

## RESEARCH ARTICLE

# Association of childcare practices and stunting among children beneficiaries of the Pantawid Pamilyang Pilipino Program: A nested case-control study

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## ABSTRACT

**Background:** Childcare is a challenging task particularly for caregivers in urban slums. The *Pantawid Pamilyang Pilipino Program* (4Ps) aims to improve the beneficiaries' caregiving practices which could compensate for the negative effects of poverty on children's nutritional status.

**Objective:** To determine the association between childcare practices (CCP) and stunting among children beneficiaries residing in Pasay City.

**Methodology:** This nested case-control study included 7 to 9 year-old children cohorts who were enrolled in the 4Ps in 2008, comprising 82 stunted and 97 normal-height-for-age children. The outcome and predictor variables were the child's height-for-age z score (HAZ) and household (HH) CCP, respectively. Multiple logistic and linear regression analyses were performed to determine the association between the desirability of HH CCP and stunting, and HH CCP score and HAZ, respectively.

**Results:** Six out of 10 beneficiaries had "desirable" CCP. Stunting was more likely observed among children whose households have undesirable CCP; who were enrolled in 4Ps at a younger age; had low birth weights; male; whose primary caregivers are less than 40 years old; whose maternal heights are less than 151 cm; whose primary caregivers had less than 7 years of education; and whose monthly household income is less than PHP 9,000. Undesirable CCP is associated with stunting, and the HH CCP score had a positive relationship with HAZ score among children.

**Conclusion:** A desirable CCP decreases the likelihood of stunting among children. Therefore, improving the childcare practices of beneficiaries could decrease the prevalence of childhood stunting.

**Keywords:** childcare practices, childhood stunting, Pantawid Pamilyang Pilipino Program, well-being

## Introduction

Childcare is a complex and difficult task because it includes a range of behaviors and practices that provide food, health care, stimulation, and emotional support necessary for a child's healthy survival. It is even more challenging, especially in poor resource settings such as urban slums. Studies have shown that children in informal urban settlements have poorer health outcomes than rural children [1]. There is a wide disparity in the health and nutrition status as well as health care utilization among the richest and the poorest Filipinos [2,3]. People living in urban slums, particularly the children, are prone to many health problems because of their unhealthy living conditions. The cost of services and the constraints that the poor face every day limit their access to health services [4,5,6,7]. Adequate

care and support should be given to the children in urban slums so they can achieve their full growth potential. Effective interventions include safe delivery and appropriate newborn care; breastfeeding; complementary feeding; water, sanitation, and hygiene; immunization; Vitamin A supplementation; and appropriate management of common childhood illnesses. It is important to meet the children's primary health care needs because this is fundamental to our nation's achievement of inclusive growth and sustainable development. Likewise, the inadequate and undesirable coping mechanisms of the poor have to change in to better health-seeking behavior.

There is a growing consensus that to improve child health and nutrition, it is necessary to design interventions that

address not only the biological causes of poverty-related diseases, but also the social determinants of health [8]. The *Pantawid Pamilyang Pilipino Program (4Ps)* is a human capital investment that is integrated with existing government health and nutrition programs. It was seen as a promising intervention to increase overall use of health services, by providing cash grants on condition that beneficiaries undergo primary health care visits [9,10]. Cash grants received by the beneficiaries could address some of the barriers that prevent them from using the government's health services [11]. The 4Ps also aims to improve the beneficiaries' caregiving practices that could compensate for the negative effects of poverty on the children's nutritional status.

This study was conducted to identify potential associations between the household's childcare practices (CCP) and stunting in children who were enrolled in the program in 2008. It was assumed that the beneficiaries' participation in the 4Ps would improve their childcare practices and with improved care, the probability of stunting would be reduced. The results of this study could provide additional information on how the program influences the childcare practices of the urban poor, taking into consideration various contextual factors.

