/year)	8,034
Less current cost per child (MWK/year) (i.e., cost of time spent by caretakers and helpers)	-4,017
Incremental cost of caretaker & helper per child (MWK/year)	4,017
Cost for 3 years of preschool:	
Incremental cost of caretaker & helper per child (MWK) @ 5% discount rate	**11,565**
Incremental cost of caretaker & helper per child (MWK) @ 8% discount rate	**11,255**
Incremental cost of caretaker & helper per child (MWK) @ 14% discount rate	**10,700**

Source: Estimates by authors.

Table 5.2: Incremental cost of reducing the children to caregivers and helpers ratio to 15

Cost of salaries per child @ 23.5 children per caretaker and helper (MWK/year)	8,034
Cost of salaries per child @ 15 children per caretaker and helper (MWK/year)	12,563
Incremental cost per child of additional caretakers and helpers (MWK/year)	4,529
Cost for 3 years of preschool:	
Incremental cost of additional caretakers & helper per child (MWK) @ 5% discount rate	**13,037**
Incremental cost of additional caretakers & helpers per child (MWK) @ 8% discount rate	**12,688**
Incremental cost of additional caretakers & helpers per child (MWK) @ 14% discount rate	**12,062**

Source: Estimates by authors.

5.1.4. Cost of free meal provision

Many education programs provide meals to the children. Providing one free meal per child per day may improve cognitive development and learning, while at the same time provide an incentive for some parents to enroll their children in preschool as well as reduce drop-out rates.

The cost of providing one free meal per child per day is estimated at MWK 141 per child per day (Table 5.3). This translates to a cost of MWK 81,342-87,920 per child over the three years of preschool, using a discount rate of 5-14%.

Table 5.3: Incremental cost of free meal provision at preschool

GDP per capita (MWK), 2020	327,500	Projection
Household consumption share of GDP	82%	World Bank (2020) and IFAD (2018)
Consumption per capita (MWK/year)	267,003	Calculated from above
Food consumption expenditure (% of consumption)	63%	World Bank (2016)
Food consumption per capita (MWK/year)	167,678	Calculated from above
Average household size	4.5	Malawi DHS 2015-16
Food consumption per household (MWK/year)	754,551	Calculated from above
Household food consumption (kcal/day)	8,800	Based on kcal requirement by age
Food consumption of 3-5 year old children (kcal/day)	1,500	Average kcal requirement
Food consumption of 3-5 year old children (MWK/meal)	117.5	=1500/8800*754551/365/3 assuming 3 meals per day
Food transport & preparation cost (20%) (MWK/meal)	23.5	
Cost of meal provision (MWK/child/day)	**141**	

Source: Estimates by authors.

5.1.5 Cost of incremental education provision

This cost is the same as for Intervention 1, with the difference that the incremental increase in grade attainment is 0.75 years instead of 1.25 years (see benefit section), and incremental avoided grade repetition in primary school is 0.37 years instead of 0.62 years (see Table 3.3). The present value of the cost of additional education provision is MWK 11,644-31,238 per child in preschool (Table 5.4).

Table 5.4: Cost of additional years of education

	Primary school	Secondary school
Current cost of a year of education (MWK per student)	50,000	100,000
Incremental grade attainment (years)	0.75	0.75
Avoided grade repetition in primary school (years)	-0.37	-0.37
Incremental years in primary school	0.38	-0.37
Incremental years in secondary school		0.75
Cost of incremental education (MWK per child)	19,050	56,550
Share of students leaving school (level of schooling)	50%	50%
Cost of incremental education (MWK per child)	**37,800**	
Present value of the cost of additional years of education (MWK per student)		
@ 5% discount rate	31,238	
@ 8% discount rate	22,278	
@ 14% discount rate	11,644	

Source: Estimates by authors.

