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Impact of the Family Hope Program on Cognitive Outcomes in Poor Rural Indonesia

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ABSTRACT

Research Originality: This article assesses the impact of Indonesia's Family Hope Program (PKH) using a composite cognitive score rather than single test scores and jointly analyzing additional outcomes (Body Mass Index and the Early Development Instrument), which previous conditional cash transfer evaluations have not examined together.

Research Objectives: The study examines whether PKH improves cognitive outcomes among primary school children aged 6–9 years in poor rural areas of Indonesia.

Research Method: The analysis uses 2013 ECED survey data about 11,183 children aged 6–9 years and employs propensity score matching to address selection bias using observational data.

Empirical Results: PKH has no statistically significant effect on any cognitive test score or the composite index, and does not improve Body Mass Index. However, it has small positive effects on Early Development Instrument scores for language and cognitive development, especially basic literacy and numeracy.

Implications: The findings indicate that investments in school quality, early-childhood education, home learning resources, and nutrition should complement PKH.

Keywords:

cognitive outcome; conditional cash transfer; early development instrument; family hope program (PKH); propensity score matching

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INTRODUCTION

Conditional cash transfer (CCT) programs are social protection policies typically provided to poor households with pregnant mothers, young children, or school-aged children. They are conditioned on beneficiaries fulfilling requirements such as regular health check-ups and school attendance (Evans et al., 2019; Marx, 2023; Sanchez et al., 2016). These conditions are designed to encourage early investment in children's health, nutrition, and education, which accumulates over the life cycle and is expected to break the intergenerational transmission of poverty (Cahyadi et al., 2020). Examining whether CCTs actually improve children's cognitive outcomes is crucial because cognitive outcomes are strong predictors of both educational success and economic well-being in adulthood (Heckman et al., 2006).

Indonesia has implemented CCTs through the Family Hope Program (PKH) since 2007. PKH targets poor households and links cash benefits to the utilization of health and education services. Previous research on PKH has focused on its impact on consumption, vaccination coverage, children's physical growth, and school attendance rates (Cahyadi et al., 2020; Kusuma, McConnell, et al., 2017; Kusuma, Thabrany, et al., 2017). However, evidence regarding whether PKH improves children's cognitive achievement remains scarce, particularly for children enrolled in primary school. This question is especially relevant for Indonesia, where low foundational skills among early-grade students remain a major policy concern. At the same time, PKH continues to absorb a substantial share of the social protection budget and is often justified as an investment in human capital.

Previous research on the impact of CCTs on children's cognitive outcomes generally relies on single test scores as outcomes, including math and language scores (Marx, 2023; Ponce & Bedi, 2010; Zhou et al., 2020). Some of these studies report positive but modest gains in test scores among beneficiary children (Garcia & Hill, 2010; Marx, 2023), while others find no clear improvement in general cognitive ability despite better nutrition or health (Sanchez et al., 2016). In addition, very few evaluations jointly consider cognitive achievement and other dimensions of child development, such as nutritional status or school readiness, even though CCTs are expected to influence multiple aspects of child well-being. This study addresses these limitations by using a more integrative measure of cognitive outcomes and complementing it with additional indicators of child development. First, instead of focusing solely on single test scores, we construct a composite cognitive score as the average of test scores in Bahasa Indonesia, mathematics, and abstract reasoning. Each domain is scaled from 0 to 100, standardized to z-scores, and the composite score summarizes overall cognitive performance across subjects. The use of a composite cognitive measure is motivated by evidence that average scores across domains can predict adult outcomes more strongly than any single test score alone (Watts, 2020). It also reflects educational practices in Indonesia in 2013, when graduation and selection into higher levels of schooling relied on average scores across several subjects. Thus, an integrative indicator is arguably more relevant for capturing children's human capital.

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Second, in addition to cognitive test scores, we analyze the impact of PKH on Body Mass Index (BMI) and Early Development Instrument (EDI) scores, specifically the language and cognitive development domain and its subdomains. BMI captures children's nutritional status, which is a key intermediate channel through which CCTs may affect cognitive development. EDI indicators reported by caregivers provide information on children's readiness to learn, including basic literacy, interest in books and numbers, memory, advanced literacy, and basic numeracy skills. They are thus closely related to later cognitive achievement in school. Combining these outcomes paints a broader picture of how PKH may shape multiple, interconnected aspects of child development than cognitive test scores alone.

Third, the analysis focuses on poor rural districts in Indonesia, using data from the 2013 Early Childhood Education and Development (ECED) survey, which covers 310 villages across nine districts in nine provinces. All sampled villages were rural areas classified as underdeveloped and with high poverty rates. Studying PKH in these disadvantaged rural contexts is important to understand whether CCTs can effectively support children's learning in areas where households face multiple deprivations and local education systems may be constrained by limited infrastructure and teacher supply.