## Methodology

### *Study Design, Setting, and Population*

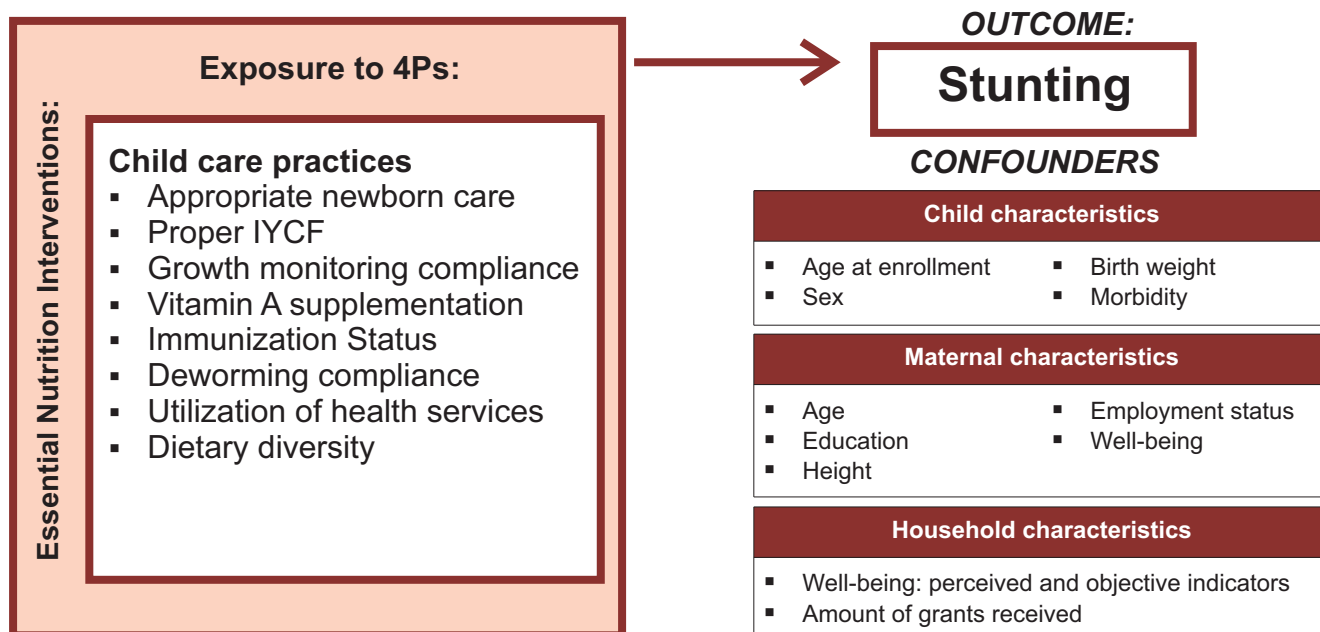
A nested case-control was conducted to determine associations between the household's CCP and stunting

among 7 to 9 year-old children beneficiaries residing in Pasay City, Metro Manila. It was chosen as the study site because it is where the program was first implemented. Stunting was defined as height-for-age z-score (HAZ) of equal to or less than minus two standard deviation (-2SD) below the mean of a reference standard [12]. Figure 1 shows the conceptual framework of the study. The cohorts were all 0 to 24 month-old children who were enrolled in the program in January 2008 when it was first implemented. Cases were stunted children, while controls were children with normal anthropometric measurements. Exposed children belonged to households (HH) with a desirable CCP, while unexposed children were those whose families have an undesirable CCP.

The sampling population consisted of households with children beneficiaries. The sampling frame used was a list of all enrolled children obtained from the Department of Social Welfare and Development. Children who met the following inclusion criteria became participants of the study:

- Born between January 2006 until January 2008
- Belong to households in Pasay City
- Cases must have a  $HAZ \leq -2 SD$
- Controls must have a  $HAZ \geq 1.45 SD$

Those living in households who have transferred to another residence as well as those who are no longer active program beneficiaries were excluded from the study. Children who were not stunted but were either underweight or wasted were also excluded as potential controls. It was assumed that 65% of the controls have good CCP. Using 44% prevalence of stunting



**Figure 1.** Conceptual framework: The association of childcare practices of 4Ps households and stunting among children beneficiaries

among 6 to 10 year-old children of poorest quintile in urban areas (3), the computed minimum sample size was 87 cases and 87 controls. This sample size was based on an unmatched study, using 95% two-sided confidence level, power of 80%, and 1:1 ratio of controls to cases. Figure 2 presents the schematic diagram in determining the cases and controls.

