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Abstract

Objectives: This study presents results of cost and cost-effectiveness analysis of two parenting interventions (group-based and pairs) integrated into primary health care centers in rural Bangladesh.

Methods: A within-trial cost-effectiveness analysis was conducted from the provider perspective. Incremental cost effectiveness ratios were estimated for all primary child development outcomes and presented in terms of cost per standard deviation improvements in the outcomes. A series of cost scenario analyses were conducted to assess the effect of changing cost assumptions on the cost and cost-effectiveness results. All results are presented in 2022 USD.

Results: Total provider costs in the within-trial analysis were US$ 67,668 for the group-based intervention and US$ 117,028 for the pair intervention. Estimated cost per child covered by the interventions was US$156 for the group intervention and US$136 for the pair intervention, reflecting likely economies of scale in delivery of the pair intervntion. An additional US$100 expenditure on the group intervention is estimated to lead to a 0.55 SD improvement in cognition, 0.44 SD in language development and 0.33 SD in motor development. For the pair intervention, the corresponding estimates are improvements of 0.95 SD, 0.81 SD, and 0.88 SD, respectively. Under potential scale up scenarios, intervention cost can reduce substantially resulting in cost per child of US$44 and US$47 for group and pair interventions, respectively.

Conclusion: The findings indicates that cost-efficiency and cost-effectiveness results for both interventions are comparable with the results from limited similar interventions in LMICs. However, implementation costs of the interventions will be substantially lower at scale due to lower monitoring costs, economies of scale, and full integration into the public health system.

Keywords: Early childhood development, cost-effectiveness analysis, parenting, Bangladesh

Research in context

Evidence before this study

Two previous trials of early childhood development (ECD) interventions in rural Bangladesh support the effectiveness of group-based and pair-based interventions in improving child outcomes. However, economic evaluation was not conducted at that time. Additionally, a literature search was conducted in PubMed to identify within trial- economic evaluations of early childhood development interventions, using the terms "economic evaluation" AND "early childhood development" AND "trial". The search was restricted to publications between Jan 1, 2000 and Nov 10, 2023. Additional citation searching was conducted to further identify relevant studies. Studies taking place in a high-income country, or that only looked at home-visiting interventions, were excluded. Six relevant primary studies were identified: two in China and one in each of India, Kenya, Pakistan and Vietnam. Despite differences in methodologies, all studies broadly conclude that the intervention was cost-effective. However, an additional scoping review identified that compares cost-effectiveness estimates across settings highlights substantial variation in both costs and outcomes.

Added value of this study

This study supplements existing evidence on the effectiveness of two interventions with economic analysis, and contributes to scarce evidence on ECD interventions, in particular, those integrated into public healthcare system. Our costs and effectiveness estimates are based on results from two cluster-randomised trials.

Implications of all the available evidence

Our analysis showed that the cost-effectiveness of both group-based and pair interventions is comparable with the results from limited similar interventions in LMICs, and that the interventions are potentially scalable in Bangladesh. The implementation costs of the interventions will deacrese significantly at scale due to economies of scale, lower monitoring costs and full integration into the primary healthcare system of Bangladesh.

Introduction:

The period from pregnancy to age three is a very sensitive period for brain development.[1] Health, wellbeing and learning during this period are the foundation for the future lifecourse.[2] [3] However, this is the period when children are most susceptible to environmental influences,[4,5] including adversities and risk factors such as extreme poverty, malnutrition, inadequate home stimulation, maternal mental health and insecurity.[6] Based on proxy indicators of poverty and stunting, 250 million children under five years old are at risk of not reaching their full developmental potential in low and middle income countries.[2] Poor early development is predictive of lower educational attainment and subsequent lower adult income.[7,8] Indeed, deficiencies in early age are compounded and become gradually more difficult to repeal beyond early childhood. [9]