5.1.6 Cost of delayed labor force participation

Increased grade attainment may result in students staying in school to a higher age, resulting in delayed labor force participation and thus foregone income for the period of delay. With avoided grade repetition of 0.37 years as a result of improved preschools (see Table 3.3), labor force participation is delayed by 0.38 years on average due to the increased grade attainment of 0.75 years.

As for Intervention 1, cost of delayed labor force participation is the present value of foregone income during the period of additional school attendance that the child otherwise would have earned, that is present value of income in about 12 years from preschool enrollment (Table 5.5).

Table 5.5: Cost of delayed labor force participation

Incremental grade attainment (years)	0.75
Avoided grade repetition in primary school (years)	-0.37
Delayed labor force participation (years)	**0.38**
Present value of foregone income (MWK per child)	
@ 5% discount rate	142,398
@ 8% discount rate	101,552
@ 14% discount rate	53,078

Source: Estimates by authors.

5.1.7 Total cost of intervention per child

A summary of the cost of preschool improvement per child in 2020 prices is presented in Table 5.6. The cost totals MWK 255,754. The cost of delayed LFP is 40% of total cost and cost of preschool meals is 34%. Noteworthy is that the cost of providing salaries to caretakers and helpers (net of their cost of time) and hiring additional caretakers and helpers amount to less than 10% of total cost.

Table 5.6: Total cost of intervention, 2020 prices (MWK per child)

Cost of improved infrastructure & supplies	22,415
Cost of preschool meals	85,566
Cost of salaries for caretakers & helpers	11,255
Cost of hiring additional caretakers & helpers	12,688
Cost of education provision from increased grade attainment	22,278
Cost of delayed labor force participation	101,552
Total cost	**255,754**

Note: Present value of cost at 8% discount rate. Source: Estimates by authors.

5.2 Benefit of Intervention

The benefit of the intervention is educational benefit resulting in increased lifetime income. There is no additional parents' time savings as hours of preschool is unchanged.

5.2.1 Educational benefit

The educational benefit is expressed as years of increase in grade attainment. The upper bound of 2.0 years increase in grade attainment per child estimated from Engle et al (2011) is applied for a child enrolled in an improved preschool. This means that the incremental benefit of preschool improvement, over existing preschools, is 0.75 years of increased grade attainment.

As for Intervention 1, higher grade attainment is assumed to increase lifetime income by 11.1% per year of attainment (Turkson, Wong and Dubosse, 2020) , or in this case by 8.3% for 0.75 years of higher grade attainment. Income is earned from the age leaving school to the age of 60 years. Income is projected to grow at the annual rate of growth in GDP per capita (Table 5.7).

Table 5.7: Benefit of intervention, 2020 (MWK per child)

	Increase in lifetime income
@ 5% discount rate	**1,188,009**
@ 8% discount rate	**480,942**
@ 14% discount rate	**117,353**

Note: Present values at discount rates of 5-14%. Source: Estimates by authors.

5.2.2 Meal benefit

The potential benefit to the households of children receiving a free meal at preschool is: i) nutritional; and ii) financial. Potential nutritional benefits are not accounted for here. They may accrue especially to children from food insecure households in which children may not receive an equivalent meal at home as they will at the preschool. This benefit is, however, difficult to quantify for children of age 3-5 years and a recent RCT showed no improvement in anthropometric outcomes for children exposed to a suite of nutrition interventions including feeding (Gelli et al. 2018). The financial benefit is the cost saving to the household of no longer having to provide the meal at home. In food insecure households, however, children may not receive the full meal at home. So the financial saving for these households would be less than the full cost of the meal. We assume that children from food insecure households only receive half of the meal at home. Based on a cost per meal of MWK 117.5 (see table 5.8), and 56% of households being food insecure, the average benefit (cost saving) is MWK 85 per meal. This translates to MWK 48,641-52,558 over the three years of preschool, using a discount rate of 5-14%. The benefit is only 10% of the lifetime income benefit.

