The Link between Expenditure on Contraceptives and Number of Young Dependents in the Philippines

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The growing population of the Philippines hinders the country from achieving economic development due to the limited resources available. The 2010 Census on Population and Housing (CPH) reports that the Philippine population has struck 92.1 million, a 15.8-million increase from the 76.3 million population size reported in 2000. Moreover, the relationship between population and family size, on the one hand, and poverty incidence on the other, has been established through econometric models showing the causality between presence of young dependents in a household and household welfare. Using the Family Income and Expenditure Survey (FIES) 2009 data, this study examines the factors affecting the number of young dependents in a household, and focuses in particular on the household's level of contraceptive expenditure. The negative binomial regression model is used to quantify the effect of the factors and predict the average number of young dependents in a household. This model allows for overdispersion in the data. Results show that for every P10,000 increase in total expenditure on contraceptives for a period of six months, the mean number of young dependents decreases by 3.7%. Other demographic variables such as education of household head and income of the household are controlled for in the study.

Keywords: young dependents, contraceptive expenditure, negative binomial regression, overdispersion

1. Introduction

The National Statistics Office (NSO) reports that, based on the 2010 Census of Population and Housing (CPH) the total population of the Philippines for

2010 has reached 92.34 million, an increase of 15.83 million over the Philippine population in 2000. From 2000 to 2010, the average annual growth rate was 1.90%, which is high by international standards. Moreover, the household population of the Philippines reached 92.1 million in 2010, an increase of 15.8 million (or 20.7%) over the household population of 76.3 million in 2000. Some regions have grown faster than others, most notably Region IVA (35.3%) and Region XII (27.6%). Based on the projections of the World Population Review, the Philippines currently ranks as the 12th most populated country in the world (World Population Review, 2014).

The rapid population growth in the poorest countries hinders economic development, pushes the children into poverty, and threatens global political stability (Sachs, 2008; Reading, 2011). Although the world population growth rate has declined, Sachs (2008) explains that global population growth remains a primary concern, as it continues to increase rapidly in those regions which are least able to ensure health, stability and prosperity of the population. Moreover, rising populations pose a threat to resource scarcity because of its impact on the Earth's ecosystems and biodiversity.

There is strong evidence that population has an effect on economic development. Mapa et al. (2012) assert that the link between population and family size on the one hand and poverty incidence on the other hand has been established using both macro and micro data. For example, at the provincial level, Mapa et al. (2006) establish that increasing the proportion of young dependents decreases per capita income, all other things being equal. On the other hand, working at the micro level, Pernia et al. (2008) observe that family size is closely associated with poverty incidence, as evidenced by household survey data over time. This is so, says Pernia et al. (2008), because poor families are heavily burdened when they end up with more children than they themselves desire. A strong population program is needed to address the problem of poverty. This could be in the form of providing family planning services in the short run, and making an advocacy for smaller family sizes in the long run (Orbeta, 2006). In an earlier study, Orbeta (2003) notes that larger family sizes lead to high poverty incidence and a worsening of income inequality.

What might cause a high level of unwanted fertility? The answer has been attributed to low contraceptive prevalence. The high level of unwanted fertility for the poor, says Orbeta (2003), is explained by the limited access to family planning and allied services, lower contraceptive prevalence rates, and a higher unmet need for family planning. For this reason, there is strong need for an effective family program (such as the Reproductive Health Law) to enable the poor to realize their fertility goals. Interestingly, although poor women want more children on average than better-off women do, they experience a much larger gap between the number of children they want and the number of children they actually have (Darroch et al., 2009).

There is evidence that poor women will benefit most from the availability of contraceptives. Darroch et al. (2009) explain that fulfilling demand for contraceptives could benefit disadvantaged women, given that poor Filipino women experience disproportionately high levels of unmet need and unintended pregnancy.

Although this study is chiefly concerned with the effect of contraceptive use on number of dependents, it is important to mention that contraceptive use is important not only in controlling fertility levels but also in preventing unintended pregnancies. Accurate and complete knowledge about contraceptive methods and pregnancy risks improve the ability of women and their partners to have safe pregnancies, give births to healthy babies and form a family of the size they want and at the pace they choose (Darroch et al., 2009).This is especially true for countries like the Philippines where, despite being illegal, abortion is the solution women seek, instead of giving birth to children they cannot care for or that would cause them to be disgraced in the eyes of society (Juarez, et al., 2005). Induced abortion has become one of the methods Filipino women use to meet their reproductive goals.

