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Examining the effects of 4Ps participation on nutritional outcomes in the Philippines

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Alyssa Villanueva, Valerie Gilbert Ulep, and Rosela Agcaoili



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Abstract

Over the years, the Pantawid Pamilyang Pilipino Program (4Ps) has been at the forefront of the government's efforts to alleviate poverty and improve health and nutrition outcomes among the most vulnerable Filipino families. These programs, which offer financial assistance in return for complying with health, education, and nutrition-related requirements, have shown positive effects on children's nutritional outcomes. This study investigates how children's nutritional outcomes are affected by conditional cash transfers (i.e., 4Ps) in the Philippines. It aims to explore the role that the 4Ps play in the prevalence of stunting and wasting in children. By using the 2018-2019 Expanded National Nutrition Survey (ENNS) from the Food and Nutrition Research Institute, and through propensity score matching, the research assesses the probability that the poor and poorest households will take part in the 4Ps program. The study estimates the causal effect of 4Ps participation on a range of nutritional indicators, including weight-for-height, height-for-age, weight-for-height, and body mass index Z-scores, stunting, underweight, wasting, and severe stunting, by comparing matched groups and taking various covariates into account. The results highlight the need for a nuanced understanding of the program's effects as they show no significant improvement in children's nutritional status based on the program's impacts.

Keywords: Pantawid Pamilyang Pilipino Program (4Ps), conditional cash transfers (CCTs), nutrition, Philippines

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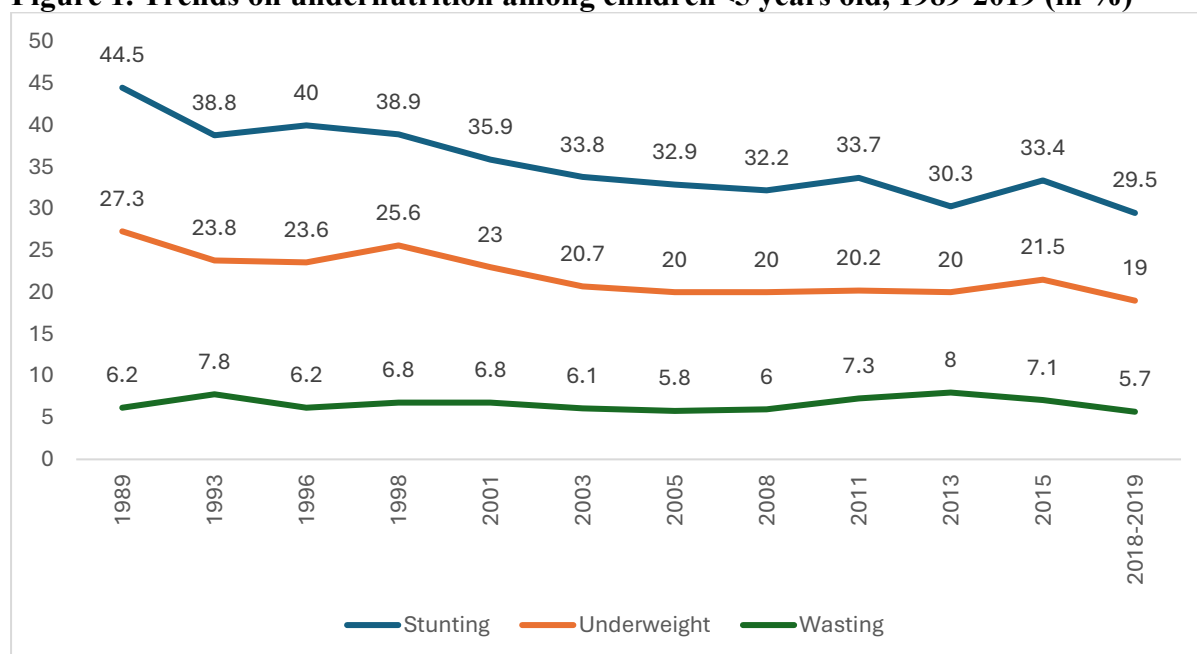
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Alyssa Villanueva, Valerie Gilbert Ulep, and Rosela Agcaoili¹

Introduction

Nutrition outcomes in the Philippines have exhibited fluctuating trends over the years (Figure 1). There was a reduction in prevalence rates in three sub-forms of undernutrition—underweight, stunting and wasting—among children under five years old in 2018–2019 compared to 2015 (DOST-FNRI 2020). Despite these improvements, undernutrition remains a persistent issue, with one in three children still stunted. Moreover, wasting rates hover above the national target.

Figure 1. Trends on undernutrition among children <5 years old, 1989-2019 (in %)



Source: Authors' visualization of data from Food and Nutrition Research Institute (2020)

In 2007, the Philippines introduced its flagship poverty alleviation initiative called the Pantawid Pamilyang Pilipino Program (4Ps), which aimed to improve the human capital of children in low-income households by investing in their nutrition and health, along with their education. As a conditional cash transfer (CCT) program, 4Ps provides financial support to eligible households, contingent upon meeting specific conditions such as regular health check-ups, school attendance, and active participation in nutrition-related activities (Acosta et al. 2019).

The 4Ps was patterned after the CCT program implemented in Latin America and South Africa. A few studies have highlighted the positive impact of these CCT initiatives on

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children's nutritional outcomes (Lopez-Arana et al. 2016; Bliss et al. 2018; and Chakrabarti et al. 2021). However, their researchers recognized certain limitations in their studies, such as loss of follow-up samples and the absence of baseline assessments, due to the quasi-experimental nature of their research.

