

## Correlates of Hunger: Evidence from the Community-Based Monitoring System (CBMS) Data of Pasay City

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Hunger is a form of deprivation. It is one of the major problems of many countries, and reducing it is a global concern. In fact, the first of the United Nation's Millennium Development Goals (MDG) is to eradicate extreme poverty and hunger. However, attempting to reduce poverty and hunger entails the identification of the poor and those who are hungry. A lot can be said about who is poor. But who is hungry?

Thus, information is required about those who are hungry and their circumstances—who they are, where they live, what social conditions they face, how they respond to programs and projects intended for them, and so forth. With such hunger profiles, designing and implementing programs that are geared towards eradicating hunger are maximized. Despite economic growth and technological advances, food insecurity continues to be a problem. This has received increased attention because of its potential consequence—hunger.

Hunger, the consumption of a diet inadequate to sustain good health and normal activity, growth, and development (Millman & DeRose, 1998), could be experienced temporarily by people who are food secure but more

likely to be experienced by those who are not. Who are they? Where do they live? What social and economic conditions do they face? Such information is vital for local government units (LGUs) when they prepare comprehensive development plans that are geared towards eradicating hunger in their communities.

The primary objective of this study is to determine correlates of hunger utilizing the Community-Based Monitoring System (CBMS) data of Pasay City. Specific objectives include:

- To generate hunger profiles and information about the hungry households and their circumstances; and
- To generate hunger models that will identify correlates of hunger.

The hunger profiles generated can aid LGUs in their program and policy development. Coupled with the identified correlates of hunger, targeting those households who are hungry could be enhanced, allowing better utilization of their limited resources.

The CBMS data used in the study were for Pasay City for the census year 2005. It was used to compliment the poverty profiles earlier prepared for Pasay City (Arcilla, Co, & Ocampo, 2011). Besides, it was one of the most recent during the time this study was conducted, which contained the complete enumeration of all the households in its 201 barangays.

Only two hunger measures were used in the study. One of which is the measure that is based on income. The other is based on the responses of household heads as to whether they had experienced food shortage in the past three months.

Variables that are available from the CBMS data of Pasay City were considered in identifying the correlates of hunger. Recent efforts to get a detailed description of hunger, not focusing on subjective perceptions, were successful in giving an operative definition of hunger. Millman and DeRose (1998) defined it as the consumption of a diet inadequate to sustain good health and normal activity, growth, and development. Emphasis on energy as a measure of food adequacy is justified since increased dietary energy, if derived from normal staple foods, brings with it more protein and other nutrients.

Hence, an ideal indicator of hunger is one that focuses on whether people are getting enough to eat. The indicator of hunger being used officially in generating hunger statistics for the country is based on this principle. It involves the comparison between the diet actually consumed and what is required. The National Statistical Coordination Board (NSCB) does this comparison in terms of monetary values. Thus, a household will be classified

as hungry if its per capita income (PCI) is lower than the food threshold, the minimum cost of the food items that will satisfy minimum nutritional requirements.

The other indicator of hunger is based on whether or not the household had experienced food shortage in the past three months. If so, the household is classified as hungry.

## Literature Review

Numerous studies have been conducted that identified poverty correlates (Balisacan, 1997; Tabunda, 2000; Reyes, 2003; Albacea & Pacificador, 2003; Albert & Collado, 2004; Mina, 2008; Arcilla, Co, & Ocampo, 2011). These studies had used nationwide surveys such as the Labor Force Survey (LFS), the Family Income and Expenditure Surveys (FIES), and the Annual Poverty Indicators Survey (APIS) as well as CBMS data, employing statistical techniques such as multiple linear regression and logistic regression analyses.

Compared to poverty studies, not as many studies have identified hunger correlates that used baseline data such as the CBMS. Martin, Rogers, Cook, and Joseph (2004) explored whether social capital—a measure of trust, reciprocity, and social networks—is associated with household food security, independent of household level socioeconomic factors. Results of logistic regression showed that households with higher levels of social capital were less likely to experience hunger.

Weinreb et al. (2002, as cited by Martin et al., 2004) showed that hunger negatively impacts one's physical, mental, and emotional health. Results showed that hungry children were more likely to be chronically sick and had behavioral problems compared to children who were not hungry.

Amon and Albacea (2007) obtained hunger incidence at the municipal level using direct, the empirical best linear unbiased (EBLUP), and regression-synthetic estimation techniques with the use of the FIES and Census on Population and Housing (CPH) data. The direct and EBLUP estimates were found to be unreliable. The model obtained using the regression-based estimation procedure gave reliable estimates and had identified four predictors, namely, municipal proportion of (1) households headed by a married male who is an elementary undergraduate, (2) households with members aged between one and six years, (3) housing units with roof made of light materials, and (4) barangays with electricity.

Methodology

Data Requirements

The study utilized CBMS data collected from Pasay City during the 2005 census year. These are the most recent data, which involved a complete enumeration of 65,117 households in 201 barangays in Pasay City. However, due to some missing observations as a result of nonresponse, there were actually 65,019 responses in most of the variables in the database. This translates to a 99.8% response rate among the households included in the study. Variables included in the study were those that are available across LGUs of Pasay (Table 1). These were used in identifying the correlates of hunger.

