Baek *et al. BMC Health Services Research* (2025) 25:384
https://doi.org/10.1186/s12913-025-12516-z

BMC Health Services Research

RESEARCH

Economic returns on investing in early childhood development in Vietnam: a cost-benefit analysis

Yeji Baek[1,2*], Jane Fisher[1], Thach Tran[1], Alice Owen[1], Trang Nguyen[3], Stanley Luchters[4,5,6], David B. Hipgrave[7,8], Sarah Hanieh[9], Tuan Tran[3], Tran-Thi-Thu Ha[3], Beverley-Ann Biggs[9] and Zanfina Ademi[1,2]

Abstract

Background Economic evidence on the long-term benefits of investing in early childhood development is limited. This study aimed to estimate the potential long-term economic benefits of an early childhood development intervention 'Learning Clubs' in Vietnam.

Methods We conducted a cost-benefit analysis to estimate the costs and benefits of the intervention compared to the standard of care from a limited societal perspective. The intervention cost and child cognitive development outcome were derived from the published 'Learning Clubs' trial-based cost-effectiveness analysis. Benefits were monetised based on the gains in wages associated with improved cognitive development over a lifetime at the population level, using a life-table model. The benefit-cost ratio was estimated as the benefits in wages divided by the intervention cost with a 3% discount rate, assuming nationwide scale up to a hypothetical national birth cohort. Sensitivity, scenario, and threshold analyses were conducted to examine the uncertainty around the model.

Results The benefit-cost ratio was 5.52, indicating that the expected benefit for each US$1 invested would be US$5.52. The intervention would generate economic benefits of US$1,566 per child over their lifetime. Upon nationwide scale-up, the total benefit would amount to US$2.28 billion per national annual birth cohort. Probabilistic sensitivity analyses estimated the benefit-cost ratio to be 5.90 (95%CI 2.66 to 11.12). The findings were relatively robust as the benefit-cost ratios remained above 1 in all sensitivity and scenario analyses.

Conclusions Our findings support greater investments in early childhood development. The Excel-based model is available for further use and adaption to other settings.

Keywords Early childhood development, Cost-benefit analysis, Vietnam

*Correspondence:
Yeji Baek
yeji.baek@monash.edu
[1]School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia
[2]Health Economics and Policy Evaluation Research (HEPER), Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Melbourne, Australia
[3]Research and Training Centre for Community Development (RTCCD), Hanoi, Vietnam
[4]Centre for Sexual Health and HIV AIDS Research (Ceshhar), Harare, Zimbabwe
[5]Liverpool School of Tropical Medicine (LSTM), Liverpool, UK
[6]Department of Public Health and Primary Care, Ghent University, Ghent, Belgium
[7]UNICEF, Baghdad, Iraq
[8]Saw Swee Hock School of Public Health, National University of Singapore and National University Health System, SingHealth-Duke-NUS Global Health Institute, Singapore, Singapore
[9]Department of Infectious Diseases, the Peter Doherty Institute for Infection and Immunity, University of Melbourne, Melbourne, Australia

Background

Early childhood development refers to the cognitive, physical, language, socioemotional, and motor development of children from conception to eight years of age [1]. Promoting early childhood development is critical as the early years of life have long-lasting impacts on individual and societal well-being. During the first three years of life, the brain develops most rapidly and is more sensitive to experiences than in later years [2, 3]. The most promotive experiences in the early years of life come from nurturing care provided by parents, family, and community [4]. Parenting interventions for children can be effective in improving child cognitive, language, motor, and socioemotional development in addition to benefits in parenting knowledge, practices, and parent-child interactions across low-, middle-, and high-income countries [5].

Vietnam is a lower middle-income country in Southeast Asia with a Gross Domestic Product (GDP) per capita of US$4,164 in 2022 [6]. With over 7 million children under 5 years of age (around 8% of the total population) [7], promoting early childhood development is a key priority area as outlined in Government Decision 1437/2018/TTg. To improve women's health and infant health and development, a multicomponent, community-based parenting intervention 'Learning Clubs', now known as 'Early Journey of Life', was implemented in rural Vietnam [8, 9]. The intervention included locally facilitated community-based group sessions and a home visit, which aimed to address modifiable risk factors for child development, including maternal and infant malnutrition, unresponsive care, insufficient cognitive stimulation, maternal mental health, and family violence [8, 9]. The sessions followed a structured and evidence-based curriculum comprising stage-specific information with participatory learning opportunities, such as talks, videos, scenario-based discussions, hands-on practice and role plays [8, 9]. The intervention was effective in improving child cognitive, language, and motor development compared to the usual standard of maternal and child healthcare in a cluster randomized controlled trial [8, 9]. Additionally, the intervention was cost-effective and improved equity over a 30-month time horizon [10–12].