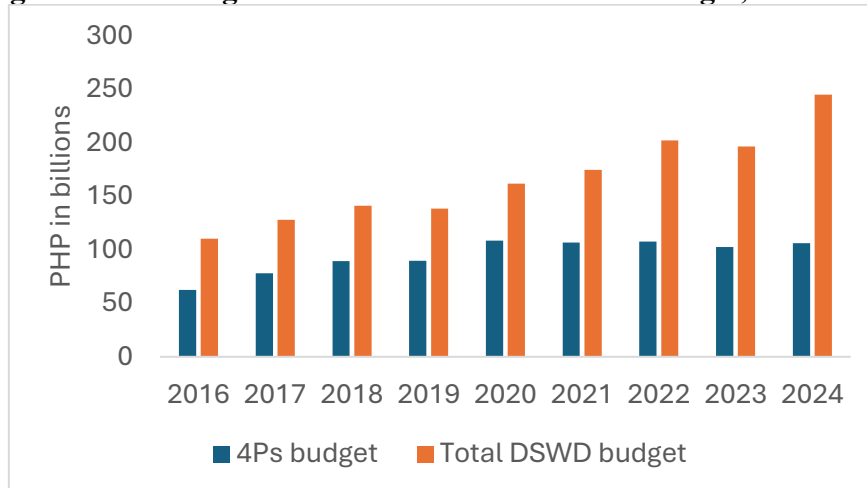
In this chapter, the effect of 4Ps on child malnutrition, specifically on underweight, stunting, severe stunting and wasting conditions, is analyzed using the Propensity Score Matching (PSM) approach.

Pantawid Pamilyang Pilipino Program (4Ps)

Twelve years after its introduction, the 4Ps was institutionalized when Republic Act No. 11310 was signed into law on 17 April 2019. The Department of Social Welfare and Development (DSWD) is the main government agency responsible for implementing the 4Ps.

The 4Ps get more than 60 percent of DSWD's total annual budget. Figure 2 shows the increasing share of 4Ps in the agency's budget from 2016 to 2020 (60.4% in 2016 to 67.2% in 2020). However, in 2021, the program started to receive a lower allocation, dropping to 43.4 percent in 2024. Despite this, the Commission on Audit (2022) estimated that a total of PHP 537.39 billion cash grants were given to over 4 million households and 9 million children in 41,676 barangays from 2008–2021. The rise in the number of beneficiary households was observed after the implementation of Memorandum Circular No. 12 in 2019, which institutionalized the replacement of households that exited the program.

Figure 2. 4Ps budget allocation and DSWD total budget, 2016–2024

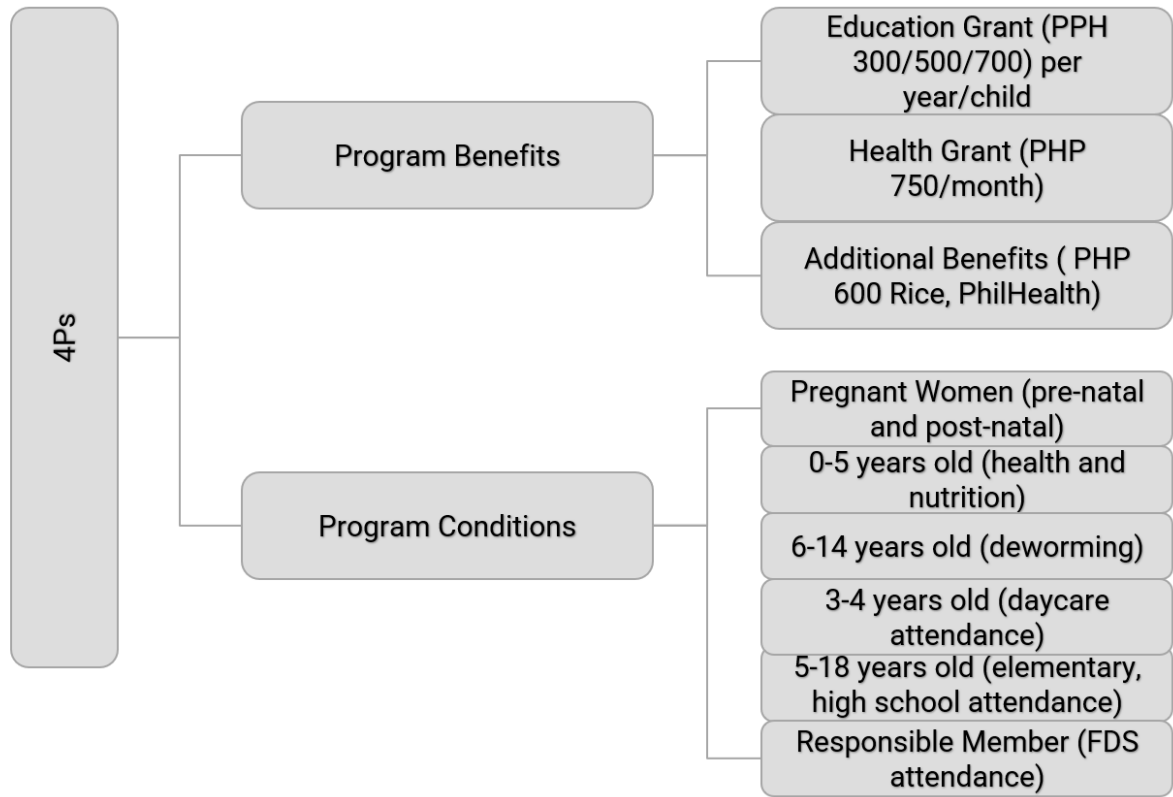


Source: Authors' compilation of data from Department of Budget and Management

The program operates on a reciprocal commitment, where families receive benefits in exchange for meeting specific conditions. After they have been successfully verified to have complied to the conditions, beneficiary households receive bi-monthly cash benefits (Figure 3). Education grants are extended to households meeting conditions for school-age children (ages 3 to 18). Meanwhile, health grants are allocated to households with monitored family members, including pregnant women and children aged 0–14. Beneficiaries also enjoy additional support from DSWD programs that provide temporary assistance such as the

National Health Insurance Program (which ensures health coverage) and the Rice Subsidy (which bolsters food security).