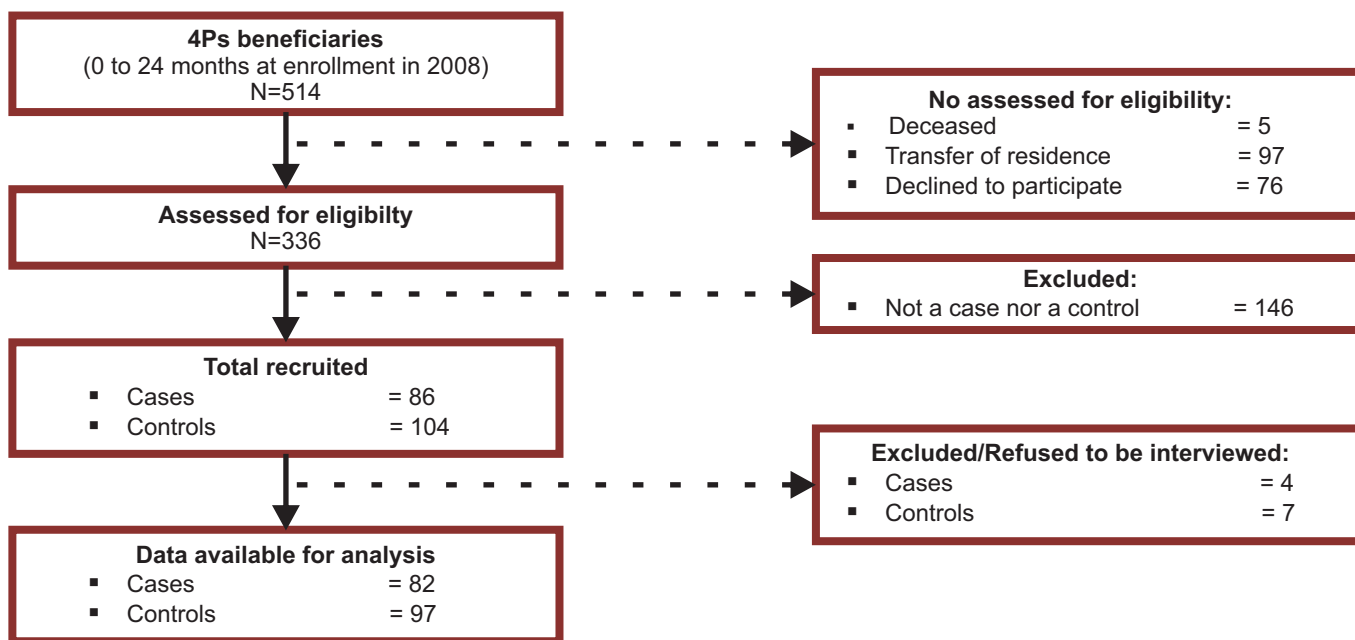
*Data Collection and Analysis*

Data collection was done in October 2015. Each child's weight and height were obtained following a standardized method, using portable electronic scales (Tanita™) and non-elastic measuring tapes [13]. To ensure accurate and precise anthropometric data, the participants' weights and heights were measured twice and the average of the two measurements was used for the final analysis.

The following data were obtained from the primary caregivers through a face-to-face interview: medical history of the children, childcare practices, one 24-hour food recall, and perceived household well-being. The dietary diversity questionnaire developed by the Food and Agriculture Organization (FAO) was used [14]. A child's diet was considered diverse if at least five food groups were consumed for the past 24 hours [15]. Selected portions of the Filipino Well-being questionnaire were used to determine the perceived well-being status of the beneficiaries [16]. This research was approved by the University of the Philippines Manila Ethics Review Board.

To describe the characteristics of the study participants, an independent t-test was employed to compare the means of continuous variables while the Chi Square Test of Homogeneity was used to determine the statistical difference between proportions of categorical variables of stunted and normal children. Statistical significance was considered at  $p < 0.05$  and all tests were one-sided. Childcare practices are based on essential nutrition actions that include the following behaviors: appropriate newborn care, optimal infant and young child feeding practices, growth monitoring and promotion, compliance with Vitamin A supplementation, deworming, and immunization, proper hygiene practices and health check-up practices, and provision of a diverse diet [17]. Overall household childcare practices (HH CCP) were derived from 17 component questions and consisted of a composite dichotomous score. Using 10 as the cut-off score, the total score obtained by a household was interpreted as “desirable” if the response to 10 or more of the 17 component questions was positive. Univariate and power analyses results showed that with 10 as cut-off score, the overall desirability of HH CCP was significantly associated with stunting, with a power of 73.35%.

Crude odds ratio (OR) was calculated to examine the relationship between stunting and CCP by univariate analysis. Multivariate logistic regression was used to quantify the independent predictors of stunting and the adjusted odds ratios were obtained. To estimate the relationships between HAZ and HH CCP score, as well as other possible predictor variables which include child,



**Figure 2.** Schematic diagram in determining the cases and controls

caregiver, and household characteristics, multiple linear regression was performed.

