

10th National Convention on Statistics (NCS)
EDSA Shangri-La Hotel
October 1-2, 2007

**Estimating the Proportion of Stunted 0-5 Year-Old Children at the Provincial
Level in the Philippines**

by

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ESTIMATING THE PROPORTION OF STUNTED 0-5 YEAR-OLD CHILDREN AT THE PROVINCIAL LEVEL IN THE PHILIPPINES¹

by

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ABSTRACT

This paper aims to estimate the proportion of stunted among 0-5 year old children for all the provinces and selected cities in the Philippines using three methods of estimation, namely; the direct regression-synthetic, and empirical best linear unbiased prediction (EBLUP) estimation procedures. The estimates were evaluated based on accuracy, precision, and reliability as measured by their standard error, mean square error and coefficient of variation. Estimates with small standard error and mean square error, and those estimates whose coefficients of variation are at most 10% are considered the “best” estimates. The direct method made use of the data from the 2003 National Nutrition Surveys (NNS) while the 2000 Census of Population and Housing (CPH), 2000 Field Health Service Information System (FHSIS) and 2002 Administrative Data from the National Epidemiology Center of the Department of Health served as sources of auxiliary variables used in model-based procedures, such as regression-synthetic and EBLUP. Majority of the estimates obtained using the three methods lie within the range 20-30%. The direct estimation procedure generated only 11.2% reliable estimates while only 19.4% are accurate and precise. In the model-based technique, the inverse of the total error variance due to both modeling and sampling processes was used as weights in the model-fitting process. The resulting model has an adjusted R^2 of 56.6% with a mean square error of 0.01. The regression-synthetic method resulted to 59.2% reliable estimates while 83.7% of the estimates are accurate and precise. Meanwhile, using the EBLUP procedure, a weighted average of the direct and regression-synthetic estimates with weights equal to the variance of the error due to the modeling process over the total variation due to modeling and sampling processes was obtained. This procedure generated 16.3% accurate and precise estimates and 11.2% reliable estimates. Based on these results, it can be concluded that the “best” estimator for the provincial proportion of stunted 0-5 year old children is the regression-synthetic estimation technique. This method yielded the most number of accurate, precise, and reliable estimates. Using this estimation procedure, the areas with the lowest prevalence of stunted 0-5 year-old children are located in the National Capital Region. These are San Juan (2.09%), Las Piñas (2.26) and Parañaque (2.92%). On the other hand, high prevalences of stunted pre-school children are found in Ifugao (54.14%), Maguindanao (50.14%), and Kalinga (49.88%).

KEYWORDS: stunting, design-based, model-based, empirical best linear unbiased prediction

I. INTRODUCTION

An excellent indicator of the nutritional status of children is their anthropometric measurements. The nutritional status of children is evaluated by taking body measurements

¹ Paper to be presented at the 10th National Convention on Statistics, October 1-2, 2007, Shang-ri La, EDSA, Philippines

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such as weight and height, which are then compared with standard weights/heights of well-nourished child in the same age and sex classes. Comparisons with standards enable the determination of the percentage prevalence of underweight, stunted, and wasted among children of various age groups.

Underweight is the usual and most popular indicator of poor nutritional status among children, both in 0-5 and in 6-10 years age groups. But this paper will focus on the prevalence of stunting. Stunting is an indicator that is used to determine past or chronic nutritional status where the child's actual height/length is compared with the standard or reference height/length for his age. If the child's height/length falls below this standard or reference height/length, the child is "stunted". Height-for-age is the indicator used for children, 2 years old and above, while (recumbent) length-for-age is the indicator used for children below 2 years old.