The Global Strategy for Women's, Children's and Adolescents' Health 2016–2030 synthesized a new vision under the objectives of Survive, Thrive and Transform.[10] Accordingly, the World Health Organization (WHO), World Bank Group, United Nation Children Fund (UNICEF) and United Nation Economic and Social Cooperation (UNESCO) are prioritising programs delivered in early childhood.[11] A number of randomized controlled trials of psychosocial stimulation interventions conducted in low and middle income coutries (LMICs), including Bangladesh, China, India, Pakistan, Brazil, Colombia documented that psychosocial stimulation can improve children's cognitive, language and motor development and their behaviour. [12-19] Many of these interventions used the primary health care system [15,20,21], while others used conditional[17] and unconditional cash transfer platforms of the respective government for the poor[22], or home visits targeting specific population e.g. maltreated children.[23] Some of the interventions showed sustained benefits at middle childhood and at adulthood.[24-26] Investment in early childhood can therefore benefit individuals across the life course and help reduce social inequalities.[27,28] Most of these trials were implemented at small scale and were intensive, which may limit scalability and increase costs. The importance of low cost and scalable interventions that are integrated within healthcare systems has been emphasized by the Lancet series on ECD and other ECD researchers and policy makers.[29] However, effectiveness and cost-effectiveness evidence for these interventions are scarce, particularly in low- and middle-income countries.[30] This dearth of evidence represents a key obstacle to their large scale implementation.[31]

To fill this gap, two parallel cluster randomized controlled trials were designed and implemented in rural Bangladesh to test the effectiveness of two parenting interventions integrated into Bangladeshi primary health-care services [20,21]. The trials evaluated the impact of fortnightly group-based parenting sessions (hereinafter referred to as 'group-based' intervention)[21] or fortnightly pairs of mother-child dyads sessions (hereinafter referred to as 'pair' intervention)[20], both facilitated by government health workers and runningfor 12 months. Both interventions significantly improved children's cognition, language, and motor development and child behaviour, but had no significant effect on children's growth [20,21].

This study presents detailed results from the cost and cost-effectiveness analysis of both interventions, along with the findingson their cost and affordability at scale.

Methods

Study design

Detailed description of both group-based and pair trials and the interventions are presented elsewhere [20,21]. In brief, the *group-based parenting* was conducted in 40 community clinics (CC) in the Kishorganj district of Bangladesh. The *mother-child pair* trial was implemented in 90 CCs in Narsingdi district. Both studies were conducted as two-arm, single blind, cluster randomised trial. In these trials, the selected CCs or clusters (40 in group-based and 90 in pair) were stratified by subdistrict and then randomly allocated to the intervention or control arms. The clinic was chosen as the unit for randomization to minimize the risk of contamination between the arms, given that the intervention was integrated into clinic services and carried out by the existing clinic staff.

Study setting and participants

Group-based trial was implemented in two rural sub-districts in Kishorganj District, located approximately 100 km from Dhaka, the capital city of Bangladesh. The pair trial was implemented in three rural sub-districts in Narsingdi district, Bangladesh. The district is in the centre of the country, 50 kilometres north-east of Dhaka. Both interventions were delivered from CCs by front-line health workers. Each CC was designed to provide primary health care services through a trained Community Health Care Provider (CHCP) for a population of at least least 6,000. Health

Assistants (HA) and Family Welfare Assistants (FWA) also provide health services from the CC alternatively in every three days of a week in their assigned CC. They offer general illness management e.g. diarrhea, family planning advice and provide logistics, provide care for pregnant women (including iron and folate supplementation), health, hygiene and nutrition education, monitor child growth, and make referrals to other healthcare facilities. The primary health care system in both districts is comparable to other districts in Bangladesh.

Eligible participants for both trials were underweight children aged 5–24 months and their mothers/caregivers who were living within 30 minutes walking distance from the households to CCs. However, the sample in each CC was restricted to a maximum of 25 children, for pragmatic reasons. Underweight was defined as a weight-for-age Z score of −2 SDs of the WHO standard[32] for the pair intervention, and -1.5 SDs of the WHO standard for the group intervention.

Description of the interventions and comparators

Interventions

Both interventions consisted of 25 fortnightly sessions, in which mothers/caregivers were shown how to support their child's development through play and interactions. In addition, mothers/caregivers were lent books and toys to take home after each session. The primary difference between the interventions was the number of mother-child dyads in the sessions. In the group-based intervention, an average of four mother-child dyads in each group attened the sessions, and the group size was limited by the available space within the clinic. While in the pair intervention, a pair of mother/child dyads (two mothers and their children) attended the sessions.

We developed the intervention sessions based on the Reach-Up and Learn curriculum, which was adapted from the Jamaican Reach-Up home visiting program[33]. The play sessions with mothers and children were participatory and adhered to a predetermined structure. Each session included a review of previous home activities with discussion, a local song, engaging activities with a picture book and developmentally appropriate toys, language-based activities, the delivery of nutritional messages, and a review of tasks to be continued at home. Each session had specific activities and materials tailored to the child's developmental stage, ensuring that they were both stimulating and suitable for the child's abilities. However, the curriculum used for the pair intervention targeted

activities according to the child's age in months, while the group intervention activities were divided into broader age bands (e.g. 12-18 months).

