ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics

Bachelor Thesis International Bachelor of Economics and Business Economics

A MULTIDIMENSIONAL EVALUATION OF PHILLIPINES'S CONDITIONAL CASH TRANSFER PROGRAMME

Name student: Abhinand S V Chandrasekar
Student ID number: 465572

Supervisor: Domenico Favoino
Second assessor: Laura Hering

Date final version: 03/08/2021

Abstract

Pantawid Pamilyang Pilipino (4P) is an ongoing Conditional Cash Transfer (CCT) programme in the Phillipines with the aim of poverty allevation. While 4P has been extensively studied, traditional evaluations of CCTs fail to account for the targets of the programme when evaluating outcomes. This problem is compounded with 4P which has 5 indicators for child development: preschool attendance, school attendance, deworming, vaccinations, and health checkups. For example, existing research on attendance measured percentage changes in attendance between treatment and control groups but did not consider the programme target of 85 percent minimum attendance. This meant that impacts of the programme were overstated and failed to identify problem areas. This paper focused on impact of the 4P programme on child development and identified problem areas that can be improved using successes of other poverty alleviation programmes. The paper used a novel multidimensional poverty framework which studied individual indicators and combined these into a holistic measure of multidimensional poverty for individuals within the programme. The model revealed that the programme had significant impacts on all individual indicators except vaccination. A significant problem area was identified in the vaccination programme and potential solutions to the issue were proposed from successful vaccination programmes. Programme impacts were found to be smaller than those stated in existing literature for all individual indicators except school attendance. On average, the incidence of multidimensional poverty was found to be 5.6 percent lower for individuals living in households in the treatment group compared to the control group.

1. Introduction

Although the world has seen a decline in absolute poverty (living on less than US$ 1.90 per day) it has been coupled with rising inequality, thus without adequate policy, poverty decline is unlikely to accelerate to a meaningful level (World Bank, 2017). One of the policy solutions to this are Conditional Cash Transfer (CCT) programme such as Mexico's Progresa (1997) that has since been replicated in Latin America, Sub-Saharan Africa, and Southeast Asia (United Nations Social Development Division, 2019)

CCT are cash grants generally transferred to female heads of a household at regular intervals, provided that several conditions are met; conditions range from child school attendance to immunization and beyond. One such CCT program is the Pantawid Pamilyang Pilipino Programme (4P) in the Phillipines that targets maternal health. child health and child schooling outcomes. The 4P programme consists of two separate grants: health and education. These grants are awarded to households based on the number of children in 3 age groups: 0-2, 3-5, and 6-14 years old. The 4P programme is unique to many other CCTs because the programme is currently in its third phase and is set to continue in the future in subsequent phases. Phase 3 of the 4P programme and planned future phases are set to be identical in form to its Phase 1 implementation. This means that better evaluations of its Phase 1 implementation can have a direct impact on the current programme if research findings are considered and problem areas are dealt with when implementing subsequent phases.

Child education is a topic of particular concern. Bird (2007) suggests that education is an important tool in escaping intergenerational poverty, and therefore should be one of the main outcomes for a poverty alleviation programmes. On the other hand, Victora et al., (2008) link undernutrition and poor health to schooling and find that malnutrition as a small child result in less schooling and lower adult incomes. Thus, this paper focuses on the impact of the 4P programme on child development segments of the 4P programme as they are both education and child health are key factors of child development in successful poverty alleviation.

There are 2 key issues in existing frameworks used to evaluate CCTs: Lack of context when evaluating outcomes, and comparability of success between programmes. This paper will evaluate the effect of the Pantawid Pamilyang Pilipina Programme (4P) on child development in the Phillipines using a modified multidimensional evaluation framework adapted from Vaz et al. (2019). Multidimensional evaluations by Vaz et al. (2019) of Mexico's Progresa showed lower efficacy rates than traditional evaluation and thus similar results can be expected with

this model. This paper will explore whether the efficacy of 4P on child school enrolment, vaccination, and deworming rates is lower when using this framework. . This paper will also explore the policy implications of findings from multidimensional model and areas of concern that should be addressed.

2. Literature Review

Progresa was the first CCT designed as a randomised controlled trial (RCT), where treatment and control groups were assigned at random to enable rigorous impact evaluation of the programme (Schultz, 2004). Similarly, the 4P program utilises demand-side policy through cash transfers to stimulate spending on education and nutrition to achieve its objectives (Chaudary et al., 2012). Demand side policy was used to incentivise schooling by directly reducing the attractiveness of income from child labourers as opposed to pursuing purely supply based incentives.