Table 1. Variable Description

Variable	Description
Demographic Characteristics	
HSIZE	Household size
NMEM05	Number of household members 0–5 years old
NMEM611	Number of household members 6–11 years old
NMEM1215	Number of household members 12–15 years old
AGE	Age of the household head
SEX	Sex of the household head (0 = female, 1 = male)
EDUC	Highest educational attainment of the household head (0 = no grade completed, 1 = elementary undergraduate, 2 = elementary graduate, 3 = high school undergraduate, 4 = high school graduate, 5 = college undergraduate, 6 = college graduate and beyond)
OFWIND	Overseas Filipino worker (OFW) indicator (0 = absent, 1 = present)
UNIPARENT	Single-parent indicator (0 = absent, 1 = present)
THIRDSEX	Third sex indicator (0 = absent, 1 = present)
HANDICAPPED	Handicapped indicator (0 = absent, 1 = present)
BOARDIND	Boarder/bed-spacer indicator (0 = absent, 1 = present)
Economic Characteristics	
TOTIN	Total household income
JOBIND	Job/work indicator (0 = unemployed, 1 = employed)
CROPIND	Engaged in crop farming and gardening (0 = no, 1 = yes)
POULTIND	Engaged in livestock/poultry (0 = no, 1 = yes)

Table 1 continued...

FISHIND	Engaged in fishing (0 = no, 1 = yes)
FORIND	Engaged in forestry (0 = no, 1 = yes)
SALIND	Engaged in wholesale/retail (0 = no, 1 = yes)
PUBLIND	Engaged in publishing (0 = no, 1 = yes)
MANIND	Engaged in manufacturing (0 = no, 1 = yes)
MAINTIND	Engaged in maintenance services (0 = no, 1 = yes)
FOODIND	Engaged in food services (0 = no, 1 = yes)
ENTERTAIN	Engaged in entertainment services (0 = no, 1 = yes)
SERVIND	Engaged in community, social, and personal services (0 = no, 1 = yes)
COMPUTIND	Engaged in computer communication (0 = no, 1 = yes)
TRNIND	Engaged in transportation, storage, and communication (0 = no, 1 = yes)
MININD	Engaged in mining and quarrying (0 = no, 1 = yes)
CNSIND	Engaged in construction (0 = no, 1 = yes)
EOTHIND	Engaged in other activities NEC (non-elsewhere category) (0 = no, 1 = yes)
Basic Needs	
TENUR	Tenure status of house/lot (1 = owner, owner-like possession of house and lot; 2 = rent house/room including lot; 3 = own house/rent lot, 4 = own house, rent-free lot with consent of owner; 5 = own house, rent-free lot without consent of owner; 6 = rent-free house and lot with consent of owner; 7 = rent-free house and lot without consent of owner; 8 = other tenure status)
HTYPE	Building type of the housing unit (1 = single house, 2 = duplex, 3 = apartment/condominium/townhouse, 4 = commercial/industrial/agricultural, 5 = others)
WALL	Construction materials of wall (1 = strong materials, 2 = light materials, 3 = salvaged/makeshift materials, 4 = mixed but predominantly strong, 5 = mixed but predominantly light, 6 = mixed but predominantly salvaged)
ROOF	Construction materials of roof (1 = strong materials, 2 = light materials, 3 = salvaged/makeshift materials, 4 = mixed but predominantly strong, 5 = mixed but predominantly light, 6 = mixed but predominantly salvaged)
WATER	Type of water facility (1 = community water system—own; 2 = community water system—shared; 3 = deep well—own; 4 = deep well—shared; 5 = artesian well—own; 6 = artesian well—shared; 7 = dug/shallow well—own; 8 = dug/shallow well—shared; 9 = river, stream, lake, spring, bodies of water; 10 = bottled water; 11 = others)
TOIL	Type of toilet facility (1 = water-sealed flush to sewerage/septic tank—own, 2 = water-sealed flush to sewerage/septic tank—shared, 3 = closed pit, 4 = open pit, 5 = no toilet, 6 = others)
FSHORT	Experienced food shortage (0 = no, 1 = yes)

Table 1 continued...

Consumer Durables	
TV	Own TV (0 = no, 1 = yes)
VHS	Own VHS/VCD/DVD player (0 = no, 1 = yes)
COMPUTER	Own computer (0 = no, 1 = yes)
REF	Own refrigerator (0 = no, 1 = yes)
IRON	Own electric iron (0 = no, 1 = yes)
STOVE	Own LPG/gas stove/range (0 = no, 1 = yes)
WMACH	Own washing machine (0 = no, 1 = yes)
MICROW	Own microwave oven (0 = no, 1 = yes)
PHONE	Own telephone/cell phone (0 = no, 1 = yes)
AIRC	Own air-con (0 = no, 1 = yes)
CAR	Own vehicles (0 = no, 1 = yes)
Access to Government/Private Organization Programs	
SEXPROG	Received programs on gender issues (0 = no, 1 = yes)
PEACEPROG	Received programs on peace and order (0 = no, 1 = yes)
MEDHEAL	Received programs on health (0 = no, 1 = yes)
MSCHOL	Received programs on education (0 = no, 1 = yes)
MTRAININD	Received programs on livelihood training (0 = no, 1 = yes)
ASSHLOTIND	Received programs on housing (0 = no, 1 = yes)
CREDIND	Received credit programs (0 = no, 1 = yes)
CLEANPROG	Received cleanliness programs (0 = no, 1 = yes)
JOBPROG	Received employment programs (0 = no, 1 = yes)
OTHPRIND	Received other programs (0 = no, 1 = yes)

### Statistical Techniques

The household's hunger status was determined using two indicators of hunger. One indicator of hunger is based on the reported income of the household. A household is classified as hungry if its PCI is below the food threshold. This indicator of hunger is the one being used officially in generating hunger statistics for the country by NSCB. The other indicator of hunger is based on whether or not the household had experienced food shortage in the past three months. A household is classified as hungry if it had experienced food shortage.

