

How is policy-making enhanced by measuring poverty and living conditions at a local level? The case of Poland

Marcin Szymkowiak

Poznan University of Economics and Business
Statistical Office in Poznan

Outline

- 1 Poverty Mapping in Poland
 - Background on Poverty Mapping in Poland
- 2 Aim of the study
 - Aim of the study
 - Definition of at-risk-poverty rate
- 3 Estimation of poverty rate at NUTS 3 level
 - Estimation of poverty rate at NUTS 3 level
 - Data sources
 - Summary
- 4 Estimation of poverty rate at LAU 1 level
 - EB estimator – selected results
 - M-quantile approach – selected results
- 5 Disability
 - The problem of disability across the world
 - The problem of disability in EU and Poland
 - European Disability Strategy 2010–2020
 - Literature

Background on Poverty Mapping in Poland

- According to Central Statistical Office (CSO) in Poland, the poverty indicator for the whole country in 2011 based on EU-SILC survey amounts to 17.7%.
- CSO does not publish information about the poverty indicator for the lower level of spatial aggregation (NUTS 2 and lower levels). This information is available only at the level of the whole country and at the regional level (NUTS 1).

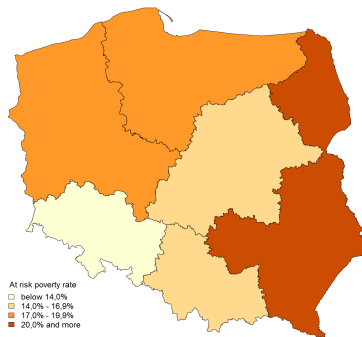


Figure: The poverty rate at the level of regions (NUTS 1)

Background on Poverty Mapping in Poland

- In Poland there is a huge demand for information about poverty indicators at lower level of spatial aggregation.
- Poverty maps are required in Poland by Ministry of Infrastructure and Development, Ministry of Labour and Social Policy, local authorities and many other organizations.
- Given the small sample size in the relevant cross classifications of the EU-SILC survey, it is necessary to use chosen techniques of indirect estimation draw on alternative data sources to estimate the parameters of interest at low levels of spatial aggregation with acceptable precision.

Teritorial aggregation of Poland – 2011



- 7 regions (NUTS 1)
- 16 voivodships (NUTS 2)
- 66 subregions (NUTS 3)
- 379 poviats (NUTS 4/LAU 1)
- 2478 gminas (NUTS 5/LAU 2)

Teritorial aggregation of Poland – 2011



- 7 regions (NUTS 1)
- 16 voivodships (NUTS 2)
- 66 subregions (NUTS 3)
- 379 poviats (NUTS 4/LAU 1)
- 2478 gminas (NUTS 5/LAU 2)

Teritorial aggregation of Poland – 2011



- 7 regions (NUTS 1)
- 16 voivodships (NUTS 2)
- 66 subregions (NUTS 3)
- 379 poviats (NUTS 4/LAU 1)
- 2478 gminas (NUTS 5/LAU 2)

Teritorial aggregation of Poland – 2011



- 7 regions (NUTS 1)
- 16 voivodships (NUTS 2)
- 66 subregions (NUTS 3)
- 379 poviats (NUTS 4/LAU 1)
- 2478 gminas (NUTS 5/LAU 2)

Teritorial aggregation of Poland – 2011



- 7 regions (NUTS 1)
- 16 voivodships (NUTS 2)
- 66 subregions (NUTS 3)
- 379 poviats (NUTS 4/LAU 1)
- 2478 gminas (NUTS 5/LAU 2)

Data sources

To estimate indicators devoted to poverty, data from different sources may be used:

- **The European Survey on Income and Living Conditions (EU-SILC)** provides information about poverty indicators and social inclusion indicators. This is the main source of data which is used to estimate the poverty rate.
- **Polish Local Databank (PLD - source of covariates)** - it is Poland's biggest organized information bank about the socio-economic, demographic and environmental situation. PLD describes in general provinces (NUTS 2), subregions (NUTS 3), poviats (LAU 1) and gminas (LAU 2) - elements of the social and administrative division of the country.
- **National Census of Population and Housing 2011 – NCPH 2011 (NCPH 2011 - source of covariates)**

The sample size in the EU-SILC (NUTS 2)

- The biggest sample size was observed in mazowieckie and śląskie provinces.
- The smallest sample size was observed in lubuskie and opolskie provinces.
- There is a clear downward trend in the sample size in subsequent years.
- The sample size in cross-classification of NUTS 3 and LAU 1 level is obviously smaller for almost all of the domains.

