

# Improving the Reliability of Ukrainian Poverty Indicators Estimates Using Auxiliary Information

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# Problems

The state Household Living Conditions Survey (HLCS) provided by the State Statistics Service of Ukraine on quarterly basis is the main source of information for measuring of a number of important indicators which in details reflect incomes, expenditures, consumption features, poverty of Ukrainian households. The sample size is about 10,5 thousand households.

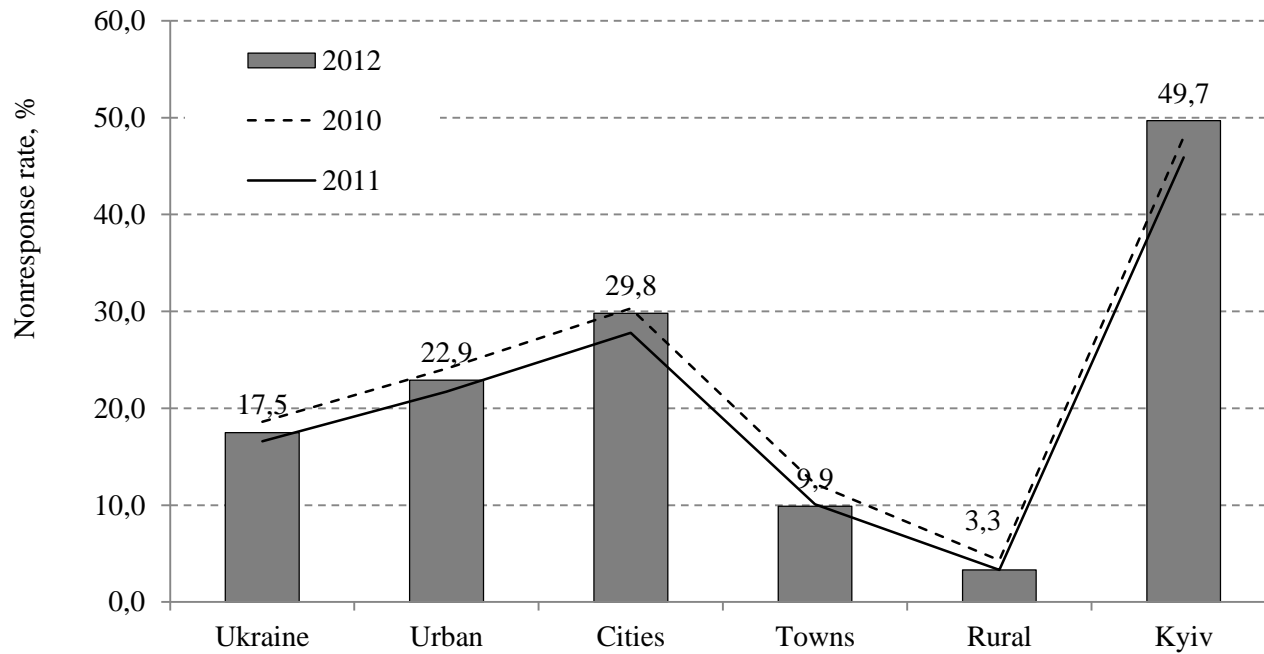
Analysis of reliability of the poverty indicators estimates defined on base of HLCS data has proved the direct estimates at the regional level to be insufficiently reliable. The most important factors of this are the small sample size in some regions, which can make less than 250 households, and high nonresponse rate.

The high nonresponse rate registered among the territories with relatively high rate of well-off population (primarily the capital Kyiv and other cities) and some other estimates, for example analysis of the Gini values, make the possibility to suggest about incomplete coverage of well-to-do households by the HLCS.