National prevalence of stunting in developing countries ranges up to 64.2% (WHO, 1997, p.18). Child health goals for the early part of the next century have specifically targeted improvements in the rates of stunting. One of the five health outcome targets (out of eleven total targets for health) given by the World Health Organization in its recently revised *Health for All in the 21st Century* is "the percentage of children under five years who are stunted should be less than 20% in all countries and in all specific subgroups within countries by the year 2020" (WHO, 1998, p.22)

In the study of Dr. Linda S. Adair, et. al. that was conducted among more than 2,000 children living in metropolitan Cebu, stunting was linked to impaired intellectual development. Those stunted earliest in life, before six months of age, were the most severely stunted by age two, the study found. The same children scored significantly lower on intelligence tests at 8 and 11 years of age than children who were not stunted. The importance of knowing the prevalence of stunting could not be overemphasized. It is for this reason that this paper was focused on determining the prevalence of stunting among children.

The Anthropometric Survey, one of the components of the FNRI's NNS and with major objective of determining the nutritional status of individuals, is designed for estimation of national parameters. The sample size is appropriate only for national level estimation of the prevalence of underweight, stunting and wasting. Although the FNRI is aware of the importance of determining the regional and provincial estimates of the mentioned nutritional indicators, the limited funds and resources hinder its execution.

Realizing the importance of providing data at a level of disaggregation needed for local level program and policy development, and considering FNRI's limited resources to generate data at this level, it has become necessary for the Institute to make use of an alternative scheme, the small area estimation technique.

Small area estimation technique is used to estimate at smaller areas (e.g. provinces) than designed by combining survey data with other data sources (known as auxiliary data or covariates) that are available on an area basis. These cannot be sample survey sources but can either be data from some administrative system or from a previous census. If the survey variable of interest is related to these other data, more precise estimates at a lower level of disaggregation can be produced.

This paper offers empirical basis on the small area/domain estimation of the prevalence of stunting among 0-5 year-old children. Using the direct estimates derived from the 2003 National Nutrition Surveys (NNS), census data and administrative records, this paper provides quality statistics at the provincial level. These provincial estimates could be used by statistics-users, especially from the local government units in the formulation of programs and policies aiming at improving the height-for-age of the children, particularly the pre-school children, in their respective areas.

II. Methodology

The Anthropometry Survey, one of the components of the Sixth NNS, provides data on height, age and sex of 0-5 year-old children. These body measurements were compared with standard height of well-nourished children of the same age and sex classes to determine the prevalence of stunted among this age group. A total of 4,111 children belonging to the 0-5 age group from 98 provinces and selected cities of the country were the subjects of this study. Direct estimates of the prevalence of stunting at the provincial level were generated. Measures of precision, accuracy and reliability of these direct estimates were also obtained. These measures were used for comparing the direct estimates with those obtained using the model-based techniques.

Auxiliary variables were from the 2000 Census of Population and Housing (CPH) of NSO, 2000 Field Health Service Information System (FHSIS) and 2002 Administrative Data from the National Epidemiology Center of the Department of Health (DOH). These variables were identified using correlation analysis.

With these auxiliary variables, a linear regression model was fitted with the direct estimates as the dependent variable. This linear model is one with two sources of error, namely; error due to the modeling process and error due to the sampling process. A two-stage estimation technique was used to estimate the parameters of the model.

The modeling process makes use of several auxiliary variables. The model with the highest adjusted R^2 and satisfies the assumptions of the procedure became candidates for the “best” model. Further evaluation of the model as to its predicting ability and conformity with economic theory was performed. Finally, the “best” predicting model was chosen and then used to generate the regression-synthetic estimates. The standard error as well as the coefficient of variation of these estimates as its measures of precision and reliability was also obtained.

The empirical best linear unbiased predictor (EBLUP) estimator is a weighted average of the direct estimator and the regression-synthetic estimator. This estimator was used to obtain the third set of estimates, known as the EBLUP estimates. The mean square error of the EBLUP estimates was computed using the expression given by Prasad and Rao in 1990. This mean square error is used to measure the precision and accuracy of the EBLUP estimates.

The three set of estimates are then compared and the “best” set of estimates are chosen in terms of their mean square error, standard error and coefficient of variation. All the computations are performed using the software *STATA*, Statistical Packages for Social Sciences (*SPSS*) and Microsoft Excel.