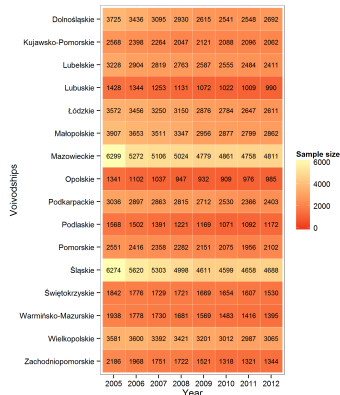


Figure: The sample size in EU-SILC in Poland in years 2005–2012 by province (NUTS 2)

Aim of the study

- Estimation of at-risk-poverty indicator at the level of subregions (NUTS 3) and poviats (LAU1) using different small area estimation techniques.
- So far this indicator has not been published at this level of spatial aggregation.
- Using small area estimation techniques increased the scope of information about poverty in Poland at the level of 66 subregions and at the level of 379 poviats in Poland.
- Using small area estimation techniques also enabled to produce the poverty map of Poland at these level of spatial aggregation as well as the territorial analysis of this phenomenon.

Definition of at-risk-poverty rate

- Percentage of persons with an equivalised disposable income (after social transfers) below the at-risk-of-poverty threshold set at 60% of the national median of equivalised disposable income.
- Formula for poverty rate

$$ARPR = \frac{N_u}{N} \cdot 100, \quad (1)$$

where:

N_u — number of households living in poverty,

N — number of all households.

Estimation of poverty rate at NUTS 3 level

- In 2013 the Center for Small Area Estimation, which is a special unit at the Statistical Office in Poznan, in cooperation with Central Statistical Office of Poland and the World Bank prepared a poverty map of Poland at the level of subregions (NUTS 3) using the Fay-Herriot approach.
- By implementing the Fay-Herriot area level model it was possible to produce estimates of the HCR in Poland at the level of subregions, i.e. at a lower level of aggregation than the direct estimates published by official statistics so far. This has increased the scope of information about poverty: it is now available at the level of 66 subregions.

Data sources

- EU-SILC - the only variable taken from the EU-SILC survey to the constructed model was the poverty indicator.
- Many variables were considered as explanatory ones and were coming from the 2011 National Census of Population and Housing.
- Data coming from the Local Data Bank were also considered.

Spatial variation in poverty in Poland based on SAE

- The results reveal a strong territorial variation in the poverty indicator.
- Analysis of the poverty map reveals a difference between Central and Eastern Poland (with a higher poverty rate) and Western Poland, characterised by a lower scope of poverty.

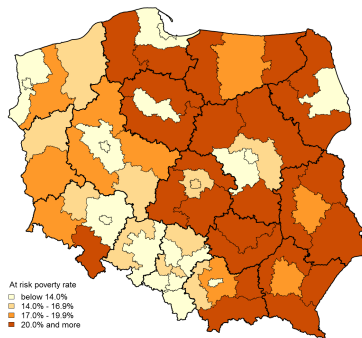


Figure: ARPR at subregions level (NUTS 3)

Spatial variation in poverty in Poland based on SAE

- The lowest values of the poverty indicator can be observed in big cities.
- Most subregions surrounding big cities exhibit significantly lower levels of poverty (below 13%) than other subregions in the same province.

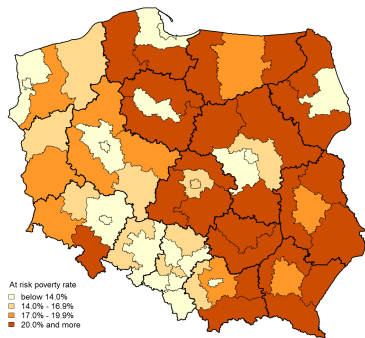


Figure: ARPR at subregions level (NUTS 3)