Table 5.8: Benefit of preschool free meal provision, 2020 (MWK per meal)

	Food secure households	Food insecure households
Cost per meal (MWK)	117.5	117.5
Cost saving per meal (MWK)	100%	50%
Food secure and insecure households*	44%	56%
Average cost saving per meal (MWK)	**85**	

** Malawi IHPS 2016.*

5.3. Benefit-Cost Ratios

Total present value of benefit and cost of the intervention for the entire period of 2020 to 2030 is presented in Table 5.9. This reflects improvement of preschools gradually increasing from 10% of all preschools in 2021 to 100% in 2030. The benefit-cost ratio (BCR) is 2.1 in the base case with a discount rate of 8%. The BCR is sensitive to discount rates, ranging from 0.9 to 4.1. The BCR is also sensitive to the magnitude of avoided grade repetition in primary school resulting from attending preschool. The BCR is 1.7 (instead of 2.1) if avoided grade repetition is only half of what is applied in the base case. The BCR is 1.5 if there is no reduction in grade repetition.

The BCRs for the intervention is substantially lower than for Intervention 1. This is expected as marginal benefits will tend to decline with increasing levels of investment and expenditure on preschools. Nevertheless, the BCRs are well above 1.0 in the base case.

Table 5.9: Benefit and cost of intervention (MWK million)

	Benefit	Cost	BCR
@ 5% discount rate	1,860,019	450,310	4.1
@ 8% discount rate	646,755	305,043	2.1
@ 14% discount rate	133,787	156,770	0.9

Source: Estimates by authors.

6. Conclusion

As established earlier in the paper, investments in early childhood are extremely advantageous for children both in the short and long term, better educational attainment leading to improved labor market outcomes and increased income. Based on extensive sector expert consultations and a review of literature, this paper examined the social and economic costs and benefits of two interventions impacting early childhood development in Malawi.

1. Expansion of CBCCs to new communities
2. Improvement of existing CBCCs

The results as seen in Table 6.1. In the base case with a discount rate of 8%, the BCR for expansion of preschools in new communities is 4.5. For improvement of existing preschools, the BCR is 2.1. The more the preschool achieves a reduction in late primary school enrollment and primary grade repetition, and therefore less delayed LFP and incremental education expenses from staying in school longer, the higher the BCR. The BCR for improvement of preexisting preschools is lower than for expansion given that marginal benefits will tend to decrease with increasing levels of investment and expenditure on the preschools.

Table 6.1: Overall benefit and cost of interventions (MWK million)

Interventions	Benefit	Cost	BCR
Expansion of Preschools to New Communities	750,082	168,398	4.5
Improvement of Pre-existing Prsschools	646,755	305,043	2.1

@ 8% Discount rate

Increasing enrolment in preschools is seen as an important pathway for targeting school readiness skills in children, thereby impacting learning levels. The investment in preschool education not only leads to large positive gains in educational attainment but also other outcomes later in life such as increased lifetime incomes and improved health. The policy implication emerging from this research indicate that investing in expansion of preschools to new and underserved communities in Malawi would generate potentially high benefits. The impact is manifold - reducing late primary school enrolment and primary school grade repetition for preschoolers as they proceed through primary school, and improve school readiness and potential lifetime incomes.

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8. Notes from Jere R. Behrman, 24-4-2021

a. Overall Summary: This is a nice and very systematic study that clearly lays out most of the details of the estimates and their interpretations and considers some important dimensions of benefit-cost ratios that some times are not incorporated into analyses (e.g., the opportunity costs of added school duration, the opportunity costs of unpaid workers, the resource costs of added time in school induced by preschool programs). The distinction between the expansion of CBCCs into new communities and upgrading existing CBCCs also is very useful. Following are some comments and questions that hopefully will help the authors think through possible further revisions.