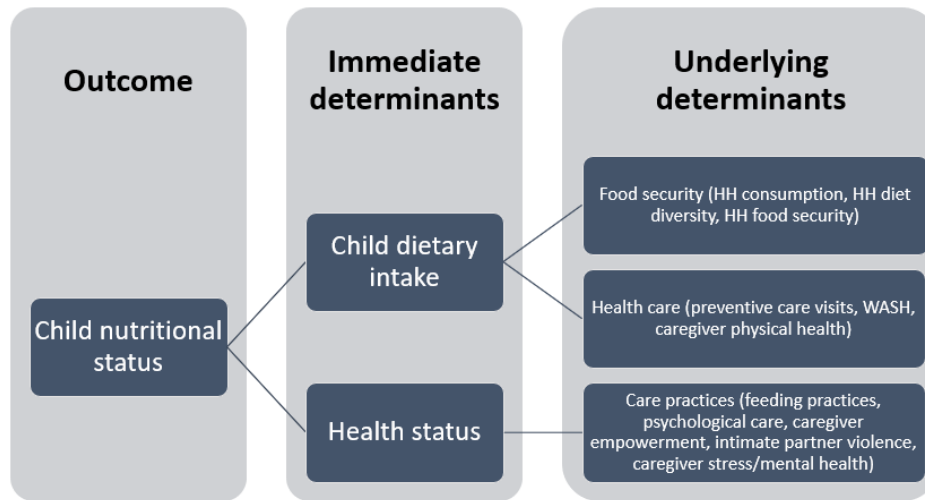
Figure 3. Overview of benefits and eligibility criteria for the 4Ps



Note: 4Ps = Pantawid Pamilyang Pilipino Program; FDS = Family Development Session; UCT = unconditional cash transfer.
Source: Authors’ illustration based on the Pantawid Pamilyang Pilipino Program Act (Republic Act 11310)

Nutritional effects require more comprehensive interventions than what cash transfers normally aim to achieve. To understand the types of impact that can be pragmatically expected from cash transfer programs on child nutrition, one needs to recognize the underlying and immediate determinants of child nutrition. The immediate determinants of a child’s nutrition are dietary intake and health status, which are then influenced by food security (i.e., a household’s consumption, household diet diversity and household food security), health care, and care practices (Figure 4). The 4Ps influences some elements in these causality pathways.

Figure 4. Theory of change: Pathways of 4Ps toward potential nutritional impacts



Source: Adapted from the extended model of the care conceptual framework of UNICEF for nutrition

Aside from offering support services such as the Family Development Session (FDS)—a monthly group activity that aims to empower parents and promote effective parenting practices—the 4Ps plays a role in addressing malnutrition. The FDS fosters health-seeking behavior and helps beneficiaries comply with the health conditionalities even after the cash transfer ends. Furthermore, the cash grant component aims to ensure that communities are healthier, more resilient, and free from the cycle of undernutrition by enabling them to access nutritious food.

These grants were often spent on school-related expenses, transportation to health facilities, and food items. Spending on food directly impacts households' food security and ensures that children receive adequate nutrition (in effect, addressing malnutrition due to insufficient food intake).

The program's cash grants reach women predominantly (around 86%), who are likely to be the children's primary caregivers. The FDS, likewise, equips caregivers with the knowledge of childcare practices, including feeding behaviors and nutrient intake. These are examples of pathways where 4Ps can influence and enhance child nutrition (Cho et al. 2020).

The 4Ps also addresses other underlying drivers of malnutrition at the household level through its linkages to other initiatives. For instance, FDS participants may be provided with seedlings from the Department of Agriculture or linked to free toilet bowl initiatives. Overall, the 4Ps supports children's nutritional needs during their formative years for better cognitive and physical development and, subsequently, better health outcomes (UNICEF 2019).

Several empirical studies have shown the positive effects of 4Ps. There are studies that attributed certain programs' successes to factors such as participants' enhanced utilization of health services, positive shifts in dietary patterns, and notable behavioral changes (Kandpal et al. 2016).

Other studies noted that potential adverse externalities could be linked to the program (World Bank 2013). Filmer et al. (2018) proposed that CCTs might drive up prices of nutrient-rich food. In areas with more 4Ps beneficiaries, the perishable goods such as high-protein food crucial for children's growth, were found to have higher prices. This led to less eating by non-beneficiaries and more children being stunted.

The impact of various phases of 4Ps on children's nutritional outcomes had also been examined in several research (Cho et al. 2020; Kandpal et al. 2016; Filmer et al. 2018; and Orbeta et al. 2014, 2021) More recent evaluation research, which utilized diverse methodologies, yielded inconclusive results. Studies on the initial phase of 4Ps demonstrated the program's robust impact: That is, the program reduced severe stunting in children aged 6-36 months and enhanced height-for-age z-scores (HAZ) (Table 1). It also influenced parental dietary decisions. However, subsequent impact evaluations revealed that the program had no significant effect on stunting outcomes. The third evaluation in 2017–2018 highlighted an increase in severe stunting rates among children aged 0-5 years.

Table 1. Impact evaluations of 4Ps on nutrition

Studies/Author(s)	Year	Methodology	Findings
IE1 by World Bank researchers and DSWD	2013	RCT	Significant reduction in stunting and severe stunting
Kandpal et al.	2016	RCT	Improvement in anthropometric measures (e.g., height for age)
Filmer et al.	2018	RCT	Increases in stunting among non-beneficiary children
IE2 by PIDS researchers and DSWD	2014	RDD	No significant effect on stunting outcomes
IE3 by PIDS researchers and DSWD	2021	RDD	Negative results among non-monitored children in beneficiary households No significant impact for children aged 0-2 years Positive impact on older children monitored

4Ps = Pantawid Pamilyang Pilipino Program; DSWD = Department of Social Welfare and Development; IE = impact evaluation; PIDS = Philippine Institute for Development Studies; RCT = randomized controlled trial; RDD = regression discontinuity design.

Source: Authors' compilation

Empirical studies from other countries offer valuable insights into the nuanced effects of CCT programs on nutrition outcomes (Table 2). In their evaluation of the Moderate Acute

Malnutrition Out (MAM'Out) program in Burkina Faso and the Bolsa Familia program in Brazil, Hounge et al. (2017) and Sperandio et al. (2017) respectively found no significant effects on child nutritional status.