III. RESULTS AND DISCUSSIONS

3.1 Direct Estimation of the Provincial Proportion of Stunted 0-5 Year-Old Filipino Children

The direct estimates of the provincial proportion of stunted preschool-age children are shown in Appendix Table 1, with their corresponding measures of reliability and precision. Provincial estimates range from 0% to 66.79%, with Guimaras, Aurora, Camiguin, San Juan, Las Piñas, Muntinlupa, Parañaque, and Pasay having the lowest estimate of 0% and Makati with the highest (see Table 1). Other provinces with high estimates are Bohol (57.11%), Antique (55.01%) and Zamboanga del Norte (50.88%). On the other hand, other areas with low estimates are located in NCR and include Valenzuela (3.46%), Malabon

(6.62%), and Pasig (7.74%). However, these estimates are not reliable as reflected by their coefficients of variation which are greater than 10%.

Table 1. Top ten provinces in terms of the proportion of stunted pre-school children using the direct estimation procedure.

Ranking	Province/City Name	Proportion of Stunted Children (expressed in percent)	Coefficient of Variation (%)
1	Makati	66.79	42.78
2	Bohol	57.11	10.56
3	Antique	55.01	14.90
4	Mt. Province	52.35	10.32
5	Zamboanga del Norte	50.88	14.45
6	Kalinga	50.01	8.25
7	Nueva Vizcaya	49.99	28.89
8	Cotabato	49.70	24.20
9	Samar	47.98	21.20
10	Sultan Kudarat	44.69	30.85

Around 31% of the provincial estimates on the proportion of stunted children aged 0-5 years using direct estimation fall within the range from 20 to 30. This suggests that almost one-third of 0-5 year-old children are suffering from stunting. About 20% of the provinces and cities have estimates greater than 40%. Moreover, only 14 out of 98 places or 14.3% of the estimates have proportion of stunted children with less than or equal to 10%.

The mean square errors (MSE), which measure precision of the estimates, are not small. Majority or around 41% of the estimates have MSEs of greater than 0.004, implying that most of the direct estimates of the proportion of stunted children are not precise and accurate. Out of the 98 provinces and cities, only 19 have low measures of MSE which ranges from 0 to 0.001 implying that these estimates are precise and accurate. A small percentage of the estimates are found to be reliable, that is, only 11.2% of the estimates have coefficient of variation of at most 10%. Majority of the provinces and cities have coefficients between 10 to 20%.

3.2 Regression-Synthetic Estimation of the Provincial Proportion of Stunted 0-5 Year-Old Filipino Children

The predicting model for the provincial proportion of stunted children aged 0-5 years is composed of the following predictors: provincial proportion of housing units with floor area of at least 120 m², provincial proportion of barangays with less than 10 hotels and lodging facilities present, provincial proportion of persons who only completed grade 1, provincial proportion of housing units under construction, provincial proportion of persons living with a son or daughter as household head, and provincial proportion of 0-5 year old children who

were found to have pneumonia. All the predictors are significantly different from zero at 5% level of significance. The predicting model has an R^2 of 56.6% and an adjusted R^2 of 53.7%. Furthermore, the residuals are normally, identically and independently distributed with mean equal to zero and a constant variance. Also, there is no presence of multicollinearity among the predictors. The estimates of the parameters of the model are presented in Table 2.

Table 2. Estimated regression coefficients of the predicting model for provincial proportion of stunted 0-5 year old children using weighted least squares method.

Predictor	Estimated Coefficient	Standard Error
provincial proportion of housing units with floor area of at least 120 m ²	-1.74	0.45
provincial proportion of barangays with less than 10 hotels and lodging facilities present	-0.60	0.28
provincial proportion of persons who only completed grade 1	9.34	1.42
provincial proportion of housing units under construction	-4.49	1.47
provincial proportion of persons living with a son or daughter as household head	23.99	7.13
provincial proportion of 0-5 year old children who were found to have pneumonia	0.08	0.04
constant	0.45	0.28

The regression-synthetic estimates resulted to a mean provincial proportion of stunted children equal to 26.13%. Among these provinces, Ifugao has the highest estimate of provincial proportion of stunted 0-5 year-old children with an estimate of 54.14% (see Table 3). On the other hand, San Juan has the lowest estimate with 2.09%. Out of the 98 provinces and cities, around 5 have estimates between 0 -10%. The largest proportion of estimates lies within the range 20–30%.