Large bodies of research have emphasized the key role of education in childhood development, life outcomes, and future earnings. Bird (2007) suggests that education should be a key outcome in development programmes aimed at poverty reduction, as it is effective tool in escaping intergenerational poverty. Research by Kabeer & Mahmud (2009) indicate that in the absence of incentives for schooling, low-income households are far less likely to send their children to school than the rest of the population and have a low priority in investing in human capital. Investments in human capital increases cognitive skills, this has a long lasting and significant impact on earnings in adulthood through increased productivity (Glewwe, 2002).

Education and poverty are inextricably linked. However, poverty is a multi-faceted issue with numerous contributing factors. One such factor is childhood health. Smith (2009) indicate that apart from education, childhood health is the one other factor with a disproportionately large impact on adult earnings, and wealth trajectories. Victora et al. (2008) find links between malnutrition and poor health during childhood reduces schooling outcomes and earnings in adulthood. Therefore, it is key that poverty alleviation programmes address both childhood education and health outcomes.

Traditional impact evaluation of CCT programmes extensively studies programme effects for individual interventions in the sample. A key issue with this form of evaluation is

that it is one-dimensional and thus fails to account for the goals and thresholds of the programme when studying treatment effects. One such paper studying the impact of Progresa on schooling by Skoufias et al. (2001) found large and significant impacts using a probit model on post treatment school attendance for girls aged 14-15 (10.9 percent) and girls aged (9.5 percent). When examined using the multidimensional framework, changes in the attendance shrink to 5.7 percent in the sample once eligibility and program goals are accounted for (Vaz et al., 2019).

Similarly, a multidimensional evaluation of the Nicaraguan CCT, Red de Protección Social by Chandrasekar & Heerschap (2020), reveal large disparities between program effects and program goals on stunting and wasting in children. When studied in the context of programme thresholds, the significant 5.5 percent reduction in stunting identified by traditional evaluations shrink to a 0.3 percent reduction (Chandrasekar & Heerschap, 2020). These disparities between significant effects identified in traditional evaluations and those that are isolated after accounting for the goals of a CCT highlight the importance of multidimensional evaluations of CCT programmes. Based on these works we can expect similar results in the evaluation of individual outcomes in 4P.

The 4P programme has been well studied, however existing impact evaluations have been one-dimensional studies of programme effects on schooling, child health, maternal health, and consumption. A research paper by Catubig & Villano (2017) studied the impact of the 4P programme on school enrolment using both individual-level and school-level enrolment data from Davao Oriental Phillipines. Focusing on individual-level data to isolate the effects of the 4P programme the paper found that school enrolment increased by an average of 1.12 percent at a 5 percent significance level for children treated by the 4P programme (Catubig & Villano, 2017). Son & Florentino (2008) further group children in the sample by their working status and find a similar 1 percent increase at a 5 percent significance level in the proportion of children that are only studying and not working. Further simulations using a behavioural model suggest that a doubling of the education transfer may yield a 4 percent increase in the proportion of children only studying (Son & Florentino, 2008).

Chaudary, Friedman & Onishi (2012) found that at a 5 percent significance level school children ages 6-14 were more likely to have been offered deworming pills (4 percent), more likely to have taken at least 1 pill (5 percent) and more likely to have taken more than 1 pill (9 percent) if they were in the treatment groups when compared to those in the control group. The

evaluation also studied the impact of the programme on immunization rates among children and found no statistically significant differences in the proportion of children receiving the BCG vaccine with near universal coverage (Chaudary et al., 2012). However, Chaudary et. al. do not explore other vaccines in the 4P requirements and thus do not provide an accurate image of the immunization programme. Following the findings of Bondy, Thind, Koval, & Speechley (2009) that suggest lower income households are far less likely to receive proper immunization in the Phillipines, it is likely that the impact on other vaccines is also non-significant.

Chaudary et al. (2012) also study the impact of the 4P programme on household expenditure by studying the varying spending patterns of Pantawid and non-Pantawid households in education and medical expenses. The paper reports that on average Pantawid household spend more on education per capita (38 percent) and medical expenses per capita (34 percent) when compared to non-Pantawid households. A key issue with studying the impacts on household spending for the 4P programme is that increase in household spending is not one of the objectives of the programme and therefore lacks any clear and justifiable threshold to examine. Any examination of household expenditure is thus only useful for reference as the increases are unable to shed light on required spending per capita for meeting health standards in the Philippines. Thus, this paper will only focus on examining the impact of the 4P on the interventions with clear thresholds: child education and child health.

3. Pantawid Pamilyang Pilipino Program (4P)

According to the Family Income and Expenditure Survey (FIES) in 2008, the Philippines was home to roughly 23.1 million individuals in poverty: roughly 25 percent of the entire population. To combat this, the 4P programme was created in 2008 and specifically designed as an RCT to ensure rigorous evaluation. Phase 1 of the programme targeted 376,000 households in 148 municipalities (*barangays*) in 34 provinces. Barangays were assigned to treatment or control groups at random. All households within a treatment/control barangay are treatment/control households. However, whether they are given the health grant, educational grant, or both depends on the number of eligible individuals in the household. For child development there are 3 main groups: children aged 0-2, children aged 3-5, and school aged children (6-14). Not all households are eligible for all grants and each household can have a different combination of conditions to fulfill to get the full amount of grant money they are eligible for.