## Results

### *Characteristics of Children Beneficiaries*

Eighty-two cases and 97 controls were included in this investigation. Cases had a mean height-for-age z score (HAZ) of -2.58, mean weight-for-age z score (WAZ) of -2.67, and a mean Body Mass Index z score (BMIz) of -1.32. Controls, on the other hand, had a mean HAZ of -0.25, WAZ of -0.27, and BMIz of -0.25. The mean age upon enrollment in 4Ps was  $9.34 \pm 6.55$  months and  $11.27 \pm 7.18$  months for cases and controls respectively. On the average, the children were enrolled in the program at age 10.39 months. Information on birth weight was available in only 148 children. It was noted that the mean birth weight of stunted children was significantly lower than normal children (2.86 kg versus 3.05 kg;  $p = 0.014$ ). Table 1 shows that there were more stunted children who were enrolled in 4Ps at an early age compared to the controls (68.3% versus 54.6%;  $p = 0.043$ ). The age, sex distribution, and presence of co-morbid conditions among the children-beneficiaries were similar.

### *Characteristics of Primary Caregivers*

The mean height of the 171 participating mothers was 152.44 cm. Mothers of stunted children were significantly shorter than mothers of normal children (150.92 cm versus 153.79 cm;  $p = 0.004$ ). The average height of mothers of

stunted children was also shorter by 0.88 cm compared to the height of average Filipino women living urban areas, which was 151.8 cm [3]. The ages of the primary caregivers varied widely, the youngest being 17 while the oldest was 70 years old. On the average, the caregivers of the children were 39.42 years old. However, compared to normal children, there were more caregivers of stunted children who were less than 40 years old (Table 2). The rest of the primary caregivers' characteristics did not differ significantly. As a whole, mothers were the primary caregivers of 80% of the children beneficiaries. More than 80% had 7 to 10 years of education, and almost 70% were currently unemployed.

The perceived well-being scores of both groups did not differ significantly. On the average, the primary caregivers' perceived well-being status was just "in the middle," falling neither at the highest nor at the lowest level. On the other hand, a comparison of the self-ratings on economic status prior to enrolment in 4Ps and seven years after showed that before program enrolment, almost 60% of the respondents perceived themselves as "poor." However, after seven years of program participation, the proportion of caregivers of stunted children who still rated themselves as "poor" was significantly higher than that of normal children (20.7% versus 9.3%;  $p = 0.025$ ).

### *Household Characteristics of Program Beneficiaries*

Households included in the study had an average of seven members. Households of stunted children had monthly incomes that were significantly lower than that of

**Table 1.** Percent distribution of some demographic characteristics of stunted and normal children beneficiaries (October, 2015),  $n = 179$

Child characteristics	Total n = 179	Stunted n = 82	Normal n = 97	P value
Age at enrolment, n (%)				<b>0.043*</b>
▪ 0 to 12 months	109 (60.9)	56 (68.3)	53 (54.6)	
▪ 13 to 24 months	70 (39.1)	26 (31.7)	44 (45.5)	
Age in years, n (%)				0.137
▪ 7 to 8	155 (86.6)	74 (90.2)	81 (83.5)	
▪ 9	24 (13.4)	8 (9.8)	16 (16.5)	
Birthweight, n (%) <sup>a</sup>				0.104
▪ Low birthweight	16 (10.8)	10 (15.2)	6 (7.3)	
▪ Normal	132 (89.2)	56 (84.8)	76 (92.7)	
Sex, n (%)				0.066
▪ Male	84 (46.9)	44 (53.7)	40 (41.2)	
▪ Female	95 (53.1)	38 (46.3)	57 (58.8)	
Chronic diseases, n (%)				0.407
▪ With	7 (3.9)	4 (4.9)	3 (3.1)	
▪ Without	172 (96.1)	78 (95.1)	94 (96.9)	

\*Significant at 95% confidence level

<sup>a</sup>No data on birthweight in 31 or 17.3% of the children

**Table 2.** Percent distribution of some socio-demographic characteristics and well-being status of primary caregivers of stunted and normal children beneficiaries (October, 2015), n = 179