This study addresses three related gaps in the literature. First, existing PKH evaluations in Indonesia focus on consumption, health, and schooling indicators and do not examine children's cognitive test scores, particularly for primary-school children in poor rural areas. Second, CCT studies of cognitive outcomes rely primarily on single test scores. In contrast, we employ a composite cognitive score that captures multiple domains and better aligns with how educational success is defined in practice. Third, the literature rarely examines cognitive achievement alongside BMI and EDI measures of school readiness, limiting our understanding of the broader developmental pathways through which CCTs may operate. To fill these gaps, this study examines the impact of PKH on (i) Bahasa Indonesia, mathematics, abstract reasoning, and composite cognitive scores, (ii) children's BMI, and (iii) EDI language and cognitive development outcomes for elementary school children aged 6–9 years and living in poor rural Indonesia, using propensity score matching to address selection bias.

METHODS

This study uses cross-sectional data from the 2013 ECED survey, administered in 310 poor rural villages across 9 districts in 9 provinces. The ECED survey collected detailed information on children's schooling, cognitive achievement, anthropometric measures, early development, and household socioeconomic characteristics in low-income rural communities. We restricted the sample to children aged 6–9 years who were enrolled in primary school at the time of the survey. PKH participation is not randomly assigned in the ECED sample. The program targets poor and vulnerable households using a combination of proxy means testing and eligibility criteria related to the presence of pregnant women, young children, and school-aged children. As a result, children in

PKH-recipient households differ systematically from children in non-recipient households, and simple comparisons of mean outcomes, even with regression adjustments, are likely to be biased. To address this selection problem, we employed propensity score matching (PSM) to estimate the average treatment effect on the treated (ATT) (Rosenbaum & Rubin, 1983). PSM summarizes a household's characteristics into a single propensity score, which indicates the predicted probability that a child's household receives PKH. This measurement allows matching treated children with observationally similar untreated children based on comparable propensity scores. Under the assumptions of conditional independence and common support, PSM can reduce selection bias and approximate the counterfactual outcomes that treated children would have experienced in the absence of the program.

First, we estimated each child's propensity score using a logistic regression of the treatment variable (PKH participation) on a set of covariates that plausibly affect both program eligibility and child outcomes. The treatment variable is a binary indicator at the child level, equal to 1 if the household reported ever receiving PKH benefits and 0 otherwise. The covariates affecting both program eligibility and child outcomes include the child's age (Baker, 2016; Gemellia & Wongkaren, 2021) and gender (Baker, 2016), the head of household's level of education (Choi & Min, 2024; Garcia & Hill, 2010), age (Garcia & Hill, 2010), and gender (Ponce & Bedi, 2010), whether the mother was working (Gemellia & Wongkaren, 2021), the number of children in the household (Becker, 1962), a wealth index constructed using principal component analysis of asset ownership and housing characteristics (Jeffery et al., 2020; Sanchez et al., 2016), and regional characteristics, namely, a dummy variable distinguishing Western from Eastern Indonesia (Garcia & Hill, 2010).

Second, we used the estimated propensity scores to match treated and untreated children. Several matching algorithms were applied, including nearest-neighbor matching, kernel matching, and radius matching with different calipers. We assessed the quality of matching by examining the reduction in standardized bias and the balance of each covariate after matching. The final specification relies on radius matching with a narrow caliper, which provided the best overall balance across covariates.

After constructing the matched sample, we estimated the impact of PKH on children's outcomes. The first group of outcomes captures children's cognitive achievement. In the ECED survey, children completed standardized tests in Bahasa Indonesia, mathematics, and abstract reasoning. The Bahasa Indonesia and mathematics tests were developed based on the national early primary school curriculum, while abstract reasoning was assessed using Raven's Colored Progressive Matrices. Two versions of the test were administered: a short version for children aged 6–7 years and a longer version for those aged 8–9 years. For analysis, only the 38 items present in both versions were used. Raw scores on each test were rescaled to a 0–100 range and then standardized into z-scores using the mean and standard deviation of scores for 6-year-old children in the sample. The composite cognitive score is the average of the three domain scores and ranges from 0 to 100. All cognitive outcomes were then standardized into

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z-scores using the mean and standard deviation of cognitive scores among 6-year-old children.

The second outcome is children's nutritional status, represented by BMI, calculated as body weight (in kilograms) divided by the square of height (in meters). The third group of outcomes is based on the Early Development Instrument (EDI) language and cognitive development domain, as reported by caregivers. This domain aggregates items from four subdomains: basic literacy, interest in books and numbers, having a good memory, and advanced literacy and basic numeracy skills. We used the overall domain score and four subdomain scores, each ranging from 0 to 10, with higher values indicating better school readiness. Analyzing cognitive test scores, BMI, and EDI indicators together enabled us to assess not only narrow test-based skills but also the broader developmental environment in which those skills are formed.