*McNemar's Test*

McNemar's test for matched or correlated populations was performed to determine if there is an agreement in hunger status between the PCI indicator and the food shortage indicator. This will test the null hypothesis that there is no change between the "before and after" situations versus the alternative hypothesis that there is a significant change between the "before and after" situations. The data layout for this test is as follows:

"Before"	"After"	
	+	-
+	A	B
-	C	D

The test statistic is given by  $\chi^2 = \frac{(B-C)^2}{B+C}$ , which has the chi-square distribution with 1 degree of freedom.

*Chi-square ( $\chi^2$ ) Test*

In generating hunger profiles, contingency analyses were performed since a household's hunger status and most of the correlates of hunger were in the nominal scale such as gender of the household head. Specifically, the  $\chi^2$  test was used to determine if hunger status is correlated with each of the categorical demographic variables, economic characteristics, basic needs, ownership of consumer durables, and access to government/private organization programs listed in Table 1.

The  $\chi^2$  test for independence of two categorical variables tests the null hypothesis that the row variable and column variable are independent versus the alternative hypothesis that they are related. The test statistic is given by,  $\chi^2 = \sum \frac{(O-E)^2}{E}$ , where O is the observed cell frequency and E is the expected cell frequency assuming the null hypothesis were true such that  $E = \frac{(\text{row total})(\text{column total})}{\text{grand total}}$ . This test statistic has the  $\chi^2$  distribution with degrees

of freedom = (number of rows - 1)(number of columns - 1).

*Multiple Logistic Regression*

Multiple logistic regression analysis was used to identify the significant correlates of hunger. Since household's hunger status is a dichotomous

variable, this multivariate regression technique was most appropriate, which allows the investigation of the effects of a particular correlate of hunger conditional on the levels of the other identified correlates. The initial independent variables in the logistic regression models are the variables in Table 1. The multiple logistic regression model specification is given by

$$\ln \left( \frac{p(\underline{x})}{1-p(\underline{x})} \right) = \beta_0 + \sum_{j=1}^k \beta_j X_j \quad (1)$$

Or, equivalently,

$$p(\underline{x}) = \frac{e^{\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k}}{1 + e^{\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k}}, \text{ where } p(\underline{x}) = P(Y = 1 | \underline{x}) \quad (2)$$

In this model, the explanatory variables  $X_1, X_2, \dots, X_k$  could be numerical or categorical and the dependent variable  $Y$  is binary,  $Y = 1$  (event) or  $Y = 0$  (nonevent). Nominally scaled polychotomous categorical variables were recoded using dummy variables. A stepwise selection procedure was employed to determine the best subset of the proposed explanatory variables that will comprise the final reduced model.

The odds ratio corresponding to the explanatory variable  $X_j$  with coefficient  $\beta_j$  in the logistic regression model is given by  $\theta = e^{\beta_j}$ . In case the explanatory variable  $X$  is binary ( $X = 1$  or  $0$ ), then the odds of an event ( $Y = 1$ ) for a subject who is exposed to the risk factor ( $X = 1$ ) is  $e^\beta$  times the odds of the event ( $Y = 1$ ) for a subject who is not exposed to the risk factor ( $X = 0$ ). On the other hand, if  $X$  is continuous, then the odds of the event ( $Y = 1$ ) increases multiplicatively by a factor of  $e^\beta$  for every 1 unit increase in  $X$ .

#### *Cochran–Armitage Test for Trend*

The Cochran–Armitage trend test of the odds ratios was likewise performed for the ordinal-scaled correlates of poverty. Suppose that a risk factor has  $K > 2$  levels of exposure and the response variable is binary:  $Y = 1$  (event) and  $Y = 0$  (nonevent).

Outcome	Exposure Level					Total
	1	2	3	...	K	
$Y = 1$	$a_1$	$a_2$	$a_3$		$a_K$	$n_1$
$Y = 0$	$c_1$	$c_2$	$c_3$	...	$c_K$	$n_0$
Total	$m_1$	$m_2$	$m_3$	...	$m_K$	$N$



Choose one exposure level, say, level 1, as baseline against which to compare the other levels. The Cochran–Armitage test for trend in the resulting  $K - 1$  odds ratios tests the null hypothesis  $H_o: \theta_1 = \theta_2 = \theta_3 = \dots = \theta_{K-1}$  versus the alternative hypotheses  $H_a: \theta_1 < \theta_2 < \theta_3 < \dots < \theta_{K-1}$  (or  $\theta_1 > \theta_2 > \theta_3 > \dots > \theta_{K-1}$ ) using the test statistic

$$\chi^2 = \frac{n^2(n-1) \left\{ \sum_k x_k (a_k - e_k) \right\}^2}{n_1 n_0 \left\{ n \sum_k x_k^2 m_k - \left( \sum_k x_k m_k \right)^2 \right\}} \sim \chi^2_{1df} \quad (3)$$

where  $x_k$  is the dose measure at the  $k^{\text{th}}$  exposure level and  $e_k$ s are the expected frequencies for  $Y = 1$ . Set  $x_k = k$  if the  $x_k$ s are spaced 1 unit apart.