However, the potential long-term economic benefits of scaling up the intervention have not been described, and the existing economic evidence to support decision making for the implementation of parenting interventions is scarce in low-and middle-income countries. Three studies from Colombia, Kenya, and Nicaragua showed that the benefits of early childhood development interventions outweighed their costs [13–15]. The benefit–cost ratios ranged from 1.09 to 2.7 for a subsidized childcare and child development program in Colombia [15], 15.5 for a group-based parenting intervention in Kenya [13], and 1.5 for an integrated early childhood development program in Nicaragua [14]. Additionally, a longitudinal study from Jamaica found that a psychosocial stimulation intervention for stunted children increased earnings by 25% at the age of 22 [16]. Understanding of the potential long-term economic benefits of investing in early childhood development is limited, and there have been no studies in the Southeast Asian region. Further evidence is required to support policymakers and donors in efficient planning, implementation, and scaling up of interventions at the population level. Thus, this study aimed to estimate the potential long-term economic benefits of the Learning Clubs intervention relative to the costs through a cost-benefit analysis.

Methods

Learning clubs trial

The 'Learning Clubs' intervention was implemented to improve women's health and infant health and development in HaNam, a rural Red River delta province in Northern Vietnam [9]. In the intervention group, women were invited to participate in 19 community-based group sessions (8 sessions during pregnancy and 11 sessions in the first post-partum year) and one home visit in the first post-partum month in addition to usual standard of maternal and child healthcare [9]. When feasible, women were accompanied by their partners or a baby's grandparent [9]. The group sessions took place on Sunday mornings every 2 to 4 weeks for 1 to 1.5 hours in a local commune facility [9]. Women in the control group received the standard of care alone [9].

The cluster randomized controlled trial showed that children aged 2 years in the intervention group had higher cognitive, language, and motor development scores than those in the control group (546 children in the intervention; 622 children in the control group) [9]. Additionally, the intervention was cost-effective in improving child development, with greater benefits in disadvantaged groups over a 30-month time horizon [9, 10]. The intervention and its effect are described elsewhere, including in the study protocols [8–12].

Model overview

We developed an open-source life-table model to estimate the costs and benefits of the 'Learning Clubs' intervention compared to the usual standard of care from the limited societal perspective over lifetime (Fig. 1). The cost-benefit analysis was conducted to summarize the costs and benefits of the intervention, inform decision-makers, and compare the benefit-cost ratios with those of other early childhood development interventions. A study protocol for economic evaluation of the Learning Clubs intervention has been published [12]. The model included the intervention costs from the service provider

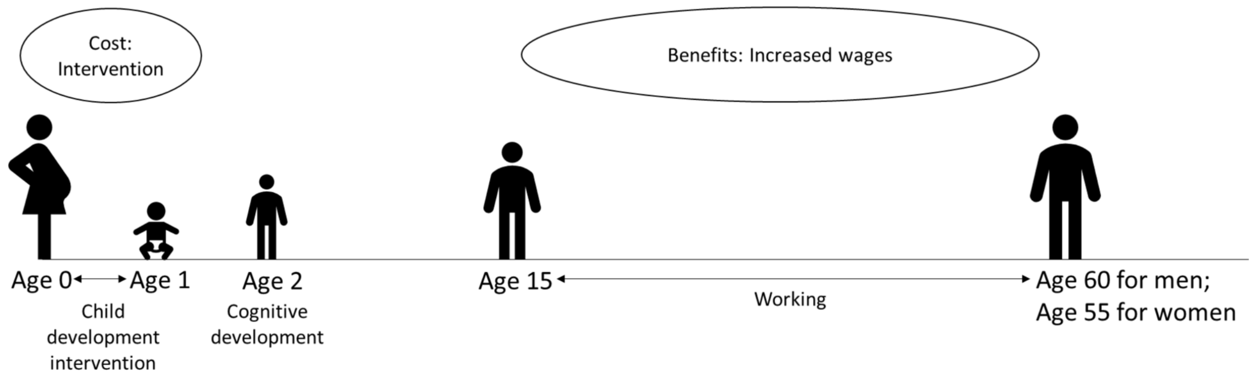

Fig. 1 Model framework

Table 1 Model inputs

Parameter	Base-case	Range/Alternatives	Distribution	Source
Population at age 0	1,453,563 (Boys 764,574; Girls 688,989)	Fixed	Fixed	World Population Prospects [7]
Intervention cost per child	US$284	± 10%	Gamma	Baek et al. [10]
Effect of intervention on cognitive development	0.41	95%CI 0.26 to 0.56 Boys 0.45; Girls 0.36	Lognormal	Fisher et al. [9]
Employment proportion (men; women)	15–19 years: 20%; 19% 20–24 years: 51%; 47% 25–29 years: 74%; 66% 30–34 years: 89%; 77% 35–39 years: 98%; 85% 40–44 years: 89%; 80% 45–49 years: 92%; 81% 50–54 years: 98%; 80% 55–59 years: 89%; 0%	± 2%	Uniform	Authors' calculations based on Vietnam General Statistics Office and World Population Prospects [7, 18]
Gains in wages associated with cognitive development	0.045	95%CI 0.026 to 0.096 0.397	Lognormal	Ozawa et al. [17] Garcia et al. [13]
Average monthly wage	Men US$300; Women US$260	± 10%	Gamma	Vietnam General Statistics Office [18]
Retirement age	Men at age 60; Women at age 55	65 years old	Fixed	Vietnam General Statistics Office [18]
Discount rate	3%	0%, 6%	Fixed	Guidelines [19, 20], previous studies [10, 13, 21, 22]
Inflation rate	2.6% (Gross Domestic Product implicit price deflator)	3.2% (Consumer price index), 8.3% (Wage inflation)	Fixed	World Bank [23, 24], Institute of Labour Science and Social Affairs [25]

and household perspectives as described in a trial-based cost-effectiveness study [10]. The gains in wages associated with improved cognitive development were included as the potential long-term economic benefits of the intervention, using publicly available data [17]. Model parameters are presented in Table 1 and Supplementary Material 1. The key model output was a benefit-cost ratio, estimated as the benefits in wages divided by the intervention cost. A benefit-cost ratio greater than 1 indicates that the intervention would deliver positive net benefits whereas a benefit-cost ratio less than 1 indicates that the intervention cost outweighs the benefits.