Table 3. Top ten provinces in terms of the proportion of stunted pre-school children using regression-synthetic estimation procedure

Ranking	Province/City Name	Proportion of Stunted Children (expressed in percent)	Coefficient of Variation (%)
1	Ifugao	54.14	6.31
2	Maguindanao	50.14	5.56
3	Kalinga	49.88	6.31
4	Samar	48.03	6.36
5	Mt. Province	45.77	7.01
6	Northern Samar	45.28	5.33
7	Negros Oriental	42.10	7.00
8	Sarangani	40.15	6.68
9	Sulu	38.99	6.74
10	Tawi-Tawi	38.92	6.92

The most accurate and precise estimate is for the province of Oriental Mindoro with a mean square error of 0.0002. On the other hand, the highest mean square error is 0.005 of

the estimate for the City of Manila. Majority of the mean square errors of the estimates are less than 0.001, while there is no MSE falling within the range 0.003-0.004

For the coefficients of variation of the provincial regression -synthetic estimates, more than half of the estimates have coefficients of at most 10%, indicating that these estimates are reliable. The most reliable estimate is for the province of Davao Oriental with coefficient of variation of 4.68%.

3.3 EBLUP Estimation of the Provincial Proportion of Stunted 0-5 Year-Old Filipino Children

EBLUP estimates of the proportion of stunted pre-school children were formed by combining the direct and regression-synthetic estimates. Using the EBLUP, the estimated proportion of stunted children is 27.11%, on the average. The province of Kalinga has the highest estimate with 50% while San Juan has the lowest estimated proportion with 2.1%. More than one-third of the EBLUP estimates are within the range of 20-30%. With almost same frequency is the range 30-40%.

Table 4. Top ten provinces in terms of the proportion of stunted pre-school children using EBLUP estimation procedure.

Ranking	Province/City Name	Proportion of Stunted Children (expressed in percent)	Coefficient of Variation (%)
1	Kalinga	49.97	7.16
2	Mt. Province	49.93	8.66
3	Samar	48.01	12.23
4	Ifugao	47.64	10.72
5	Maguindanao	45.57	6.47
6	Bohol	45.37	10.16
7	Antique	45.21	11.93
8	Isabela Ctiy	42.86	13.56
9	Zamboanga del Norte	42.17	12.13
10	Sarangani	40.82	10.39

Around 16% of the estimates have mean square errors of at most 0.001 and 30.6% have errors between 0.001-0.002. Only 7.1% of the estimates have mean square errors greater than 0.004. The province of Catanduanes has the most precise and accurate estimate (0.0001) while Makati has the least with MSE equal to 0.005.

In terms of reliability, the province of Catanduanes was also found to have the most reliable EBLUP provincial estimates with coefficient of variation equal to 4.46%. It can then be said that Catanduanes has the best EBLUP estimate of the proportion of stunted 0-5 year old children since its estimate is the most accurate, precise, and most reliable as compared

to the rest. Around 11% of the estimates are reliable, having coefficients of at most 10%. Most number of estimates has coefficients falling within the range 10– 20%.

3.4 Comparison of the Distribution of Provincial Estimates

Figure 1 shows the comparison of the distribution of the estimates of the provincial proportion of stunted 0-5 year old children using the three estimators. Majority of the provincial estimates for the three estimators have stunting prevalence ranging from 20-30%. The three methods produced almost the same number of provincial proportions of stunted children falling within the range. Both model-based procedures resulted to least number of provincial estimates falling within the range 0-10%. It can also be seen from the figure that model-based methods of estimation produced more comparable sets of estimates.