On the other hand, other studies showed how different CCT programs bring a positive effect. Lopez-Arana et al. (2016) found a reduction in thinness among children under Colombia's Familias Accion program. Similarly, Chakrabarti et al. (2021) observed decreasing stunting rates in India. Bliss et al. (2018) documented increased weight and improved weight-for-height (WHZ) z-scores among children in Niger.

Table 2. Impact evaluations of selected studies on Conditional Cash Transfer Programs on nutrition

Studies/Author(s)	Year	Methodology	Findings
Houngbe et al.	2017	RCT	No change in the malnutrition status of children in Burkina Faso
Sperandio et al.	2017	PSM	No change in the malnutrition status of children in Brazil
Lopez-Arana	2016	DID	Reduced the odds of thinness, but had no effect on stunting in Colombia
Chakrabarti et al.	2021	DID	Decline in stunting in India
Bliss et al.	2018	Multilevel mixed effects regression	Increased child weight gain and WHZ in Niger

DID = difference in differences; PSM = propensity score matching; RCT = randomized controlled trial; WHZ = weight-for-height z-score.

Source: Authors' compilation

As shown in the table above, CCT programs exhibit different outcomes, depending on the program structure (such as small transfer amounts that fail to yield positive and significant changes on target outcomes) and contextual factors driven by socioeconomic, cultural, and environmental differences (such as distance to the facility and poor roads, Onwuchekwa et. al 2021) and even religious beliefs. Nutrition outcomes are considered higher-level outcomes mainly because they draw from several sectors such as agriculture, social welfare, water, sanitation, and hygiene (WASH), social welfare, health as well as individual behaviors. As such, there is no single program that can significantly reduce stunting. Therefore, the conduct of additional studies may help improve the effectiveness of existing programs, design new interventions, and enhance stakeholders' understanding of the factors and determinants behind CCT's success in improving child nutrition globally. Qualitative studies that look into households and individual level behaviors can shed light on these mixed findings.

Methodology

Covariates and Propensity Score Matching

This chapter utilized the 2019 Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI) National Nutrition Survey dataset for its analysis, specifically targeting the bottom 40 percent of the survey population—i.e., households classified within the poor and poorest wealth quintiles.

The authors generated the nutrition outcome variables, specifically the anthropometric indices in z-scores:² HAZ, WHZ, weight-for-age (WAZ), and BMI-for-age (BMIZ). They used the World Health Organization's (WHO) child growth standards for precise measurements using the indicators on children's physical development. They then established classifications for underweight (WAZ below minus two standard deviations), stunting (HAZ below minus two standard deviations), severe stunting (HAZ below minus three standard deviations), and wasting (WHZ below minus two standard deviations), to gauge nutritional status based on WHO growth standards.

Implausible values were further excluded to enhance the accuracy of the study. The biologically implausible values identified were as follows: z-scores falling below -5 or exceeding +5 for BMIZ, WAZ and WHZ, and below -6 or above +6 for HAZ (Renzaho et al. 2017).

Dataset variables used included: (a) the child's characteristics: gender, age, ethnicity, religion; (b) household composition and assets: number of household members aged 3-5 years old, inclusion in the poorest quintile, has at least one TV, has at least one VCD, has at least one refrigerator, has at least one washing machine, has at least one cellphone, has at least one telephone, has at least one radio, has at least one motorcycle, and an electrical connection; (c) household demographics: household head being a male; the household head's civil status, work status, education (i.e., primary or less/secondary/intermediate/other classification); the spouse's education (i.e., primary or less/secondary/intermediate/other classification). These socio-demographic and socio-economic variables indicated the likelihood of households' participation in 4Ps.

Descriptive statistics were used to summarize important variables. The inclusion of covariates in a logistic regression model generated propensity scores.

A propensity score is defined as the probability of households' participation in 4Ps given their socio-demographic and socio-economic characteristics:

$$p(X) = Pr(D = 1|X)$$

where X is the vector of explanatory variables while D tells whether the household was exposed to the treatment or not.

² z-score = $\frac{mi - mrr}{r}$, where mi is the observed height or weight of a child of a specified age and gender, mr is the median height or weight, and r is the standard deviation of the height or weight of children belonging to that particular age-gender group in the reference population.

The impact of the treatment, given by δ_i is the difference between the potential outcomes when households are treated versus not treated.

$$Y_{1i} - Y_{0i}$$

The propensity score serves as a summary of all relevant variables to assess treatment effects and control confounding variables in subsequent analyses.

Following propensity score adjustments, the authors conducted a balance assessment to calculate standardized differences for each covariate and thus to ensure consistent data balance for the planned analysis. The dataset included both continuous and categorical variables represented by binary indicators. Utilizing the propensity score, the authors analyzed the average effect among individuals specifically receiving the 4Ps program. The Average Treatment Effect of the Treated (ATT) is the difference between the average outcome of treated individuals and the unobserved counterfactual:

$$ATT = E(Y_1|D = 1) - E(Y_0|D = 1)$$

The authors then matched families in the treatment and control groups³ using propensity scores and applied these in a logistic regression model to assess the impact of being a 4Ps beneficiary on various nutritional indicators, including HAZ, WAZ, WHZ, BMIZ, underweight, stunting, severe stunting, and wasting variables. This quantitative analysis illuminated how the program influences the development and growth of its beneficiaries.