Using the two criteria of hunger, we obtained the correlates of hunger from estimating the model. The statistical results were then used to determine which correlates were common and which ones differed.

## Results and Discussion

The household's food poverty status of 65,019 households in Pasay City were determined using the PCI and the food shortage criteria. According to NSCB, 2006, the food threshold in Pasay for 2005 was PHP 11,199. The other indicator of hunger is based on whether or not the household had experienced food shortage in the past three months.

### Hunger Profiles

There are 2,650 out of 65,019 households in Pasay City with PCI below food threshold (Table 2). On the other hand, only 722 of the 65,019 households reported to have experienced food shortage in the past three months. The 4.08% of households in Pasay City that were classified as food poor using the PCI criterion was significantly different from the 1.11% Pasay City hunger incidence based on the food shortage criterion. This significant disagreement in hunger incidence between the PCI and food shortage criteria is justified by the result of the McNemar's test ( $p < 0.0001$ ).

Table 2. Hunger Incidence by PCI Versus Food Shortage

PCI Criterion	Food Shortage Criterion		Total
	+ : Hungry	- : Not Hungry	
+ : Hungry	162 (6.1%)	2,488 (93.9%)	2,650 (4.08%)
- : Not Hungry	560 (0.9%)	61,809 (99.1%)	62,369 (95.92%)
Total	722 (1.11%)	64,297 (98.89%)	n = 65,019

Table 3 shows that the following household characteristics had significantly higher hunger incidence under both PCI and food shortage criteria: “lower educational attainment,” “without OFW,” “with third sex,” and “with handicapped.” Households headed by males had a significantly higher hunger incidence than households headed by females based on the PCI criterion only while the following household characteristics are significant indicators of higher hunger incidence based on the food shortage criterion only: “with single parent” and “with boarder/bed spacer.”

The Cochran–Armitage trend test also indicated a significantly higher hunger incidence among households whose household heads have a lower educational attainment. This phenomenon was consistent for both indicators of hunger.

Engagements in the following economic activities were found to be significant indicators of hunger incidence for both criteria: crop farming and gardening, community/social/personal services, and construction (Table 4). Household heads with no work/job and households engaged in fishing but are not engaged in food services or computer communication were indicators of higher hunger incidence using the PCI criterion alone, while households not engaged in maintenance services but are engaged in other activities were significant indicators of higher hunger incidence using the food shortage criterion alone.

Table 3. Hunger Incidence by Demographic Characteristics

Variable	Categories	n	PCI (Subsistence)			Food Shortage		
			% Hungry	Odds Ratio*	p-Value	% Hungry	Odds Ratio*	p-Value
SEX (sex of household head)	Female	14,179	3.3	1.3	<0.0001	1.0	1.1	0.2400
	Male	50,834	4.3			1.1		
EDUCAL (highest educational attainment of household head)	No grade completed	132	10.6	(ref**)	<0.0001	6.1	(ref**)	<0.0001

Table 3 continued...

	Elementary undergrad	3,226	9.1	0.8	<0.0001+	2.5	0.4	<0.0001+
	Elementary graduate	5,240	6.8	0.6		1.9	0.3	
	High school undergraduate	6,083	8.4	0.8		2.2	0.3	
	High school graduate	26,779	3.9	0.3		1.1	0.2	
	College undergraduate	11,205	2.6	0.2		0.6	0.1	
	College graduate and beyond	12,322	1.2	0.1		0.3	0.05	
OFWIND (OFW indicator)	Without OFW	59,577	4.3	0.3	<0.0001	1.1	0.7	0.0224
	With OFW	5,439	1.5			0.8		
	With boarder / bed spacer	1,412	3.1			2.4		
	With OFW	5,439	1.5			0.8		
UNIPARENT (single-parent indicator)	Without single parent	60,675	4.0	1.1	0.0884	1.0	2.5	<0.0001
	With single parent	4,344	4.6			2.4		
THIRDSEX (third-sex indicator)	Without third sex	64,374	4.1	1.7	0.0045	1.1	3.3	<0.0001
	With third sex	645	6.4			3.6		
HANDICAPPED (handicapped indicator)	Without handicapped	63,577	4.0	2.0	<0.0001	1.0	5.0	<0.0001
	With handicapped	1,442	7.6			4.2		
BOARDIND (boarder/bed-spacer indicator)	Without boarder/bed spacer	63,598	4.1	0.8	0.0756	1.1	2.0	<0.0001
	With boarder/bed spacer	1,412	3.1				2.4	

\*Odds ratio for hunger incidence among households using row 1 as reference category.

\*\*Reference category.

\*Cochran–Armitage test for trend.

Table 4. Hunger Incidence by Economic Activities

Variable	Categories	n	PCI (Subsistence)			Food Shortage		
			% Hungry	Odds Ratio*	p-Value	% Hungry	Odds Ratio*	p-Value
JOBIND (job/work indicator)	Without	17,793	4.8	1.3	<0.0001	1.2	1.1	0.1127
	With	47,219	3.8			1.1		
CROPIND (engaged in crop farming and gardening)	Not engaged	64,361	4.1	2.1	0.0083	1.1	0.3	<0.0001
	Engaged	658	2.0			3.2		

Table 3 continued...