It is unfortunate that contraceptive use remains extremely low among poor couples because they lack information and access to them (Pernia et al., 2008). Since the mid-1990s, the percentage of currently married women of reproductive age reporting current use of any method of contraception (this is defined as the contraceptive prevalence rate (CPR)) has remained steady at 45% to 50%, based on results from successive Demographic and Health Surveys and Family Planning Surveys of the NSO.

2. Review of Related Literature

Bloom and Williamson (1998) argue that population dynamics matter in the determination of economic growth. In East Asia, 1.4 to 1.9 percentage points of East Asian GDP per capita growth from 1965 to 1990 is accounted for by population dynamics (as much as one-third of the observed economic growth for the period). This has led them to conclude that “population dynamics is the most important growth determinant by far.”

In studying this link between population and economic growth, Kelley and Schmidt (1995) observe that a decrease in population growth rate from its median (across a 30-year panel from 1960 to 1990) of 2.54% to 1.54% results in an increase in per capita GNP median growth rate from 1.36% to 2.00%. Re-estimating the models at a later time, Kelly and Schmidt (2001) arrive at the following conclusions:

1. Demographic trends (declining population growth, fertility, mortality; changing age distribution; and rising density and population sizes) have sizeable impact on economic growth.

2. While the overall impact of population growth is negative, fertility and mortality effects have offsetting effects with increases due to mortality decline stimulating growth while increases due to rise in fertility attenuating growth.
3. Increasing densities and population size contribute a positive but relatively small boost to economic growth, with scale effects dominating density.
4. In most models, the impact of demography has declined over time.

Now that the effect of population on development has been argued, it is in order to ask what causes population growth. Population growth rates are high due to the continued high fertility rates in the country. But high fertility rates will also mean prolonged periods of high youth dependency, a burden which, Orbeta (2003) argues, will rob us of the opportunity for the demographic bonus that allowed other East Asian countries to increase their saving rates, physical and human capital investments that have spurred their economic growth in the last two decades.

A comparison of the population and development scenarios of Philippines and Thailand has been made by Orbeta (2003). He concludes that the difference in fertility levels spawned not only a divergence in population growth and population size but also a glaring deviation in youth dependency burden. Among the known impacts of high dependency burden is that it depresses savings and, consequently, physical as well as human capital investments (Orbeta, 2003).

There is growing evidence that larger family sizes (as a result of high fertility) make it difficult for poor families to get out of poverty and for the currently nonpoor to be more prone to slide below the poverty threshold (Orbeta, 2003). In a more recent study, Orbeta (2006) describes the impact of a large number of young dependents on household welfare:

> "Having more children in a family reduces enrollment of children, particularly in secondary and tertiary levels, and reduces expenditure per child who remains in school. It also reduces savings of households. In addition, and perhaps more important for development policy, the negative impact is consistently much bigger among poorer households, implying that besides the continued high poverty incidence, there will also be a perpetuation or even worsening of income inequality."

More evidence of the effect of young dependents on household welfare is offered by Herrin and Costelo (1998) who find that there is a negative relationship between accumulation of household assets and the number of young children 0 to 6 and 7 to 12 years old. Moreover, Mason (1992) shows that child bearing negatively affects saving rate. Although it does not affect absolute amount of savings, asset per child was found to be greater in lower fertility households.

King (1987) gives reasons why the welfare of a household with large family size is worse: (1) children in large families perform worse in school, (2) children in large families have poorer health, lower survival probabilities, and are less developed physically, (3) impact on parental welfare is not as clear.

Lloyd (1994) also explains that the adverse impact on children born into large families can be grouped into: (1) resource dilution, with each child getting a smaller share of family resources, including income time and maternal nutrition, (2) the "opportunity effect" through diminished access to public resources such as health care and education, (3) the "equity effect," which means unequal distribution of resources among siblings; and (4) the "intergenerational effect," with the adherence to the traditional role affecting the transmission of opportunities to the next generation.

Current fertility choices not only have contemporary but also intergenerational impact. There is overwhelming evidence that fertility leads to decrease in investments in human capital (Orbeta, 2003).

Do the poor always prefer large family sizes? Pernia et al. (2008) explain that there is evidence that the poor prefer smaller families. The problem is that they are unable to achieve their preference. Based on the 2008 National Demographic and Health Survey (NDHS), 37% of births in the five years preceding the survey are either not wanted at the time of pregnancy (mistimed) or entirely unwanted.