Robustness checks

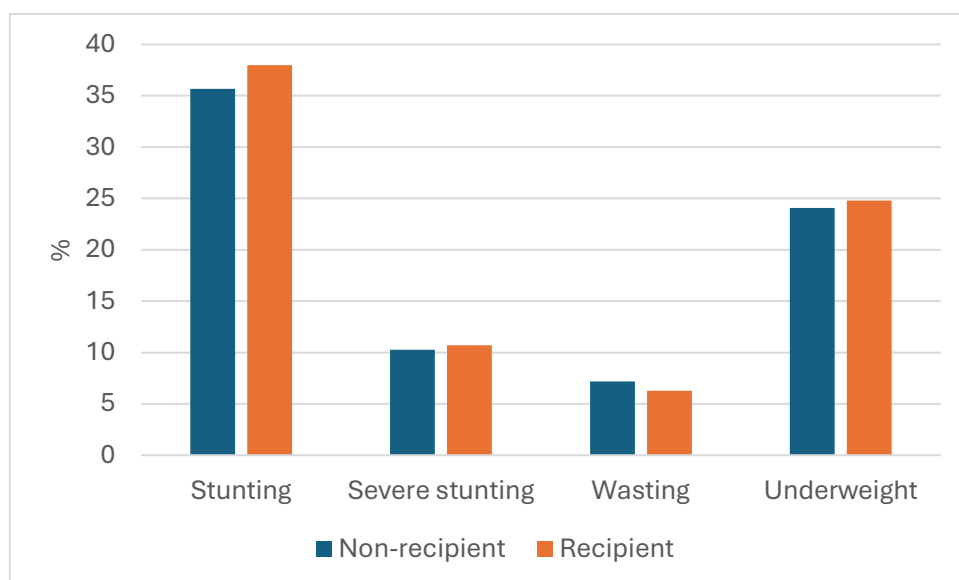
Propensity Score Matching (PSM) can control observed covariates, but the authors acknowledged its limitations. It assumes ignorability, common support, unobservable factors, among others. The implications of violating these assumptions on results can be assessed using robustness checks to ensure the reliability of the research findings. The researchers performed robustness checks on the PSM using Inverse Probability Weighting (IPW) and Nearest Neighbor Matching (NNM) to provide an additional layer of validation for their results. In the IPW approach, they weighed observations based on the inverse of the estimated propensity scores. In NNM, they matched each treated unit with its closest counterpart in the control group (StataCorp 2023). This dual-method analysis enhanced the reliability and validity of the conclusions, contributing to the overall robustness of the PSM technique applied in this study.

Results and discussion

Consistent with the trend depicted in Figure 1, Figure 5 shows that the prevalence of stunting is at its peak while the prevalence of wasting remains comparatively lower. It is worth noting that, except for wasting, individuals benefiting from 4Ps exhibit a higher prevalence of underweight, severe stunting, and stunting.

³ treatment group = 4Ps recipients; control = 4Ps non-recipients

Figure 5. Comparison of prevalence of stunting, severe stunting, wasting, and underweight among 4Ps recipients vs. 4Ps non-recipients, 2019



Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)

The test of balance in observable characteristics between control and treatment households based on the 2019 data from the DOST-FNRI NNS is outlined in Table 3. There are significant differences in some explanatory and outcome variables between non-recipients and recipients due to pre-existing variations in household characteristics. Certain t-tests and proportion tests for specific variables resulted in p -values < 0.1 , signifying standard deviations between treatment and control households in some pairwise comparisons. The p -values and significant differences between control and treatment households indicate that random assignment was not entirely successful.

Table 3. Summary statistics of the matching variables

	Non-recipient		Recipient		
Variable	Total Number of Observations	Mean (SE)	Total Number of Observations	Mean (SE)	T-test/Proportion Test <i>p</i> -value
<i>Anthropometric measures</i>					
WAZ (weight-for-age) z-score	4,621	-1.217 (0.016)	2,345	-1.280 (0.021)	0.021**
HAZ (weight-for-age) z-score	4,583	-1.474 (0.018)	2,331	-1.569 (0.025)	0.005***
WHZ (weight-for-height) z-score	4,590	-0.561 (0.016)	2,329	-0.566 (0.021)	0.851
BMI z-score	4,599	-0.426 (0.016)	2,334	-0.426 (0.021)	0.990
Stunting	4,600	0.323 (0.007)	2,336	0.351 (0.010)	0.016**

Underweight	4,621	0.225 (0.006)	2,345	0.231 (0.009)	0.568
Wasting	4,590	0.078 (0.004)	2,329	0.069 (0.005)	0.186
Severe stunting	4,583	0.089 (0.004)	2,331	0.093 (0.006)	0.661
<i>Child's characteristics and diet</i>					
Age (in months)	5,219	27.872 (0.239)	2,574	28.560 (0.346)	0.100
Sex (=1 male, 0 otherwise)	5,219	0.524 (0.007)	2,574	0.524 (0.010)	0.990
Ethnicity (=1 indigenous, 0 otherwise)	4,628	0.166 (0.005)	2,350	. 0192 (0.008)	0.007***
Religion (=1 Roman Catholic, 0 otherwise)	5,219	0.636 (0.007)	2,574	0.559 (0.010)	0.000***
<i>Household composition and assets</i>					
No. of HH members 3-5 years old	5,219	0.485 (0.012)	2,574	0.486 (0.015)	0.966
Poorest wealth quantile (=1 yes, 0 otherwise)	5,217	0.537 (0.007)	2,574	0.585 (0.010)	0.000***
At least 1 TV (=1 yes, 0 otherwise)	5,219	0.510 (0.007)	2,574	0.509 (0.010)	0.900
At least 1 VCD (=1 yes, 0 otherwise)	5,219	0.113 (0.004)	2,574	0.127 (0.007)	0.080*
At least 1 refrigerator (=1 yes, 0 otherwise)	5,219	0.067 (0.003)	2,574	0.063 (0.005)	0.491
At least 1 washing machine (=1 yes, 0 otherwise)	5,219	0.066 (0.003)	2,574	0.065 (0.005)	0.965
At least 1 cell phone (=1 yes, 0 otherwise)	5,219	0.596 (0.007)	2,574	0.634 (0.009)	0.001***
At least 1 telephone (=1 yes, 0 otherwise)	5,219	0.003 (0.001)	2,574	0.003 (0.001)	0.975
At least 1 radio (=1 yes, 0 otherwise)	5,219	0.244 (0.006)	2,574	0.281 (0.009)	0.000***
At least 1 motorcycle	5,219	0.328 (0.006)	2,574	0.342 (0.009)	0.216