POULTIND (engaged in livestock/poultry)	Not engaged	64,874	4.1	1.5	0.5533	1.1	0.8	1.0000
	Engaged	145	2.8			1.4		
FISHIND (engaged in fishing)	Not engaged	64,951	4.1	0.4	0.0221	1.1	1.5	1.0000
	Engaged	68	10.3			0.0		
FORIND (engaged in forestry)	Not engaged	64,955	4.1	0.9	1.0000	1.1	0.7	0.5108
	Engaged	64	4.7			1.6		
SALIND (engaged in wholesale/retail)	Not engaged	54,396	4.1	1.0	0.8918	1.1	1.0	0.6460
	Engaged	10,623	4.1			1.2		
PUBLIND (engaged in publishing)	Not engaged	64,876	4.1	1.5	0.5738	1.1	1.6	1.0000
	Engaged	143	2.8			0.7		
MANIND (engaged in manufacturing)	Not engaged	64,492	4.1	1.6	0.1226	1.1	1.2	0.8832
	Engaged	527	2.7			1.0		
MAINTIND (engaged in maintenance services)	Not engaged	64,016	4.1	0.8	0.1653	1.1	5.7	0.0087
	Engaged	1,003	5.0			0.2		
FOODIND (engaged in food services)	Not engaged	64,323	4.1	1.7	0.0368	1.1	1.3	0.6577
	Engaged	695	2.5			0.9		
ENTERTAIN (engaged in entertainment services)	Not engaged	64,721	4.1	2.5	0.0510	1.1	3.3	0.2719
	Engaged	298	1.7			0.3		
SERVIND (engaged in community, social, and personal services)	Not engaged	63,682	4.0	0.7	0.0013	1.1	0.6	0.0436
	Engaged	1,337	5.8			1.7		
COMPUTIND (engaged in computer communication)	Not engaged	64,745	4.1	3.9	0.0189	1.1	3.1	0.3728
	Engaged	274	1.1			0.4		
TRNIND (engaged in transportation, storage, and communication)	Not engaged	60,686	4.1	0.9	0.3440	1.1	1.2	0.3208
	Engaged	4,333	4.4			1.0		
MININD (engaged in mining and quarrying)	Not engaged	64,931	4.1	0.9	1.0000	1.1	1.0	0.6259
	Engaged	88	4.6			1.1		
CNSIND (engaged in construction)	Not engaged	63,295	4.1	0.7	0.0028	1.1	0.5	<0.0001
	Engaged	1,724	5.5			2.2		
EOTHIND (engaged in other activities NEC)	Not engaged	64,552	4.1	0.7	0.1992	1.1	0.5	0.0185
	Engaged	467	5.4			2.4		

\*Odds ratio for hunger incidence among households not engaged in economic activities versus households that are engaged in these economic activities.

Table 5 shows that for both PCI and food shortage criteria, hunger incidence is strongly associated with all the household's basic needs under consideration, namely, tenure status of house/lot, house type, construction materials of walls, construction materials of roof, type of water facility, and type of toilet facility.

Table 5. Hunger Incidence by Household's Basic Needs

Variable	Categories	n	PCI (Subsistence)			Food Shortage		
			% Hungry	Odds Ratio*	p-Value	% Hungry	Odds Ratio*	p-Value
TENUR (tenure status of house/lot)	Owner, owner-like... house and lot	24,048	2.6	(ref**)	<0.0001	1.1	(ref**)	<0.0001
	Rent house/room including lot	27,583	4.9	1.9		1.0	0.9	
	Own house/rent lot	1,544	4.1	1.6		1.3	1.2	
	Own house/rent-free lot with consent	3,255	4.8	1.9		1.8	1.6	
	Own house/rent-free lot without consent	1,899	7.6	2.8		2.7	2.5	
	Rent-free house and lot with consent	6,179	4.0	1.6		0.8	0.7	
	Rent-free house and lot without consent	408	8.3	3.4		0.5	0.5	
	Other	103	22.3	10.8		6.8	6.6	
HTYPE (house type)	Single house	36,320	3.8	(ref**)	<0.0001	1.2	(ref**)	<0.0001
	Duplex	12,306	4.7	1.2		1.1	0.9	
	Apartment	13,989	3.3	0.9		0.7	0.6	
	Commercial	903	3.9	1.0		1.2	1.0	
	Other	1,448	13.8	4.1		2.6	2.2	
WALL (construction materials of walls)	Strong	46,810	3.0	(ref**)	<0.0001	0.9	(ref**)	<0.0001
	Light	1,206	8.9	3.2		3.7	4.2	
	Salvaged/makeshift	1,270	9.4	3.4		1.2	1.3	
	Mixed but predominantly strong	14,472	6.1	2.1		1.2	1.3	
	Mixed but predominantly light	984	12.6	4.7		5.7	6.7	
	Mixed but predominantly light	3,667	12.0	4.4		2.9	3.3	
	Mixed but predominantly salvaged	544	12.1	4.5		3.3	3.8	

Table 5 continued...