Health workers, including CHCPs, FWAs, and HAs, who were stationed at each community clinic, administered the play sessions, which typically lasted 40-60 minutes (40-50 minutes for the group-based intervention). Prior to the initiation of the intervention, these health workers underwent a comprehensive 10-day training on the curriculum. Additionally, they received a half-day refresher training every three months. The supervisors of these health workers also underwent a one-day training session to enhance their understanding of the intervention. CHCPs and HAs were overseen by Assistant Health Inspectors (AHIs), while Family Planning Inspectors (FPIs) supervised the FWAs. The project staff provided supervision to the health workers to maintain the quality and effectiveness of the intervention and to ensure proper monitoring.

Control arm

Participants in the control arms in both trials received standard services provided by the health workers at the clinics. More detail on each intervention and study design is provided in published impact analyses [20,21].

Outcomes/effectiveness

Outcomes in both trials were measured in the comparison and intervention group clinics, at baseline and after 1 year of the interventions. In the group intervention, all participants were evaluated, while in the pair intervention a subsample of around 40% of participants were evaluated.

Primary outcomes: The primary outcomes were children's development and their behaviour and growth. We measured children's cognitive, language and motor development using the Bayley Scales of Infant and Toddler Development (3rd version) [34]. We measured behavior scores based on Wolke's behaviour rating scale[35]. Child behavior was rated using four scales: approach to examiner, emotionaltone, cooperativeness, and vocalizations. Trained testers also measured children weight and length/height using WHO standard methods[36]. Z-scores of weight-for-age, weight-for-height, and height-for-age were calculated using WHO AnthroPlus.

 Secondary outcomes: The secondary outcomes were maternal knowledge on child care, quality of home stimulation and mothers' depressive symptoms. Maternal knowledge was measured using a specially designed instrument consisting of 20 questions[22]. We measured quality of home

stimulation using Family Care Indicator, a validated tool in this context[37]. We also collected maternal depressive symptoms using six questions taken from the Center for Epidemiological Studies Depression Scale[38].

More details on the outcomes and measurement tools and well as the findings are presented elsewhere.[20,21]

Cost analysis

Base case analysis was conducted as a within-trial analysis, accounting for the full economic cost of implementing the intervention. Economic costs of each intervention were estimated from the provider perspective, including costs incurred by the implementing partner (icddr,b; program costs) and costs incurred by the Bangladesh Ministry of Health and Family Welfare (provider costs). Total costs include both start-up costs, such as training, and implementation costs of the intervention, including facility staff and materials. The start-up period was 9 months for both interventions, while the implementation period was 12 months for the group intervention and 16 months for the pair intervention. However, the duration of the intervention was 12 months for all participants in both interventions.

A combination of activity-based, expenditure and ingredient approaches were used to estimate costs.[39]. All cost analysis was conducted retrospectively. Program costs were based on analysis of project accounts. All included program costs are intended to reflect the costs of intervention design, monitoring and evaluation (M&E) and quality assurance only, excluding research costs. This allocation of costs was based primarily on time-use survey data for program staff, which was used to disaggregate total staff salary costs. Additionally, travel costs were allocated to the intervention (i.e. excluding research costs) based on interviews with relevant project staff and information from program financial reports. As a detailed disaggregation of other costs incurred by the implementing partner was not possible, we conservatively assumed that the proportion of all other implementing partner costs (including overheads and consumable costs) that should be allocated to the intervention reflect the staff time-use allocation to the intervention.

Recurrent costs including intervention materials, toys, books and refreshments were directly allocated to the interventions, as were start-up costs related to training. Structured questionaires were used to collect provider cost data from CCs, using a sample of five randomly selected CCs delivering the pair intervention, and three randomly selected CCs delivering the group

intervention. The total estimated facility costs include the costs of staff directly involved in the intervention, facility overhead costs attributable to the intervention, and capital costs. Capital items were annualized for their respective functional lifetime.