(=1 yes, 0 otherwise)					
Has electricity connection (=1 yes, 0 otherwise)	5,219	0.632 (0.007)	2,574	0.660 (0.009)	0.014***
<i>Household head's characteristics</i>					
HH's civil status (=1 married, 0 otherwise)	5,219	0.608 (0.007)	2,574	0.772 (0.008)	0.000***
HH head's male (=1 yes, 0 otherwise)	5,219	0.870 (0.005)	2,574	0.883 (0.006)	0.104
HH's work status (=1 has work, 0 otherwise)	5,219	0.878 (0.005)	2,574	0.906 (0.006)	0.000***
HH head's education is primary or less (=1 yes, 0 otherwise)	5,219	0.488 (0.007)	2,574	0.602 (0.010)	0.000***
HH head's education is secondary level (=1 yes, 0 otherwise)	5,219	0.365 (0.007)	2,574	0.279 (0.009)	0.000***
HH head's education is intermediate (=1 yes, 0 otherwise)	5,219	0.061 (0.003)	2,574	0.033 (0.004)	0.000***
HH head's education is others (=1 yes, 0 otherwise)	5,219	0.029 (0.002)	2,574	0.014 (0.002)	0.000***
Spouse's education is primary or less (=1 yes, 0 otherwise)	5,219	0.315 (0.006)	2,574	0.446 (0.010)	0.000***
Spouse's education is secondary level (=1 yes, 0 otherwise)	5,219	0.416 (0.007)	2,574	0.344 (0.009)	0.000***
Spouse's education is intermediate (=1 yes, 0 otherwise)	5,219	0.075 (0.004)	2,574	0.042 (0.004)	0.000***

Spouse's education is others (=1 yes, 0 otherwise)	5,219	0.022 (0.002)	2,574	0.012 (0.002)	0.004***
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Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)

The outcomes from various estimation methods exhibited inconsistencies (Table 4). Specifically, statistical significance was only observed in NNM for stunting at the 10 percent level; and in IPW for wasting, also at the 10 percent significance level. The existing pattern suggests a lack of conclusive evidence regarding the positive effects of cash transfer programs on the nutritional status of children, underscoring a significant gap in understanding the pathways through which these programs exert an impact. Therefore, the effects of the program were deemed insignificant for HAZ, WAZ, WHZ, BMIZ, as well as the prevalence of stunting, underweight, wasting, and severe stunting.

These latest findings may be compared with previous impact evaluation results to see how the effectiveness of 4Ps has changed through the years. The lack of discernible improvements in other nutritional indicators such as HAZ, WAZ, WHZ, BMIZ, and the prevalence of underweight and wasting further underscores the complexity and challenges in achieving sustained improvements in nutritional outcomes.

The above statistical results show how the inconsistency in the program's impact on nutrition mirrors the findings of studies on CCT programs in other countries. The insufficient change in malnutrition status from programs such as MAM'Out in Burkina Faso, Bolsa Familia in Brazil, and Familias En Accion in Colombia on one hand, and the successes observed in programs in India and Niger, on the other hand, emphasize the need for a nuanced and adaptable approach to nutrition programs. The specific contexts and population dynamics in each location should thus be considered.

Table 4. Impacts on nutritional outcomes of 4Ps Participation

Variable	Coefficient, AI Robust SE, and P-value															
	WAZ	HAZ	WHZ	BMIZ	Stunting			Underweight			Wasting			Severe stunting		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ATET Recipient (1 vs 0)	-0.025 (0.027)	-0.045 (0.031)	0.011 (0.028)	0.012 (0.028)	0.020 (0.012)	0.028 * (0.016)	0.019 (0.016)	-0.002 (0.011)	0.008 (0.018)	0.006 (0.015)	- 0.012 * (0.007)	-0.017 (0.029)	-0.006 (0.009)	-0.003 (0.008)	-0.014 (0.027)	0.006 (0.011)
95% CI	-0.077	-0.105	-0.043	-0.042	-0.004	-0.003	-0.013	-0.024	-0.027	-0.023	-0.026	-0.074	-0.024	-0.019	-0.068	-0.014
	0.028	0.015	0.066	0.067	0.044	0.059	0.052	0.020	0.043	0.036	0.001	0.039	0.012	0.012	0.039	0.027
N	6,966	6,914	6,919	6,933	6,936	6,936	6,936	6,966	6,966	6,966	6,919	6,919	6,919	6,914	6,914	6,914

Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)

Note: AI = Abadie-Imbens; ATET = average treatment effects on treated; BMIZ = BMI-for-age z-score; CI = confidence interval; HAZ = height-for-age z-score; N = number; SE = standard errors; WAZ = weight-for-age z-score; WHZ = weight-for-height z-score

*p< 0.05; ** p< 0.01; *** p< 0.001. An inverse-probability-weighted (IPW) treatment-effects estimator was used for models 1, 2, 3, 5, 8, 11, and 14. For robustness checks, nearest-neighbor matching (NNM) was used for models 6, 9, 12, and 15 while propensity score matching (PSM) was used for models 7, 10, 13, and 15.

The authors in this chapter also conducted an overidentification test to ensure the balance of covariates and validate the estimated treatment effect. Negligible differences in weighted means and variance ratios close to one were observed, affirming covariate equilibrium (Appendix A). Test results indicated that the researchers could not reject the null hypothesis of balanced covariates, providing confidence in the achieved covariate balance (Table 5). Through matching, the authors achieved similarity in propensity scores, as reflected in negligible differences in weighted means and variance ratios close to one. In general, the empirical distributions of the intervention and comparison groups align well post-matching.