WATER (type of water facility)	Community water system—own	27,973	3.7	(ref**)	<0.0001	0.8	(ref**)	<0.0001
	Community water system—shared	10,785	7.9	2.2		2.5	3.2	
	Deep well—own	323	7.4	2.1		6.8	9.0	
	Deep well—shared	346	8.4	2.4		11.3	15.8	
	Artesian well—own	12	16.7	5.2		0.0	—	
	Artesian well—shared	22	9.1	2.6		9.1	12.4	
	Dug/shallow well—own	9	11.1	3.2		11.1	15.5	
	Dug/shallow well—shared	7	14.3	4.3		0.0	—	
	Bottled water	24,417	2.6	0.7		0.5	0.6	
	Others	1,121	7.9	2.2		5.5	7.2	
	Water sealed—own	7,634	1.8	(ref**)		0.4	(ref**)	
TOILET (type of toilet facility)	Water-sealed—shared	3,075	5.3	3.1	<0.0001	1.2	3.0	<0.0001
	Closed pit	39,046	3.4	1.9		1.0	2.5	
	Open pit	13,494	6.0	3.5		1.4	3.5	
	No toilet	1,743	12.3	7.7		3.5	9.0	

\*Odds ratio for hunger incidence among households using row 1 as reference category.

\*\*Reference category.

Table 6 shows that ownership of household consumer durables were significant indicators of hunger. Specifically, hunger incidence was found to be significantly lower among households that own these consumer durables. The odds ratios indicated that hunger incidence among households without consumer durables was more than two up to almost four times the hunger incidence among households that own consumer durables.

Table 6. Hunger Incidence by Household's Consumer Durables

Variable	Categories	n	PCI (Subsistence)			Food Shortage		
			% Hungry	Odds Ratio*	p-Value	% Hungry	Odds Ratio*	p-Value
TV (own TV)	Without	8,792	7.9	2.4	<0.0001	2.2	2.4	<0.0001
	With	56,224	3.5			0.9		
VHS (own VHS/ VCD/DVD player)	Without	23,409	6.9	2.9	<0.0001	2.0	3.2	<0.0001
	With	41,607	2.5			0.6		

Table 6 continued...

COMPUTER (own computer)	Without	54,703	4.6	3.7	<0.0001	1.3	4.5	<0.0001
	With	10,304	1.3			0.3		
REF (own ref)	Without	29,084	6.4	3.1	<0.0001	1.9	3.9	<0.0001
	With	35,932	2.2			0.5		
IRON (own electric iron)	Without	15,564	7.9	2.9	<0.0001	2.2	2.9	<0.0001
	With	49,452	2.9			0.8		
STOVE (own LPG/gas stove/range)	Without	14,726	7.8	2.7	<0.0001	2.3	2.9	<0.0001
	With	50,290	3.0			0.8		
WMACH (own washing machine)	Without	35,014	5.5	2.4	<0.0001	1.6	2.9	<0.0001
	With	30,002	2.4			0.6		
MICROW (own microwave oven)	Without	54,814	4.5	2.6	<0.0001	1.2	3.0	<0.0001
	With	10,202	1.8			0.4		
PHONE (own telephone/cell phone)	Without	20,398	8.2	3.9	<0.0001	2.2	3.6	<0.0001
	With	44,611	2.2			0.6		
AIRC (own air-con)	Without	56,670	4.5	3.4	<0.0001	1.2	3.3	<0.0001
	With	8,345	1.4			0.4		
CAR (own vehicles)	Without	57,412	4.4	2.8	<0.0001	1.2	3.7	<0.0001
	With	7,601	1.6			0.3		

\*Odds ratio for hunger incidence among households without consumer durables versus those that have them.

Table 7 shows that availment of the following programs were significant indicators of hunger incidence for both criteria: gender issues, peace and order, health, education, credit, and employment. Availment of other programs was also a significant indicator of hunger incidence from the PCI criterion while availment of programs on livelihood training and on housing was significant indicators of hunger incidence only for the food shortage criterion. Households that availed these programs tend to have a higher hunger incidence than households that did not receive them.

Table 7. Hunger Incidence by Household's Availment of Programs

Variable	Categories	n	PCI (Subsistence)			Food Shortage		
			% Hungry	Odds Ratio*	p-Value	% Hungry	Odds Ratio*	p-Value
SEXPROG (received programs on gender issues)	Did not receive	63,686	4.0	1.5	0.0007	1.1	2.7	<0.0001
	Received	1,333	5.9			2.9		

Table 7 continued...

PEACEPROG (received programs on peace and order)	Did not receive	42,886	3.9	1.2	0.0004	1.2	0.7	0.0002
	Received	22,133	4.5			0.9		
MEDHEAL (received programs on health)	Did not receive	48,642	4.0	1.1	0.0061	1.0	1.3	0.0005
	Received	16,377	4.5			1.4		
MSCHOL (received programs on education)	Did not receive	64,231	4.0	2.0	<0.0001	1.1	3.0	<0.0001
	Received	788	7.6			3.2		
MTRAININD (received programs on livelihood training)	Did not receive	64,648	4.1	0.7	0.2237	1.1	3.5	<0.0001
	Received	371	2.7			3.8		
ASSHLOTIND (received programs on housing)	Did not receive	64,722	4.1	1.1	0.9075	1.1	2.8	0.0039
	Received	297	4.4			3.0		
CREDIND (received credit programs)	Did not receive	64,644	4.1	1.7	0.0158	1.1	4.9	<0.0001
	Received	375	6.7			5.1		
CLEANPROG (received cleanliness programs)	Did not receive	47,374	4.0	1.0	0.3884	1.2	0.9	0.1422
		17,645	4.2			1.0		
	Received	5,342	5.2			1.2		
JOBPROG (received employment programs)	Did not receive	64,645	4.1	1.6	0.0303	1.1	2.7	0.0017
	Received	374	6.4			2.9		
OTHPRIND (received other programs)	Did not receive	59,677	4.0	1.3	<0.0001	1.1	1.1	0.5689
	Received	5,342	5.2			1.2		

\*Odds ratio for hunger incidence among households that availed versus those that did not avail them.