To help guide local policymakers, two alternative cost at scale scenarios were explored in the analysis. First, cost at scale scenario 1 assumes that 10% of within-trial program costs would be incurred in the event of intervention scale-up. This reflects that program costs (i.e., M&E, quality assurance and intervention design) comprise a disproportionately high proportion of costs in the within-trial analysis, but would likely not be incurred if the intervention were to be scaled up domestically. However, some degree of quality assurance would still be required at scale to ensure effectiveness is maintained. Second, cost scenario 2 excludes both program costs and facility costs. This reflects that adoption of the intervention may involve a reallocation of existing resources, rather than requiring new investment in staff and facilities. This assumes that there is existing capacity to adopt the intervention. Thus, cost scenario 2 broadly reflects the financial cost of intervention implementation.

Costs were estimated in Bangladeshi Taka (BDT) and inflated to 2022 base year values using local inflation rates. These costs were then converted to USD (exchange rate of 91.7; ref). Base-case estimates assume an annual discount rate of 3% to convert to present values.

Cost-effectiveness analysis

Incremental cost-effectiveness ratios (ICERs) were calculated by dividing incremental outcomes by incremental costs of the interventions. ICERs were estimated for all primary child development outcomes for which an effect of the intervention was detected. For the purposes of the cost-effectiveness analysis, all outcomes are presented in terms of standard deviation improvements in outcomes per currency unit.

A series of cost scenario analyses were conducted to assess the effect of changing cost assumptions on the cost and cost-effectiveness results. Base case ICERs are compared with ICERs generated based on both cost scenario 1 and 2 (see above). Further one-way sensitivity analyses were also conducted to explore the impact of uncertainty in other parameters on results. Trial outcomes were varied based on their 95% confidence intervals, and alternative discount rates of 0% and 6% were used.

Cost and affordability at scale

The potential cost of delivering the interventions at scale was estimated. A maximum capacity of 416,000 children a year was assumed, based on previous estimates of the capacity of the 13,000 excisting community clinics nationally in Bangladesh[21]. The total cost of this expansion was estimated based on both cost scenario 1 and 2, and compared with the annual budget of the Bangladesh Ministry of Health and Family Welfare [40].

Results

Provider cost analysis

Table 1 summarises estimated within-trial provider costs for both interventions. Total provider costs were 67,529 USD for the group intervention and 117,726 USD for the pair intervention. Program costs account for a majority of costs for both the group intervention (68%) and pair intervention (48%). The total estimated cost per child is 156 USD for the group intervention and 136 USD for the pair intervention in the within-trial analysis. Although this may appear counterintuitive as the group-based intervention is in theory less intensive, this reflects the large proportion of program costs, where there may be economies of scale in monitoring activities, for exampleas the number of participants in the pair intervention was more than double that in the group intervention. Although program costs are higher for the pair intervention than for the group intervention in the within-trial analysis, the per child costs are lower, reflecting that some minimum level of program costs are likely required to establish an intervention. Alternative cost assumptions at scale are explored below.

Table 1: Within-trial program costs for total intervention period

	Group cost, USD (n=434)	Pair cost, USD (n=859)
Facility staff	2,570	16,816
Facility capital	173	1,177
Facility overheads	189	1,960
Toy making staff	1,579	4,291
Motivational workshops	7,033	13,654

Training	4,701	8,786
Intervention materials and consumables*	5,656	13,608
Program staff	30,655	37,601
Program travel	5,436	7,462
Other program costs	9,674	11,674
Total provider costs	67,668	117,028
Total provider costs per child	156	136

*Including toys, printed materials, refreshments etc.

Intervention outcomes

Table 2 displays outcomes from the trial impact analysis for each intervention. Primary outcome measures included child development assessed using the Bayley scale. The group-based intervention was found to have significant benefits of intervention to child cognition (effect size 0.85 SDs, 95% CI: 0.59, 1.11), language (0.69 SDs, 0.43, 0.94), and motor development (0.52 SDs, 0.31, 0.73). The pair intervention also significantly improved children's cognition (1.3 SDs, 1.1, 1.5), language (1.1 SDs, 0.9, 1.2), and motor development (1.2 SDs, 1.0, 1.3).

Table 2 Trial child development outcomes

Trial outcomes	Group intervention Effect size, SDs [95% CI]	Pair intervention Effect size, SDs [95% CI]
Cognition	0.85 [0.59-1.11]	1.3 [1.1-1.5]
Language	0.69 [0.43 -0.94]	1.1 [0.9-1.2]
Motor	0.52 [0.31-0.73]	1.2 [1.0-1.3]

Within-trial cost-effectiveness analysis

Table 3 reports base case ICERs for each intervention, and for each of the outcomes. Higher ratios imply a larger impact on child development per given amount of expenditure. As estimated intervention effect sizes are larger for the pair intervention, and the estimated cost per child is lower, the pair intervention is more cost-effective in the base case analysis. In the base case provider perspective analysis, an additional 100 USD expenditure on the group intervention is

estimated to lead to a 0.55 SD improvement cognition, 0.44 SD in Language development and 0.33 SD in motor development. For the pair intervention, the corresponding estimates are improvements of 0.95 SD, 0.81 SD, and 0.88 SD respectively.