# Inequality-adjusted Human Development Index, HDR-2014

HDI rank	Human Development Index (HDI)	Inequality-adjusted HDI (IHD)			Coefficient of human inequality	Inequality in life expectancy	Inequality-adjusted life expectancy index	Inequality in education <sup>a</sup>	Inequality-adjusted education index	Inequality in income <sup>b</sup>	Inequality-adjusted income index	Income inequality			
	Value	Value	Overall loss (%)	Difference from HDI rank <sup>c</sup>	Value	(%)	Value	(%)	Value	(%)	Value	Quintile ratio	Palma ratio	Gini coefficient	
	2013	2013	2013	2013	2013	2013	2013	2013 <sup>d</sup>	2013	2013 <sup>e</sup>	2013	2003–2012	2003–2012	2003–2012	
<b>HIGH HUMAN DEVELOPMENT</b>															
50	Uruguay	0.790	0.662	16.1	-8	15.7	9.2	0.799	10.9	0.635	27.1	0.573	10.3	2.5	45.3
51	Bahamas	0.789	0.676	14.3	-3	14.0	9.4	0.770	8.0	0.657	24.5	0.612	..	..	..
51	Montenegro	0.789	0.733	7.2	5	7.1	7.6	0.779	2.5	0.754	11.3	0.689	4.3	1.0	28.6
53	Belarus	0.786	0.726	7.6	6	7.5	6.8	0.716	4.8	0.781	11.1	0.685	3.8	0.9	26.5
54	Romania	0.785	0.702	10.5	4	10.4	8.8	0.755	5.0	0.710	17.3	0.645	4.1	1.0	27.4
55	Libya	0.784	..	..	..	..	10.1	0.765	..	..	..	..	..	..	..
75	Iran (Islamic Republic of)	0.749	0.498	33.6	-34	32.1	12.5	0.728	37.3	0.429	46.6	0.395	7.0	1.7	38.3
76	Azerbaijan	0.747	0.659	11.8	7	11.5	21.7	0.611	8.3	0.642	4.5	0.730	5.3	1.4	33.7
77	Jordan	0.745	0.607	18.6	-5	18.5	11.9	0.730	22.4	0.543	21.1	0.564	5.7	1.5	35.4
77	Serbia	0.745	0.663	10.9	12	10.9	8.5	0.761	10.7	0.621	13.5	0.618	4.6	1.1	29.6
79	Brazil	0.744	0.542	27.0	-16	26.3	14.5	0.709	24.7	0.498	39.7	0.452	20.6	4.3	54.7
79	Georgia	0.744	0.636	14.5	4	14.0	12.9	0.728	3.3	0.745	25.9	0.474	9.5	2.1	42.1
79	Grenada	0.744	..	..	..	..	8.4	0.744	..	..	..	..	..	..	..
82	Peru	0.737	0.562	23.7	-9	23.4	13.9	0.726	25.6	0.494	30.6	0.495	13.5	2.9	48.1
83	Ukraine	0.734	0.667	9.2	18	9.1	10.4	0.669	6.1	0.747	10.9	0.593	3.6	0.9	25.6
84	Belize	0.732	..	..	..	..	11.4	0.734	..	..	37.9	0.426	17.6	..	53.1
84	The former Yugoslav Republic of Macedonia	0.732	0.633	13.6	7	13.3	7.6	0.785	10.6	0.574	21.8	0.563	10.0	2.3	43.6
86	Bosnia and Herzegovina	0.731	0.653	10.6	13	10.4	6.7	0.809	5.2	0.621	19.2	0.555	6.5	1.5	36.2
87	Armenia	0.730	0.655	10.4	15	10.2	12.7	0.733	3.7	0.675	14.3	0.567	4.6	1.2	31.3
88	Fiji	0.724	0.613	15.3	6	15.1	12.3	0.672	10.5	0.686	22.6	0.500	8.0	2.2	42.8
89	Thailand	0.722	0.573	20.7	-2	20.0	9.8	0.755	16.1	0.510	34.0	0.488	6.9	1.8	39.4
90	Tunisia	0.721	..	..	..	..	10.6	0.768	..	..	..	..	6.4	1.5	36.1
91	China	0.719	..	..	..	..	9.8	0.768	..	..	29.5	0.505	10.1	2.1	42.1

# Nonresponse rates (HLCS 2010-2012)



# Approaches to enhancing the reliability of poverty indicators estimation

Usage of auxiliary information with application of:

- calibration of HLCS weights;
- indirect estimation.