There is growth in total population resulting from unwanted fertility as defined by couples. This calls for the need for efforts to assist couples in eliminating unwanted fertility and achieving their fertility goals in ways that are safe, legal, affordable and consistent with their moral convictions and religious beliefs (Herrin and Costelo, 1998).There is also growth resulting from a desired family size or wanted fertility that is higher than replacement fertility. This requires efforts to modify fertility preferences of couples toward a small family size norm.

Ensuring access to a full range of modern family planning methods cum appropriate information raises the success of achieving the desired family size. Limiting family planning options to natural family planning (NFP) methods only fails to address the private and social costs of mistimed and unwanted pregnancies (Pernia et al., 2008).What is needed is a family planning program that is responsive to individual needs and that offers high quality fertility planning and related health services play a role in the efforts to eliminate unwanted fertility (Herrin and Costelo, 1998).

Moreover, Herrin and Costelo (1998) also argue that "with respect to population growth resulting from high desired family size, that is, wanted fertility that is higher than the replacement fertility, efforts are needed to modify the fertility preferences of couples towards a small family size norm. Here, a broader set of policies is needed that could create socioeconomic conditions that favor a smaller family size and greater human capital investment per child."

The 2011 Family Health Survey (FHS) reports that unmet need for family planning among married women in the Philippines remains high at 19.3%: 10.5% for birth spacing and 8.8% for limiting births. Moreover, Darroch et al. (2009)

observe that the poorest third of women are twice as likely as wealthier women to cite lack of access as a reason for not using contraceptives. Problems obtaining contraceptive services and health care in general in the Philippines are common among women who live in rural areas, have no education, have five or more children, and live in the regions of Mindanao, Caraga and ARMM (Darroch et al., 2009).

Contraceptive use is very important in reducing unintended pregnancy and induced abortion. Although nearly all Filipino women want children, they spend many of their childbearing years trying to avoid pregnancy. Women spend 19.4 years, on the average, during which they want to postpone or completely avoid a birth (Singh, 2006). In other words, women must use effective contraception for the majority of their childbearing years to avoid unwanted pregnancies (Darroch et al., 2009).

In the majority of abortion cases in the Philippines, women seek abortions because they are not able to care for a child or for an additional child (Singh et al., 2006). High levels of unintended pregnancy are therefore at the very heart of why large numbers of Filipino women seek induced abortions each year. There could be as few as 0.3 million unintended pregnancies annually if all couples who have an unmet need for contraceptive services or who use traditional methods were given the opportunity to obtain and use modern contraceptive methods (Darroch et al., 2009).

Because abortion is illegal in the Philippines, the procedure is almost always clandestine and often unsafe. Projections based on data from 2000 indicate that about 1000 women in the Philippines died as a result of abortion in 2008, as many as 90,000 were hospitalized for complications (Darroch et al., 2009). Moreover, Darroch also introduces the disability-adjusted life year (DALY) as an internationally-used measure of the years of productive life lost to death and disability from disease and other health conditions. In 2008, Filipino women lost an estimated 144,000 DALYs to unintended pregnancies.

3. Methodology

3.1 The Generalized Linear Model

The response variable is number of young dependents (children aged 0-14 years old in the household), which is a count variable. The study compares the fit statistics of two models: the *Poisson regression model* and the *negative binomial regression model* to study the effect on number of young dependents of contraceptive expenditure, education of household head, type of place of residence, region where household is located, age of household head, sex of household head and income of the household. The model which gives better fit is then chosen. Both the Poisson Regression and negative binomial regression models fall under the class of Generalized Linear Models (GLMs) which we describe below. All GLMs have three components: the random component, the systematic component, and the link function.

Following the discussion of Agresti (2007) on the GLM, the *random component* specifies the distribution of the response variable Y. The distribution specified for the response should belong to the exponential family of distributions. Examples of distributions which are part of the exponential family are the normal, binomial, Poisson, negative binomial, gamma, exponential, and beta distributions. For this study, only the Poisson and negative binomial distributions are used, since these two distributions are the ones designed to model count variables.

The *systematic component* of the GLM specifies the explanatory variables to be included. These variables enter linearly as predictors on the right-hand side of the model equation. That is, the systematic component is given by

$$\alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$$

where the variables $\{x_i\}$ are the explanatory variables.