All analyses were conducted using Microsoft Excel 2016 and @Risk 8 and the model is available online (Supplementary Material 1). The study followed the Consolidated Health Economic Evaluation Reporting Standards 2022 [26].

Study population

The modelled population was a hypothetical national cohort of 1,453,563 babies (boys 764,574, 53%; girls 688,989, 47%) at age 0 in Vietnam (Table 1) [7]. The annual total population number and the age- and sex-specific life table data were derived from the World

Population Prospects 2022 Revision [7]. The probabilities of dying and surviving by a single age for men, women, and the total population were obtained from 'Life tables - Single Ages' separately for men and women for the year 2021 [7].

Costs

The intervention cost was taken from the trial-based cost-effectiveness study [10]. The cost included the development of the intervention package (manuals, family books, video clips), materials and supplies (posters, leaflets, toys, dolls, baby bath), training, personnel, Learning Clubs organizing sessions, supervision, and household participation costs [10]. Further details are described elsewhere [10].

The intervention cost in Vietnamese dong (VND) was inflated to the year 2021 based on the GDP implicit price deflator [23] and then converted to US$ ($1 = 23,159.78 VND) [27]. The GDP implicit price deflator measures the average annual rate of price change in the economy as a whole and is recommended for cost adjustments in the health sector [19].

Benefits

The benefits were monetised based on wage returns to improved cognitive development arising from the population-wide roll out of the Learning Clubs intervention. The trial showed that the effect size of the intervention on child cognitive score at age two was 0.41 standard deviations (SD) (Table 1). We hypothesised that improved cognitive development during early childhood would lead to higher wages later in life based on existing evidence [16, 17]. Similar approaches have been used in previous studies to estimate the gains in lifetime wages associated with improved cognitive development [13, 15] or additional years of schooling [28, 29]. In this study, returns to wages from cognitive ability were derived from a meta-analysis [17]. The findings showed that a SD increase in cognitive test scores was associated with a 4.5% (95% CI 2.6–9.6%) increase in wages in middle-income countries [17].

The lifetime wages were estimated based on sex-and age group- specific employment proportions and sex-specific wages, derived from the Vietnam Labour Force Survey 2021 [18] using the life Table [7] (Table 1). The sex-and age group- specific employment proportions were estimated from the distribution of the employment population derived from the Vietnam Labour Force Survey [18] and the total population within each sex and age group obtained from the World Population Prospects [7]. The sex-specific wages were taken from the Vietnam Labour Force Survey [18]. The monthly wage in Vietnam was 6,953,200 VND ($US300) for men and 6,029,800 VND (US$260) for women in 2021 [18]. Considering that the statutory working age is from 15 years to 60 years old and 3 months of age for men and from 15 years to 55 years old and 4 months of age for women [18], we assumed the population did not earn wages beyond those ages. Wages were adjusted for inflation every year using the GDP implicit price deflator in Vietnam. The 10-year average of the GDP implicit price deflators (2013–2022) was used to account for variations in each year based on World Bank data [23]. Further, wages were discounted at 3% per year [19, 20] to calculate a net present value for the year 2021. All detailed data are presented in Supplementary Material 1.

Subgroup analyses

Subgroup analyses by sex were conducted based on sex-specific employment proportions and average wages in Vietnam [18]. The total effect size of the intervention (0.41) was used in the base-case analysis as the trial was not powered to detect differences by sex [9, 10]. Instead, sex-specific effect sizes were used in the scenario analyses (boys 0.45; girls 0.36) [9, 10] (Table 1).

Sensitivity analyses

One-way and probabilistic sensitivity analyses were conducted to represent the uncertainty in the model. One-way sensitivity analyses were conducted by individually varying the intervention cost, the effect of the intervention on child cognitive development, employment proportion, average wage, and wage returns based on the respective ranges in Table 1.

Probabilistic sensitivity analyses were conducted by varying multiple parameters simultaneously, including the intervention cost, the effect of the intervention on child cognitive development, employment proportion, average wage, and wage returns. Values were randomly sampled from the distributions of each parameter in Table 1 using Monte Carlo simulations for 1,000 iterations.

Scenario and threshold analyses

Scenario analyses were conducted using alternative values for sex-specific effect sizes, wage returns, retirement age, discount rates, and inflation rates (Table 1). Wage returns associated with cognitive development varied based on a similar cost-benefit study from Kenya for comparison [13]. The Kenya study assumed that one SD increase in cognition was associated with a 39.7% increase in annual wages [13]. Additionally, the retirement age at 65 years was used, considering an increase in the retirement age.