The cash transfers of the 4P programme were given to the female heads of the household as is standard practice in CCT programmes. The cash rewards were linked to the desired outcomes of the programme. Households with children aged 0-14 received a lump sum health grant of US$ 11 per month on the condition that several requirements and fulfilled. Children under 5 years old had to meet vaccination requirements and visit health centres in following DOH guidelines: for children aged 0-2 (monthly visits) and for children aged 2-5 (bi-monthly visits). School aged children (6-14) had to comply with DOH de-worming protocols (Chaudary et al., 2012).

The second set of desired outcomes for the 4P programme was in education. The education grant consisted of a US$ 6.50 transfer per child/month for up to three children in a household for 10 months in a year. The education grant was conditional on enrolment in Daycare, Kindergarten, Elementary, or Secondary School with an attendance rate of at least 85 percent for children aged 3-14 (Chaudary et al., 2012).

4. Data

Two sets of data were used in this paper to conduct the evaluation. The main dataset used in the estimations of programmes effects throughout the multidimensional framework model was obtained from the World Bank. Chaudary et al. (2012) conducted the official impact evaluation of the 4P programme for the World Bank.

The dataset used in this paper is from the Phase 1 evaluation of the 4P programme by Chaudary et al. (2012) consisting of 376,000 households in total. The impact evaluation survey for Phase 1 was conducted on 1,418 eligible households in 2012 and were selected based on the NHTS-PR to be a representative sample of all poor and eligible households in the Philippines (Chaudary et al., 2012). Of the 1,418 households in the sample, 704 are treatment households and 714 are control households.

All households in the sample were visited by interviewers and were asked an extensive list of questions covering age, income, child immunization, deworming, health checkups, enrolment, and attendance. The programme began transfers in 2009 and was subsequently expanded in late 2011 to include the control groups from Phase 1 and thus this paper evaluates program impacts from 2.5 years of treatment exposure. Thus, transfer dependency and long-

term behavioural changes in consumption, spending and health cannot be studied within the scope of this data.

The data consists of desired child health and education indicators of the programme with clear thresholds. Table A.2 describe the main indicators that are used to measure compliance to the main objectives of 4P and their respective thresholds for deprivation. Child education is measured using 2 indicators: enrolment and school attendance. Children between 3-14 must be enrolled in Pre-school, primary, or secondary school and maintain and attendance rate of at least 85 percent. Child health is measured using the vaccination and de-worming schedules of the DOH and are set according to age during estimations.

4P did not conduct a baseline survey of the households in the impact evaluation. Chaudary et al. (2012) constructed a pseudo-baseline using data from the National Household Assessment Data collected in 2008. Baseline balance tests were run on multiple socioeconomics and demographic characteristics of the household to determine if randomisation was indeed successful. Table A.1 reports the results of the balance tests and shows no statistically significant differences for all indicators between the treatment and control households indicating that randomisation was successful.

Without baseline data within the impact evaluation study, econometric models such as the Differences-in-Difference model could not be implemented, therefore an OLS model will be used for studying individual outcomes. One key issue with the OLS is that it cannot fully isolate programme impacts from the parallel trends of both the treatment and control groups in the absence of treatment. Given that model estimations are done at the barangay level, this issue is usually mitigated with the use of household and barangay level control variables. However, in line Vaz et al. (2019) control variables are not included within model estimations as a key assumption of the model is that CCTs that are designed as RCTs are perfectly randomized in treatment assignment. The baseline tests are used to confirm this.

5. Methodology

To properly describe the multidimensional framework being used in this paper, I will explain the statistical model that will be used for analysis throughout the framework. This paper will use an OLS model to estimate the impact of the programme on various objectives. Since the treatment and control groups are identical in demographic and socioeconomic characteristics at the baseline it is unlikely that significant variation in their trajectories stem

from unobserved variables outside the model. Therefore, although the OLS estimations are likely to be larger than actual programme impact as the treatment-control group differences will also encompass the effects of trends in the absence of treatments it can still lead to meaningful conclusions.

The model studies the programme impact on individual outcomes and uses three metrics to measure the overall success of a programme: the incidence of multidimensional poverty in the programme, the extent of poverty, and progress made towards the objectives by households that have not achieved all the objective of the programme. Given that the data available from this is only from 2011, this paper cannot study changes in the incidence of poverty over time.