The *link function* of the GLM specifies a function $g(\cdot)$ that relates the mean of Y, $\mu = E(Y)$, to the explanatory variables as

$$g(\mu) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$$

In other words, the link function connects the mean of the response variable to the systematic component. Examples of common link functions are $g(\mu) = \mu$, called the *identity link*; $g(\mu) = \log \mu$, called the *log link*; and $g(\mu) = \log[\mu / (1-\mu)]$, called the *logit link*.

3.1 Poisson Regression Model

A *Poisson loglinear model* is a model used for count dependent variables. The model is a case of the GLM which assumes a Poisson distribution for Y, and uses the log link function. Thus, the GLM specification of our model is:

i. Random component: $Y \sim$ Poisson (μ)
ii. Systematic component: $\alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$
iii. Link function: $g(\mu) = \log \mu = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$

The explanatory variables $\{x_i\}$ represent contraceptive expenditure of the household, education of household head, type of place of residence (urban or rural), region where household is located, age of household head, sex of household head and income of the household. The Poisson loglinear model assumes that the mean of Y is equal to its variance (that is, the count data are equidispersed). Unless the count data are equidispersed (e.g. if the variance is greater than the mean, or *overdispersed*), the usual Poisson MLE standard errors may be wrong. An alternative to the Poisson regression model is the negative binomial regression model.

3.3 Negative binomial regression

The negative binomial is another distribution that is used to model count variables. Unlike the Poisson, it has an additional parameter such that the variance can exceed the mean (Agresti, 2007).The negative binomial distribution has mean and variance given by:

$$E(Y) = \mu, Var(Y) = \mu + D\mu^2$$

The index D, which is nonnegative, is called the *dispersion parameter*. Agresti (2007) explains that greater heterogeneity in the Poisson means results in a larger value of D. As $D \rightarrow 0$, $Var(Y) \rightarrow \mu$ and the negative binomial distribution converges to the Poisson distribution. The farther D falls above 0, the greater the overdispersion relative to Poisson variability.

3.4 Estimation procedure

The estimation procedure uses a ridge-stabilized Newton-Raphson algorithm to maximize the log-likelihood function $L(\theta; Y)$ with respect to the regression parameters. For the negative binomial distribution, the estimation procedure also produces a maximum likelihood estimate of the scale parameter. The documentation of PROC GENMOD in SAS describes the maximum likelihood estimation:

On the r^{th} iteration, the algorithm updates the parameter vector β_r with

$$\beta_{r+1} = \beta_r - H^{-1}s$$

where H is the Hessian (second derivative) matrix, and s is the gradient (first derivative) vector of the log-likelihood function, both evaluated at the current value of the parameter vector. That is,

$$s = \left[s_j\right] = \left[\frac{\partial L}{\partial \beta_j}\right]$$

and

$$H = \left[h_{ij}\right] = \left[\frac{\partial^2 L}{\partial \beta_i \partial \beta_j}\right]$$

In some cases, the scale parameter is estimated by maximum likelihood. In these cases, elements corresponding to the scale parameter are computed and included in s and H.

3.5 Gamma statistic

The gamma statistic G will be computed in measuring the association between number of young dependents and some of the explanatory variables.

It is a measure describing the relation between two ordinally scaled variables. Suppose A and B are two variables measured in the ordinal level, where A_1, A_2, …, A_k are the possible values of A while B_1, B_2, …, B_r are the possible values of B. Furthermore, we assume the following ordering for the levels of A and B: $A_1 < A_2 < \ldots < A_k$ and $B_1 < B_2 < \ldots < B_r$. Siegel and Castellan (1988) give the following formula for the parameter γ:

$$\gamma = \frac{P[A \,\&\, B\, agree\, in\, order] - P[A \,\&\, B\, disagree\, in\, order]}{1 - P[A \,\&\, B\, are\, tied]}$$
$$= \frac{P[A \,\&\, B\, agree\, in\, order] - P[A \,\&\, B\, disagree\, in\, order]}{P[A \,\&\, B\, agree\, in\, order] + P[A \,\&\, B\, disagree\, in\, order]}$$

The gamma statistic G, used to estimate γ is then defined as

$$G = \frac{\#\, agreements - \#\, disagreements}{\#\, agreements + \#\, disagreements}$$

The value of G is a number between –1 and +1. If there are no disagreements in the ordering, $G = 1$. Similarly, if there are no agreements in the orderings, then $G = -1$. Moreover, the quantity

$$z = (G - \gamma)\sqrt{\frac{\#\, agreements - \#\, disagreements}{N(1 - G^2)}}$$

is approximately normally distributed with mean 0 and variance 1. The test of significance is conservative since the variance of G is an upper limit (Siegel and Castellan, 1988):

$$Var(G) \leq \frac{N(1 - G^2)}{\#\, agreements - \#\, disagreements}$$

4. Dataset and Variables

Data for this study came from the 2009 Family Income and Expenditure Survey (FIES), a nationwide survey of households conducted every three years by the National Statistics Office (NSO). The FIES is the main source of data on family income and expenditure. Only households who spend at least PhP 1.00 on contraceptive expenditure from January to June 2009 are included in the study.