RESULTS AND DISCUSSION

The sample derived from the 2013 ECED survey comprised 11,183 children aged 6–9 years. Among them, only 603 children (5.4%) lived in households that had received PKH. Table 1 presents summary statistics for all the variables used in the analysis. All cognitive outcomes were presented in z-scores, calculated using the mean and standard deviation of the test scores of 6-year-old children. The mean values of all cognitive outcomes were positive, indicating that, on average, the children aged 6–9 years in the sample performed better than 6-year-olds. The sample children had an average BMI of 14.275, which corresponds to the underweight category according to World Health Organization standards, reflecting generally poor nutritional status in these high-poverty rural areas. In contrast, average EDI scores were relatively high, ranging from 8.390 to 9.451 on a 0–10 scale, suggesting that many children displayed relatively strong language and cognitive development according to caregiver reports.

The average age of children in the sample was 7.63 years, with a gender distribution of 50.9% male and 49.1% female. Heads of household were on average 40.88 years old and had completed 7.55 years of schooling, with the majority being male (91.8%). The average number of children per household was 2.23. The wealth index was presented as a z-score with a mean of 0 and a standard deviation of 1. Approximately 51.3% of the children resided in the Western Region of Indonesia and 48.7% in the Eastern Region.

The first step of the PSM method is to estimate the propensity score, defined as the probability that the household where the child lives is a PKH recipient. A logit model was estimated with PKH participation as the dependent variable and a set of observable covariates reflecting child, household, socioeconomic, and regional characteristics as regressors.

Table 1. Summary of Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
Bahasa Indonesia skills	11,183	0.787	1.069	-1.399	1.987
Mathematics skills	11,183	0.480	0.982	-1.610	1.672
Abstract reasoning skills	11,183	0.712	1.132	-1.615	2.870
Composite cognitive skills	11,183	0.796	1.117	-1.871	2.571
Body Mass Index	11,004	14.275	1.755	4.401	30.755
EDI/Language and cognitive development	8,758	9.150	1.574	0	10
EDI/Basic literacy skills	8,994	9.451	1.424	0	10
EDI/Interest in books, numbers, and good memory	8,915	9.373	1.570	0	10
EDI/Advanced literacy skills	8,986	8.390	2.866	0	10
EDI/Basic numeracy skills	8,933	9.236	1.669	0	10
Independent variable					
PKH	11,183	0.054	0.226	0	1
Control variables					
Child's age	11,183	7.633	0.921	6	9
Child's gender	11,183	0.509	0.499	0	1
Head of household's years of schooling	11,183	7.549	4.181	0	20
Head of household's age	11,183	40.875	9.219	16	64
Head of household's gender	11,179	0.918	0.273	0	1
Total number of children in the household	11,183	2.229	1.193	0	10
Working mother	10,734	0.406	0.491	0	1
Wealth index	11,183	0	1	-2.835	2.599
Regional classification	11,183	0.513	0.499	0	1

Source: ECED Survey 2013, processed by the author.

The results presented in Table 2 indicate that most covariates significantly influenced the likelihood of being a PKH recipient. The estimation results suggest that increases in the child's age and the number of children in the household, as well as having a working mother and residing in the Western region of Indonesia, raised the likelihood of households being PKH recipients by 12%, 51.7%, 22.5%, and 57.8%, respectively. Meanwhile, higher levels of schooling among the household head and a higher wealth index reduced the probability of receiving PKH by 5.1% and 43.9%, respectively.

For the PSM estimates to be credible, each treated observation must have comparable control observations within the region of common support. Table 3 summarizes the common support evaluation for several matching algorithms: nearest neighbor matching with one, five, and ten neighbors [NN(1), NN(5), NN(10)], kernel matching with bandwidth 0.06 and 0.03 [Kernel (0.06), Kernel (0.03)], and radius matching with calipers 0.10, 0.05, and 0.01 [Radius (0.1), Radius (0.05), Radius (0.01)].