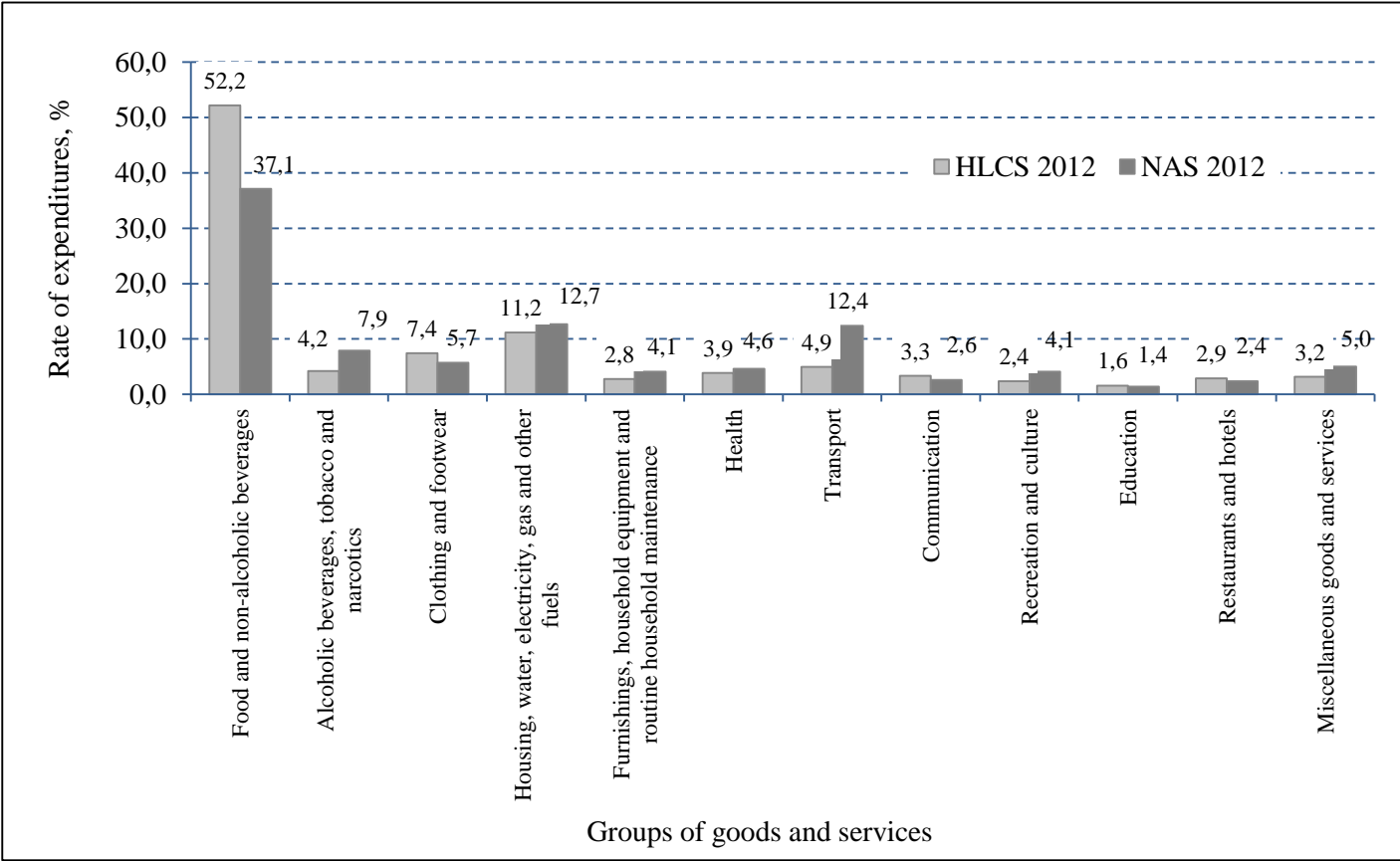
## Potential sources of the auxiliary information

Data on households final consumption expenditures by NAS;

National Sample Wage and Salary Survey (WSS);

Unavailable at the moment: tax register, data of energy supplying companies on electricity consumption.