Primary caregiver characteristics	Total n = 179	Stunted n = 82	Normal n = 97	P value
Age at enrolment, n (%) ▪ < 40 years old ▪ ≥ 41 years old	102 (57.0) 77 (43.0)	55 (67.0) 27 (33.0)	47 (48.5) 50 (51.5)	<b>0.009*</b>
Maternal ht. distribution, n = 171 (%) <sup>a</sup> ▪ < 151 cm ▪ ≥ 152 cm	62 (36.3) 109 (63.7)	40 (50.0) 40 (50.0)	22 (24.2) 69 (75.8)	<b>0.000*</b>
Primary caregivers, n (%) ▪ Mother ▪ Others	143 (79.9) 36 (20.1)	68 (82.9) 14 (17.1)	75 (77.3) 22 (22.7)	0.229
Educational attainment in years, n (%) ▪ 1 – 6 years ▪ ≥ 7 years	22 (12.3) 157 (87.7)	13 (15.9) 69 (84.1)	9 (9.3) 88 (90.7)	0.135
Employment status, n (%) ▪ Employed ▪ Unemployed	55 (30.7) 124 (69.3)	26 (31.7) 56 (68.3)	29 (29.9) 68 (70.1)	0.460
Self-rating of economic status prior to 4Ps, n (%) ▪ Poor ▪ In the middle ▪ Not poor	106 (59.2) 65 (36.3) 8 (4.5)	48 (58.5) 30 (36.6) 4 (4.9)	58 (59.8) 35 (36.1) 4 (4.1)	0.965
Self-rating of present economic status, n (%) ▪ Poor ▪ In the middle ▪ Not poor	26 (14.5) 114 (63.7) 39 (21.8)	17 (20.7) 44 (53.7) 21 (25.6)	9 (9.3) 70 (72.2) 18 (18.6)	<b>0.025*</b>
Mean perceived well-being score (± SD) <sup>b</sup>	5.78 (1.35)	5.59 (1.58)	5.94 (1.11)	0.082

\*Significant at 95% confidence level

<sup>a</sup>No data on maternal height in 8 or 4.5% of mothers<sup>b</sup>10 = highest perceived well-being score; 1 = lowest perceived well-being score

normal children (PhP 7,836.07 versus PhP 10,326.60;  $p = 0.001$ ). On the average, HH with normal children earned PhP 2,490.00 more than HH with stunted children. Households of cases and controls significantly differed in three ways: (1) there were more HH with stunted children having a monthly income of less than the poverty threshold of PhP 9,000.00 compared with those with normal children (65.9% versus 38.1%;  $p = 0.000$ ); (2) the proportion of HH with their own electricity connection was higher among those with normal than stunted children (97.9% versus 87.8%;  $p = 0.032$ ); and (3) there were more HH with normal children who experienced theft in their homes compared with those with stunted children (68.0% versus 46.3%;  $p = 0.003$ ) (Table 3).

On the average, HH beneficiaries were satisfied with 13 out of 18 or 72% of the selected domains of well-being (Table 3). Households of cases and controls had similar satisfaction scores. Despite living in the slums, almost 80% of the beneficiaries were still optimistic of their future. Seventy-eight percent with stunted children and 81% with normal children perceived that their life would be better by

year 2020. More than 90% acknowledged that their own efforts would be the key factor that would influence their quality of life in the future.

#### Household Childcare Practices (HH CCP) of Beneficiaries

Table 4 summarizes the number of HH beneficiaries with stunted and normal children who observed the various components of good childcare practices (CCP). Compared to stunted children, the proportion of normal children who were delivered in a health care facility (73.2% versus 57.3%;  $p = 0.007$ ) and whose births were attended by trained birth attendants were higher (78.4% versus 63.4%;  $p = 0.036$ ). Except for these two newborn care practices, both cases and controls household beneficiaries performed comparable childcare practices.

The lowest CCP score obtained among the HH beneficiaries was four, which was seen in one household with a stunted child. The highest score was 15 points, which was obtained by two households with normal children. Not

**Table 3.** Percent distribution of some household characteristics and well-being status of household beneficiaries of stunted and normal children (October, 2015), n = 179