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Table 2. Logit Estimation of the Probability of a Child's Household Being a PKH Recipient

Variable	Coef.	S.E.	Odds Ratio	p>|z|
Child's age	0.114	0.048	1.12	0.018**
Child's gender	-0.052	0.087	0.949	0.551
Head of household's years of schooling	-0.053	0.013	0.949	0.000***
Head of household's age	-0.001	0.005	0.999	0.872
Head of household's gender	-0.143	0.141	0.866	0.311
Total number of children in household	0.417	0.089	1.517	0.000***
Working mother	0.203	0.031	1.225	0.000***
Wealth index	-0.561	0.053	0.571	0.000***
Regional classification	0.456	0.094	1.578	0.000***
Constant	-4.255	0.448	0.014	0.000***
Observations: 10,730				
Pseudo R^2: 0.0703				

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

The results show that, in general, common support was adequate across all algorithms. Using the nearest-neighbor matching algorithm, all observations fell within the common support. For kernel and radius matching, some observations were off support, but their number was very small; therefore, the condition of sufficient common support was met.

Table 3. Common Support Evaluation Results

Algorithm	On support		Off support		Matched	
	Treatment	Control	Treatment	Control	Treatment	Control
NN(1)	581	10,149	0	0	0	530
NN(5)	581	10,149	0	0	0	2,264
NN(10)	581	10,149	0	0	0	3,792
Kernel (0.06)	581	10,143	0	6	0	10,143
Kernel (0.03)	581	10,133	0	16	0	10,133
Radius (0.1)	581	10,147	0	2	0	10,147
Radius (0.05)	581	10,140	0	9	0	10,140
Radius (0.01)	581	10,128	0	21	0	10,128

Source: ECED Survey 2013, processed by the author.

The next step was to assess the quality of matching. To this end, we examined the reduction in overall standardized bias and the balance of each covariate before and after matching. A covariate is considered balanced if the difference in means between the treatment and control groups is not statistically significant based on the t-test.

As shown in Table 4, the matching process successfully reduced bias between groups. The mean standardized bias across covariates before matching (23.7%) was substantially

reduced after matching, ranging from 1.2% to 18.0% across algorithms. However, several algorithms (kernel matching with a bandwidth of 0.06 and radius matching with calipers of 0.1 and 0.05) still showed significant differences between some covariates after matching, indicating incomplete balance. Therefore, the estimated ATT is not reported. Radius matching with calipers of 0.01 provided the best performance, reducing the mean and median biases to 1.2% and 0.7%, respectively, and balancing all covariates between the treated and control groups. Consequently, ATT estimates based on a Radius (0.01) specification were used as the preferred specification, while results from nearest-neighbor matching and a Kernel (0.03) specification served as robustness checks.

Table 4. Matching Quality Test Results

Algorithm	Before matching (%)		After matching (%)		Bias reduction (%)		Description
	Mean bias	Med bias	Mean bias	Med bias	Mean bias	Med bias	
NN(1)	23.7	14	3.8	3.5	83.97	75.00	All covariates are balanced.
NN(5)	23.7	14	2.2	1.7	90.72	87.86	All covariates are balanced.
NN(10)	23.7	14	1.9	1.3	91.98	90.71	All covariates are balanced.
Kernel (0.06)	23.7	14	8.7	5.1	63.29	63.57	The covariates of the head of household's years of schooling, working mother, number of children in the household, and wealth index still show significant differences.
Kernel (0.03)	23.7	14	3.3	2.5	86.08	82.14	All covariates are balanced.
Radius (0.1)	23.7	14	18	10.3	24.05	26.43	The covariates of the child's age, head of household's years of schooling, head of household's gender, working mother, number of children, and wealth index still show significant differences.
Radius (0.05)	23.7	14	9.6	5.6	59.49	60.00	The covariates of the head of household's years of schooling, working mother, number of children in the household, and wealth index still show significant differences.
Radius (0.01)	23.7	14	1.2	0.7	94.94	95.00	All covariates are balanced.

Source: ECED Survey 2013, processed by the author.

Table 5 presents ATT estimates of PKH using various matching algorithms for the four cognitive outcomes: composite cognitive score, Bahasa Indonesia skills, mathematics skills, and abstract reasoning. Across all algorithms, the estimated ATT values were small, negative, and statistically insignificant, with t-statistics below 1.645 (i.e., the significance threshold at a 90% confidence level). According to these findings, there was no statistically significant difference in cognitive test scores between children from PKH-recipient and non-recipient households, even after balancing observable characteristics using PSM.