Table 5. Post-matching, balance assessment of covariates across matching techniques (within the entire eligible sample)

	HAZ	WAZ	WHZ	BMIZ	Underweight	Stunting	Severe Stunting	Wasting
Chi2(8)	34.578	36.633	36.487	35.885	36.633	35.823	34.578	36.487
Prob > chi2	0.150	0.102	0.105	0.118	0.102	0.119	0.150	0.105

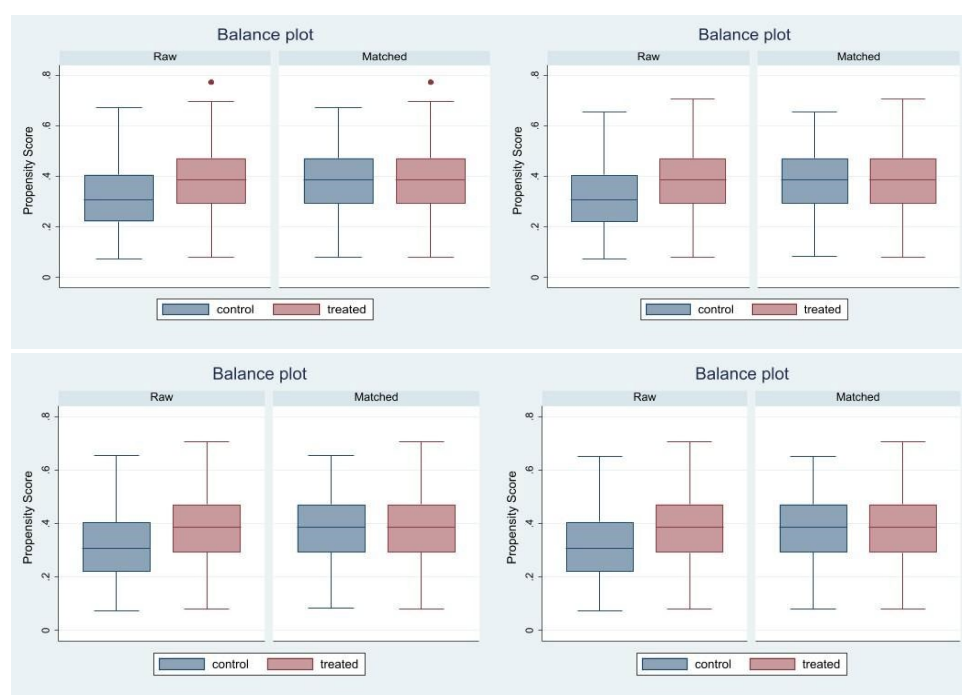
BMIZ = BMI-for-age z-score; HAZ = height-for-age z-score; WAZ = weight-for-age z-score; WHZ = weight-for-height

Note: z-score*p< 0.05; ** p< 0.01; *** p< 0.001.

Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)

Density plots for HAZ, WAZ, WHZ, and BMIZ in the matched sample are comparable, indicating balanced variables (Figure 6). While some outliers may differ, matching the estimated propensity score had effectively balanced the key characteristics, as evident in the similarity depicted in the box plots for the treated and control groups.

Figure 6. Balance plots of selected outcome variables



Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)

Conclusion

The evaluation of the 4Ps in addressing child undernutrition revealed a nuanced and evolving landscape. While the initial stages of the program demonstrated considerable success, especially in mitigating severe stunting, subsequent evaluations had raised questions about its sustained impact. The study found inconsistencies in the results, with statistical significance only observed in NNM for stunting and IPW for wasting at a 10 percent level. This suggests that the evidence supporting the 4Ps program's positive impact on children's nutritional status is inconclusive. Moreover, the 4Ps program has insignificant impacts for all nutrition outcomes HAZ, WAZ, WHZ, BMIZ as well as prevalence of stunting, underweight, wasting, and severe stunting.

The lack of conclusive evidence may be attributed to several reasons such as program design, implementation, and monitoring; contextual factors; and unwanted effects. The program design, implementation, and monitoring may have affected the consistency of outcomes. Contextual factors driven by socioeconomic, cultural, and environmental differences may have influenced how households responded to and benefited from the 4Ps program. Unwanted effects such as the increase in food costs of beneficiary communities might have constrained the program's impact on childhood nutrition, potentially leading to poor nutritional outcomes among non-beneficiaries. As food became more expensive, households found it difficult to afford and meet their dietary requirements, especially their children's.

Furthermore, to understand the CCT program's theorized effects on nutrition, one has to acknowledge that nutrition is a more complex outcome that draws upon several sectors such that no single program, on its own, can sustain the reduction of the prevalence of malnutrition. Rather, addressing malnutrition requires a complementation of interventions for maximum impact. While poverty-targeted cash transfers programs offer a good platform to reach children vulnerable to malnutrition, their design and implementation procedures, including targeting of young children, need to be dynamic to remain relevant to the nutrition agenda.

The findings call for an improved CCT program. Onwuchekwa et al. (2021) noted that CCTs with smaller cash transfers frequently fall short of making positive and significant changes on target outcomes. The delivery of a CCT program also comes with large implementation costs. Hence, the inconsistency in the findings on 4Ps may be because the cash transfers were insufficient to make sustained changes in children's nutritional outcomes. It is thus crucial that the government considers such elements when working to refine and get CCT programs to yield tangible results on children's nutrition and overall health.

The findings in this study likewise bare potential areas for future research on particular facets of the CCT program such as the benefits received in relation to the cash transfer amount or the variations among demographic groups or regions. By disaggregating the analysis, researchers can, for instance, look into household-level dynamics and interactions to gather insights into beneficiaries' behaviors that affect children's nutrition.

