

Poverty Mapping in Indonesia: An effort to Develop Small Area Data Based on Population Census 2000 Results (with example case of East Kalimantan province)

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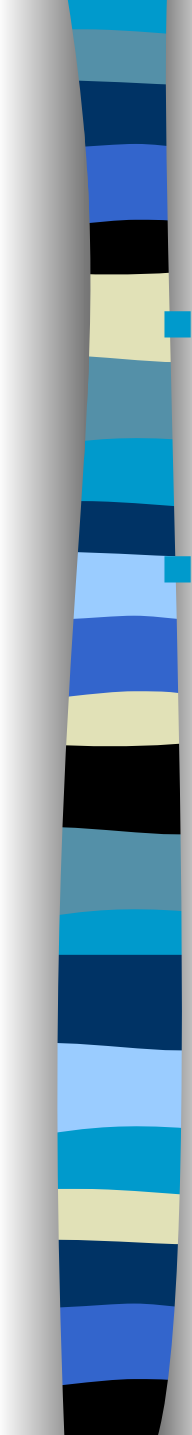
1. Introduction

Indonesia experienced economic turmoil during the last six years caused by Asia's financial crises in 1997. During that time Indonesia has experienced contracted economic growth and increasing levels of poverty

Recently, Indonesia's economic indicators show a consistent progress that will be considered by many to indicate a recovery of its economy

While on the long-term plan, economic growth accepted as panacea for the economic turmoil and reducing the poverty level, in the short-term plan the government also provide a specific program to directly assist the poor

Introduction (Continued)



- Indonesia calculated the poverty levels using data obtained from the National Socio-Economic Survey commonly known as SUSENAS (Survey Sosial Ekonomi Nasional).

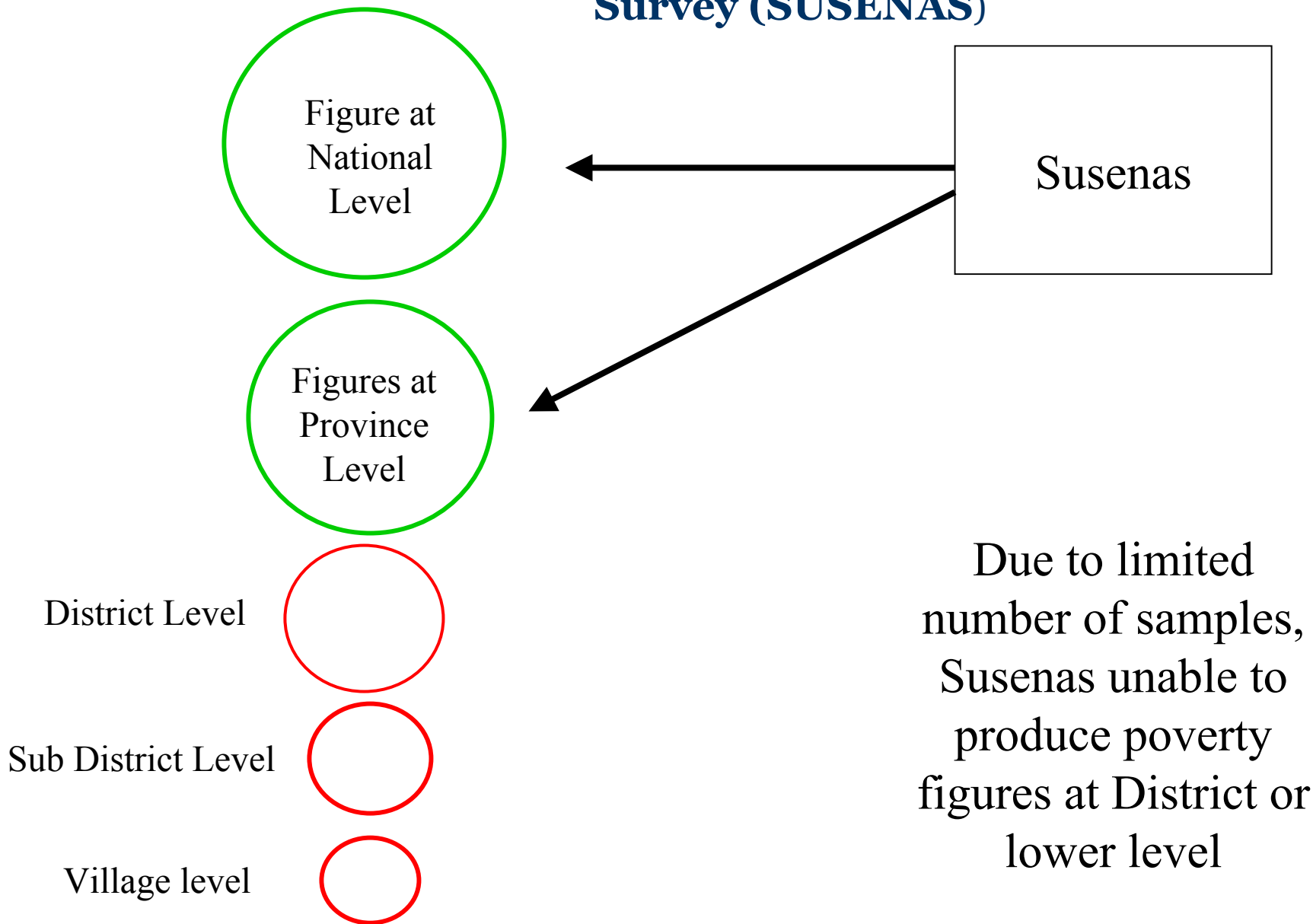
- Susenas is a nationwide household survey conducted annually by the Statistics Indonesia (BPS) since 1963. The survey collected a wide range of individual and household socio-economic characteristics, among others the consumption expenditure of the household and household members.