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Table 5. Estimated ATT of PKH on Cognitive Outcomes Using PSM

Algorithm	Obs.	Composite cognitive		Bahasa Indonesia		Mathematics		Abstract reasoning	
		ATT (S.E)	t-stat	ATT (S.E)	t-stat	ATT (S.E)	t-stat	ATT (S.E)	t-stat
NN(1)	1,085	-0.061 (0.070)	-1.3	-0.036 (0.068)	-0.54	-0.027 (0.062)	-0.45	-0.100 (0.069)	-1.45
NN(5)	2,845	-0.050 (0.055)	-0.96	-0.020 (0.052)	-0.39	-0.038 (0.049)	-0.78	-0.073 (0.055)	-1.31
NN(10)	4,373	-0.049 (0.053)	-1.07	-0.028 (0.050)	-0.56	-0.040 (0.047)	-0.86	-0.055 (0.053)	-1.03
Kernel (0.03)	10,714	-0.066 (0.050)	-1.44	-0.046 (0.047)	-0.97	-0.059 (0.044)	-1.34	-0.059 (0.051)	-1.16
Radius (0.01)	10,709	-0.050 (0.050)	-1.11	-0.032 (0.048)	-0.67	-0.046 (0.045)	-1.03	-0.048 (0.051)	-0.94

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

The absence of significant effects on cognitive outcomes is broadly in line with the mixed evidence on the educational impacts of CCTs documented in recent literature. Meta-analyses and reviews indicate that although CCTs often improve school enrolment and attendance, their effects on learning outcomes are generally smaller and more heterogeneous, especially in disadvantaged settings (Evans et al., 2023; García & Saavedra, 2017; Millán et al., 2019). Some recent studies document modest gains in specific test scores, but many find no clear impact on cognitive performance, especially when school quality is low and baseline learning levels are weak. In Indonesia, previous evaluations of PKH have shown positive effects on school participation and reductions in child labor (Cahyadi et al., 2020), but standardized cognitive test scores have not been specifically examined. The present study adds to this literature by showing that in poor rural districts, PKH does not lead to measurable improvements in cognitive achievement at ages 6–9, even though it effectively targets disadvantaged households.

To understand why PKH does not translate into better cognitive test scores, it is crucial to consider differences in household conditions between PKH-recipient and non-recipient children, the school environment, and the impact of PKH on nutritional status (BMI) and EDI outcomes. Table 6 compares household socioeconomic characteristics by PKH status. Children from PKH lived in systematically more disadvantaged environments. The heads of household in PKH families had, on average, 1.85 fewer years of schooling than those in non-PKH households and were less likely to have completed basic education. PKH households were also more likely to be headed by women and to have working mothers, while their wealth index was significantly lower. These factors imply that the PKH children grew up in households with tighter financial and time constraints and a more limited capacity to provide cognitively stimulating inputs and educational support. This is consistent with findings in low- and middle-income countries indicating that differences in parental education, household wealth, and early nutritional risks are associated with sizeable disparities in children's cognitive development (Sania et al., 2019).

Table 6. Household and Socioeconomic Characteristics by PKH Participation Status

Variable	Non-PKH			PKH			t-stat/ chi-square
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std Dev.	
Head of household's years of schooling	10,580	7.650	4.183	603	5.799	3.741	0.000***
Head of household's gender	10,576	0.921	0.270	603	0.881	0.325	0.000***
Working mother	10,153	0.399	0.490	581	0.528	0.500	0.001***
Wealth index	10,580	0.033	1.000	603	-0.578	0.796	0.000***

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

Table 7. Household Book Ownership by PKH Participation Status

Variable	Non-PKH		PKH		Diff.	t-stat/ chi-square
	Obs.	Mean	Obs.	Mean		
Owns at least one book	10,566	74.03%	603	61.36%	12.67%	0.000***
Owns more than 10 books	10,566	8.47%	603	3.48%	4.99%	0.000***
Owns more than 15 books	10,566	5.17%	603	1.49%	3.67%	0.000***

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author

The pattern of household investment in learning materials further reinforced this conclusion. Table 7 shows that PKH households were less likely than non-PKH households to own books. Only about 61% of PKH households owned at least one book, compared with 74% of non-PKH households. The gap was only wider for larger numbers of books. These differences were statistically significant at the 1% level. In this context, even with the additional income from PKH, many beneficiary households may still prioritize basic consumption needs and school-related expenses (such as uniforms and transportation) over investments in books and other educational materials, limiting the potential of the transfer to improve cognitive outcomes.

Table 8. Educational Facilities and Infrastructure per School at the District and Provincial Levels (Academic Year 2024/2025)

District	Classrooms/School		Libraries/School		Laboratories/School	
	District	Province	District	Province	District	Province
East Lampung	5.480	5.962	0.411	0.472	0.349	0.413
North Bengkulu	5.573	5.617	0.485	0.526	0.379	0.411
Sarolangun	3.943	5.154	0.358	0.449	0.208	0.317
Majalengka	5.723	5.862	0.344	0.405	0.248	0.381
Rembang	4.694	5.495	0.377	0.462	0.295	0.409
Kulon Progo	3.795	4.941	0.472	0.521	0.376	0.545
Sidenreng Rappang	5.884	5.772	0.574	0.550	0.363	0.384
Ketapang	5.252	5.487	0.494	0.557	0.314	0.359
Middle Lombok	4.415	4.761	0.385	0.395	0.194	0.260

Source: Basic Education Data, Ministry of Education and Culture, processed by the author.