Threshold analyses were conducted to identify the critical values of the intervention cost, the effect of the intervention on child cognitive development, and wage returns that would result in the benefit-cost ratio less than 1.

Table 2 Benefit-cost ratios

	Total	Men	Women
Average			
Intervention cost per child	$284	$284	$284
Lifetime wages in the control group per person (discounted)	$84,899	$98,235	$70,100
Lifetime wages in the intervention group per person (discounted)	$86,465	$100,047	$71,393
Benefits in wages per person	$1,566	$1,812	$1,293
Net benefits per person	$1,283	$1,529	$1,010
Nationwide Scale-up			
Intervention cost	$412,099,048	$216,764,060	$195,334,988
Lifetime wages in the control group (discounted)	$123,405,674,751	$75,107,700,832	$48,297,973,919
Lifetime wages in the intervention group (discounted)	$125,682,509,450	$76,493,437,912	$49,189,071,538
Benefits in wages	$2,276,834,699	$1,385,737,080	$891,097,619
Net benefits	$1,864,735,651	$1,168,973,020	$695,762,631
Increase in wages	**1.8%**	**1.8%**	**1.8%**
Benefit-cost ratio (Base-case)	**5.52**	**6.39**	**4.56**
Benefit-cost ratio (Probability sensitivity analysis based on 1,000 iterations)	**5.90 (95% CI 2.66 to 11.12)**	**6.82 (95% CI 3.02 to 12.70)**	**4.87 (95% CI 2.20 to 9.53)**

All costs are presented in US$ 2021. Discount rate of 3% is applied to estimate lifetime wages

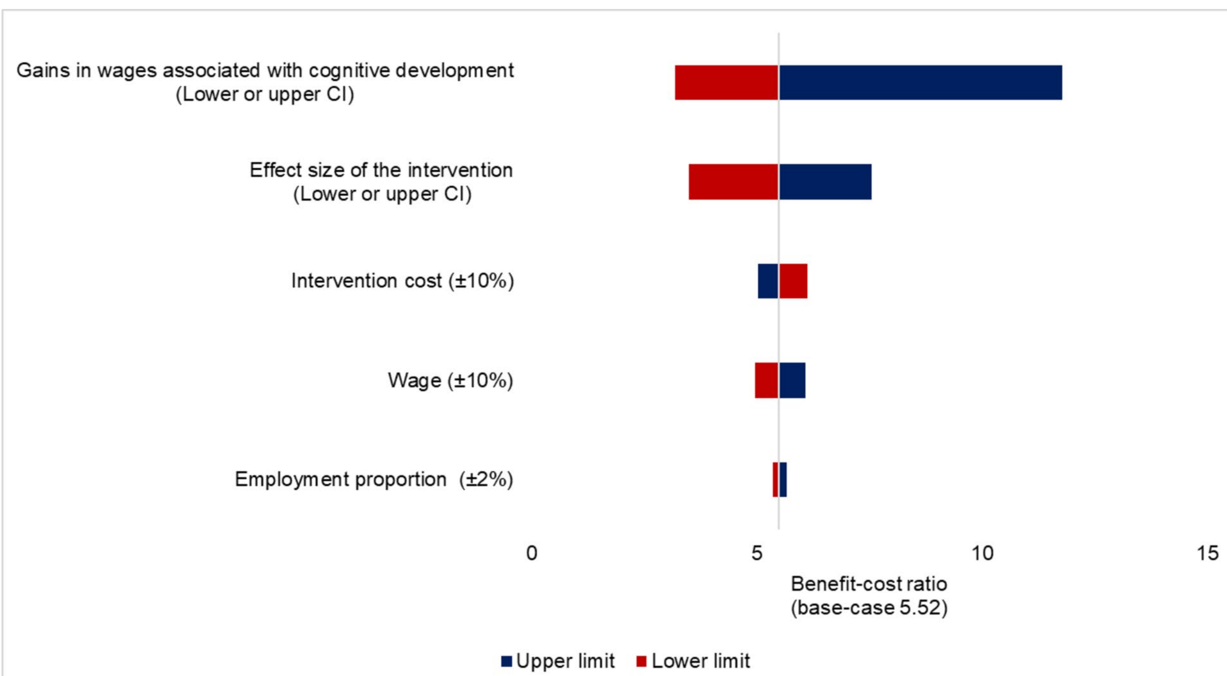

Fig. 2 Tornado diagram of one-way sensitivity analyses. CI Confidence Intervals

Results

Benefit-cost ratio

The benefit-cost ratio was 5.52 (boys 6.39; girls 4.56) (Table 2). The intervention would generate benefits of US$1,566 (net benefits US$1,283) per child. When scaled up nationwide, the total benefit would be US$2.28 billion (net benefits US$1.86 billion) per national birth cohort over the working lifetime.

Sensitivity analyses

One-way sensitivity analyses showed that the model was most sensitive to uncertainty around the gains in wages associated with cognitive development (Fig. 2). Probabilistic sensitivity analyses estimated the benefit-cost ratio of 5.90 (95%CI 2.66 to 11.12) based on 1,000 iterations (Table 2). The benefit-cost ratios remained above 1 in all analyzed cases.