5.1 Individual Indicators

Equation 1 illustrates the base formula for the model in use to estimate programme effects on an individual programme outcome. Here Y_i is the estimated proportion of individuals living in households living in households in barangay *i* that are deficient in a programme outcome. β_p is a cross sectional estimate of programme effects and X_i is a binary indicator of *treatment* that takes the value 1 if the barangay is in the treatment group and 0 if in the control group. ε_i is the error term.

$$Y_i = \alpha + \beta_p X_i + \varepsilon_i, \qquad (1)$$

The model focuses on deficiencies as the key identifier of poverty. Here the model establishes the number of objectives for the programme in evaluation and considers the number of objectives that eligible individuals missed. 4P has 5 individual objectives (p) to measure child health and education: vaccination, deworming, health checkups, preschool attendance, and school attendance. Each objective is accompanied by an indicator x_p for each objective p $[p \in 1,2\ldots,5]$. For an individual n, any $x_p < k_p$ (the threshold defined for objective$\boldsymbol{p}$) will mean that the individual n is deficient in p and therefore has the deficiency score $d_{n,p} = 1$ or $d_{n,p} = 0$ should $x_p > z_p$. To allow for heteroskedasticity, the standard errors for estimations in this paper are robust and clustered at the *barangay* level.

The 4P programme has two main objectives: education and health. To study the impact of the programme on multidimensional poverty I create a new model which uses a measure of

multidimensional poverty. This measure is created by combining individual indicators to form the weighted sum of deficiency score using the following steps. 4P has two types of grants, however, eligibility for the grants vary between households and as such not all households are eligible for both. Firstly eligibility, e, is introduced for each household h to ensure the use of relevant weights for objectives in computations.

When adapted to the 4P programme this results in $e_{h,education} = 1$ if the household has at least one member aged 6-14 years old and $e_{h,educationUnder5} = 1$ if the household has at least one member aged 3-5 years old. For health,$e_{h,health} = 1$ if the household has at least one member aged 6-14 years old and $e_{h,healthUnder5} = 1$ if the household has at least one member under the age of 5. Table A.2 reports the weights per indicator (w_p) to be used in computations conditional on household eligibility (e_h). Equal weights are assigned to combined indicators of health and education as the 4P programme has not explicitly defined their relevant weights.

According to Vaz et al. (2019), estimations for the individuals are done in the context of a household, as the target of the programme are households. Individual deficiency scores are used to compute the deficiency scores of their households in the same objectives. For a household, the *household deficiency score* (*d*) for any given *objective* (p) is given by $d_{h,p} = max(d_{1,p}, d_{2,p} \dots d_{N,p})$. Simply put, this means that if a household has just one eligible individual that is deficient in an objective, then the entire household is deficient in that objective. For example, individual 2 is living in a household of N and is between 3-5 years old. Therefore individual 2 is eligible for the education objectives (ie. attendance). If individual 2 is deficient in attendance, then the corresponding household deficiency score is $d_{h,p} = 1$.

Vaz et al. (2019) define the *weighted sum of missed objectives* for a household as the extent of poverty within the programme. I use this as a measure of how close a household is to achieving all the goals of a given programme. Here, a weighted sum of 0 indicated that the individual lives in a household that has achieved all the goals of the programme and is thus free of deficiencies. Corresponding weights must be assigned to the objectives to ensure their relative importance can be considered when indicators are combined in later stages (Vaz et al., 2019). Each objective, p is thus assigned its corresponding weight, $w_p \in R$ and $\sum_{p=1}^{6} \omega_p = 1$. This is done so that the weighted sum of deficiencies score lies between 0 and 1.

The weighted sum of missed of objectives (M) is computed using the corresponding weights (w_p) for household deficiencies ($d_{h,p}$) for the individuals in household, h, as $M_h = \sum_{p=1}^{6} w_p \, d_{h,p}$, where $M_h = [0,1]$.

$$Y_i = \alpha + \beta_M X_i + \varepsilon_i, \qquad (2)$$

Equation 2 illustrates the model used to estimate the average *weighted sum of missed objectives* for individuals living in households in barangay *i*. Here Y_i is the estimated average M for individuals living in households in barangay *i*. β_M is a cross sectional estimate of programme effects on M and X_i is a binary indicator of *treatment* that takes the value 1 if the barangay is in the treatment group and 0 if in the control group. ε_i is the error term.