Precision of estimators

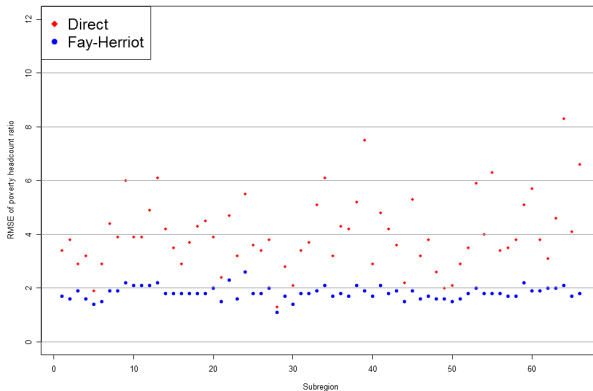


Figure: Precision of estimators of ARPR at subregions level (NUTS 3)

Summary

- Results obtained by using the Fay-Herriot model are characterized by better precision than direct estimates.
- These estimates are also considered as more accurate in contrast to direct estimation.
- The study was a starting point to further work devoted to the use of small area estimation methods in official statistics at lower level of spatial aggregation (NUTS 4/LAU 1).

Spatial distribution of poverty rate in Poland (LAU1)

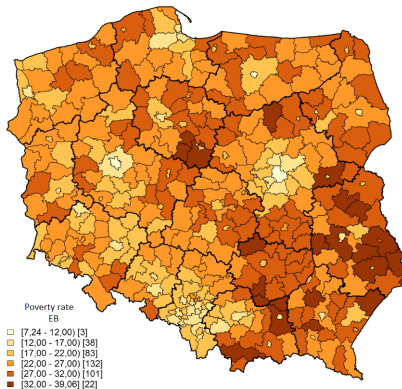


Figure: The poverty rate at the level of poviats (LAU 1) using EB estimator

Precision of obtained estimates of poverty rate

Estimator	N	Min	Q ₁	Median	Mean	Q ₃	Max
Direct	375	0,00	38,22	58,85	50,37	67,83	600,40
EB	379	7,23	12,80	14,56	14,81	16,57	24,14

Results

Table: Summary statistics of small areas poverty rate estimates

Estimator	Minimum	1st quartile	Median	Mean	3st quartile	Maximum
Poverty rate						
Direct	0	9.71	16.62	20.15	28.45	84.52
M-quantile	8.34	20.97	28.31	28.30	34.80	57.56

Results

- 1 First group are 48 poviats with the lowest poverty rate, from 8.3% to 17.3%. These domains consist mainly of the Polish capital (Warsaw), provincial capital cities (i.e. Poznan, Wroclaw, Krakow, Gdansk and Szczecin) and its agglomerations.
- 2 For peripherally located domains, as the distance from capital cities raises poverty rate increases. Other poviats that have low poverty are characterized by well-developed industry in their area or in the direct vicinity. For instance, in these poviats are copper, coal and brown coal basin, aviation and chemical industry.

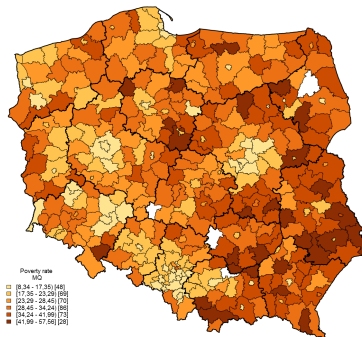


Figure: The poverty rate at the level of poviats (LAU 1) using a three level M-quantile model

Results

- The last two groups of poviats that are characterized with highest poverty rate (over 34.2%) consist of 101 poviats (27% of all poviats in Poland). For these domains more than 1/3 of households live under the poverty line.
- Moreover, a strong spatial clustering is visible in the east of Poland. In particular, poviats in the east-south part on border with Ukraine are characterized with the highest poverty. Another group of poviats with higher poverty rate are on the west-central part along the border with Germany.