Household characteristics	Total n = 179	Stunted n = 82	Normal n = 97	P value
HH size, n (%) ▪ 5 or less ▪ 6 or more	38 (21.2) 141 (78.8)	14 (17.1) 68 (82.9)	24 (24.7) 73 (75.3)	0.143
HH monthly income, n (%) ▪ < PhP 9,000 ▪ ≥ PhP 9,000	90 (50.6) 88 (49.4)	54 (65.9) 28 (34.1)	37 (38.1) 60 (61.9)	<b>0.000*</b>
Amount of cash grants received, n (%) ▪ < PhP 66,000 ▪ ≥ PhP 66,000	88 (49.2) 91 (50.8)	39 (47.6) 43 (52.4)	49 (50.5) 48 (49.5)	0.404
HH with savings, n (%) ▪ With savings ▪ Without savings	71 (39.7) 108 (60.3)	33 (40.2) 49 (59.8)	38 (39.2) 59 (60.8)	0.503
HH with debts, n (%) ▪ With debts ▪ Without debts	143 (79.9) 36 (20.1)	63 (76.8) 19 (23.2)	80 (82.5) 17 (17.5)	0.226
Quality of housing, n (%) ▪ With electricity ▪ Heavy wall materials ▪ Heavy roofing materials ▪ With own toilet ▪ With own supply of drinking water	167 (93.3) 166 (92.7) 162 (90.5) 138 (77.1) 127 (70.9)	72 (87.8) 76 (92.7) 73 (89.0) 59 (72.0) 51 (62.2)	95 (97.9) 90 (92.8) 89 (91.8) 79 (81.4) 76 (78.4)	<b>0.032*</b> 0.396 0.358 0.092 9.120
Quality of neighborhood, n (%) ▪ Experienced fire ▪ Experienced flooding in neighborhood ▪ Experienced flooding in the house ▪ Experienced theft in the house	102 (57.0) 80 (44.7) 68 (38.0) 75 (41.9)	50 (61.0) 40 (48.8) 34 (41.5) 38 (46.3)	52 (53.6) 40 (41.2) 34 (35.1) 66 (68.0)	0.200 0.195 0.234 <b>0.003*</b>
Satisfaction with life score, n (%) <sup>a</sup> ▪ < 13 points ▪ 13 to 18 points	55 (30.7) 124 (69.3)	26 (31.7) 56 (68.3)	29 (29.9) 68 (70.1)	0.460
Positive outlook by year 2020, n (%) ▪ Will get better ▪ Will stay the same ▪ Will get worse	142 (79.9) 33 (18.4) 3 (1.7)	64 (78.0) 16 (19.5) 2 (2.4)	79 (81.4) 17 (17.5) 1 (1.0)	0.353
Key factor that would influence their quality of life in the future, n (%) ▪ Own efforts ▪ Country's economic situation ▪ Country's political situation	163 (91.1) 7 (3.9) 9 (5.0)	77 (93.9) 1 (1.2) 4 (4.9)	86 (88.7) 6 (6.2) 5 (5.2)	0.230

\* Significant at 95% confidence level

<sup>a</sup> Satisfaction scores can range from 0 to 18. A score of "0" indicates dissatisfaction with all 18 domains while a score of "18" indicates satisfaction with all 18 domains

one of the respondents obtained a perfect score of 17. Sixty-three percent or 113 beneficiaries obtained a score of 10 points or higher. There were more normal children who obtained a score of 10 points or more compared with stunted children (72.2% versus 52.4%;  $p = 0.001$ ). The mean overall CCP score of the beneficiaries was  $10.16 \pm 2.44$ , which is equal to the set cut-off score of 10 points for a "desirable" overall CCP. The mean CCP score of households with stunted children was significantly lower than the mean CCP score of households with normal children (9.71 versus 10.55,  $p = 0.021$ ).

### Association of HH CCP and Stunting

Univariate analysis suggested that stunting was more likely observed among children: whose households do not have desirable childcare practices; who were enrolled in 4Ps at less than 13 months; had low birth weights; male; whose primary caregivers are currently less than 40 years old; whose maternal heights are less than 151 cm; whose primary caregivers had less than 7 years of education; and whose monthly household income is less than PhP 9,000. A backward elimination process was done to control for

**Table 4.** Comparison of HH beneficiaries with stunted and normal children who observed the various components of good childcare practices, n = 179

Criteria	Total n = 179 (%)	Stunted n = 82 (%)	Normal n = 97 (%)	P-value
Appropriate newborn care	99 (55.3)	41 (50.0)	58 (59.8)	0.272
1. Child delivered in a health care facility	118 (65.9)	47 (57.3)	71 (73.2)	0.007*
2. Assisted by a trained birth attendant	128 (71.5)	52 (63.4)	76 (78.4)	0.036*
3. Early skin-to-skin contact	143 (79.9)	68 (82.9)	75 (77.3)	0.073
Proper infant and young child feeding practice	35 (19.6)	19 (23.2)	16 (16.5)	0.824
4. Early initiation of breastfeeding	167 (93.3)	78 (95.1)	89 (91.8)	0.310
5. Exclusive breastfeeding from 0 to 6 months	104 (58.1)	50 (61.0)	54 (55.7)	0.204
6. Continued breastfeeding beyond 6 months	74 (41.3)	38 (46.3)	36 (37.1)	0.100
7. Complimentary feeding at 6 months	88 (49.2)	42 (51.2)	46 (47.4)	0.896
Growth monitoring and promotion	32 (17.9)	11 (13.4)	21 (21.6)	0.078
8. Monthly monitoring from 0-24 mos.	82 (45.8)	38 (46.3)	44 (45.4)	0.985
9. Bi-monthly monitoring from 2-5 yrs.	34 (19.0)	12 (14.6)	22 (22.7)	0.128
10. Annual Vitamin A supplementation	94 (52.5)	38 (46.3)	56 (57.7)	0.170
11. Fully immunized status	131 (73.2)	57 (69.5)	74 (76.3)	0.327
12. Annual deworming	37 (20.7)	15 (18.3)	22 (22.7)	0.302
Proper hygiene and regular health check-up	21 (11.7)	7 (8.5)	14 (14.4)	0.117
13. Daily baths	174 (97.2)	78 (95.1)	96 (99.0)	0.164
14. Regular wearing of slippers	130 (72.6)	54 (65.9)	76 (78.4)	0.377
15. Brushing of teeth 2 to 3 times a day	120 (67.0)	53 (64.6)	67 (69.1)	0.203
16. Regular medical check-ups	37 (20.7)	13 (15.9)	24 (24.7)	0.190
17. Diverse diet	130 (72.6)	55 (67.1)	75 (77.3)	0.460