b. Sensitivity of Estimates to Key Parameters: The authors explore the sensitivity of the estimates to two key assumptions: possible delay in labor force participation and the discount rate. But it seems to me that there are two additional key assumptions for which sensitivity analysis probably should be provided: 1) the extension of schooling attainment due to preschool (from Engle et al., 2011) and 2) the 10% rate of return to schooling attainment (from Psacharopoulos and Patrinos, 2002). I am unaware of additional literature for the former, but, given the uncertainty in the estimates in Engle et al., it would seem desirable to illustrate how sensitive the BCR estimates are to alternative assumptions, particularly smaller estimates. There is a lot of literature contesting the latter because of the general failure in the estimates that P & P survey to control for the possibilities that people with more ability, more motivation and better family background are likely to both have more schooling and greater earnings. Some think that the true returns once there is control for such factors may be more like 5% than 10%.

c. Who will Receive Educational Benefits for What Period:

   i. The assumption appears to be that such benefits start at age 15 (do I understand correctly?). But what if the expanded preprimary program results in expanding schooling beyond age 15 – should not the age at the end of schooling be used instead of age 15? And what if some individuals finish schooling before 15 – can they not enter the labor force before 15?

   ii. The assumption appears to be that all people obtain the same rate of return from additional schooling as do those working in the labor force whether are not they are in wage employment. An alternative that some would prefer is that the estimates adjust for labor force participation rates (including work on one's family farms and enterprises, not just the wage market). Though such participation rates are fairly high in Malawi, such an adjustment would reduce the BCR. This could be done as further sensitivity analysis. Or, at a minimum, the question should be discussed.

   iii. The assumption appears to be that everyone lives until at least age 60. This is a very strong assumption in a high-mortality, low-life-expectancy country such as Malawi. Should not the future returns be adjusted for survival rates?

d. What are the Impacts (Benefits) on Schooling of the Program: The authors note possible effects of starting schooling when younger and progressing through school more quickly – and present two simulations with and without a lag in labor force entrance as a result (though I am somewhat confused because they seem to acknowledge that the lag may contribute to costs by delaying labor force entry but also seem to state that the benefits start at age 15, no matter what). But in addition to affecting the age of beginning school and the progression rate through school, it would seem to me that an important possible benefit is greater learning per year in school. I am not aware of evidence on the magnitude of such effects for preschool programs, but some evidence from early-life nutritional interventions suggests that adult cognitive skills for men were increased substantially even though there was no significant effect on their schooling (Maluccio, John A., John Hoddinott, Jere R. Behrman, Reynaldo Martorell, Agnes R. Quisumbing, and Aryeh D. Stein. "The Impact of Improving Nutrition During Early Childhood on Education among Guatemalan Adults*." The Economic Journal 119, no. 537 (2009): 734-63. http://dx.doi.org/10.1111/j.1468-0297.2009.02220.x.)

e. What are the Impacts (Benefits) of the Changes in the Second Simulated Program? The discussion of the costs for this program include providing additional food for children from food-insecure families, replacing volunteer workers with paid workers, and increasing the caregiver to child ratio. All of these plausibly benefit the children and presumably are the bases for increasing the additional school attainment by 2.0 years. But, if possible, it would be desirable to be clearer about the links between these changes and the schooling attainment change, citing evidence if possible.

f. Possible Dynamic Complementarities: Children who are better nourished up to age 3 are likely to benefit more from preprimary programs when they are age 3-5. While the former is covered in a different chapter, this may be a point where it would be useful to comment on these possible complementarities and what they mean for this chapter. Likewise there may be important forward-looking dynamic complementarities in that children with better preprimary experiences may learn more in their school years – again it might be useful to comment on these in this chapter or in the chapter on the school years (assuming there is such a chapter).

g. (Martina) The authors do not specify to what age they modelled the CBA. Was it up to the official retirement age of 65? Or the full life expectancy drawing on the evidence of the relationship between observed outcomes and downstream end points?

h. (Martina) I did not see any section discussing the policy implication of the results. I wonder why, perhaps that will only be done at the very end? Otherwise, I do think the results have relevant policy implications as that would inform policy makers on which intervention has more value for money or if CBCCS should be maintained in general.

2021

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