4.1 Dependent variable

The dependent variable used in this study counts the number of children in the household below 15 years of age.

4.2 Explanatory variables

The main explanatory variable that is of interest is contraceptive expenditure of the household. Another explanatory variable included in the study is the total annual income of the household, a continuous variable, to measure the effect of household income on number of young dependents. The study also controls for characteristics of the household head: education of household head, the sex of household head, age of household head. The level of education has eight categories: (1) no grade completed, (2) elementary undergraduate, (3) elementary graduate, (4) high school undergraduate, (5) high school graduate, (6) college undergraduate, (7) college graduate, (8) postgraduate. Lastly, the study also controls for some spatial characteristics: the type of place of residence (urban or rural area), and the region where the household is located.

5. Empirical Results

In Table 1, we see the summary measures of the quantitative variables included in the study. On the average, the 6374 households have two young dependents. The average expenditure on contraceptives among households with at least PhP1.00 expenditure on contraceptives from January to June of 2009 is PhP1040.Since the distribution of contraceptive expenditure is skewed, this figure may not be representative. The average income of these households is PhP190,631 and the average age of the household head is 48.

Table 1. Summary Statistics for Dependent Variable and Quantitative Explanatory Variables for Households who Registered Some Spending on Contraceptives

Label	N	Mean	Std Dev	Minimum	Maximum
Number of Young Dependents	6374	1.975	1.63	0	11
Contraceptives Expenditure	6374	1040.28	8797.78	2	310000
Total Family Income	6374	190631.22	441375.2	11118	30368154
Age of Household Head	6374	48.30	13.58	13	98

Table 2 gives the percent distribution of households that declared some spending on contraceptives from January to June 2009 by selected household characteristics. The households headed by at most elementary graduate household heads account for 47.25% of all households, thus the profile of a relatively low level of education among the household heads. Most of the households (63.2%) are located in rural areas which, as we shall see later, have higher incidence of large number of young dependents. Moreover, five out of every six households (83.1%) are male-headed.

Table 2. Percent Distribution of Households that Registered an Expenditure on Contraceptives from January to June 2009 by Selected Household Characteristics

Variable	Level	Number of Households	Percent
Level of Education of Household Head	No grade completed	236	3.7
	Elementary undergraduate	1512	23.72
	Elementary graduate	1264	19.83
	High school undergraduate	866	13.59
	High School graduate	1261	19.78
	college undergraduate	646	10.13
	College graduate	573	8.99
	Postgraduate	16	0.25
Type of Location of Household	Urban	2347	36.82
	Rural	4027	63.18
Sex of Household Head	Male	5294	83.06
	Female	1080	16.94

Table 3 shows the percentage distribution by region of households who declared some expenditure on contraceptives from January to June 2009, as well as average spending on contraceptives for the same period. Bicol Region has the highest incidence of households that spend on contraceptives (12.19%). Other regions with high incidence of contraceptive spending are Western Visayas (8.83%) and ARMM (8.66%). CAR (1.44%) and Cagayan Valley (1.8%) spend lowest on contraceptives. However, the regions whose households spend highest on contraceptives are CALABARZON, CAR, Cagayan Valley, Central Luzon, and NCR.

Figure 1 gives the scatterplot between total contraceptive expenditure from January to June 2009 and number of young dependents. The plot shows a negative relationship between the two variables. Households who spend most on contraceptives have only at most three or four young dependents in the household, while households who spend less on contraceptives can have up to ten or eleven young dependents in their household. The relationship looks more exponential than linear, suggesting that a log link function may be more appropriate than an identity link function for the count regression model.

In Figure 2, we compare the percentage distribution of households by number of young dependents in urban and rural areas. It is noticeable that the distribution of households by number of young dependents is highly skewed. Moreover, there is higher percentage of households with few young dependents (at most two) in urban households. On the other hand, there is higher percentage of households having many young dependents (at least three) in rural areas.