### Correlates of Hunger

Using logistic regression analysis, Table 8 summarizes the significant correlates of hunger based on PCI and food shortage criteria. The likelihood ratio test (LRT) for model fit shows that there is strong evidence ( $p < 0.0001$ ) that at least one correlate has a significant effect on hunger on both the PCI and food shortage criteria. The corresponding concordance index  $c$ , which is a measure of the model's predictive power, is an estimate of the probability that the model predictions and the observed outcomes are concordant. Under the PCI criterion for hunger, a concordance index of 0.839 was estimated. This is the probability of correctly identifying the household that is actually experiencing between a randomly selected pair of hungry and nonhungry households. The concordance index under the food shortage criterion yielded almost the same estimated probability of 0.850.



Table 8. Significant Correlates of Hunger Incidence

Correlates	PCI (Subsistence) c = 0.839 LR Test (p < 0.0001)			Food Shortage c = 0.850 LR Test (p < 0.0001)		
	Parameter Estimate+	Odds Ratio*	p-Value	Parameter Estimate+	Odds Ratio*	p-Value
HSIZE (household size)	0.3942 (0.0092)	1.48	<0.0001	0.1894 (0.0157)	1.21	<0.0001
EDUCAL (highest educational attainment of household head)						
No grade completed	(ref**)			(ref**)		
Elementary undergraduate	-0.4635 (0.2835)	0.63	0.1021	-0.7585 (0.4042)	0.47	0.0606
Elementary graduate	-0.7180 (0.2816)	0.49	0.0108	-0.9590 (0.3995)	0.38	0.0164
High school undergraduate	-0.3983 (0.2799)	0.67	0.1548	-0.7162 (0.3963)	0.49	0.0707
High school graduate	-0.8075 (0.2776)	0.45	0.0036	-1.0600 (0.3905)	0.35	0.0066
College undergraduate	-0.9709 (0.2827)	0.38	0.0006	-1.3196 (0.4054)	0.27	0.0011
College graduate and beyond	-1.3369 (0.2895)	0.26	<0.0001	-1.5590 (0.4197)	0.21	0.0002
OFWIND (OFW indicator)	-0.6559 (0.1197)	0.52	<0.0001	n.a.		
UNIPARENT (single-parent indicator)	n.a.			0.5632 (0.1146)	1.76	<0.0001
THIRDSEX (third-sex indicator)	n.a.			0.6477 (0.2338)	1.91	0.0056
HANDICAPPED (handicapped indicator)	n.a.			0.8630 (0.1505)	2.37	<0.0001
BOARDIND (boarder/bed-spacer indicator)	n.a.			0.7835 (0.1912)	2.19	<0.0001
JOBIND (job/work indicator)	-0.5650 (0.0482)	0.57	<0.0001	n.a.		
CROPIND (engaged in crop farming and gardening)	-0.7374 (0.2993)	0.48	0.0138	1.0285 (0.2438)	2.80	<0.0001
FISHIND (engaged in fishing)	1.0242 (0.4468)	2.29	0.0219	n.a.		
SALIND (engaged in wholesale/retail)	-0.2091 (0.0585)	0.81	0.0004	n.a.		
MAINTIND (engaged in maintenance services)	n.a.			-2.0707 (0.7161)	0.13	0.0038

Table 7 continued...

FOODIND (engaged in food services)	-0.7518 (0.2682)	0.47	0.0051	n.a.		
SERVIND (engaged in community, social, and personal services)	0.4477 (0.1311)	1.57	0.0006	n.a.		
TRNIND (engaged in transportation, storage, and communication)	-0.3467 (0.0840)	0.71	<0.0001	-0.5751 (0.1683)	0.56	0.0006
CNSIND (engaged in construction)	-0.3721 (0.1162)	0.69	0.0014	n.a.		
TENUR (tenure status of house / lot)						
Owner, owner-like...house and lot	(ref**)			(ref**)		
Rent house/room including lot	0.8947 (0.0565)	2.45	<0.0001	-0.0944 (0.0946)	0.91	0.3188
Own house/rent lot	0.2463 (0.1472)	1.28	0.0943	-0.1112 (0.2405)	0.90	0.6440
Own house/rent-free lot with consent	0.2602 (0.1009)	1.30	0.0099	0.0269 (0.1559)	1.03	0.8631
Own house/rent-free lot without consent	0.0804 (0.1212)	1.08	0.5070	-0.1428 (0.1884)	0.87	0.4485
Rent-free house and lot with consent	0.3517 (0.0847)	1.42	<0.0001	-0.6014 (0.1655)	0.55	0.0003
Rent-free house and lot without consent	0.4749 (0.2029)	1.61	0.0193	-1.6215 (0.7205)	0.20	0.0244
Other	0.9953 (0.3127)	2.71	0.0015	0.0509 (0.4974)	1.05	0.9185
HTYPE (house type)						
Single house	(ref**)					
Duplex	0.1435 (0.0586)	1.15	0.0143	n.a.		
Apartment	0.0306 (0.0605)	1.03	0.6131			
Commercial	0.1083 (0.1888)	1.11	0.5662			
Other	0.4295 (0.1106)	1.54	0.0001			

+Numbers inside parenthesis are standard error of the parameter estimate.