5.2 Multidimensional Indicators

The *incidence* of multidimensional poverty for each household is calculated using the *weighted sum of missed objectives.* The incidence is defined in relation to S in the form of a binary variable, Q_h where $Q_h = 0$ if $M_h < S$, and $Q_h = 1$ if $M_h > S$. The value S represents a threshold set by the programme being evaluated that determines if the individuals living in a household are in *multidimensionally poverty* (Vaz et al., 2019).

$$Y_i = \alpha + \beta_Q X_i + \varepsilon_i, \qquad (3)$$

Equation 3 is used to estimate the average *incidence* of multidimensional poverty for individuals living in households in barangay *i*. Here Y_i is the estimated proportion of individuals living in households in barangay *i* that are multidimensionally poor ($M_h > S$). β_Q is a cross sectional estimate of programme effects on Q and X_i is a binary indicator of *treatment* that takes the value 1 if the barangay is in the treatment group and 0 if in the control group. ε_i is the error term. Although 4P does not explicitly set a threshold (*S*), this paper sets S = 0.25 for computations. The threshold (S) is the maximum value of M_h a household can have with only one deficiency for all combinations of eligibility. The incidence is used to measure the proportion of households that achieve most of the goals of the programme and are thus no longer multidimensionally poor.

6 Results and Policy Implications

6.1 Individual Indicators

Calculations of household deficiency scores on each individual indicator allow us to see differences between individuals in households of the treatment and control group for each indicator separately. This allows us to pinpoint variations in the effectiveness of each intervention in achieving programme goals. Table 1 reports results of Model 1 for each individual indicator. The control and treatment columns present the differences in the proportion of individuals living in household that are deficient in each indicator at the time of the impact evaluation study. And the coefficient column displays the programme treatment impacts on the individual indicators The two largest differences can be seen in health checkup periodicity and school attendance.

As reported by Table 1, the proportion of individuals in households where at least one school-aged member does not meet school attendance requirements of programme reported is on average 14.0 percent smaller in the treatment group (42.5 percent) than in the control group (56.5 percent) at a 5 percent significance level. Similarly, the proportion of individuals in households where at least one member aged 3-5 years old is deficient in pre-school requirements are 14.7 percent smaller in the treatment group (57.9 percent) than in the control group (72.6 percent) at a 5 percent significance level. These results contrast with our hypothesis that programme impacts are likely smaller than traditional evaluations such as Catubig & Villano (2017) which found only a 1.12 percent increase in attendance. This difference is likely due to biases from self-reported data in our model and Catubig & Villano (2017) using school data.

However, our findings are in line with the findings of Ganimian & Murnane (2016) which show that reducing the cost of school is only one part of improving attendance and enrolment and does not result consistent improvement without successful information dissemination. Ganimian & Murnane (2016) indicate that involving parents beyond just financial transfers by providing information about the quality of education and the long-term economic benefits of education from early childhood can significantly improve enrolment and attendance at minimal additional cost.

Table 1

Programme Average Impact on Individual Indicators

		Proportion of individuals [0,1] living in a household deficient in ….		Programme Effects		
		Model (1)				
		Control	**Treatment**	**Coefficient (Difference)**	**R^2**	**N**
Category	**Indicators**					
Child Education	Attendance (School aged)	0.565	0.425	-.140** (0.040)	0.0196	8160
	Attendance (Ages 3-5)	0 .726	0.579	-.147 * (0.052)	0.0236	4421
Child Health	Deworming	0 .842	0.748	-.094*** (0.025)	0.0135	8160
	Check-ups	0.849	0.712	-0.137*** (0.050)	0.0272	5669
	Vaccination	1	1	-	-	5669

Source: Pantawid Pamilyang Pilipino Program Impact Evaluation data

Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01

Similarly, the number of individuals in household where children are not receiving health check-up at DOH recommended periodicity is on average 13.7 percent smaller in the treatment group (71.2 percent) than in the control group (84.9 percent) at a 5 percent significance level. This is in line with the findings of the Cho et. al. (2020) which state that the 4P program had significant gaps in properly checking programme requirements for checkups

when transferring health grants. Mamangon (2019) finds similar gaps in monitoring and suggest that the health grants are staggered and paid out on a per checkup basis such that the individual transfer serves as an immediate financial incentive for a checkup and as an immediate compensation for incurred costs to the household.

Noteworthy is also the improvement in de-worming intake among school children. At a 5 percent significance level, the number of individuals in households where at least one school aged child has not received sufficient de-worming pills in a year is on average 9.3 percent smaller in the treatment group (74.8 percent) than in the control group (84.2 percent). A key mechanism to improve deworming rates in schools are well designed financial incentives for those who administer the deworming medication to students. Evaluations of a performance-based child nutrition program in rural China by Luo et. al (2020) find that cash incentives for teachers and principals based on the numbers of children who met nutritional requirements by the end of the school year were successful in substantially decreasing anaemia rates in treatment school. A similar approach can be applied towards deworming to improve deworming rates in 4P barangays.