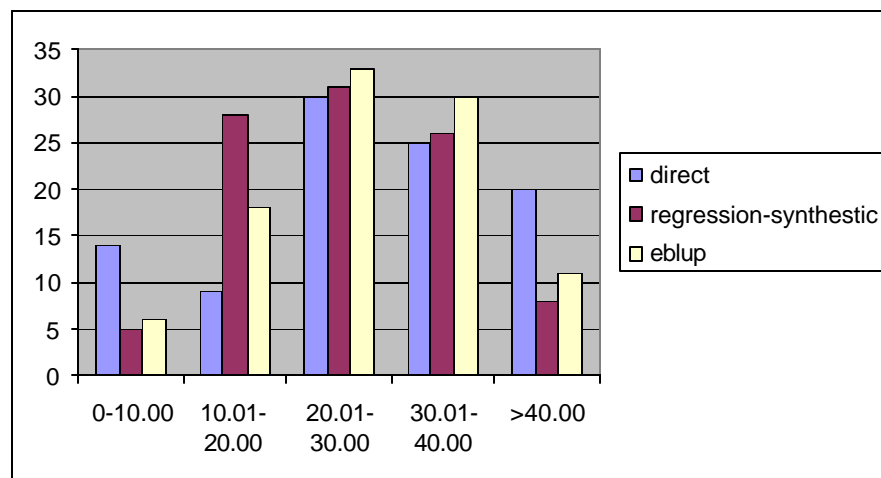


Figure 1. Comparison of the distribution of provincial estimates of the proportion of stunted 0-5 year old children using direct, regression-synthetic and EBLUP estimation methods.

In Figure 2, the regression-synthetic procedure produced the most number of accurate and precise provincial estimates where 83.7% of the provinces and cities have mean square errors less than or equal to 0.0001 and this is followed by the direct method with 19.4%. It is also reflected in the figure that the direct method produced the most number of estimates with mean square errors greater than 0.004 at around 41%.

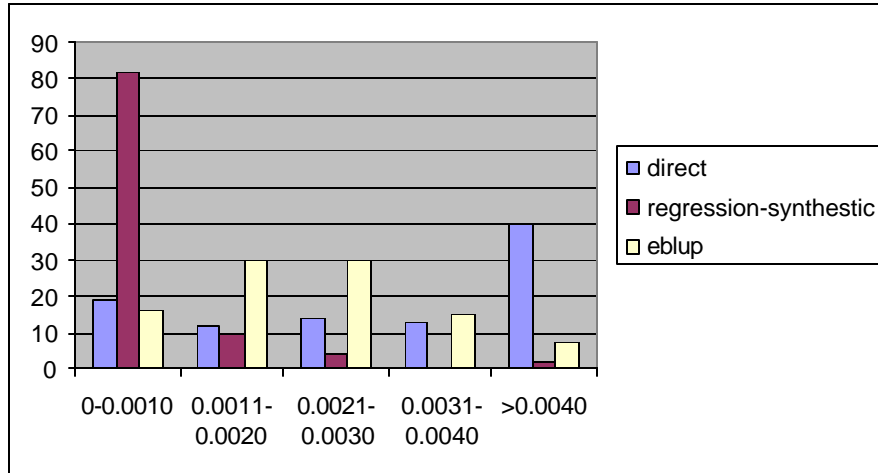


Figure 2. Comparison of the distribution of mean square errors of the provincial estimates of the proportion of stunted 0-5 year old children using direct, regression-synthetic and EBLUP estimation methods.

Both the direct and EBLUP methods produced equal number of reliable estimates (11 or 11.2%) with coefficient of variation of at most 10%. The regression-synthetic procedure generated the most number of reliable estimates with 59.2%. Hence, of the three estimation procedure, the regression-synthetic approach proved to produce the most number of reliable estimates for the provincial proportion of stunted 0-5 year old children.