■ In the early nineties, the survey questionnaires were divided into two types: core questionnaires and a module.

➤ The core questionnaires are aimed at collecting basic socio-economic data such as the number of people, age, sex, marital status, education and the like. The sample size of the core questionnaires enable Susenas to produce district level data.

➤ The module covers different topics each year. It is designed that specific important individual and household characteristics, such as consumption expenditure, employment, health and cost of education are collected once every three years. The Susenas module is able to produce only provincial level data.

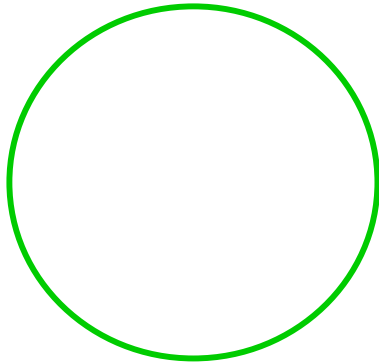
Poverty Figures using Social Economic Survey (SUSENAS)



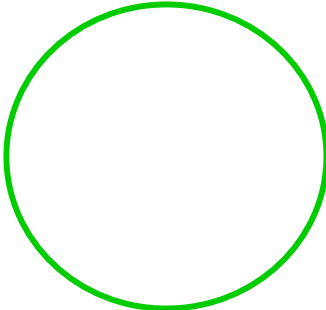
Poverty Map

**Estimated
Poverty
Figures at:**

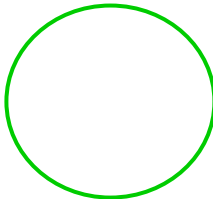
National
Level



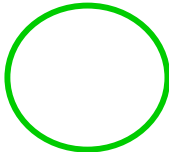
Province Level



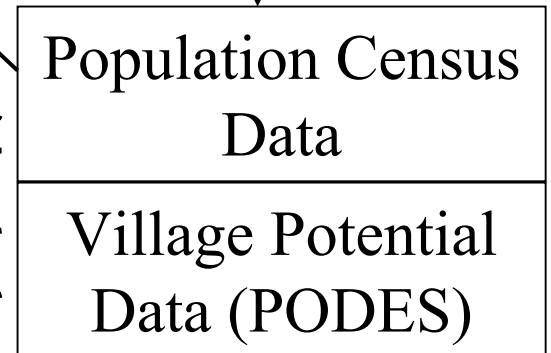
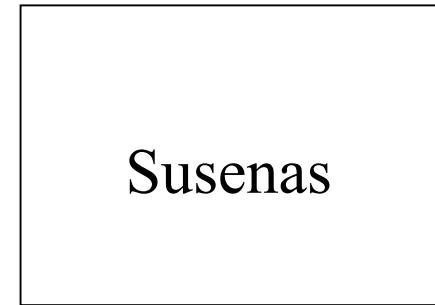
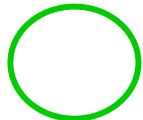
District Level