A key issue raised by computations for child vaccination is that all individuals in both the treatment and control groups failed to meet desired immunization requirements in this sample. This is in line with the findings of Bondy et al. (2009) which suggest that location is a key factor in determining immunization in the Philippines and as such individuals in low-income households are unlikely to receive adequate vaccination. This is likely driven by the supply side issues highlighted by the 4P programme evaluation indicating that resources need to be redistributed disproportionately more towards *barangays* that are further from urban centres to address the issue (World Bank, 2011). Bondy et al. (2009) suggest that although CCT programmes focus on demand side policy it is prudent to alleviate supply side constraints to maximise programme impact.

However, further investigation of individual vaccines within the DOH requirements reveal that vaccination rates vary by vaccine indicating that supply side constraints may not be the only driver of low immunization. Table A.3 displays the programme average impact on the coverage rates of each vaccine. BCG has near universal coverage in both treatment (98.4 percent) and control groups (99.3 percent) and no statistically significant differences between the two groups. This is likely because the BCG vaccine is a single dose given shortly after birth

and does not require a separate visit to a health centre and thus the 4P health have little impact on vaccine regimen completion.

Table A.3 indicates that Polio and Hepatitis B vaccine have among the poorest coverage in both the treatment and control groups. This is in line with findings by Fatima & Syed (2018) which indicate the controversy surrounding the sudden withdrawal of the dengue vaccine, Dengvaxia in the Philippines fuelled misinformation about other vaccines. Vaccine hesitancy for Polio and Hepatitis B vaccines were amplified in poorer communities where both diseases were endemic in the population and thus seemingly displayed higher levels of vaccine acquired disease (Fatima & Syed, 2018). Banerjee et. al. (2019) show that using neighbourhood 'gossips' in the social networks of rural Haryana (India) and disseminating regular reminders and information about the benefits of vaccination resulted in a substantial rise in full vaccination at minimal cost. Banerjee et. al. (2019) highlight that the use of neighbourhood 'gossips' adds a layer of trust to critical and verified information about vaccines being delivered by the 'gossip' and helps reduce hesitancy among targeted households.

In summary, we find that on average programme impacts on individual indicators are smaller when measured using the multidimensional model than traditional evaluations. Our results reveal that a key area of concern is the role of misinformation in disparities between vaccination rates of different vaccines in the programme.

6.2 Multidimensional Indicators

Table 2.1 and 2.2 reports the impact of the 4P programme on the multidimensional metrics of the model used to determine the overall success of the programme. These metrics are a more realistic representation of the impact of the programme on households as they combine all indicators to better determine impacts on multidimensional poverty. Table 2.1 displays programme impacts on the average weighted sum of missed objectives of households in treatment and control barangays.

Table 2.1
4P Programme Average Impact on Average Weighted Sum of Missed Objectives

Multidimensional Indices	Estimated average [0,1] for individuals living in households in ….		Programme Effect		
			Model (2)		
	Control	Treatment	Coefficient (Difference)	R^2	N
Weighted sum of missed objectives	0.600	0.532	-0.082***	0.020	9058

Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01

Table 2.1 indicates that on average the weighted sum of missed objectives in the treatment group (53.2 percent) is 5 percent lower than the control group (60.0 percent) at a 5 percent significance level. This indicates that the extent of poverty experiences by households in the treatment group is lower than that of the control group. The proportion of individuals living in a household that are multidimensionally poor is captured by the incidence metric.

Table 2.2 displays programme impacts on estimated average incidence of multidimensional poverty within the programme for households in treatment and control barangays. Table 2.2 indicates that on average the incidence of multidimensional poverty is 5.6 percent lower in the treatment group (83.0 percent) than in the control group (88.6 percent) at a 5 percent significance level.

Table 2.2

4P Programme Average Impact on Incidence of Multidimensional Poverty

Multidimensional Indices	Estimated average [0,1] for individual living in households in		Programme Effect		
	Control	Treatment	Coefficient (Difference)	R^2	N
Incidence (S=0.25)	0.886	0.830	-0.056**	0.006	9058

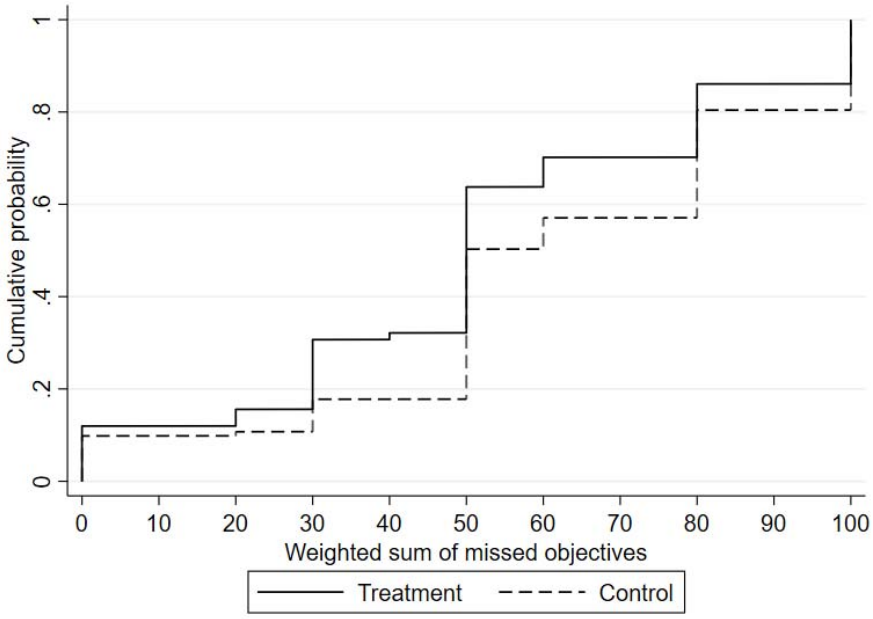
Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01