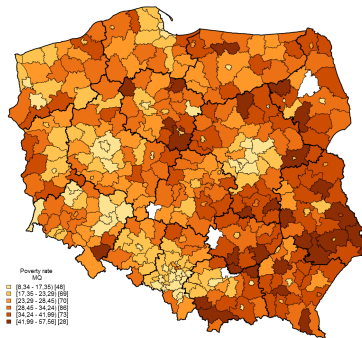


Figure: The poverty rate at the level of poviats (LAU 1) using a three level M-quantile model

Results

Table: Precision of obtained estimates of poverty rate

Estimator	less than 16.6%	16.6%–33.3%	33.3% and more	N/A
	Poverty rate			
Direct	0	27	337	11
M-quantile	9	237	129	0

Results

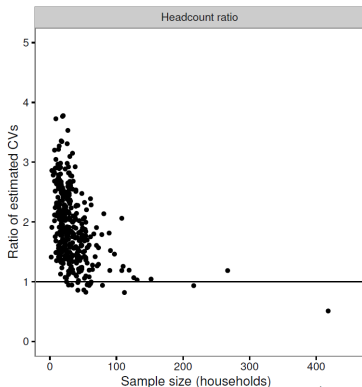


Figure: Ratio of estimated CVs and direct estimates of M-quantile estimates versus the sample size for each poviats

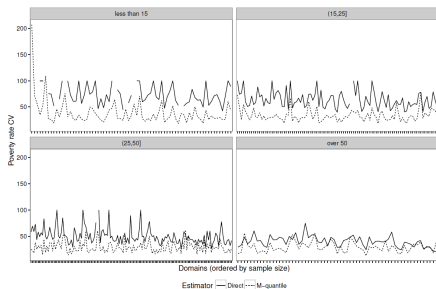


Figure: Comparison of direct and M-quantile Cv of poverty rate grouped by the sample size

Introduction

- The phenomenon of disability is regarded as one of the most serious social problems facing contemporary society.
- The number of people with disability is consistently rising, among others as a result of population aging.
- According to the latest **WHO** report, the phenomenon of disability affects over 1 billion people across the world, which accounts for about 15% of the world's population.
- It is also estimated that nearly 200 million people experience severe disability. To make matters worse, globally, the number of people with disability is expected to increase. This trend is mainly due to population aging.
- The seriousness of this issue is reflected in the **Millennium Development Goals**, where disability is identified as a problem which will require complex solutions.

Introduction

- The issue of disability and its consequences are also being discussed by the **European Union**.
- Statistical data indicate that around 16–17% of the **European Union's** residents have a slight to severe disability, which means that nearly 80 million people face various barriers which prevent their normal functioning in social life.
- **Poland** is no exception in this regard: according to the latest census of 2011 around 12% of the population suffer from disability.

Introduction

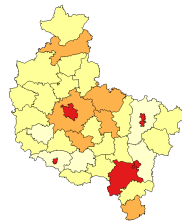
- In relation to the above, the EU formulated its **Disability Strategy 2010–2020**, which seeks to:
 - improve the quality of life of people with disabilities,
 - facilitate their social inclusion,
 - ensure their wellbeing and enable them to fully exercise their rights in various areas of life related to health or working conditions.

Spatial distribution of people with disability

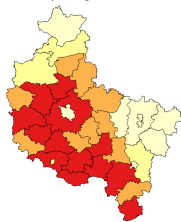
Spatial distribution of percentage of disabled - higher education



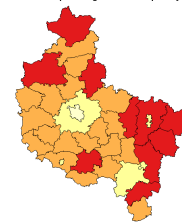
Spatial distribution of percentage of disabled - secondary education









Spatial distribution of percentage of disabled - vocational education



Spatial distribution of percentage of disabled - primary/ino education



Literature

-  Chambers, R. and Tzavidis, N. (2006), „*M-quantile models for small area estimation*”, *Biometrika*, 93(2):255–68.
-  Chambers, R. and Chandra, H. (2013), „*A random effect block bootstrap for clustered data*”, *The Journal of Computational and Graphical Statistics*, 22:452–470.
-  Molina, I. and Rao. J.N.K., (2010), „*Small area estimation of poverty indicators*”, *The Canadian Journal of Statistics*, Vol. 38, No. 3, pp. 369–385.
-  Molina I., Rao J.N.K., Nandram B., Marin J.M., Graf M. (2014), „*SAE in poverty mapping*”, presentation on the SAE 2014 conference.
-  Rao J.N.K (2003), „*Small Area Estimation*”, *Wiles Series in Survey Methodology*, A John Wiley & Sons, INC., Publication.
-  Statistical Office in Poznan, Center for Small Area Estimation (2013), „*Poverty Maps at the Subregional Level in Poland Based on Indirect Estimation*, Poznań.

Thank you very much for your attention!