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School takes on an increasingly important role in shaping children's cognitive skills relative to parental investment at home between ages 6 and 9 (Wang et al., 2023). PKH requires school-age children to attend a minimum of 85% of effective learning days, thereby increasing enrolment and attendance. However, being physically present at school does not necessarily imply exposure to effective learning. The quality of school infrastructure and teachers is crucial in determining whether increased attendance leads to better learning outcomes.

Table 8 compares the average number of classrooms, libraries, and laboratories per primary school in the sample districts with provincial averages for the 2024/2025 academic year. The nine sample districts were classified as underdeveloped areas by the Ministry of Development of Underdeveloped Regions, and this was reflected in their educational infrastructure. In most districts, the average number of classrooms, libraries, and laboratories per school was lower than the corresponding provincial averages, with only a few exceptions. Given that these figures are based on recent data, it is likely that the infrastructure gaps were even larger in 2013, when the ECED survey was conducted, before efforts to reduce regional disparities in basic education began.

Teacher availability was similarly constrained. Table 9 shows that most sample districts had fewer teachers per school than provincial and national averages, leading to larger classes and heavier workloads, especially when PKH encourages additional enrolment. In such conditions, teachers may struggle to provide sufficient attention and support to all students, and opportunities for active learning and practice may be limited. The role of teachers is particularly critical in low- and middle-income countries, where many students have few alternative learning opportunities outside school due to low household income (Sanfo, 2024). Yet, recent evidence indicates that higher teaching quality alone is insufficient to close learning gaps, as students from higher socioeconomic backgrounds tend to benefit more in the absence of comparable instructional support for disadvantaged peers (Atlay et al., 2019). In some settings, large declines in dropout have led to larger, more heterogeneous classes, with adverse effects on test scores (Gazeaud & Ricard, 2024). In low-resource settings, enrolling more children in school without simultaneously improving school quality often fails to produce meaningful gains in learning (García & Saavedra, 2017; Millán et al., 2019). These findings show that, in the absence of parallel supply-side improvements, CCTs risk straining limited school resources and having only a modest impact on learning.

Overall, the limited school infrastructure and the shortage of teachers in the sample districts mean that higher attendance induced by PKH did not automatically translate into higher-quality learning. Without adequate classrooms, libraries, laboratories, and teaching staff, students' exposure to effective instruction and learning resources remained constrained. This likely contributed to the absence of significant impacts of PKH on cognitive test scores in this study, despite its success in encouraging school participation.

The age range of 6–9 years covered by the study corresponds to early primary school, when children build on skills acquired earlier in life. A growing body of evidence indicates that early-childhood education has high returns and complements later educational investments (Cunha & Heckman, 2007). In Indonesia, early-childhood education, such as attending kindergartens (TK and RA), can lay important foundations for later learning,

particularly for children from poor households. To explore the role of early-childhood education within the PKH context, this study compared the cognitive outcomes of PKH and non-PKH children based on their participation in TK/RA (Table 10).

Table 9. Number of Teachers per Primary School in Sample Districts, Provincial, and National Levels (Academic Year 2024/2025)

District	Teachers/School		
	District	Province	National
East Lampung	9.97	11.36	10.11
North Bengkulu	10.67	11.61	10.11
Sarolangun	10.27	11.08	10.11
Majalengka	9.40	10.15	10.11
Rembang	8.12	8.15	10.11
Kulon Progo	8.10	10.03	10.11
Sidenreng Rappang	9.10	10.12	10.11
Ketapang	8.67	8.41	10.11
Middle Lombok	10.00	13.06	10.11

Source: Basic Education Data, Ministry of Education and Culture, processed by the author.

Table 10. Cognitive Outcomes of PKH Beneficiary Children by Participation in Kindergarten or Raudatul Athfal

Variable	Non-TK/RA				TK/RA			
	PKH	Non-PKH	Diff.	t-stat	PKH	Non-PKH	Diff.	t-stat
Bahasa Indonesia	0.431	0.571	-0.140	2.2**	0.868	0.967	-0.099	1.6
Mathematics	0.053	0.249	-0.196	3.4***	0.557	0.679	-0.122	2.2**
Abstract reasoning	0.354	0.510	-0.156	2.4**	0.742	0.890	-0.148	2.2**
Composite cognitive	0.329	0.531	-0.201	3.1***	0.876	1.023	-0.147	2.3**

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

The results indicate that children who attended TK/RA had higher cognitive scores than those who did not, regardless of PKH status. Among children who did not attend TK/RA, PKH beneficiaries performed significantly worse than non-PKH children, with cognitive gaps of around 0.20 standard deviations in composite scores and similar magnitudes in subject-specific tests, as shown in Table 10. Among children who attended TK/RA, PKH beneficiaries still had lower cognitive scores than their non-PKH peers, but the gaps were narrower. This pattern suggests that TK/RA enrolment not only raised average cognitive achievement but also helped to narrow performance gaps between children from PKH and non-PKH households.