Table A.4 reports the results of proportion tests for various levels of weighted sums of missed objective. These indicate differences between treatment and control groups at varying intensities of poverty in the 4P programme. Notable is the significant difference in the proportion of individuals that have missed under 50 percent of objectives. At a 5 percent significance level, the treatment group has a consistently larger proportion of individuals than the control group for any weighted sum below 50 percent. On average, 82.2 percent of individuals in the control group live in households that missed 50 percent or more of the programme's objectives while in the treatment group this is 36.2 percent.

Figure 1 displays the cumulative probabilities for the weighted sum of missed objectives for the treatment and control groups. The cumulative probabilities suggest that a significantly larger proportion of the treatment group have weighted sums at 50 percent or below than the control group. Kolmogorov-Smirnov test is used to test this. At a five percent significance level, Kolmogorov-Smirnov equality-of-distributions test rejects the null-hypothesis of equality, with a difference of 0.143.

Figure 1

4P Cumulative Distribution of Weighted Sum of Missed objectives



7 Discussion and Conclusion

Several factors limit the suitability of the Pantawid Pamilya programme for evaluation using this model. Chiefly, while the 4P programme was set up in an experimental design, no baseline data was collected by the impact evaluation surveys. The lack of a baseline set of data makes it difficult to incorporate more advanced econometric models for statistical analysis of programme impacts. One such method would be the DiD model that can better account for initial differences between treatment and control groups that stem from unobserved variables. While some of this mitigated by successful randomisation of treatment assignment it means that the estimated programme impacts are likely slightly overstated as the effects of unobserved variables are not isolated by the OLS regressions. Similarly, barangay level control variables could help isolate effects on indicators from barangay specific differences, but these control variables do not exist within the dataset and are thus not used in the OLS regressions. However, 4P assigned treatment at random and baseline tests of household indicators for treatment and control barangays show no indication that observed and unobserved variables are not identical between the groups.

This model requires clear and meaningful thresholds to be set for each objective such that evaluation can adequately reflect the impact of the programme in alleviating poverty.

Similarly, the relative importance of the outcomes to the programme are key to assigning accurate weights in evaluations. For 4P, these weights are not set, and the outcomes are assumed to be equally important. However, if for example diseases such as polio are endemic in the targeted population it could be that the relative importance of immunization is far higher than other objectives in the programme, but this is not reflected in our model without programme stated weights.

Finally, the application of the framework is that the model reveals large disparities between individual objectives of the programme. For example, while the model found significant impact on schooling, de-worming, and check-up periodicity in children, it also revealed that no household met the immunization requirements of the programme. This indicates that the implementation of the vaccination objective was not sufficient to help treatment household achieve the immunization goals.

The results of the analysis reveal significant impact of the programme in Phillipines however these insights have little external validity as this version of the model and the programme are tailor made to address the issues of poverty in the Phillipines. The framework itself has significantly higher external validity as is can be repurposed and applied in evaluating any development policy or can be reapplied to the 4P programme using better econometric techniques in the future.

The goal of this research paper was to estimate the impact of the 4P program on multidimensional poverty in child development in the Phillipines using a multidimensional framework. The regression estimates indicate that the 4P programme had a small but significant impact in reducing overall multidimensional poverty however, the success of the interventions vary largely. The incidence of poverty for individuals living in treatment households are significantly lower than those in control groups. Further analysis of the intensity of poverty reveal that treatment households experience multidimensional poverty at a lower intensity than control households and have achieved more objectives.

In conclusion, the findings of this research indicate that the 4P programme was indeed successful in reducing multidimensional poverty in the Philippines and are in line with the existing body of research evaluating the programme. In line with our hypothesis on individual outcomes the impact of 4P on individual outcomes were significantly smaller than indicated by traditional evaluations on average. Model estimates also reveal those key interventions such as the immunization programme require further development and resources within

immunization should be disproportionately larger for vaccines such as polio and Hepatitis B. Finally model estimates reveal that while demand side incentives have worked in increasing the proportion of individuals meeting programme objectives, several incentives need to be modified to adopt successes of other programs from around the worlds and address the supply side issues highlighted by the model and other research outlined in the paper.