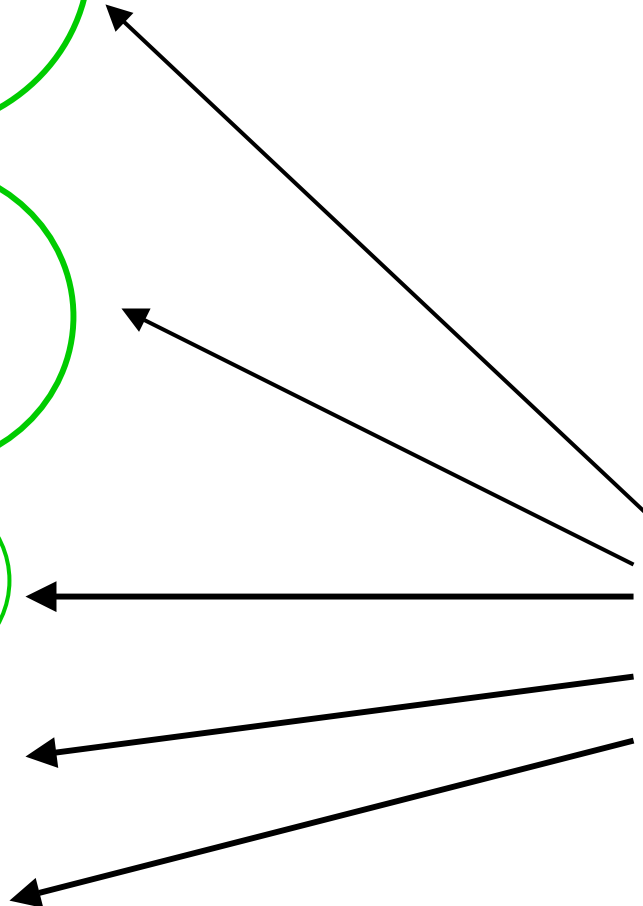
Sub District Level



Village level



Mapping



2. The Importance of Poverty Map

The calculation of the poverty line in Indonesia has relied primarily on the results of Susenas module data, namely the consumption expenditure of the households and their members.

However, as it is realized, the present poverty line can only estimate the number of poor people at provincial level. While for the specific program targeting the poor, most of the needs are at the district level (to some extent is the village level).

Realizing that fact, BPS adopted the methodology developed by Chris Elbers et.al (It is applied by the SMERU team on Poverty Mapping in Jakarta, East Kalimantan and East Java Provinces) The estimate of poverty at micro-level in the rest of 27 provinces have been accomplished. At this occasion it will be presented the summary results of Province of East Kalimantan.

2. The Importance(continued)

Provide a statistical procedure to combine two data sources Susenas (the detailed data available in module consumption 1999) and the comprehensive coverage of population census 2000. Susenas is used to impute missing information in the census, so that reliable estimates of poverty and inequality can be generated at micro-level.

Provide the government a micro-level poverty and inequality estimates which will be useful in the targeting of development assistance.



3. Steps in Producing Poverty Map

3.1 Basic Idea

- Pick variables common between survey and census.
- Construct a consumption model using some of these variables and their transformations.
- The model is a prediction model.
- Using estimated coefficients in the consumption model to impute the consumption for each census record.
- Using imputed consumption to get the welfare measure of interest (*e.g.* FGT measures)

3. Steps in Producing(continued)

3.2 Data Needs

Data needed for the analysis, are :

- Consumption data is covered by SUSENAS.
- Population Census covers basic data for everyone in Indonesia.
- Villages Census covers all villages information in Indonesia to obtain location effect for the analysis.