Our findings imply that participation in early-childhood education can mitigate some of the disadvantages associated with growing up in a poor PKH-recipient household. In other words, TK/RA has the potential to act as an equalizing force, reducing cognitive disparities between beneficiary and non-beneficiary children. From a policy perspective, this supports the idea of systematically linking PKH to early childhood education services.

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Table 11. Estimated ATT of the PKH Program on Body Mass Index

Variable	Obs.	ATT	S.E	t-stat
Body Mass Index	10,689	0.021	0.068	-0.31

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

Analysis of other child outcomes further illuminates the mechanisms underlying the main results. Table 11 reports the ATT estimates of PKH on children's BMI. The estimated effect was close to 0 (0.021) and statistically insignificant, indicating that PKH did not improve nutritional status among beneficiary children. In high-poverty areas where nutritious food is relatively expensive, the amount of cash transferred by PKH may be insufficient to improve diet quality substantially. Moreover, households may allocate transfers to multiple competing needs, such as staple foods, school-related expenditures, and other basic consumption, leaving little room for upgrading children's nutrition. Evidence indicates that childhood stunting is associated with weaker cognitive and intellectual functioning, highlighting the importance of good nutrition as a foundation for learning (Sideropoulos et al., 2025). A persistently low BMI and poor nutritional status may reduce children's concentration, energy, and memory, thereby constraining their learning capacity and limiting the potential impact of PKH on their cognitive test scores. By contrast, the ATT estimates for EDI outcomes in Table 12 are more encouraging. PKH had a positive, statistically significant effect on the EDI language and cognitive development domain (ATT ≈ 0.14, significant at the 10% level) and on the subdomains of basic literacy and basic numeracy (significant at the 5–10% level). The effects on the subdomains of interest in books, numbers, and good memory and advanced literacy skills were also positive but not statistically significant.

Table 12. Estimated ATT of the PKH Program on EDI/Language and Cognitive Development

Variable	Obs.	ATT	S.E	t-stat
Domain				
Language and cognitive development	8,509	0.14	0.08	1.74*
Subdomains				
Basic literacy skills	8,754	0.142	0.071	2.01**
Interest in books, numbers, and having a good memory	8,678	0.101	0.079	1.28
Advanced literacy skills	8,744	0.159	0.148	1.08
Basic numeracy skills	8,693	0.143	0.082	1.76*

*** significant at 1%; ** significant at 5%; * significant at 10%
Source: ECED Survey 2013, processed by the author.

These findings indicate that PKH was associated with higher school readiness among beneficiary children, particularly in foundational literacy and numeracy. One plausible interpretation is that PKH reduces financial barriers to school entry and continuity, enabling poor households to keep their children in school and meet basic schooling requirements. This may translate into improvements in behaviors and skills captured by the EDI, such as being interested in books, recognizing letters and numbers, and performing simple numerical

operations, even if these changes are not yet reflected in higher scores on more demanding standardized cognitive tests. These modest gains have longer-term implications, provided that they are sustained and supported by improvements in school quality.

These findings imply that cash transfers alone are unlikely to yield substantial improvements in learning outcomes in high-poverty rural settings without complementary investments in early childhood services, school quality, and child nutrition. To ensure that PKH can fully play its role as a human capital investment, policymakers should therefore consider the following strategies.

First, the government should prioritize strengthening school infrastructure, particularly in underdeveloped rural areas where PKH beneficiaries are concentrated. The results show that many schools in the study districts have fewer classrooms, libraries, and laboratories than provincial and national averages, even in recent years. The gap was likely even wider at the time of the ECED survey. In such contexts, additional attendance driven by PKH is unlikely to yield meaningful learning gains if children spend their time in overcrowded classrooms without access to basic learning facilities. Ensuring that primary schools have adequate classrooms, functioning libraries, simple laboratories, and sufficient learning materials is therefore essential. Moreover, these facilities must not only be provided but also effectively used as part of the teaching and learning process so that they genuinely enrich children's learning experiences.

Second, improving both the quantity and the quality of teachers is crucial to convert higher enrolment and attendance into better learning outcomes. The analysis of teacher–school ratios indicates that schools in the sample districts were often understaffed compared with provincial and national benchmarks. When teachers face large classes and additional students due to PKH, they may struggle to provide individual attention and manage classrooms effectively. Policy efforts should therefore focus on recruiting more teachers in underserved rural areas and on enhancing their professional competencies through targeted training programs. Priority areas include subject-matter mastery, classroom management, the use of effective and child-centered teaching strategies, and the reinforcement of teacher discipline and motivation. With more competent and adequately supported teachers, the additional time PKH children spend in school is more likely to lead to real improvements in cognitive skills.