\*Significant at 95% confidence level

**Table 5.** Multiple logistic regression model summary on the association of HH CCP and stunting among children beneficiaries

Variables	OR	95% CI		P-value
		Lower	Upper	
Desirable CCP at 10 points cut-off	0.30	0.13	0.70	<b>0.005*</b>
Child characteristics				
▪ Male	1.96	0.89	4.32	0.097
▪ Enrolled to the program at < 13months old	2.67	0.89	4.32	<b>0.018*</b>
▪ Low birth weight	1.36	0.40	4.67	0.626
Primary caregiver characteristics				
▪ Maternal height < 151 cm	1.83	0.79	4.24	0.158
▪ Primary caregiver age < 40 years	2.72	1.16	6.38	<b>0.021*</b>
▪ Less than 7 years education	2.48	0.61	10.13	0.204
Household characteristics				
▪ Monthly income < PhP 9,000.00	3.41	1.54	7.52	<b>0.002*</b>

\*Significant at 95% confidence level

significant confounders. The final model with the adjusted effect estimate of CCP on stunting is shown in Table 5. Children of households with a desirable overall CCP have 0.30 times less odds of being stunted ( $p = 0.005$ ).

Multiple linear regression (MLR) analysis as shown in Table 6 resulted in a model with a significant regression equation ( $F(9, 133) = 3.706$ ,  $p = 0.000$  with an adjusted  $R^2$

value of 0.146). Analysis demonstrated that CCP score is positively correlated with HAZ score. This regression model is a good fit for the data, indicating that CCP score, current age of the child, child's age at enrolment, birth weight, maternal height, primary caregiver's age, years of education, and perceived well-being status, as well as household monthly income, significantly predict HAZ score,  $F(9, 133) = 3.706$ ,  $p < 0.000$ .

**Table 6.** Model summary of the association between HH CCP and child, primary caregiver, and HH characteristics and HAZ<sup>a</sup>

R	R2	Adjusted R2	St. error of the Estimate	R2 change	Change Statistics			
					F change	df1	df2	Sig. F change
0.448 <sup>a</sup>	0.201	0.146	1.157	0.201	3.706	9	133	0.000

<sup>a</sup> Dependent variable: HAZ

<sup>b</sup> Predictors: (constant), CCP score, child's current age, age of child at enrolment, birthweight, maternal height, age of caregiver, primary caregiver's years of education, primary caregiver's perceived well-being score, and HH monthly income

## Discussion

Household childcare practice (HH CCP) is an index derived from 17 component variables identified by the World Health Organization as essential nutrition actions [17]. These include appropriate newborn care, optimal infant and young child feeding practices, growth monitoring and promotion, Vitamin A supplementation, immunization, deworming, proper hygiene and health check-up practices, and provision of a diverse diet. It was demonstrated in this study that households living in urban slums with undesirable CCP have more than twice the odds of having stunted children compared with households having good CCP. On the average, households with normal children significantly had higher CCP scores than households with stunted children. Furthermore, the HH CCP score positively correlated with HAZ score. These findings are consistent with previous investigations that reported that good caregiving practices could mitigate the ill effects of poverty and lack of education of mothers [18,19,20]. However, this study identified various child, primary caregiver, and household characteristics that confounded the association between overall desirability of household CCP and stunting. Factors that positively correlated with HAZ were age of child at enrollment, birthweight, maternal height, primary caregiver's age, educational attainment, perceived well-being status, and household monthly income.