Table 3. Percent Distribution and Average Expenditure on Contraceptives of Households who Registered an Expenditure on Contraceptives from January to June 2009 by Region

Region	Number of Households	Percent	Average Expenditure on Contraceptives (in PhP)
NCR	450	7.06	1861.43
CAR	92	1.44	4501.72
Ilocos Region	211	3.31	1160.61
Cagayan Valley	115	1.8	2597.13
Central Luzon	180	2.82	2167.49
CALABARZON	356	5.59	4855.02
MIMAROPA	271	4.25	566.09
Bicol Region	777	12.19	672.12
Western Visayas	563	8.83	602.12
Central Visayas	383	6.01	489.29
Eastern Visayas	293	4.6	958.33
Zamboanga Peninsula	470	7.37	816.85
Northern Mindanao	365	5.73	386.95
Southern Mindanao	487	7.64	694.03
Central Mindanao	496	7.78	284.37
ARMM	552	8.66	212.20
Caraga	313	4.91	360.01

In Figure 3, we compare the percentage distribution of households by number of young dependents by sex of household head. Interestingly, there is a glaring difference in the skewness of the two frequency distributions. First, the percentage of households having no young dependent or just one is much higher for female-headed households, while the percentage of households having at least two young dependents is much higher for male-headed households. This indicates a strong relationship between sex of household head and number of young dependents. In particular, female-headed households are associated with fewer young dependents than are male-headed households.

The gamma coefficients (which measure the association between number of young dependents and some of the independent variables) are summarized in Table 4. The z-values that are computed are conservative values, and thus the true p-values could be smaller than what is reported. The gamma coefficient captures the ordinal nature of some of the variables in the study.

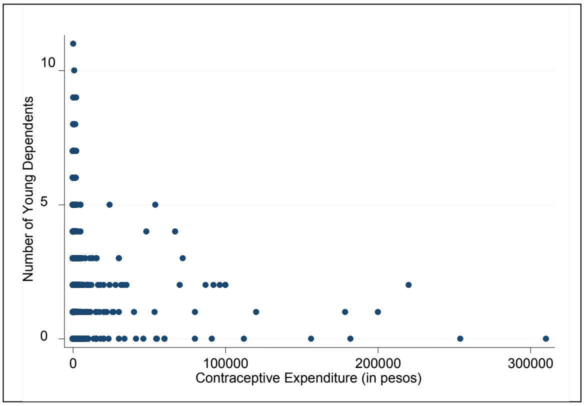

Figure 1. Scatterplot between Contraceptive Expenditure (in pesos) from January to June 2009 and Number of Young Dependents

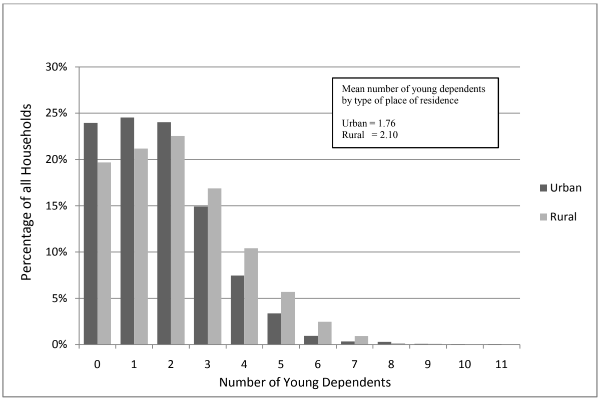

Figure 2. Percentage Distribution of Households by Number of Young Dependents by Type of Place of Residence

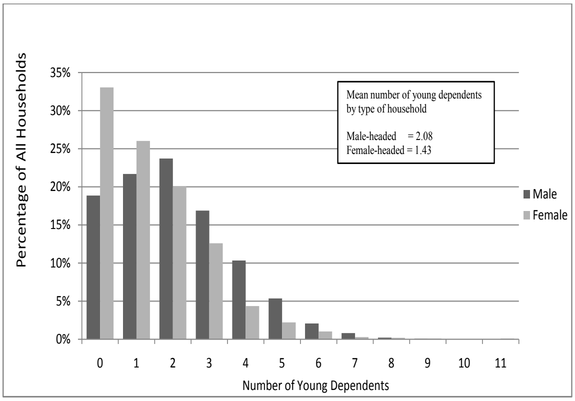

Figure 3. Percentage Distribution of Households by Number of Young Dependents by Sex of Household Head

The results based on the gamma measures of association, given in Table 4, show that there is a significant association between number of young dependents and the education of the household head, sex of the household head, and type of place of residence. The association between number of young dependents and sex of household head is particularly strong at $G = -0.2973$. This indicates that female-headed households are associated with fewer young dependents. Moreover, the table also shows that rural households are associated with more young dependents ($G = 0.1408$), and a higher level of education of the household head is associated with fewer young dependents ($G = -0.0518$).