3. Steps in Producing(continued)

3.3 Data requirement

- Census and survey data sets. In Indonesia using Population Census 2000 and Social-Economic Survey (SUSENAS) 1999
- The year of data collection are close, so that data can be joined with both the survey and census
- Village-level data, contain means of individual variables
- Village Census (PODES) 2000 to accommodate location effect

3. Steps in Producing(continued)

3.4 Identify common variables

- First, list all the variables from the census and survey, and see if they are common.
- Second, adjust the definition of the variables if necessary. The definition of categories may be different between the two data sets.

3. Steps in Producing(continued)

3.5 Join the tertiary data

- The tertiary data be joined using the administrative code as the key.
- The easiness of this step is dependent upon the uniformity of administrative code.
- In case of Indonesia, this step has been difficult for some provinces due to the change in administrative boundaries and civil conflict.
- The geographic variables in the tertiary data and the variables common between survey and census are the potential regress variable (x variables).

3. Steps in Producing(continued)

3.6 Check the distribution

- Due to the transformation, data collection procedure or different periods of data collection, the distribution of the x variables may be different.
- We can plot the distribution of the x variables, and check the summary statistics of the x variables.
- If the distribution of a variable is very different, it is best excluded from the consumption model.
- This step should be carried out province by province

3. Steps in Producing(continued)

3.7 Construct the consumption model

Our exercise is following the Elbers, C., Lanjouw, J.E, and Lanjouw P's model (2001). The model start with the Consumption Model, which the concern is to develop an accurate empirical model of household consumption

$$(1) \quad \ln y_{ch} = E[\ln y_{ch} \mid x_{ch}] + \mu_{ch}$$

c : subscript for cluster

h : subscript for household (HH) in cluster c

y_{ch} : per-capita consumption of household h in cluster c

x_{ch} : household characteristics for household h in cluster c

- Want to find a set of regressors that explain the variation of the *per capita* logarithmic consumption.
- Check robustness of the model by randomly dropping some clusters or some observations. (This is to avoid over-fitting of the model.)

Linear approximation of the model (1) can be written as:

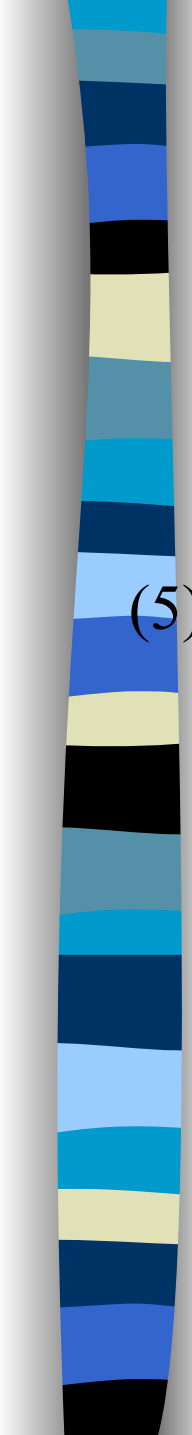
$$(2) \quad \ln y_{ch} = x_{ch} \hat{a} + \mu_{ch} \quad \text{commonly recognized as } \mathbf{Beta} \text{ model}$$

The next model is the variance of the idiosyncratic part of the disturbance, σ^2 . Note that the total first stage residual can be decomposed into uncorrelated components as follow:

$$(3) \quad \overline{\mu}_{ch} = \overline{\eta}_c + \varepsilon_{ch}$$

The logistic model of the variance ε_{ch} conditional on Z_{ch} , bounding the prediction between zero and a maximum A set equal to $(1.05)^*$ $\max \{ \varepsilon_{ch}^2 \}$:

$$(4) \quad \ln \left[\frac{e^2_{ch}}{A - e^2_{ch}} \right] = Z_{ch}^T \hat{\alpha} + r_{ch} \quad \text{commonly called as } \mathbf{Alpha} \text{ model.}$$



Letting $\exp \left[Z_{ch}^T \hat{\alpha} \right] = B$ and using the delta method, the model implies a household specific variance for ε_{ch}

(5)

$$\hat{\sigma}_{\varepsilon, ch}^2 = \left[\frac{AB}{1+B} \right] + \frac{1}{2} \hat{\text{Var}}(r) \left[\frac{AB(1-B)}{(1+B)^3} \right]$$

3. Steps in Producing(continued)

3.8 FGT measure

■ FGT (P^α) measure is often used for poverty measurement.

$$P^\alpha = \frac{1}{N} \sum_t \left[\frac{z - x_t}{z} \right]^\alpha \cdot \text{Ind}(x_t < z)$$

x_t : percapita consumption for individual I, z : poverty line,
 N : # individuals, P^α : FGT measure

■ Higher α places more weight on poorer people.