Table 3 Scenario analyses

	Benefit-cost ratio
Base-case	5.52
Men based on the effect size of the intervention for boys (0.45)	7.02
Women based on the effect size of the intervention for girls (0.36)	4.01
Gains in wages associated with cognitive development based on the Kenya study (39.7%), discount rate 5% [13]	23.84
Retirement at age 65	6.17
Discount rate 0%	18.10
Discount rate 6%	1.93
Inflation rate based on consumer price index (3.2%)	6.79
Inflation rate based on wage growth rate (8.3%)	53.41

Table 4 Threshold analyses

	Base-case values for benefit-cost ratio of 5.52	Values needed for benefit-cost ratio < 1
Intervention cost per child	US$284	US$1,566
Effect of the intervention on cognitive development	0.41	0.074
Gains in wages associated with cognitive development	0.045	0.008
Discount rate	3%	8.5%
Inflation rate	2.6%	−2.2%

Scenario analyses

The benefit-cost ratio ranged from 1.93 when discount rate was 6% to 53.41 when inflation rate was 8.3% (Table 3). The discount rate, inflation rate, and gains in wages associated with cognitive development had greater impacts on the results than the sex-specific effect size and retirement age.

Threshold analyses

The threshold analyses identified the values of each parameter that would result in benefit-cost ratios less than 1 (Table 4). Increasing the intervention cost per child to US$1,566, decreasing the effect size of the intervention to 0.074, decreasing the gains in wages associated with cognitive development to 0.8%, increasing the discount rate to 8.5%, or the decreasing inflation rate to −2.2% would make the intervention cost outweigh the benefits.

Discussion

Cost-benefit analyses can support informed decision making in resource allocation by quantifying the return on investment. This cost-benefit analysis suggests that investing in early childhood development through the Learning Clubs intervention can provide long-term economic benefits to individuals and to the country. The benefit-cost ratio of the intervention was 5.52, indicating the expected benefit would be US$5.52 for each $1 invested, based on increased lifetime wages associated with improved child cognitive development. The findings were relatively robust as the benefit-cost ratios remained above 1 across sensitivity and scenario analyses.

Our findings support existing evidence that early childhood development interventions can yield long-term benefits greater than the costs. Previous studies conducted in the US found economic returns of US$7.33 [30], US$10.83 [31], and US$12.90 [32] per dollar invested, higher than the returns in our study. However, direct comparison may not be appropriate given the substantial variations in target population, service intensity, benefits measured, study design, and settings. The centre-based interventions in the US mainly targeted African American children from disadvantaged backgrounds from birth to age 8 [30], ages 3 and 4 [32], or ages between 3 and 9 [31]. In contrast, the Learning Clubs intervention was delivered to all women and their babies in the target communities, starting from mid-pregnancy to the end of the first postpartum year [9]. The interventions were more intense in the US with 2.5 to 9.75 h per day for 5 days at centres and monthly or weekly home visits [30–32] compared to the Learning Clubs sessions with 1 to 1.5 h on every 2 to 4 Sundays, including take-home family books and posters and one time home visits [9]. Additionally, while our study only captured participants' wages as benefits, the US studies included a broader range of benefits such as reductions in expenditures for criminal activities, mental health, and substance abuse treatment, and higher parental income and tax revenues, in addition to participants' earnings [30–32]. This may contribute to higher economic returns. Lastly, these studies estimated their benefits based on longitudinal studies that followed up at ages 21 [30], 26 [31], and 40 [32] while our study extrapolated long-term outcomes from the trial assessed at age 2.

Similar to our study, studies from Nicaragua [14], Colombia [15], and Kenya [13] modelled the long-term benefits based solely on the gains in wages from short-term outcomes. Evidence from longitudinal studies is scarce in low-and middle-income countries, probably due to limited resources to follow participants up. In Nicaragua, an integrated program reported economic returns of US$1.50 per dollar invested [14]. It consisted of centre-based care for 3 h per day and twice-weekly parenting sessions at homes with micronutrient supplements for children aged between 6 months and 5 years [14]. The benefit-cost ratios of a community-based subsidized childcare program in Colombia ranged from 1.09 to 2.7 [15]. It targeted children aged 6 months to 6 years from low-income families by providing childcare during weekdays, supplemental nutrition, and psychosocial stimulation [15]. The highest returns were reported from Kenya, with US$15.54 per dollar invested [13]. A parenting intervention targeted children aged 6 to 24 months and provided 16 fortnightly group sessions for 1.5 h [13]. Their high returns may partially come from their assumptions that one SD increase in cognitive abilities associated with a 39.7% increase in wages based on the longitudinal Kenya Life Panel Survey [13, 33], whereas our study derived the value, 4.5%, from a meta-analysis in middle-income countries [17]. Our scenario analysis showed that the benefit-cost ratio increased to 23.84 when considering the same value of 39.7%, as seen in the study from Kenya [13]. Despite substantial heterogeneity across studies, the overall evidence indicates that early childhood development interventions could generate benefits that outweigh their costs.