Table 4. Gamma Measures of Association between Number of Young Dependents and Some Explanatory Variables

Variable	Gamma statistic	Asymptotic Std. Error	z-value	p-value
Education	-0.0518	0.0121	-4.28	<0.001
Sex of Household head	-0.2973	0.0223	-13.33	<0.001
Type of Place of Residence	0.1408	0.0177	7.95	<0.001

To establish whether number of young dependents is associated with the region where the household is located, it is inappropriate to use the Gamma measure of association since the region of the household is measured in the nominal level of measurement. Thus, to test for a difference in number of young dependents across the different regions, the Kruskal-Wallis test is used. The result is a significant difference in average number of young dependents across the different regions at 1% level of significance.

We first compare the goodness-of-fit measures of the Poisson and negative binomial regression models (both of which are used for count dependent variables). Table 5 shows some fit statistics for both models. The log likelihood of the negative binomial regression is greater, suggesting a better model fit. The ratio of *Pearson Chi-square / DF* should be as close to 1 as possible (since the chi-square distribution's mean is its degrees of freedom). Table 5 shows that this ratio is closer to 1 for the negative binomial regression, suggesting that the negative binomial regression model provides better fit of the data.

Table 5. Fit Statistics for the Poisson and Negative Binomial Regression Models

	Poisson Regression	Negative Binomial Regression
Log Likelihood	-3304.75	-3275.67
Pearson Chi-Square	7642.51	6741.55
Pearson Chi-Square/DF	1.2049	1.0628

The results based on the negative binomial regression model are shown in Table 6. The estimates give a number of insightful results. The values in the "Exponentiated Estimate" column represent the estimated multiplicative effect on the mean number of young dependents for each 1-unit increase in the corresponding explanatory variable. Thus, for every PhP1.00 increase in the expenditure on contraceptives for a period of six months, the mean number of young dependents in the household goes down by a factor of 0.9999962. This implies that, all other things being equal, if the household spends PhP10,000 on contraceptives for a period of six months, the mean number of young dependents in the household decreases by 3.7%, an admittedly small effect. Spending PhP100,000 on contraceptives for a period of six months decreases the mean number of young dependents by 31.6%.The study, however, is not trying to establish a direct causal relationship between expenditure on contraceptives and number of young dependents (since contraceptive expenditure will affect fertility via intermediate variables), but rather a strong relationship between the two.

Table 6 also shows the effect of the education of the household head on mean number of young dependents. The postgraduate category is set as the base category with which comparisons are made. For example, households headed by college graduates are estimated to have 53% more young dependents than households headed by postgraduates, while households headed by elementary graduates are estimated to have more than two times as many young dependents as households headed by postgraduates, all other things being equal. The estimated mean number of young dependents monotonically decreases with increasing level of education of the household head, a result consistent with other studies (e.g. Kaur, 2000; Maglad, 1993).

A higher income increases the mean number of young dependents, which is contrary to expectations. As a result of controlling for the effects of other variables, the coefficient for type of place of residence (urban or rural area) is not significant. However, the interaction term between type of place of residence and income of the household is significant. This implies that for urban households, the multiplicative effect of a PhP1.00 increase in income is 1.00000023.Moreover, the interaction term between sex of household head and income is also significant. This indicates that for male-headed households, the multiplicative effect of a PhP1.00 increase in income on mean number of young dependents is 1.00000036.

There is a difference in mean number of young dependents between male-headed and female-headed households. Male-headed households are estimated to have 22% more young dependents than female-headed households. Lastly, we see differences in mean number of young dependents across the different regions. With NCR as base category, some regions have households with a significantly greater mean number of young dependents. For example, households in Bicol Region and Caraga Region are estimated to have, respectively, 36% and 29% greater mean number of young dependents than the households in NCR.