$\alpha=0$: poverty rate (head count index)

$\alpha=1$: poverty gap

■ $\alpha=2$: poverty severity

4. Result of Estimation

4.1. Diagnostic Test

Diagnostic Test (Urban Area) of East Kalimantan

Variable Name	Survey Average value	Census Average value	Estimated Parameter	Weighted Survey	Weighted Census
1. Head of Household graduated from Junior High School	0.166	0.180	-0.368	-0.061	-0.066
2. Average value of Household member graduated from Junior High School	0.171	0.167	10.348	1.767	1.733
3. Head of Household graduated from Senior High School	0.328	0.372	0.295	0.097	0.110
4. Average value of Household member graduated from Senior High School	0.246	0.244	-9.159	-2.257	-2.238
5. Permanent House	0.964	0.945	0.671	0.647	0.634
6. Percentages of Working Adult	0.399	0.375	0.949	0.378	0.356
7. Availability of Toilet in House	0.874	0.835	0.712	0.622	0.594
8. Average of Schooling Years	9.266	9.258	0.623	5.770	5.765
Constant			5.243	5.243	5.243
				12.267	12.196

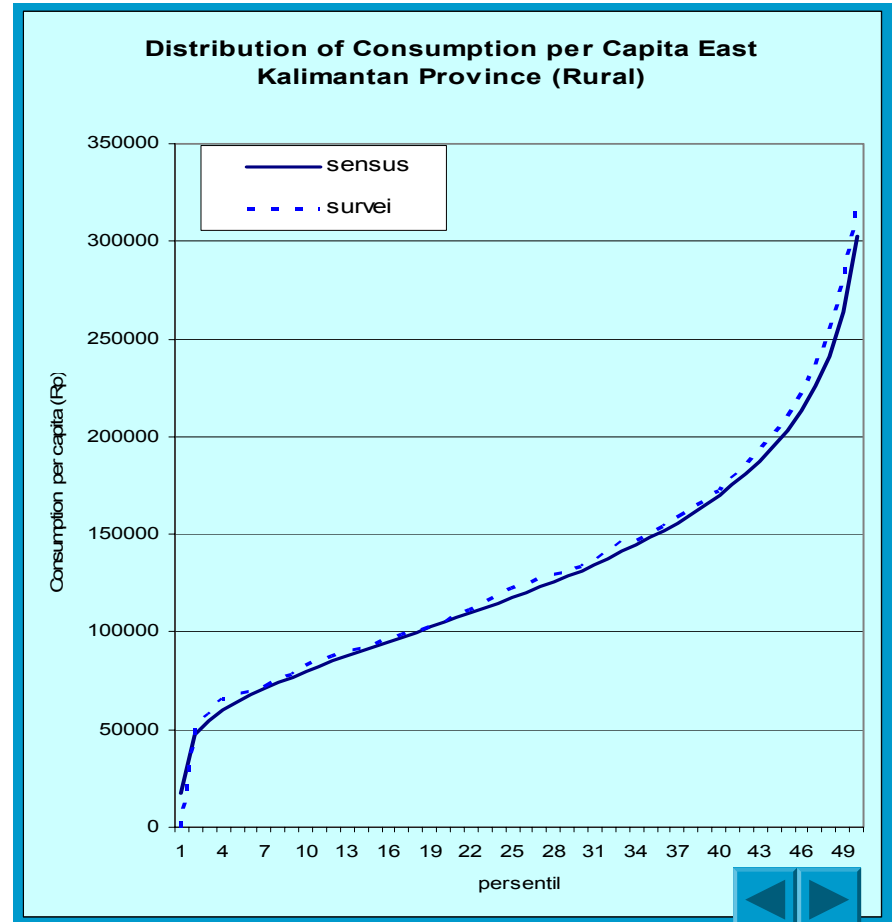
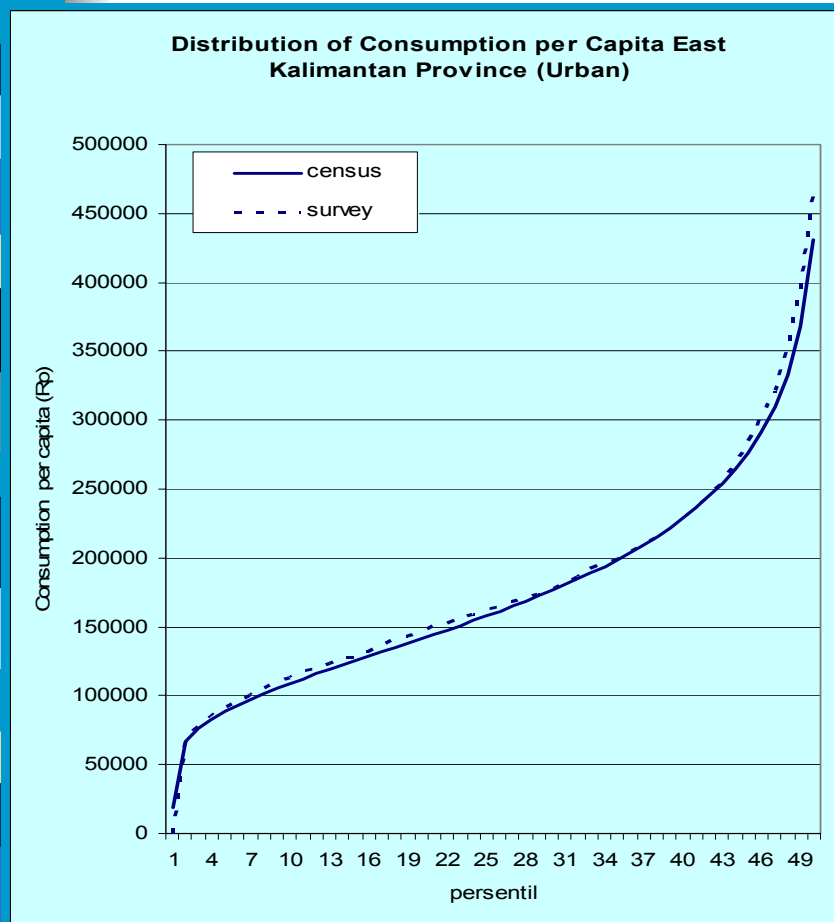
4. Result of Estimation (continued)

Diagnostic Test (Rural Area) of East Kalimantan

Variable Name	Survey Average value	Census Average value	Estimated Parameter	Weighted Survey	Weighted Census
1. Head of Household Sex	0.939	0.932	0.108	0.102	0.1012.
2. Number of Household member	4.971	4.876	-0.348	-1.731	-1.698
3. Permanent House	0.885	0.825	0.038	0.034	0.032
4. Average of Working Adult	0.450	0.465	0.253	0.114	0.117
5. Electricity	0.671	0.630	0.138	0.093	0.087
6. Working in Other Job x Schooling years	4.214	3.259	0.005	0.021	0.016
7. Transportation Sector x Schooling years	7.829	6.566	0.004	0.029	0.024
8. Square Value of Household Member	27.640	29.290	0.020	0.542	0.575
9. Square Value of Schooling Years	62.545	54.678	0.001	0.064	0.056
Constant			12.267	12.267	12.267
				11.534	11.577