Our study found higher economic returns for men compared to women, with benefit-cost ratios of 6.82 and 4.87, respectively. This difference resulted from our assumption of higher wages and greater employment participation among men based on the labour force survey in Vietnam [18]. Larger differences were found in the US studies, with benefit-cost ratios of 17.88 for men and 2.67 for women [31], 12.9 for men and 1.7 for women [32], and 10.19 for men and 2.61 for women [30]. The differences were mainly from the benefits associated with reduced crime among men [31, 32]. Considering additional potential benefits in the equation such as improvements in equitable division of unpaid care or domestic work may increase returns for women. Additionally, future potential increases in women's participation in employment and wage growth could affect their economic returns, reflecting gradual progress toward gender equity.

The strength of this study includes that input parameters were from robust data sources, including the randomized controlled trial, meta-analysis, and sex-and age-specific Vietnamese data to estimate the plausible benefit-cost ratios. Further, we conducted various sensitivity analyses to examine the uncertainty around the model. The study method, including all assumptions, is explicitly described and the open-source model is available for further use, ensuring transparency and replication in other settings. Lastly, this study adds values as the first cost-benefit analysis of early childhood development intervention in Vietnam from the Southeast Asian region, to our knowledge. Our model and findings could be generalizable across the region to inform policymakers, though further context-based data would be necessary.

The main limitation of this study is that various assumptions were made to estimate the potential long-term costs and benefits. There are common challenges in such modelling studies, as estimating long-term benefits is complicated, and requires several assumptions, including the sustainability of the effect size, future wage growth, labour force participation, gains in wages associated with cognitive development, and discount rates [13, 34]. First, one of the main assumptions in our analysis was the association between cognitive development in early childhood and earnings in adulthood. Due to the lack of longitudinal studies, we used data from the meta-analysis that includes a study from Vietnam [17]. We acknowledge that the age range and cognitive assessment tools in the studies included in the meta-analysis are different from those used in our study. None of the studies measured child cognitive development at age two using the Bayley Scales of Infant and Toddler Development [35], the measure used in the Learning Clubs trial [9]. Although the meta-analysis includes a study from Vietnam [17, 36], we used the pooled estimate from the meta-analysis in our base-case analysis instead of the value from Vietnam. This was because the pooled estimate had a larger sample size and covered a wider range of age groups and cognitive development assessment tools. The effect size value from the Vietnam study falls within the 95% confidence interval of the pooled estimate, which was considered in our sensitivity analyses. Additionally, to address uncertainty, we explored the impacts of wage gains associated with cognitive development and the effect size on the benefit-cost ratios in sensitivity, scenario, and threshold analyses. Second, our model included only the intervention cost due to limited evidence on other long-term costs. We acknowledge that there may be other cost differences, such as in healthcare utilization and education across the lifespan, between the intervention and control groups. A long-term cohort study would be beneficial to examine these costs. Third, the benefit-cost ratio was estimated based on a trial from a rural area. However, intervention costs and effects are likely different in urban or mountainous areas. Fourth, the change in Vietnam's economy may also affect the benefit-cost ratio. The International Labour Organization reported changes in economic structure with rapid growth of the private economy and an aging population in Vietnam [37]. To address the uncertainty, several sensitivity and scenario analyses were conducted based on various assumptions such as considering different cost and effect size of the intervention and increased retirement age. Fifth, other limitations include our assumption that the population would not earn wages beyond the statutory working age and that gains in wages were the single source of benefits, which makes our estimates conservative. Informal income, unpaid care, or domestic work were not considered. There are other potential benefits from early childhood development interventions such as health benefits, reduced crime and substance abuse, and improved parental labour income as found in the US studies [30–32]. Further benefits for siblings, future classmates or co-workers, and intergenerational effects could be considered [32, 38] with advanced methods and additional evidence.

Beyond the economic benefits, improving child development is important for promoting child rights. The international treaty 'United Nations Convention on the Rights of the Child' underlines that States Parties to the Convention have an obligation to uphold child rights [39]. It further highlights that States Parties shall undertake all appropriate legislative, administrative, and other measures to the maximum extent of their available resources for the implementation of the rights (Article 4) [39]. In this regard, a children's rights-based approach to cost-benefit analysis is suggested, arguing that the obligation to children's rights and interests should be at the forefront of cost-benefit analysis [40]. Our findings can inform policymakers regarding efficient resource allocation to advance early childhood development and protect child rights.

Conclusions

Our findings support greater resource allocation in promoting early childhood development, which can provide long-term economic benefits. The benefits would increase when considering other positive outcomes for overall well-being and other benefits to family members, communities, and society. The Excel model is available for further use and adaption to inform decision making in other settings.

Abbreviations

GDP	Gross Domestic Product
SD	Standard deviation
VND	Vietnamese dong

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-025-12516-z.

Supplementary Material 1.

Acknowledgements

We thank the Vietnam Ministry of Health's Department of Maternal and Child Health, the WHO Vietnam Office, the HaNam Province Communist Party Peoples' Committee, the Provincial Centre for Disease Control, Vietnam National Women's Union, the Green Pine Clinic, the data safety monitoring board, the national and provincial trainers, the Research and Training Centre for Community Development, and the community members for their contribution to this study. We greatly appreciate all the study participants, especially the women and children in HaNam.