Table 6. Estimates of the Negative Binomial Regression Model

Variable	Estimate	Exponentiated Estimate	Standard Error	Wald Chi-Square	p-value
Intercept**	0.7045	2.0229	0.2972	5.6196	0.0178
Contraceptive Expenditure**	-0.0000038	0.9999962	0.0000018	4.7192	0.0298
Total Income of Household***	0.0000006	1.0000006	0.0000001	28.1122	0.0000
Age of Household Head***	-0.0234	0.9768	0.0008	797.0729	0.0000
No Grade Completed***	0.8977	2.4539	0.2933	9.3648	0.0022
Elementary Undergraduate***	0.8417	2.3203	0.2891	8.4763	0.0036
Elementary Graduate***	0.7906	2.2048	0.2891	7.4792	0.0062
High School Undergraduate***	0.7543	2.1262	0.2893	6.7976	0.0091
High School Graduate**	0.6830	1.9799	0.2889	5.5896	0.0181
College Undergraduate**	0.5900	1.8040	0.2894	4.1561	0.0415
College Graduate	0.4241	1.5282	0.2895	2.1466	0.1429
Postgraduate (Base Category)					
Urban Rural (Base Category)	-0.0011	0.9989	0.0283	0.0016	0.9680
Male-headed*** Female-headed	0.2020	1.2238	0.0348	33.6111	0.0000
NCR (Base Category)					
CAR	0.0345	1.0351	0.0959	0.1294	0.7191
Ilocos Region**	0.1564	1.1692	0.0685	5.2140	0.0224
Cagayan Valley	-0.0785	0.9245	0.0916	0.7341	0.3916
Central Luzon	0.0091	1.0092	0.0755	0.0147	0.9036
CALABARZON	0.0817	1.0852	0.0590	1.9206	0.1658
MIMAROPA***	0.2163	1.2415	0.0617	12.2985	0.0005
Bicol Region***	0.3067	1.3589	0.0506	36.7121	0.0000
Western Visayas*	0.1009	1.1062	0.0549	3.3827	0.0659
Central Visayas*	0.1036	1.1092	0.0585	3.1339	0.0767
Eastern Visayas**	0.1380	1.1479	0.0629	4.8043	0.0284
Zamboanga Peninsula***	0.1543	1.1668	0.0559	7.6103	0.0058
Northern Mindanao*	0.1105	1.1169	0.0591	3.4960	0.0615
Southern Mindanao	-0.0098	0.9903	0.0560	0.0303	0.8618
Central Mindanao	0.0660	1.0682	0.0555	1.4153	0.2342
ARMM	0.0309	1.0314	0.0560	0.3047	0.5810
Caraga***	0.2523	1.2870	0.0592	18.1655	0.0000
Total Income of Household and Type of Place of Residence Interaction***	-0.00000037	0.99999963	0.00000010	13.7592	0.0002
Total Income of Household and Sex of Household Head Interaction***	-0.00000024	0.99999976	0.00000008	9.3169	0.0023
Dispersion	0.0729		0.0107		
***Sig. at 1%; **Sig. at 5%; *Sig. at 10%					

Lastly, the nonzero estimate of the dispersion parameter indicates that overdispersion is present, i.e. the variance exceeds the mean. This would have been a concern if Poisson regression were used, but not a concern for negative binomial regression, since the negative binomial regression model allows for overdispersion.

6. Conclusions

The results have shown that a number of variables have an effect on number of young dependents. One of these variables is expenditure on contraceptives, which is estimated to decrease the mean number of young dependents by 3.7% for every PhP10,000 spent on contraceptives for a period of six months. The education of the household head is also critical in reducing number of young dependents. The results show a monotonic relationship between mean number of young dependents and education of the household head. The age of the household head is also strongly related to number of young dependents, with elderly household heads having fewer young dependents. In addition, the interaction between type of place of residence and total income of the household affects the number of young dependents. In particular, the effect of household income on number of young dependents is less among urban households.

We have also seen that the sex of the household head also has an effect: the estimated mean number of young dependents for female-headed households is less than that of male-headed households. Moreover, the effect of sex of the household head interacts with the effect of total income of the household: the effect of income in reducing the mean number of young dependents is less among male-headed households. Lastly, there is a difference in mean number of young dependents across the different regions, with Cagayan Valley, Southern Mindanao and NCR being the regions with the fewest mean young dependents, and Bicol and Caraga Regions with the greatest.

The study shows that spending on contraceptives is still needed to reduce number of young dependents, though its effect will only be felt when the households are willing to spend greatly. With the passage of the RH Law, more Filipino households will have more access to contraceptives. Education is another policy variable of the study. There is a strong connection between level of education of the household head and number of young dependents. Investments in education will bring down the number of young dependents in the country.

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