Third, the results highlight the important role of early-childhood education in mitigating the initial disadvantages of PKH children. Children who attended TK/RA had higher cognitive scores than those who did not, and participation in TK/RA appeared to reduce the cognitive achievement gap between PKH and non-PKH children. Early-childhood education can act as an equalizing force. In the medium to long run, it is desirable to more closely integrate PKH with early-childhood education services, for example, by gradually introducing attendance at TK/RA as a program conditionality. A similar approach has been adopted in El Salvador, where CCT conditionalities include minimum school attendance requirements for children aged 5–15 years (Sanchez Chico et al., 2020). Evidence from other CCTs also indicates that cash alone may not be effective for the development of young children; thus, conditionalities should be designed to reflect early childhood needs

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(Lopez Boo & Creamer, 2019). However, this must be done carefully and in stages because access to TK/RA remains limited and uneven, especially in rural and underdeveloped regions (Brinkman et al., 2017; Nakajima et al., 2016). In the initial phase, TK/RA attendance requirements should be applied flexibly, taking into account local service availability: where TK/RA services exist, PKH households should be encouraged or required to enroll their children; where services are absent, such requirements should not be imposed. During this phase, the government's main responsibility is to expand TK/RA infrastructure and services, particularly in poor and remote areas, so that all young children can access inclusive and affordable early-learning opportunities. Only once TK/RA coverage is broadly adequate can the policy move to a second phase, in which TK/RA attendance becomes a standard conditionality for PKH beneficiaries, implemented uniformly across regions.

Finally, given that PKH does not significantly improve children's BMI and that many beneficiary children remain underweight, complementary nutrition interventions are needed to support the development of their cognitive skills. The insignificant ATT on BMI suggests that the current transfer level may not be sufficient to substantially upgrade diet quality, especially when households face multiple competing needs. In high-poverty and underdeveloped areas, PKH could therefore be complemented by the targeted provision of nutritious food for beneficiary children, for example, through school feeding schemes, fortified snacks, or vouchers for nutritious products. To maintain fiscal efficiency, these interventions should carefully target PKH households in the poorest and most disadvantaged regions, where the risk of undernutrition is highest, and the potential returns in terms of improved learning are likely to be greatest. By simultaneously addressing constraints in school infrastructure, teacher capacity, early childhood education, and child nutrition, PKH would have a much greater chance of fulfilling its objective of breaking the intergenerational transmission of poverty through investments in children's human capital.

CONCLUSION

This study examined whether PKH improves the cognitive outcomes of primary-school children aged 6–9 years in poor rural districts. Using 2013 ECED survey data and PSM to address selection into PKH, we assessed the program's impact on Bahasa Indonesia proficiency, mathematics skills, abstract reasoning, a composite cognitive score, BMI, and EDI language and cognitive development outcomes. The estimates show that PKH does not have a statistically significant effect on any of the cognitive test scores, with small, insignificant ATT values across the matching algorithms. By contrast, PKH is associated with modest but positive effects on EDI outcomes in the language and cognitive development domain, particularly in basic literacy and basic numeracy, suggesting that the program enhances school readiness, even though these gains have not yet translated into higher cognitive test scores. Descriptive evidence points to several constraints that likely attenuate PKH's impact on learning: PKH children grow up in households with lower parental education, lower wealth, and fewer books; they attend schools with below-average infrastructure and teacher availability; they also often remain underweight, with no detectable effect of PKH on BMI.

These findings imply that cash transfers alone are unlikely to yield substantial improvements in learning outcomes in high-poverty rural settings without complementary investments in early childhood services, school quality, and child nutrition. Therefore, to strengthen PKH's role as a human capital investment, policymakers should consider the following strategies. First, school infrastructure should be improved in underdeveloped rural districts by ensuring access to adequate classrooms, libraries, laboratories, and learning materials. Second, both the quantity and the quality of teachers in disadvantaged areas must be increased. Third, PKH should be more closely linked to early childhood education by gradually introducing TK/RA attendance as a condition while simultaneously expanding TK/RA service availability and applying requirements flexibly where access remains limited. Finally, transfers should be complemented with selective nutrition interventions, such as school feeding schemes or vouchers for nutritious foods, focusing on PKH children in the poorest and most underdeveloped regions. By addressing these constraints, PKH will be better positioned to improve children's cognitive achievement and contribute to the long-term goal of breaking the intergenerational transmission of poverty.

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