# Comparison of household expenditure structure according to HLCS, 2012 and NAS, 2012



# Classification of Individual Consumption According to Purpose

- 01 - Food and non-alcoholic beverages
- 02 - Alcoholic beverages, tobacco and narcotics
- 03 - Clothing and footwear
- 04 - Housing, water, electricity, gas and other fuels
- 05 - Furnishings, household equipment and routine household maintenance
- 06 - Health
- 07 - Transport
- 08 - Communication
- 09 - Recreation and culture
- 10 - Education
- 11 - Restaurants and hotels
- 12 - Miscellaneous goods and services



# “Standard” calibration of HLCS weights

*Auxiliary information:*

Population number by strata based on demographic and social statistics

Estimates of number of households by strata

Data by six age and sex groups

# “Special” calibration of HLCS weights

*Auxiliary information:*

Adjusted structure of household consumption expenditures

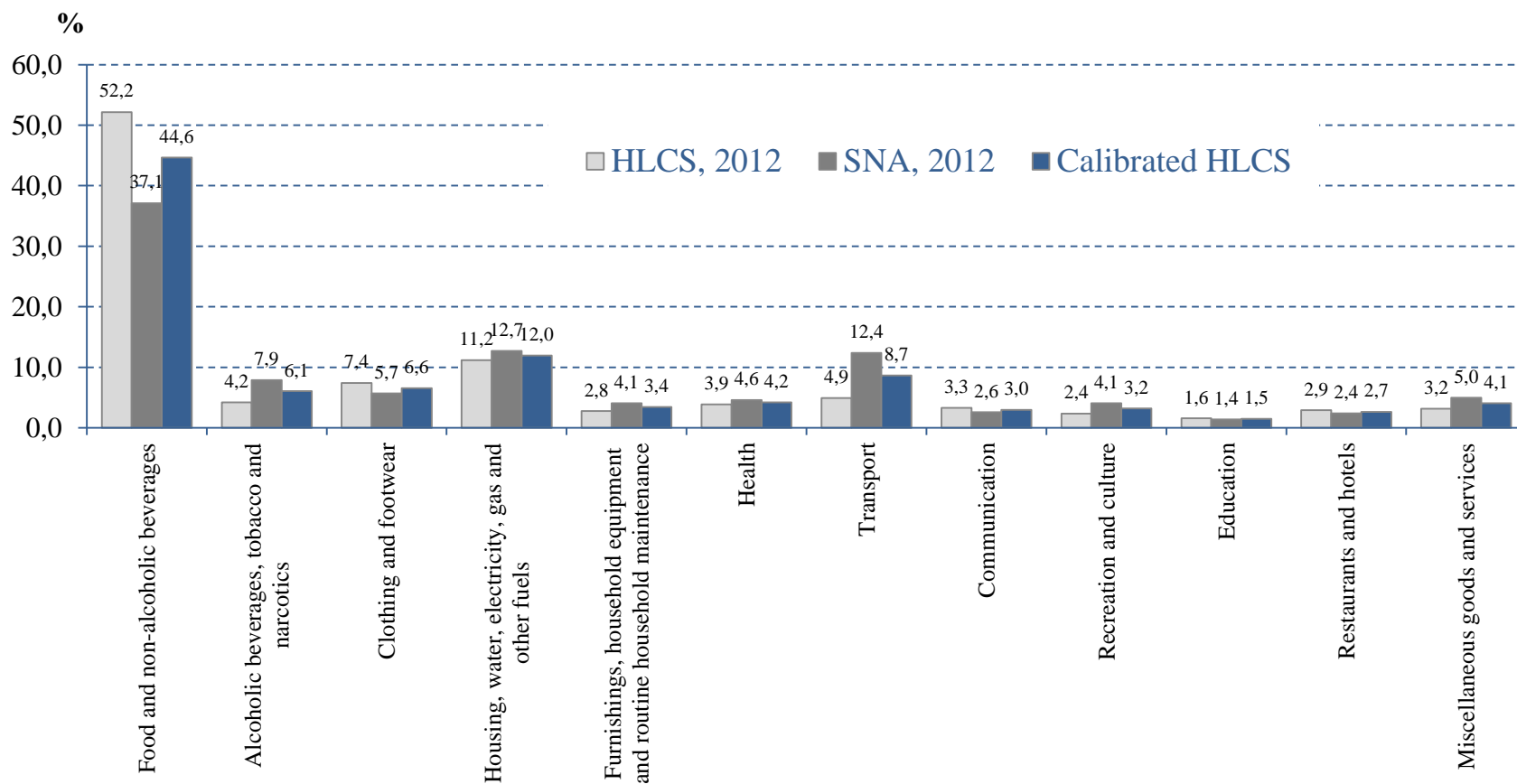
Estimates of number of households by strata