4. Result of Estimation (continued)

4.2. Distribution of Consumption per Capita



4. Result of Estimation (continued)

4.3. Poverty Head-Count Index East Kalimantan (District Level)

Administrative Code	Administrative Name	Household Number	Population	Head-Count Index (P_0)	
				Estimated	St. Error
64	EAST KALIMANTAN	603 221	2 416 762	0,1769	0,0123
6401	PASIR	66 043	263 084	0,2694	0,0245
6402	KUTAI BARAT	34 871	132 713	0,2497	0,0201
6403	KUTAI	108 870	428 113	0,2490	0,0210
6404	KUTAI TIMUR	39 584	143 885	0,2228	0,0269
6405	BERAU	28 137	116 586	0,2147	0,0298
6406	MALINAU	7 974	35 114	0,3061	0,0358
6407	BULONGAN	19 525	80 823	0,2336	0,0312
6408	NUNUKAN	16 948	76 983	0,2582	0,0340
6471	BALIKPAPAN	98 825	409 593	0,0920	0,0243
6472	SAMARINDA	130 100	517 115	0,0930	0,0220
6473	TARAKAN	26 024	114 010	0,1251	0,0351
6474	BONTANG	26 320	98 743	0,1037	0,0387

4. Result of Estimation (continued)

4.3. Poverty Head-Count Index East Kalimantan Sub-District Level

Administrative Code	Administrative Name	Household Number	Population	Head-Count Index (P_0)	
				Estimation	St. Error
64	EAST KALIMANTAN	603 221	2 416 762	0,1769	0,0123
6472	SAMARINDA	130 100	517 115	0,0930	0,0220
6472010	PALARAN	9 977	35 938	0,1171	0,0553
6472020	SAMARINDA ILIR	23 091	94 288	0,1101	0,0394
6472030	SAMARINDA SEBERANG	20 709	77 289	0,0738	0,0346
6472040	SUNGAI KUNJANG	19 125	77 924	0,0865	0,0498
6472050	SAMARINDA ULU	25 483	102 242	0,0671	0,0273
6472060	SAMARINDA UTARA	31 715	129 434	0,1096	0,0

4. Result of Estimation (continued)

4.3. Poverty Head-Count Index East Kalimantan Village Level

Administrative Code	Administrative Name	Urban/Rural	Household Number	Population	Head-Count Index (P_0)	
					Estimation	St. Error
64	EAST KALIMANTAN	Urban + Rural	603 221	2 416 762	0,1769	0,0123
6472	SAMARINDA	Urban + Rural	130 100	517 115	0,0930	0,0220
6472020	SAMARINDA ILIR	Urban + Rural	23 091	94 288	0,1101	0,0394
6472020001	PULAU ATAS	Rural	509	1 913	0,2843	0,1753
6472020002	SINDANG SARI	Rural	599	2 251	0,2174	0,1538
6472020003	MAKROMAN	Rural	1 336	5 221	0,2062	0,1662
6472020004	SAMBUTAN	Rural	1 507	5 812	0,1748	0,1450
6472020005	SUNGAI KAPIH	Rural	1 581	6 272	0,2061	0,1549
6472020006	SELILI	Urban	2 837	10 854	0,0734	0,0758
6472020007	SUNGAI DAMA	Urban	2 054	8 502	0,1072	0,1057
6472020008	SIDODAMAI	Urban	2 540	10 476	0,1539	0,1076
6472020009	SIDOMULYO	Urban	3 265	13 954	0,0651	0,0559
6472020010	KARANG MUMUS	Urban	1 646	7 045	0,0434	0,0425
6472020011	PELABUHAN	Urban	1 428	5 884	0,0639	0,0709
6472020012	PASAR PAGI	Urban	864	3 790	0,0761	0,0749
6472020013	SUNGAI PINANG LUAR	Urban	2 925	12 314	0,0618	0,0580



5. Concluding Remarks

- Recently, the most important aim of development effort in Indonesia is to reduce poverty, which can be accomplished by economic growth and/ or by income redistribution.
- The growth strategy for a pro-poor does not have to only focus on economic growth, but could also combined with an active policy of income redistribution

5. Concluding .. (continued)

- The policy package for a pro-poor growth strategy has to take account specific country circumstances and initial conditions. The policy also should give priority to expenditure on basic human needs such as education, health and nutrition. In this respect the availability of the estimation poverty and inequality at micro-level will be helpful
- In the case of Indonesia, it is the BPS commitment to produce the poverty map that can be used by the government for its specific targeting the poor. Map goal is to show the overall picture with reasonable accuracy.