Table 3 Within-trial cost-effectiveness analysis results

Incremental cost-effectiveness ratios (Additional SD per $100 USD)	Group intervention	Pair intervention
Cognition	0.55	0.95
Language	0.44	0.81
Motor	0.33	0.88

Cost at scale scenario analyses

In cost scenario 1, excluding program costs from the cost estimates results in an estimated cost of 61 USD per child for the group intervention and 77 USD for the pair intervention (Table 4). Further excluding facility costs (in addition to excluding the remaining 10% of program costs) in cost scenario 2 has a relatively small influence on the less labour intensive group intervention, reducing costs to 44 USD per child, while a larger reduction in costs isobserved for the pair intervention, which would cost 47 USD per child under this assumption. As all of these costs are less than $100 USD per child, cost-effectiveness ratios for these cost scenarios were not calculated.

Table 4 Cost at scale scenario analyses

	Group intervention	Pair intervention
Base case analysis		
Total cost	67,529	117,726
Cost per child	156	136
Cost at scale scenario 1		
Total cost	26,340	66,662
Cost per child	61	77
Cost at scale scenario 2		
Total cost	18,831	40,478
Cost per child	44	47

Other sensitivity analyses

Appendix 1 shows the impact of changes in discount rates and trial outcomes on the results of the cost-effectiveness analyses. Discount rates had limited influence on results. Variation in outcomes has greater influence on results, though all ICERs for both interventions remained at a minimum of 0.2 additional SD per $100 USD.

Cost and affordability of scale up

Scaling up the intervention to 416,000 children annually in Bangladesh would cost around $25.4 milion USD for the group intervention and $31.9 million USD for the pair intervention under cost scenario 1. This amounts to around 0.71% and 0.90% of the annual national health budget respectively. Under cost scenario 2, where facility costs are removed, the equivalent figures are 0.51% and 0.55% respectively. It is likely that further economies of scale in expenditure categories such as intervention materials could reduce this cost in the event of scale up.

Discussion

We conducted an economic evaluation of two parenting interventions integrated into primary health care centers in rural Bangladesh. Estimated total provider costs per child were $156 USD for a group-based intervention and $136 USD for a pair intervention. The group-based intervention was more expensive in the within-trial analysis, given higher program costs (i.e., M&E and quality assurance), and had a smaller impact on child outcomes when compared with the pair intervention. Although at scale the group-based intervention would be cheaper, the trial was much smaller than that of the pair-based intervention, with around half the number of participants, and therefore per child program costs were higher. In the within-trial analysis, the group intervention had effect sizes per US$100 expenditure of 0.55 SD in cognition, 0.44 SD in language and 0.33 in motor, while the equivalent effect sizes for the pair-based intervention were 0.95, 0.81 and 0.88. It is worth noting that both interventions were evaluated with respect to separate control arms only, and were not directly compared.

This study contributes to limited global evidence on the cost and cost-effectiveness of parenting interventions. Relevant studies of comparable group interventions include a study of a group intervention in India which estimated that group sessions cost $38 per child per year.[41] In Kenya, an evaluation of a group-based parenting intervention estimated provider costs of US$119 per

child.[42] Finally, in Vietnam, a study estimated total provider costs for a group intervention of $234 USD per child.[43] Comparison across studies is hindered by differences in intervention group size, intensity, duration, and context. However, none of the interventions referred to above were integrated within health systems, which may enhance intervention credibility, and facilitate expansion to larger scale implementation. In China, two interventions that were integrated within existing primary health services cost $50.87 USD[44] and US$146.10 per child,[19] though again differences in costing methodologies limit comparisons. The effect sizes for the interventions in the present study are comparatively large. For example, in comparison, effect sizes in Kenya were 0.52 SD for cognition and 0.42 SD for receptive language, while in India they were 0.28 SD for cognition and 0.30 for language. This compares to respective effect sizes of 0.85 SD and 0.69 SD for the group-based intervention and 1.3 SD and 1.1 SD for the pair intervention.