*or*

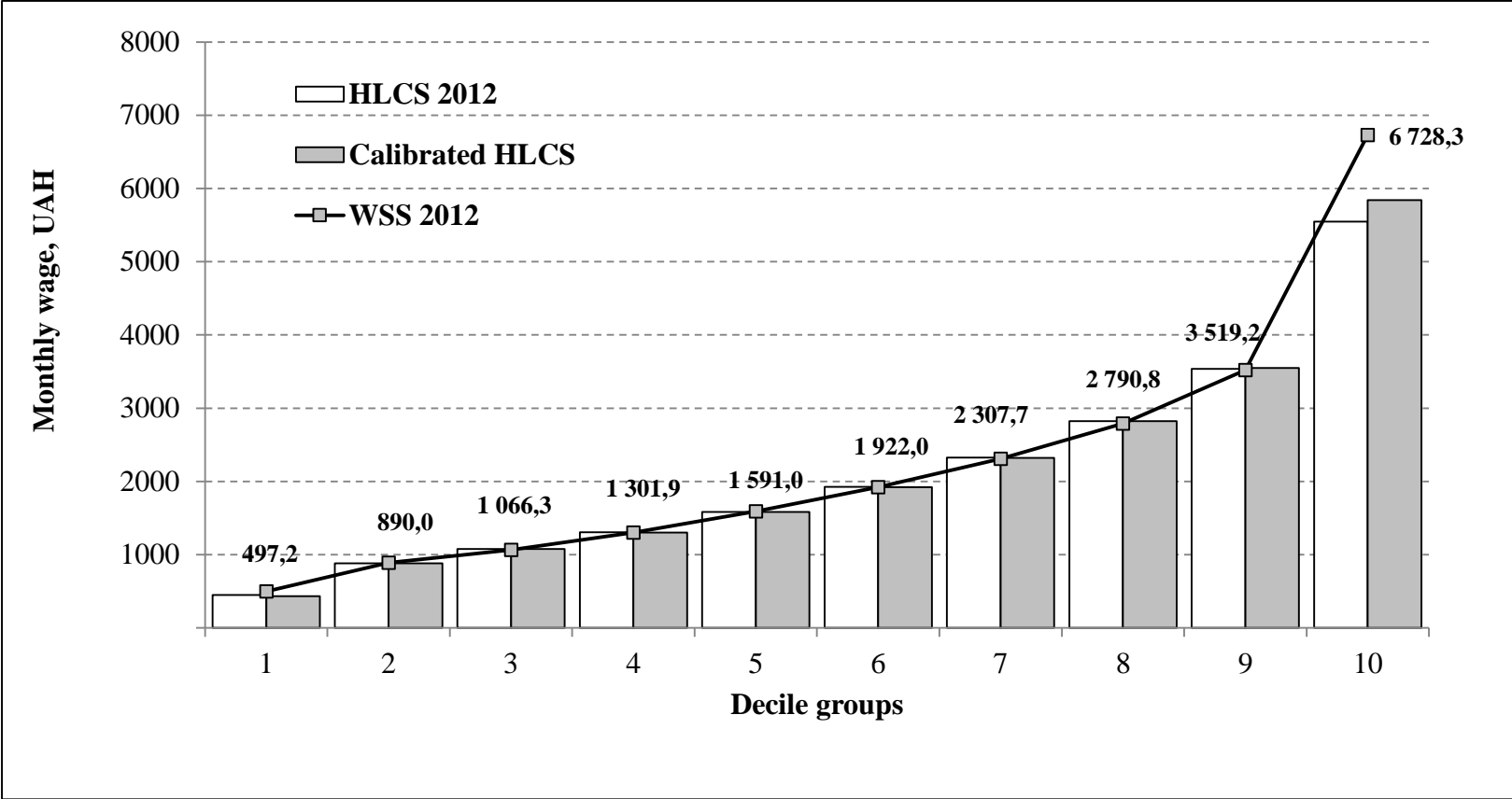
Decile distribution of wages by WSS

Estimates of number of households by strata

# Comparison of household expenditure structure according to HLCS, NAS and calibrated HLCS, 2012



# Comparison of average wages of employees by decile groups according to WSS, HLCS and calibrated HLCS, 2012



## Household income rates by decile groups before and after calibration

<b>Decile groups</b>	<b>Before, %</b>	<b>After, %</b>
1	4,5	4,2
2	6,1	5,5
3	7,0	6,3
4	7,7	7,1
5	8,6	8,2
6	9,4	9,2
7	10,5	10,5
8	11,8	12,1
9	13,8	14,7
10	20,6	22,3
Total	100,0	100,0

# Inequality indices before and after calibration

<b>Index</b>	<b>Before</b>	<b>After</b>
Gini	0,23	0,27
Decile group 10/ Decile group 1	4,60	5,36
Decile group 9,10/ Decile group 1,2	3,30	3,85

# Composite estimation

$$P_{comp,k}^{(j)} = (1 - \hat{\gamma}_{1k}^{(j)}) \cdot P_k^{(j)} - \hat{\gamma}_{2k}^{(j)} \cdot x_{1k}^{(j)} - \hat{\gamma}_{3k}^{(j)} \cdot x_{2k}^{(j)} + \hat{\gamma}_{1k}^{(j)} \cdot P^{(j)}, \quad j = 1, 2, 3.$$

$P_{comp,k}^{(j)}$  - the composite estimator of the  $j$  - th poverty indicator for the  $k$  - th region in the considered year;

$P_k^{(j)}$  - the direct estimator of the  $j$  - th poverty indicator for the  $k$  - th region in the considered year;