Authors' contributions

All authors contributed to the study design and data interpretation. YB wrote the first draft of the manuscript and conducted data analysis with support from ZA, ThT, AO, and JF. All authors contributed to data interpretation and critically reviewed the manuscript. All authors read and approved the final manuscript.

Funding

The cluster-randomized controlled trial was supported by the Australian National Health and Medical Research Council Project Grant (GNT1100147). The economic evaluation research was funded by Grand Challenges Canada under the Saving Brains Initiative (seed funding 2014–2015, and TTS-1803-22331).

YB was supported by Monash University Postgraduate Publications Award to undertake this study. JF is supported by the Finkel Professorial Fellowship which receives funding from the Finkel Family Foundation.

The funders had no role in study design, data collection, analysis, interpretation of data, writing of the report, and the decision to submit the paper for publication.

Data availability

All data generated or analysed during this study are included in this published article and its supplementary information file.

Declarations

Ethics approval and consent to participate

Ethics approval was not required as this study used publicly available data. Approval to conduct the Learning Clubs randomized controlled trial was provided by the Monash University Human Research Ethics Committee (Certificate Number 20160683), Melbourne, Australia, and the Institutional Review Board of the Hanoi School of Public Health (Certificate Number 017-017-377IDD- YTCC), Hanoi, Vietnam. Participants provided informed consent and the trial was conducted in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 19 September 2024 / Accepted: 5 March 2025
Published online: 15 March 2025

References

1. World Health Organization, United Nations Children's Fund. Nurturing care framework progress report 2018–2023: reflections and looking forward. Geneva: World Health Organization and the United Nations Children's Fund; 2023.
2. Dekaban AS, Sadowsky D. Changes in brain weights during the span of human life: relation of brain weights to body heights and body weights. Ann Neurol. 1978;4(4):345–56. https://doi.org/10.1002/ANA.410040410.
3. Tierney AL, Charles A, Nelson I. Brain development and the role of experience in the early years. Zero Three. 2009;30(2):9.
4. Britto PR, Lye SJ, Proulx K, et al. Nurturing care: promoting early childhood development. Lancet. 2017;389(10064):91–102. https://doi.org/10.1016/S0140-6736(16)31390-3.
5. Jeong J, Franchett EE, Ramos de Oliveira CV, Rehmani K, Yousafzai AK. Parenting interventions to promote early child development in the first three years of life: a global systematic review and meta-analysis. PLoS Med. 2021;18(5):e1003602. https://doi.org/10.1371/JOURNAL.PMED.1003602.
6. The World Bank. GDP per capita (current US$) - Viet Nam. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=VN. Accessed 17 Nov 2023.
7. World Population Prospects 2022, Online Edition. United Nations, Department of Economic and Social Affairs, Population Division. 2022. https://population.un.org/wpp/Download/Archive/Standard/. Accessed 21 March 2023.
8. Fisher J, Tran T, Luchters S, et al. Addressing multiple modifiable risks through structured community-based learning clubs to improve maternal and infant health and infant development in rural Vietnam: protocol for a parallel group cluster randomised controlled trial. BMJ Open. 2018;8(7):e023539. https://doi.org/10.1136/BMJOPEN-2018-023539.
9. Fisher J, Tran T, Tran H, et al. Structured, multicomponent, community-based programme for women's health and infant health and development in rural Vietnam: a parallel-group cluster randomised controlled trial. Lancet Child Adolesc Health. 2023;7(5):311–25. https://doi.org/10.1016/S2352-4642(23)00032-9.