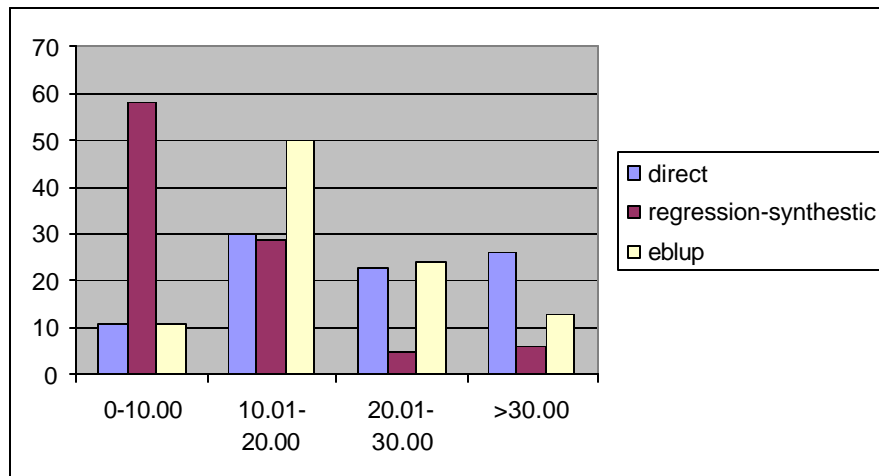


Figure 3. Comparison of the distribution of coefficient of variation of the provincial estimates of the proportion of stunted 0-5 year old children using direct, regression-synthetic and EBLUP estimation methods.

3.5 Comparison of Composition of the Top Ten Provinces with High Proportion of Stunted Children Aged 0-5 Years Using the Three Estimation Procedures

The City of Makati emerged to have the highest proportion of stunted 0-5 year old children using the direct estimation procedure, while the provinces of Ifugao and Kalinga came out to have the highest proportion using the regression-synthetic and the EBLUP procedures, respectively. The provinces of Mt. Province, Kalinga and Samar were all included in the top ten provinces with high proportion of stunted pre-schoolers using the three estimation procedures. Hence, these provinces should be given priority for inclusion should the government implement a nutrition intervention program. Six provinces, namely Ifugao, Maguindanao, Kalinga, Samar, Mt. Province and Sarangani, were identified as belonging to the top ten provinces both by the regression-synthetic and EBLUP estimation procedures.

IV. CONCLUSION

The level of stunting among children under 5 years of age in the country remains to be high and a matter of great concern. The stunting problem requires continued and urgent attention of all parties concerned. In this regard, a more targeted intervention nutrition program should be undertaken aiming to decrease, if not diminish, the prevalence of stunting among the pre-school children. And the requirement for a more focused and targeted intervention program is the identification of specific areas (provinces and cities) that should serve as beneficiaries. This approach is important in order to realize WHO's target of decreasing the prevalence of stunting among pre-schoolers.

The FNRI's 2003 NNS was designed to produce national estimates of nutritional indicators, necessary for assessing the nutritional status of the Filipino populace of various age groups and physiological status. It was not designed to produce estimates at the provincial level due to lack of budget. This scenario makes it impossible for nutrition program planners and implementers to design a more focused program. Hence, this paper aimed to provide estimates for the provincial proportion of stunted 0-5 year old children for all the provinces and selected cities of the Philippines using direct, regression-synthetic and empirical best linear unbiased prediction estimation (EBLUP) techniques. Estimates produced using these three estimation methods were evaluated in terms of their accuracy, precision and reliability as measured by mean square error, standard error and coefficient of variation.

The direct estimates of the provincial proportion of stunted 0-5 year old children range from 0 to 67%. Of the 98 provinces and cities, 14 have estimates that are less than or equal to 10%. Most of the estimates have mean square errors greater than 0.004 and only 11 have coefficient of variation of at most 10%. Thus, majority of the direct estimates are not accurate, precise and reliable.

Auxiliary variables from the 2000 Census of Population and Housing of NSO, 2000 Field Health Service Information System (FHSIS) and 2002 Administrative Data from the National Epidemiology Center of the Department of Health were used for the model-based estimation techniques. Weighted least squares estimation was employed to obtain a predictive model. On the average, the regression-synthetic estimate of the provincial proportion of stunted 0-5 year old children is 26.13%. The range of the estimates is from 2% to 54%, which is narrower than the range of estimates derived through direct approach. About 84% of the mean square errors of the estimates are at most 0.001, implying that majority of the estimates are accurate and precise. In terms of reliability, 59% of the estimates have coefficients of variation at most equal to 10%.