Numerous studies have pointed out that low birthweight is a significant risk factor for stunting [21,22]. Low BW is either due to preterm birth or to restricted intrauterine growth due to inadequate prenatal care, poor maternal health and nutrition, and short maternal stature. Since low BW stems from the mother's poor nutrition and health, children with low BW started life at a disadvantage and would therefore require longer intervention time to catch up on weight- and height-for-age compared with normal infants. The findings of this study corroborate another study which demonstrated that children with normal BW were 2.2 to 4.5 times more likely to have adequate anthropometric indices [23]. Genetic

background and environmental socio-economic factors that affected the mother during the various stages of her life contribute significantly to maternal height, which is inversely related to low BW and eventual stunting in children [21,24,25]. Other investigators also identified age of the child, age of the mother, number of children under 5 years, low-income neighbourhood, and wealth index, as significantly associated with HAZ [20,26,27].

Contrary to the study of Rivera, *et al.* which found a positive impact on the height of children who were exposed to the program at a younger age, there were more stunted children enrolled in the 4Ps at an early age in this study [28]. It should be pointed out that this study determined the medium-term effect of the program while that of Rivera's determined its short-term effect. It could be that since the program is relatively new, the beneficiaries in Rivera's study were still highly motivated to comply with the health conditions, resulting in a positive short-term impact. On the other hand, a possible reason why this study did not indicate a medium-term positive impact is that the intended behavioral changes of beneficiaries were not sustained, thus, failing to prevent stunting among the children.

For the past seven years, the cash grant, as an external motivating factor, was not sufficient to induce a permanent health behavior change among majority of the beneficiaries. Based on the 4Ps' guidelines, each household should receive a total of PhP 105,000 for their seven years of program participation, but this could only be achieved if they have been compliant with all the conditionalities. However, based on the data gathered, beneficiaries had received an average of PhP 66,239.11, which is only 63% of the estimated full amount of cash grants that should have been received. This study's finding that only 6 out of 10 of the households have desirable childcare practices is consistent with the information obtained. The barriers that hinder the beneficiaries from committing to desirable childcare practices are probably not outweighed by the cash grants, the perceived benefits of good care, or the seriousness of childhood stunting.



Another reason for the lack of positive impact is the undesirable environmental condition that hinders the beneficiaries from committing to healthier lifestyles. The barriers to good caring practices typical of slum areas are lack of financial resources, unemployment, poor living conditions, inadequate caregiver education, and low caregiver and household well-being [29]. Subjective measures of well-being reflect the household's social position and are strongly associated with undernutrition among children 12 months or older [1]. In this study, the proportion of caregivers of stunted children who rated themselves as “poor” after seven years of program participation was higher than that of normal children. This is why stunting remains very high among the poorest quintile of the population [30]. Stunting is more common among poor households because inadequate income could result in limited access to necessities, resulting in undesirable childcare practices. Armar-Klemesu, *et al.* reported that households with good socioeconomic conditions have better preventive health-seeking behaviors [31]. This study confirmed this association. Respondents who rated themselves as “not poor” had higher levels of well-being compared with those who perceived themselves as “poor.” Caregivers with a better well-being status are more likely to commit to good childcare practices because they have a positive outlook in life, which makes them better appreciate the importance of investing in the health and nutrition of their children. In turn, better childcare practices could contribute to better HAZ among the children.

To recapitulate the study's conceptual framework, results showed that the beneficiaries' CCP brought about by their compliance with the 4Ps health conditionalities is associated with childhood stunting. Adjusting for confounders, this study has shown that children belonging to households with desirable overall CCP have 0.30 times less odds of being stunted compared to children whose households have undesirable CCPs. The CCP score positively correlated with a child's height-for-age z score. Among children beneficiaries, the HAZ score increased by 0.081 units for a point increase in each household CCP. Improving the CCP score of HH living in urban slum areas could contribute to the improvement of the children's height and nutritional status.

Even though the households in this study have been beneficiaries of the program for seven years, only a few have been “adequately exposed” to the program since only 6 out of 10 had “desirable” CCP. The cash grants given as an external motivating factor were not sufficient to induce a permanent behavior change in majority of the beneficiaries.

The poor environmental conditions are significant barriers to committing to a healthier lifestyle. Yet, despite the negative implications of living in the slums, 4Ps beneficiaries were still optimistic about their future. They took note of the fact that their own efforts are the key that would influence the quality of their lives in the future, suggesting that majority of the beneficiaries still have a sense of control over their lives. Implementers of the 4Ps could capitalize on these positive findings because self-efficacy is a strong determinant of behavior change [32].

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