10. Baek Y, Ademi Z, Tran T, et al. Promoting early childhood development in Viet Nam: cost-effectiveness analysis alongside a cluster-randomised trial. Lancet Glob Health. 2023;11(8):e1269–76. https://doi.org/10.1016/S2214-109X(23)00271-1.
11. Baek Y, Ademi Z, Tran T, et al. Considering equity and cost-effectiveness in assessing a parenting intervention to promote early childhood development in rural Vietnam. Health Policy Plan. 2023;38(8):916–25. https://doi.org/10.1093/heapol/czad057.
12. Nguyen T, Sweeny K, Tran T, et al. Protocol for an economic evaluation alongside a cluster randomised controlled trial: cost-effectiveness of learning clubs, a multicomponent intervention to improve women's health and infant's health and development in Vietnam. BMJ Open. 2019;9(12):e031721. https://doi.org/10.1136/BMJOPEN-2019-031721.
13. Garcia IL, Saya UY, Luoto JE. Cost-effectiveness and economic returns of group-based parenting interventions to promote early childhood development: results from a randomized controlled trial in rural Kenya. PLoS Med. 2021;18(9):e1003746. https://doi.org/10.1371/JOURNAL.PMED.1003746.
14. Boo FL, Palloni G, Urzua S. Cost–benefit analysis of a micronutrient supplementation and early childhood stimulation program in Nicaragua. Ann N Y Acad Sci. 2014;1308(1):139–48. https://doi.org/10.1111/NYAS.12368.
15. Bernal R, Fernández C. Subsidized childcare and child development in Colombia: effects of Hogares comunitarios de bienestar as a function of timing and length of exposure. Soc Sci Med. 2013;97:241–9. https://doi.org/10.1016/j.socscimed.2012.10.029.
16. Gertler P, Heckman J, Pinto R, et al. Labor market returns to an early childhood stimulation intervention in Jamaica. Science (1979). 2014;344(6187):998–1001. https://doi.org/10.1126/science.1251178.
17. Ozawa S, Laing SK, Higgins CR, et al. Educational and economic returns to cognitive ability in low- and middle-income countries: a systematic review. World Dev. 2022;149:105668. https://doi.org/10.1016/J.WORLDDEV.2021.105668.
18. Vietnam General Statistics Office. Report on labour force survey 2021. 2022.
19. World Health Organization. In: Edejer TT, Baltussen R, Adam T, et al. editors. Making choices in health: WHO guide to Cost-effectiveness analysis. Geneva: World Health Organization; 2003.
20. Wilkinson T, Sculpher MJ, Claxton K, et al. The international decision support initiative reference case for economic evaluation: an aid to thought. Value Health. 2016;19(8):921–8. https://doi.org/10.1016/J.JVAL.2016.04.015.
21. Bertram MY, Lauer JA, Stenberg K, Edejer TTT. Methods for the economic evaluation of health care interventions for priority setting in the health system: an update from WHO CHOICE. Int J Health Policy Manag. 2021;10(11):673. https://doi.org/10.34172/IJHPM.2020.244.
22. Gelli A, Kemp CG, Margolies A, Twalibu A, Katundu M, Levin C. Economic evaluation of an early childhood development center–based agriculture and nutrition intervention in Malawi. Food Secur. 2022;14(1):67–80. https://doi.org/10.1007/S12571-021-01203-6/TABLES/5.
23. The World Bank. World Development Indicators: GDP deflator: linked series (base year varies by country) - Viet Nam. https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS.AD?locations=VN. Accessed 17 Nov 2023.
24. The World Bank. World Development Indicators: Consumer price index (2010 = 100) - Viet Nam. https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=VN. Accessed 17 Nov 2023.
25. Institute of Labour Science and Social Affairs, International Labour Organization. Labour and social trends in Viet Nam 2021, Outlook to 2030. 2022.
26. Husereau D, Drummond M, Augustovski F, et al. Consolidated health economic evaluation reporting standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. BMC Med. 2022;20(1):1–8. https://doi.org/10.1186/S12916-021-02204-0.
27. The World Bank. World Development Indicators: exchange rates and prices. https://wdi.worldbank.org/table/4.16. Accessed 17 Nov 2023.
28. Fink G, Peet E, Danaei G, et al. Schooling and wage income losses due to early-childhood growth faltering in developing countries: national, regional, and global estimates. Am J Clin Nutr. 2016;104(1):104–12. https://doi.org/10.3945/ajcn.115.123968.
29. Tong H, Kemp CG, Walker N. Estimating additional schooling and lifetime earning obtained from improved linear growth in low- and middle-income countries using the lives saved tool (LiST). J Glob Health. 2022;12:8004. https://doi.org/10.7189/JOGH.12.08004.
30. García JL, Heckman JJ, Leaf DE, Prados MJ. Quantifying the life-cycle benefits of an influential early-childhood program. J Polit Econ. 2020;128(7):2502–41. https://doi.org/10.1086/705718.
31. Reynolds AJ, Temple JA, White BAB, Ou S, Robertson DL. Age 26 cost–benefit analysis of the child-parent center early education program. Child Dev. 2011;82(1):379–404. https://doi.org/10.1111/j.1467-8624.2010.01563.x.
32. Belfield CR, Nores M, Barnett S, Schweinhart L. The high/scope Perry preschool program. J Hum Resour. 2006;XLI(1):162–90. https://doi.org/10.3368/jhr.XLI.1.162.
33. Miguel E, Kremer M, Hamory J, Walker M. Kenya life panel survey, round 4 (KLPS-4). 2023. https://doi.org/10.7910/DVN/O0BBKI.
34. Verguet S, Bolongaita S, Morgan A, et al. Priority setting in early childhood development: an analytical framework for economic evaluation of interventions. BMJ Glob Health. 2022;7(6):e008926. https://doi.org/10.1136/BMJGH-2022-008926.
35. Bayley N. Bayley scales of infant and toddler development. 3rd ed. San Antonio: Harcourt Assessment; 2006.
36. Chua K. Skill achievement and returns in developing countries: evidence from adult skills surveys. Eur J Educ. 2017;52(4):498–510. https://doi.org/10.1111/ejed.12236.
37. International Labour Organization, Institute of Labour Science and Social Affairs. Labour and social trends in Viet Nam 2021, Outlook to 2030. 2022.
38. Skarda I, Asaria M, Cookson R. Evaluating childhood policy impacts on lifetime health, wellbeing and inequality: lifecourse distributional economic evaluation. Soc Sci Med. 2022;302:114960. https://doi.org/10.1016/j.socscimed.2022.114960.
39. United Nations. Convention on the rights of the child. 1989.
40. Stalford H. The price is rights! Cost benefit analysis and the resourcing of children's services. Child Youth Serv Rev. 2019;99:395–407. https://doi.org/10.1016/j.childyouth.2019.01.037.

Publisher's Note