Another model-based technique, the EBLUP was employed to estimate provincial proportion of stunted 0-5 year old children. It is a weighted combination of the direct and regression-synthetic estimates where the weights used are the estimates of variability due to modeling process over the total variation due to the modeling and sampling process. Using this technique, the provincial proportion of stunted 0-5 year old children is 27%, on the average. In terms of precision and accuracy, around 16% of the estimates have mean square errors of at most 0.001 and 31% have mean square errors between 0.001 and 0.002. The EBLUP estimation technique yielded 11% of the estimates with coefficient of variation at most 10% and 52% have coefficients between 10 and 20%.

Based on these results, the regression-synthetic procedure yielded the most number of accurate, precise and reliable estimates. It is therefore considered as the best estimator of the provincial proportion of stunted 0-5 year old children.

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- <http://www.unicef.org/sowc98/panel3.htm>

Appendix Table 1. Direct provincial estimates of the proportion of stunted children aged 0-5 years using the Sixth National Nutrition Surveys

Province/City	n	Proportion of Stunted Children (%)	Standard Error	MSE	CV(%)
Region 1					
Ilocos Norte	29	27.57	0.044	0.00194	16.0
Ilocos Sur	17	29.38	0.094	0.00884	31.9
La Union	43	30.23	0.045	0.00203	14.8
Pangasinan	138	28.13	0.042	0.00176	14.9
Region 2					
Cagayan	65	38.47	0.084	0.00706	21.8
Isabela	78	29.48	0.046	0.00212	15.7
Nueva Vizcaya	24	49.99	0.144	0.02074	28.9
Quirino	15	26.64	0.061	0.00372	23.0
CAR					
Abra	17	23.56	0.177	0.03133	75.0
Benguet	35	17.02	0.061	0.00372	35.8
Baguio City	25	15.99	0.089	0.00792	55.4
Ifugao	22	40.90	0.072	0.00518	17.6
Kalinga	18	50.01	0.041	0.00168	8.2
Mt. Province	21	52.35	0.054	0.00292	10.3
Apayao	14	21.42	0.015	0.00023	7.0
Region 3					
Bataan	21	9.52	0.048	0.00230	50.2
Bulacan	84	10.84	0.040	0.00160	37.3
Nueva Ecija	72	19.45	0.067	0.00449	34.5
Pampanga	82	19.40	0.060	0.00360	31.0
Tarlac	38	29.62	0.085	0.00723	28.7
Zambales	27	25.93	0.051	0.00260	19.6
Aurora	1	0.00	0.000	0.00000	Undefined
Region 4A					
Batangas	64	26.38	0.080	0.00640	30.4
Cavite	99	22.16	0.061	0.00372	27.7
Laguna	78	21.57	0.047	0.00221	22.0
Quezon	59	25.43	0.042	0.00176	16.4
Rizal	85	19.41	0.057	0.00325	29.4
Region 4B					
Marinduque	15	26.69	0.127	0.01613	47.5
Occidental Mindoro	28	39.28	0.160	0.02560	40.9
Oriental Mindoro	56	39.24	0.108	0.01166	27.4
Palawan	51	19.41	0.055	0.00303	28.1
Romblon	30	40.00	0.093	0.00865	23.3

Appendix Table 1 continued ...