\*Odds ratio for hunger incidence.

\*\*Reference category.

*PCI Criterion*

Based on the PCI criterion, significant correlates with positive relationship to hunger status imply that households with more household members; households engaged in fishing, community, social, and personal services; and those that rent houses/rooms including lots, with rent-free houses and lots with/without consent (informal settlers), and with a duplex house type are also more likely to experience hunger.

On the other hand, an inverse relationship between hunger status implies that those households with an OFW, with job/work, and engaged in crop farming and gardening; in wholesale/retail; in food services; in transportation, storage, and communication; and in construction are less likely to experience hunger. Moreover, lower odds of experiencing hunger can be seen among household heads with a higher educational attainment.

*Food-Shortage Criterion*

Based on the food-shortage criterion, significant correlates that are positively related to hunger incidence imply that households with big household sizes, single-parent heads, third-sex members, handicapped members, and a boarder/bed spacer and engaged in crop farming and gardening are more likely to have experienced hunger in the past three months.

Significant correlates with an inverse relationship between hunger incidences imply that those households engaged in maintenance services and in transportation, storage, and communication and renting a free house and lot with and without consent are less likely to have experienced hunger in the past three months. Again, lower odds of hunger in the past three months can be seen among household heads with a higher educational attainment.

**Conclusions and Recommendations**

Results of this study will aid in enhancing the Pasay City government's ability to target those households who are hungry. The bivariate contingency and multiple logistic regression analyses showed that household size and households whose housing units/lots are not owned are positive correlates of hunger. Though Pasay City is in full support of the implementation of the *Pantawid Pamilyang Pilipino Program*, which requires the beneficiaries to attend responsible parenthood sessions, there is still a strong need for the local government unit to properly educate married couples, adults, and all residents in general on the merits of responsible parenthood. Moreover, the results showed that informal settlers, households living in dwellings

with light/salvaged wall and roofing materials, without adequate water and toilet facilities, tend to have higher a hunger incidence. With over 30,000 informal-settler families, Pasay City is facing severe problems of providing housing/resettlement/relocation, and hence, there is a need for innovative ideas and programs on how to solve such problems. The city's housing program involves relocation of informal settler families affected by government priority projects or living in danger zones to off-city or in-city relocation sites. Since Pasay City with its small area is overcrowded, off-city relocation sites like Cavite are preferred. The government of Pasay City has also thought of innovative programs like the *Balik Probinsya Program*, where qualified informal-settler families who are willing to voluntarily leave their homes located in danger areas and where relocation is not possible shall be given a P25,000.00 financial assistance to help them resettle back in the province. Thus, the local government unit should directly address the issue of informal settlers and continue to implement innovative resettlement/relocation programs.

The household heads' highest educational attainment is a significant correlate of hunger incidence wherein those with a lower educational level tend to have higher odds of hunger incidence. This clearly points to the role of education in alleviating the conditions of food-poor families. A higher educational attainment of heads of families will allow them to land jobs and enable them, among other things, to own consumer durables, which are another significant correlate of hunger among households. The Pasay City government addresses the concerns in education by maintaining hundreds of day care centers where free textbooks and school supplies are provided for day care children. However, there is a further need for the local government to provide access to free education or distribute more scholarships to adults in order for them to finish college education or even short-term courses that will provide jobs or livelihoods. The Pasay City Social Welfare and Development Office has provided free education per year to thousands of day care/preschool children and scholarships to hundreds of elementary students and more than 10 high school students through the sponsorship of Petron Tulong Aral-Petron Foundation, UNICEF, and the like. Educational materials, school supplies, and feeding programs are also provided. Moreover, the Food for School program, a hunger mitigation strategy that provides 1 kilo of rice per day per child, has been successfully implemented in some schools. This program encourages mothers to send their kids to school and improve the nutritional status of the child. The programs for early education are comprehensive, but there is a need for the continuation of these programs to high school and college so that the children from food-poor households will finish college and land jobs. There is indeed a need

to strengthen programs providing allowances for high school students and scholarships for college.

Availment of government/private-organization programs was found to be more prevalent among poor households who experienced food shortage. Thus, project impact studies must be conducted to evaluate the effectiveness of such programs. Moreover, Table 7 shows a low percentage of availment in these programs, and hence, local government units may consider increasing this percentage through widespread information campaigns, additional funding, and other means.

More studies are needed to look at the significant disagreement between the PCI threshold and the households' last three months' experience of food shortage as indicators of hunger. A greater understanding of the difference between the two indicators would help in explaining this "disagreement." Results of these studies may be forwarded to NSCB so as to help in revisiting its per capita income PCI threshold and/or its food shortage indicator for hunger.

Further studies may estimate the model using a municipality with a higher incidence of hunger compared to that of Pasay City to validate the results of this study. Results from such a study could be used to determine if there is a need for LGUs to differentiate hunger alleviation programs for households in urban versus rural areas, or between NCR versus non-NCR municipalities.

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