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Appendix A

Table A.1

Differences Between Treatment and Control Households using pseudo-baseline in 2008

Indicator	Treatment	Control	Difference
Household Size	5.66	5.69	0.03
Number of children <5 years old	1.08	1.10	0.02
Number of children between 6-14 years old	1.65	1.64	0.01
Educational achievement of household heads:			
Elementary School	61.75	63.74	1.99
High School	23.05	23.21	0.16
College	5.96	5.08	0.88
Strong roof materials	26.42	27.04	0.62
Light roof materials	55.31	52.68	2.63
Electricity access	42.38	39.62	2.76

Source: Pantawid Pamilyang Pilipino Program Impact Evaluation data
Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01

Table A.2

Indicators and Weights for Different Eligibilities

Category	Indicator	Deprived if:	Weight if all	Weight only children aged 0-2	Weight only children aged 3-5	Weight only School aged children
Child Education	School /Pre-School Attendance	At least one member aged 6-14 attended less than 85% of the school days (past month) OR is not enrolled	0.25		0.5	0.5
		At least one member aged 3-5 attended less than 85% of the pre-school/daycare days (past month) OR is not enrolled	0.25			
Child Health	De-worming	at least one member aged 6-14 has not taken 2 or more de-worming pills in the last year	0.1667			0.5
	Check-ups	at least one member aged 0-2 has not made 6 visits in the past 6 months OR at least one member aged 2-5 has not made 3 visits in the past 6 months	0.1667	0.5	0.25	
	Vaccination	At least one member aged 0-5 has not met Phillipines Department of Health Vaccination requirements: <=18months old: TB BCG (1 dose), Dtap/DPT (3 of either), Polio (3 doses), MMR (1 dose) >18 months: DPT booster (1 dose)	0.1667	0.5	0.25	

Source: Department of Social Welfare and Development thresholds reported in Chaudary et al. (2012).

Table A.2 continued

Indicators and Weights for Different Eligibilities

Category	Indicator	Deprived if:	Weight only children aged both 0-2 & 3-5	Weight only children aged both 0-2 & school aged	Weight only children aged both 3-5 & school aged
Child Education	School /Pre-School Attendance	At least one member aged 6-14 attended less than 85% of the school days (past month) OR is not enrolled	0.5	0.25	0.25
		At least one member aged 3-5 attended less than 85% of the pre-school/daycare days (past month) OR is not enrolled		0.25	0.25
Child Health	De-worming	at least one member aged 6-14 has not taken 2 or more de-worming pills in the last year		0.1667	0.1667
	Check-ups	at least one member aged 0-2 has not made 6 visits in the past 6 months OR at least one member aged 2-5 has not made 3 visits in the past 6 months	0.25	0.1667	0.1667
	Vaccination	At least one member aged 0-5 has not met Phillipines Department of Health Vaccination requirements: <=18months old : TB BCG (1 dose), Dtap/DPT (3 of either), Polio (3 doses), MMR (1 dose) >18 months: DPT booster (1 dose)	0.25	0.1667	0.1667

Source: Department of Social Welfare and Development thresholds reported in Chaudary et al. (2012).

Table A.3

Programme Average Impact on Individual Vaccine Coverage

	Proportion of individuals [0,1] living in a household deficient in ….			
	Control	**Treatment**	**Coeffecient**	**SE**
Vaccine				
BCG	0. 007	0.016	0.009	0.006
DPT	0.135	0.166	0.031	0.025
Polio	0.994	0.991	-0.003	0.007
Hepatitis B	1	1	-	-

Source: Pantawid Pamilyang Pilipino Program Impact Evaluation data

Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01

Table A.4

Differences Between Treatment and Control Groups on Missed Objectives in 2011

Weighted sum of missed objectives	Proportion of individuals [0,1] living in a household with ….			
	Control	**Treatment**	**Difference**	**S.E.**
0%	0.099	0.120	-0.021***	0.007
10%	0	0	-	-
20%	0.009	0.036	-0.027***	0.003
30%	0.070	0.151	-0.081***	0.007
40%	0	0.015	-0.015***	0.002
50%	0.325	0.316	0.009	0.010
60%	0.068	0.064	0.004	0.005
70%	0	0	-	-
80%	0.233	0.159	0.075***	0 .008
90%	0	0	-	-
100%	0.196	0.139	0.057***	0.008

Source: Pantawid Pamilyang Pilipino Program Impact Evaluation data

Note: Clustered robust standard errors are reported in parentheses * p<0.1, ** p<0.05, *** p<0.01