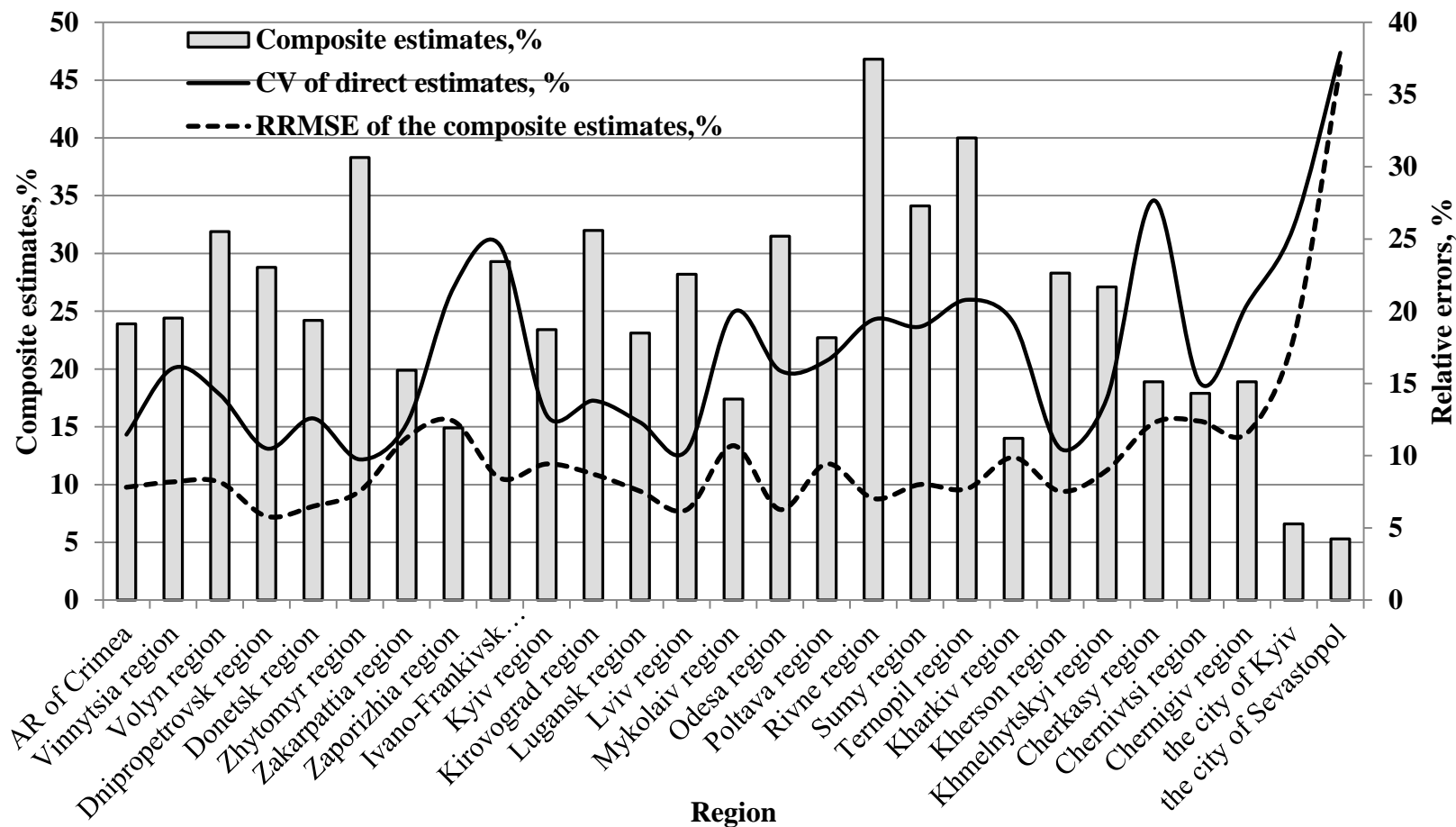
$x_{1k}^{(j)}$  - the composite estimator of the  $j$  - th poverty indicator for the  $k$  - th region in the previous year;

$x_{2k}^{(j)}$  - the per capita final consumption expenditures according to the NAS data for the  $k$  - th region in the considered year;

$P^{(j)}$  - the direct estimator of the  $j$  - th poverty indicator for the national level in the considered year;

$\hat{\gamma}_{1k}^{(j)}, \hat{\gamma}_{2k}^{(j)}, \hat{\gamma}_{3k}^{(j)}$  - the weighting coefficients of the composite estimator for the  $k$  -th region when estimating the  $j$  -th poverty indicator; “ $j$ ” index relates the poverty level indicators to the corresponding criteria:  $j = 1$  - “The poverty rate by the national line”;  $j = 2$  - “The poverty rate by the regional line”;  $j = 3$  - “The poverty rate by the cost of living rate”.

# Results of composite estimation of the poverty rate by the national threshold, 2012





## Conclusions

In Ukraine there is a serious problem of underestimation of the income and expenditure of the well-being strata of population by HLCS. This affects the income and consumption distributions which are determined from the survey and can lead to biased estimates of such indicators as income inequality indexes, poverty rates, household ability-to-pay, and so on. Other problem is that the direct estimates of poverty indicators at the regional level are insufficiently reliable.

Adjustments to overcome this drawbacks of HLCS requires usage of the auxiliary information.

On base of the obtained results it was shown that the reliability of poverty indicator estimates in Ukraine can be enhanced by using of NAS data on household final consumption expenditures on different stages of the indicators estimation process. The calibration of statistical weights using NAS data can decrease biases of estimates for regions as it provides the possibility of better accounting of well-to-do households' expenditures by the HLCS data. The indirect estimation using NAS data and poverty indicators direct estimates for the national level for current year and for the regional level for the previous year can significantly decrease the total error of estimation. Data from other surveys, such as WSS data, can be also useful.

## References

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**Thank you for your attention!**