Province/City	n	Proportion of Stunted Estimate (%)	Standard Error	MSE	CV(%)
NCR					
Manila	62	29.34	0.071	0.00504	24.3
Mandaluyong	5	43.56	0.056	0.00314	12.8
Marikina	12	8.77	0.014	0.00020	15.6
Pasig	22	7.74	0.049	0.00240	62.9
Quezon City	107	21.32	0.052	0.00270	24.6
San Juan	1	0.00	0.000	0.00000	Undefined
Calocan	73	27.10	0.069	0.00476	25.3
Malabon	11	6.62	0.059	0.00348	89.9
Navotas	23	44.62	0.128	0.01638	28.8
Valenzuela	25	3.46	0.035	0.00123	101.8
Las Piñas	4	0.00	0.000	0.00000	Undefined
Makati	4	66.79	0.286	0.08180	42.8
Muntinlupa	8	0.00	0.000	0.00000	Undefined
Parañaque	3	0.00	0.000	0.00000	Undefined
Pasay	8	0.00	0.000	0.00000	Undefined
Pateros	5	38.23	0.241	0.05808	63.1
Taguig	23	35.29	0.087	0.00757	24.6
Region 5					
Albay	52	27.24	0.085	0.00723	31.4
Camarines Norte	23	30.44	0.154	0.02372	50.7
Camarines Sur	101	28.65	0.044	0.00194	15.4
Catanduanes	18	22.22	0.010	0.00010	4.5
Masbate	43	44.04	0.075	0.00563	16.9
Sorsogon	31	22.32	0.034	0.00116	15.0
Region 6					
Aklan	13	38.50	0.244	0.05954	63.4
Antique	20	55.01	0.082	0.00672	14.9
Capiz	43	39.54	0.050	0.00250	12.5
Iloilo	78	25.40	0.049	0.00240	19.1
Negros Occidental	97	38.80	0.063	0.00397	16.2
Guimaras	1	0.00	0.000	0.0000	Undefined
Region 7					
Bohol	51	57.11	0.060	0.00360	10.6
Cebu	163	31.19	0.045	0.00203	14.5
Negros Oriental	60	33.36	0.044	0.00194	13.1
Siquijor	4	50.00	0.000	0.00000	0.0

Appendix Table 1 continued...

Province/City	n	Proportion of Stunted Estimate (%)	Standard Error	MSE	CV (%)
Region 8					
Eastern Samar	25	36.00	0.024	0.00058	6.6
Leyte	107	38.17	0.074	0.00548	19.3
Northern Samar	32	37.51	0.036	0.00130	9.5
Western Samar	50	47.98	0.102	0.01040	21.2
Southern Leyte	32	21.90	0.092	0.00846	42.2
Biliran	17	41.17	0.027	0.00073	6.6
Region 9					
Zamb. del Norte	57	50.88	0.074	0.00548	14.4
Zamb. del Sur	75	36.27	0.048	0.00230	13.3
Zambo Sibugay	30	43.32	0.056	0.00314	12.9
Isabela City	7	42.86	0.000	0.00000	0.0
Region 10					
Bukidnon	60	33.66	0.099	0.00980	29.3
Camiguin	3	0.00	0.000	0.00000	Undefined
Lanao del Norte	39	33.36	0.117	0.01369	35.0
Misamis Occidental	28	35.40	0.078	0.00608	22.1
Misamis Oriental	46	19.10	0.060	0.00360	31.3
Region 11					
Davao del Norte	50	25.14	0.076	0.00578	30.4
Davao del Sur	83	38.71	0.087	0.00757	22.5
Davao Oriental	26	30.45	0.077	0.00593	25.1
Compostela	33	21.34	0.109	0.01188	50.9
Region 12					
North Cotabato	70	49.70	0.120	0.01440	24.2
South Cotabato	77	31.74	0.061	0.00372	19.1
Sultan Kudarat	38	44.69	0.138	0.01904	30.9
Sarangani	34	41.19	0.053	0.00281	12.8
Cotabato City	10	30.00	0.061	0.00372	20.2
ARMM					
Basilan	16	18.75	0.031	0.00096	16.5
Lanao del Sur	45	35.99	0.066	0.00436	18.2
Maguindanao	81	44.62	0.032	0.00102	7.3
Sulu	63	29.83	0.044	0.00194	14.7
Tawi-tawi	11	27.28	0.025	0.00063	9.1
CARAGA					
Agusan del Norte	68	25.03	0.089	0.00792	35.7
Agusan del Sur	73	41.16	0.054	0.00292	13.1
Surigao del Norte	47	33.93	0.029	0.00084	8.5
Surigao del Sur	33	24.26	0.068	0.00462	28.2