Estimation of Provincial Poverty Incidence in the Philippines

Zita Albacea
University of the Philippines Los Baños, Institute of Statistics
College, Los Baños,
Laguna, Philippines 4031
zvja@instat.uplb.edu.ph

Ann Inez Gironella
University of the Philippines Los Baños, Institute of Statistics
College, Los Baños,
Laguna, Philippines 4031
aing@instat.uplb.edu.ph

1. Introduction

Poverty incidence is a ratio of two counts: total number of poor households and total number of households. In the Philippines, official poverty incidence is reported for each of its 15 regions with rural and urban disaggregation. However, for effective local government planning, estimates are also needed for smaller geographical areas, its 80 provinces and 25 cities.

This paper presents a methodology for small area (here, province and city) estimation (SME) of poverty incidence. It begins with computing design-based estimates to determine if SME is needed based on calculated coefficient of variation (CV). If needed, correlates of poverty from data of the current Family and Income Expenditure Survey (FIES), a stratified, two-stage national survey having provinces and cities disaggregated by urbanity as domain, are identified. The choice of the small area technique to use is made depending on the availability of auxiliary data. Best estimates are chosen on the basis of small bias, mean square error (MSE) and CV.

2. Results, Discussion and Conclusion

Using the 1994 FIES, design-based estimates of poverty incidence at the provincial and city levels range from 5% to 85% with a mean of 38%; those of bias range from -0.0097 to +0.0051 with a mean of -0.0001 indicating a slight underestimation of the true value. Estimates of MSE range from 0.0013 to 0.2572 with a mean of 0.0036. The CVs of the estimated poverty incidence range from 5% to 127% with a mean of 19%. Only 28 out of 105 small areas have CVs less than 10%. This result indicates that design-based estimates are quite variable and hence not appropriate for estimating poverty incidence at the provincial and city levels.

Three SME procedures: synthetic, composite and model-based, are then used to estimate small area poverty incidence. Synthetic estimates are computed with male- and female-headed households as large domains together with an indicator of whether the main source of income is agriculture as auxiliary variable using the 1990 Census of Population data. Composite estimates are computed by combining the design-based and synthetic estimators using the common weight *w(opt)* introduced by Purcell and Kish (1979) while model-based estimates are obtained using proportion of households in a province or city whose main source of income is agriculture as predictor.

Table 1 shows the summary statistics of the four poverty incidence estimates. The synthetic estimates are practically constant across provinces and cities within a region indicating that differences among small areas in a region are not accounted for. Composite and model-based estimates, on the other hand, are closer to the design-based estimates and take into account the variability among the provinces and cities in a region. Since the composite estimate is a combination of the design-based and synthetic estimates, the composite estimates are always between the two but closer to the design-based estimates. As regards variability, design-based estimates show the widest range of values while synthetic estimates, the narrowest. The CVs of the synthetic estimates are all desirably small, less than 10%. Composite estimates give a higher percentage of small (≤10%) CVs compared to design- and model-based estimates. Also, an improvement in the percentage distribution of the CV is attained by the composite estimate.

Table 1. Properties of the poverty incidence estimates obtained from four different estimation procedures (m = 105 provinces or cities).

PROPERTY	DESIGN-BASED ESTIMATES	SYNTHETIC ESTIMATES	COMPOSITE ESTIMATES	MODEL-BASED ESTIMATES
Average poverty incidence estimate	0.38	0.38	0.38	0.37
Range of poverty incidence estimates	0.05- 0.85	0.08-0.60	0.06-0.79	0.05-0.79
Average MSE or variance	0.0036	-0.000025	0.0026	0.0054
Range of MSE or variance	0.0013-0.2572	-0.0010-0.0004	0.0001-0.0183	0.0001-0.0242
Average coefficient of variation (%)	19.15	1.93	14.97	22.70
Range of coefficient of variation (%)	4.8-127.08	0.13-4.51	4.16-82.76	5.48-66.82
Percentage of CV values at most 10%	27%	100%	37%	14%

Table 2 shows that the percentage of CVs not exceeding 10% using the composite estimation procedure is 37%, an improvement over design-based procedure of 27%. This is also observable in every range of values of the CVs where comparison was made. Almost 100% of the composite estimates have CVs not exceeding 40% while that of model-based shows only 85%. Therefore, among the four estimation procedures examined, the composite estimator is deemed most promising for estimating provincial and city level poverty incidence in the Philippines.

Table 2. Cumulative percentage distribution of coefficient of variation of the four sets of provincial or city level poverty incidence estimates (m = 105 provinces or cities).

Coefficient of Variation Values (%)	DESIGN-BASED ESTIMATES	SYNTHETIC ESTIMATES	COMPOSITE ESTIMATES	MODEL-BASED ESTIMATES
At most 10	27%	100%	37%	14%
At most 20	68%		74%	58%
At most 30	81%		93%	73%
At most 40	95%		99%	85%
At most 50	97%			95%
At most 60	99%			98%

REFERENCES:

Ghosh, M. and J.N.K. Rao (1994). Small area estimation: an appraisal. Statistical Science 9:1, 55-93.

National Statistical Coordination Board (1996). Philippine Poverty Statistics.

National Statistics Office (1996). !994 Family Income and Expenditute Survey of Households, Bulletin Series No. 80, Volume II, Provincial/Key Cities, Final Report.

Purcell, N.J. and L. Kish (1979). Estimation for small domains. Biometrics 35, 365-384.

Wolter, K.M. (1985). Introduction of Variance Estimator. Springer-Verlag New York Inc.

RESUME

Quatre méthodes d'estimation des petites zones: basée sur la forme, synthétique, composite et basée sur un modéle, sont comparées pour évaluer les estimations des niveaux de fréquence de pauvreté, provinciaux et urbains, aux Phillipines en utilisant l'enquête 1994 FIES et le recensement de la population de 1990. Les estimations composites montrent de petits biais, écarts absolus à la moyenne et coefficient de variation, et sont donc considérées les meilleures parmi les quatre.