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Appendix

Appendix A. Evaluation of standardized differences in matched sample

Variables	HAZ				WAZ				WHZ				BMIZ			
	Standardized differences		Variance Ratio		Standardized differences		Variance Ratio		Standardized differences		Variance Ratio		Standardized differences		Variance Ratio	
	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted
<i>Child's characteristics</i>																
Age (in months)	0.051	0.002	1.01	1.007	0.052	0.003	1.014	1.004	0.052	0.002	1.016	1.005	0.053	0.003	1.015	1.007
Sex (=1 male, 0 otherwise)	-0.003	-0.002	1.00	1.00	0.000	-0.002	1.000	1.000	-0.002	-0.002	1.000	1.000	-0.000	-0.002	1.000	1.000
Ethnicity (=1 indigenous, 0 otherwise)	0.069	-0.003	1.12	0.995	0.068	-0.004	1.120	0.994	0.071	-0.004	1.127	0.994	0.068	-0.003	1.122	0.995
Religion (=1 Roman Catholic, 0 otherwise)	-0.164	0.006	1.073	0.998	-0.164	0.006	1.072	0.998	-0.164	0.006	1.072	0.998	-0.162	0.006	1.072	0.998
<i>Household composition and assets</i>																
No. of HH members 3-5 years old	0.011	0.005	0.807	0.875	0.011	0.005	0.804	0.881	0.012	0.005	0.804	0.877	0.012	0.005	0.804	0.877
Poorest wealth quantile (=1 yes, 0 otherwise)	0.081	0.001	0.981	1.000	0.080	0.001	0.981	1.000	0.081	0.001	0.981	1.000	0.079	0.002	0.982	0.999
At least 1 TV (=1 yes, 0 otherwise)	0.011	0.014	1.000	1.000	0.010	0.014	1.000	1.000	0.010	0.014	1.000	1.000	0.011	0.013	0.999	0.999
At least 1 VCD (=1 yes, 0 otherwise)	0.050	-0.006	1.123	0.987	0.049	-0.006	1.121	0.986	0.048	-0.006	1.119	0.987	0.048	-0.006	1.119	0.988

At least 1 refrigerator (=1 yes, 0 otherwise)	0.005	0.002	1.018	1.009	0.003	0.001	1.010	1.004	0.001	0.001	1.005	1.005	0.001	0.001	1.004	1.005
At least 1 washing machine (=1 yes, 0 otherwise)	0.005	0.003	1.018	1.009	0.007	0.002	1.023	1.008	0.006	0.002	1.021	1.008	0.006	0.002	1.020	1.009
At least 1 cellphone (=1 yes, 0 otherwise)	0.081	-0.006	0.962	1.004	0.084	-0.007	0.961	1.004	0.082	-0.006	0.962	1.004	0.082	-0.006	0.962	1.004
At least 1 telephone (=1 yes, 0 otherwise)	0.028	0.006	1.745	1.112	0.015	0.005	1.313	1.086	0.015	0.005	1.313	1.086	0.015	0.005	1.313	1.087
At least 1 radio (=1 yes, 0 otherwise)	0.091	-0.001	1.101	0.999	0.092	-0.000	1.104	1.000	0.093	-0.000	1.103	1.000	0.092	-0.000	1.103	1.000
At least 1 motorcycle (=1 yes, 0 otherwise)	0.036	0.002	1.025	1.001	0.037	0.002	1.025	1.001	0.037	0.002	1.026	1.001	0.037	0.002	1.026	1.001
Has electricity connection (=1 yes, 0 otherwise)	0.084	0.004	0.949	0.997	0.078	0.003	0.953	0.998	0.081	0.003	0.951	0.998	0.082	0.003	0.951	0.998
<i>Household head and spouse's characteristics</i>																
HH's civil status (=1 married, 0 otherwise)	0.367	0.002	0.738	0.998	0.365	0.002	0.740	0.998	0.369	0.002	0.737	0.997	0.367	0.002	0.737	0.997

HH head's male (=1 yes, 0 otherwise)	0.046	0.023	0.899	0.947	0.046	0.023	0.899	0.947	0.049	0.023	0.892	0.946	0.048	0.023	0.895	0.946
HH's work status (=1 has work, 0 otherwise)	0.106	0.011	0.757	0.968	0.105	0.011	0.759	0.969	0.106	0.012	0.755	0.966	0.104	0.012	0.758	0.967
HH head's education is primary or less (=1 yes, 0 otherwise)	0.237	-0.001	0.958	1.000	0.241	-0.001	0.956	1.000	0.241	-0.001	0.956	1.000	0.239	-0.001	0.956	1.000
HH head's education is secondary level (=1 yes, 0 otherwise)	-0.193	0.001	0.867	1.001	-0.197	0.001	0.864	1.001	-0.196	0.001	0.864	1.001	-0.196	0.001	0.865	1.001
HH head's education is intermediate (=1 yes, 0 otherwise)	-0.114	0.003	0.604	1.018	-0.115	0.004	0.601	1.018	-0.116	0.004	0.598	1.018	-0.113	0.003	0.605	1.018
HH head's education is others (=1 yes, 0 otherwise)	-0.110	-0.002	0.475	0.987	-0.109	-0.001	-0.476	0.989	-0.109	-0.002	-0.476	0.987	-0.109	-0.001	-0.476	0.989
Spouse's education is primary or less (=1 yes, 0 otherwise)	0.280	0.003	1.150	1.001	0.280	0.004	1.150	1.001	0.280	0.004	1.149	1.001	0.280	0.004	1.149	1.001
Spouse's education is secondary level	-0.157	0.005	0.930	1.003	-0.156	0.004	0.930	1.003	-0.156	0.004	0.930	1.003	-0.156	0.004	0.930	1.003

(=1 yes, 0 otherwise)																
Spouse's education is intermediate (=1 yes, 0 otherwise)	-0.136	0.003	.0593	1.012	-0.138	0.003	0.587	1.011	-0.137	0.002	0.590	1.011	-0.137	0.002	0.589	1.011
Spouse's education is others (=1 yes, 0 otherwise)	-0.071	0.000	0.584	1.002	-0.071	0.000	0.585	1.003	-0.075	0.000	0.566	1.003	-0.071	0.000	0.585	1.003

BMIZ = BMI-for-age z-score; HAZ = height-for-age z-score; HH = household; VCD = video compact disc; WAZ = weight-for-age z-score; WHZ = weight-for-height z-score

Source: Authors' analysis of the 2018-2019 Expanded National Nutrition Survey from DOST-FNRI (2020)