Verguet et al[45] propose a framework to improve comparability of cost-effectiveness results across interventions by dividing incremental costs by either the average or the sum of domain-specific effects on child development outcomes.[45] Using the former approach without standardizing costs results in ICERs of $227.06 USD and $113.53 USD per 1 SD improvement for the group-based and pair interventions respectively. For the latter approach the estimates are $75.69 USD per 1 SD and $37.84 USD per 1 SD. If these two interventions were added to the 12 analysed by the authors, they would be the 8th and 5th most cost-effective when using average effect sizes, or the 6th and 5th most cost-effective when using summed effect sizes. Of course, such comparisons should be treated with caution given differences in the measurement of both costs and outcomes. Additionally, ICERs expressed per 1 SD improvement in outcomes must also be interpreted with caution, as interpretation depends on the size of the SD, and given that most interventions do not reach effect sizes of this magnitude. For example, one study claims that "the intervention delivers a 1 SD improvement in infant cognitive development for $4.56", despite only estimating a 0.057 SD improvement on an observed child development index[46]. However, despite these limitations, such comparisons may provide useful indicative evidence that the cost-effectiveness of group-based and pair interventions is broadly in-line with other relevant studies.

Implementation costs of the two interventions may also be substantially lower at scale due to lower monitoring costs, economies of scale and full integration into the public health system. Indeed, both the studies were monitored by project staff mainly that also leads to high program cost. In alternative cost scenarios where program costs are excluded, the pair intervention ($77 USD per

child) is more expensive than the group intervention ($61 USD per child). Similarly, when both program and facility costs are excluded, the pair intervention cost $47 USD per child, compared with $44 USD per child for the group intervention. However, in the event of scale-up, it would be important to closely monitor whether implementation quality is maintained, as supervision and training responsibilities would fall upon government rather than program staff. Finally, alternative cost scenarios explored in this analysis assume capacity to absorb the intervention without substantial reallocation from other valuable activities, which may not be realistic. Additionally, the targeting of the intervention to risk groups during this scale-up was not explicitly considered in the analysis. However, under current capacity and group sizes, it would only be possible to reach around 14% of the approximately 3 million children born each year in Bangladesh, meaning some targeting would be necessary. All decisions regarding program scale up in a given context should account for multiple considerations beyond cost-effectiveness[47], including intervention acceptability and feasibility.

This analysis has several limitations. First, the analysis was retrospective and was conducted several years after the intervention was implemented, meaning that some institutional knowledge regarding certain costs was lost over time, and several assumptions were required. Second, despite comparatively large impacts observed in the short term, it is unclear whether these can be sustained in the long term, and how they translate to future outcomes. There is a lack of follow-up studies of ECD interventions to evaluate whether observed benefits are sustained, and this should be a future research priority. Third, it was not possible to standardize outcomes, and therefore, as in other related studies, ICERs are presented separately for different domains of child development. Finally, the impact of both the group- and pair-based interventions was assessed relative to separate control groups only, and it is not possible to directly compare the interventions, which differed in terms of study size, location and other factors. Comparisons of relative cost-effectiveness should therefore be treated with caution.

Conclusion

The findings indicates that cost-efficiency and cost-effectiveness results for both interventions are comparable with the results from limited similar interventions in LMICs. However, implementation costs of the interventions will be substantially lower at scale due to lower monitoring costs, economies of scale, and full integration into the public health system.

Ethical consideration

Written informed consent was obtained from mothers at enrollment. Ethical approval was granted by the institutional review board of the International Centre for Diarrhoeal Diseases Research, Bangladesh (icddr,b).

Acknowledgement

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Appendix 1 – Deterministic one-way sensitivity analysis results

Parameter	Group intervention (Additional SD per $100 USD)			Pair intervention (Additional SD per $100 USD)		
	Base case	Minimum	Maximum	Base case	Minimum	Maximum
Discount rate*						
Cognition	0.55	0.53	0.56	0.95	0.92	0.99
Language	0.44	0.43	0.46	0.81	0.78	0.84
Motor	0.33	0.32	0.35	0.88	0.85	0.91
Outcomes[#]						
Cognition	0.55	0.38	0.71	0.95	0.81	1.10
Language	0.44	0.28	0.60	0.81	0.66	0.88
Motor	0.33	0.20	0.47	0.88	0.73	0.95

Varied between 0% and 6%; # varied between 95% CIs (see Table 2).