



DATA SOURCES FOR MEASURING POVERTY AND INEQUALITY IN UKRAINE DURING THE WAR

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MAIN CHALLENGES

The crisis triggered by Russia's invasion of Ukraine in February 2022 has led to large-scale displacement, both internally and across borders.

This situation has necessitated the development of updated methods to generate relevant and timely statistics for stakeholders—particularly the Government, regional authorities, and international organizations—focused on social, economic, and community reconstruction efforts. The challenge intensified when the State Statistics Service of Ukraine (SSSU) suspended population and household surveys, along with the production of official statistics on demographics, living conditions, and the labor market, in accordance with martial law. Under these circumstances, it became crucial to estimate key indicators demographic and socio-economic statistics through alternative data sources, such as administrative registers and independent sample surveys conducted without the SSSU's direct involvement.

MAIN DATA SOURCES FOR POPULATION ESTIMATION

- Pre-war population statistics (SSSU, UNFPA);
- Aggregated mobile operators' data on the number and location of subscribers;
- Ministry of Justice of Ukraine records on registered births and deaths;
- Public Health Center of the Ministry of Health of Ukraine data on newborns and children registered for medical care;
- Ministry of Social Policy of Ukraine data on the number and location of internally displaced persons (IDPs);
- International Organization for Migration (IOM) surveys providing humanitarian data within Ukraine;
- United Nations Refugee Agency (UNHCR) data on the number, demographic characteristics, and regions of origin of external migrants from Ukraine;
- Pension Fund of Ukraine data on the number and demographic characteristics of pensioners;
- Ministry of Education and Science of Ukraine data on the number, distribution, and gender-age structure of students across various levels of education.

MOBILE-OPERATOR-BASED POPULATION ESTIMATES (1)

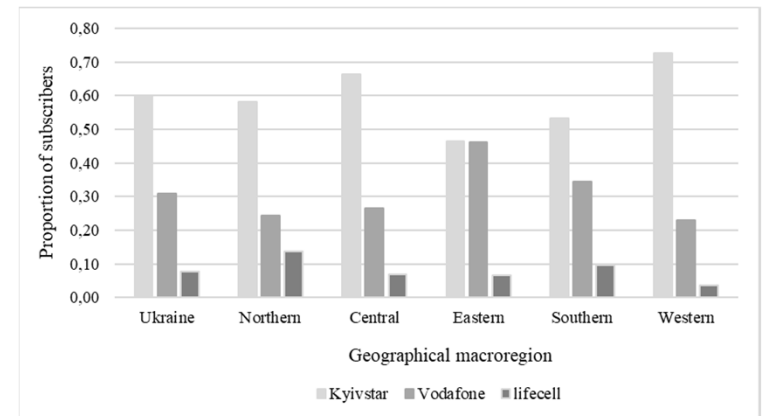
An approach to estimating the number and location of the population is based on Mobil Operators' data on the number and location of users and data from some other sources:

- ✓ data of three main Ukrainian mobile operators – Kyivstar, Vodafone Ukraine, lifecell on the number of subscribers by administrative-territorial units;
- ✓ data of a special survey of the population on mobile devices using, the number of devices, mobile operators, etc.;
- ✓ data of the Pension Fund of Ukraine on the number of persons aged 60 and older by administrative-territorial units;
- ✓ administrative data on the number of children under 14 by administrative-territorial units.

The basic formula:

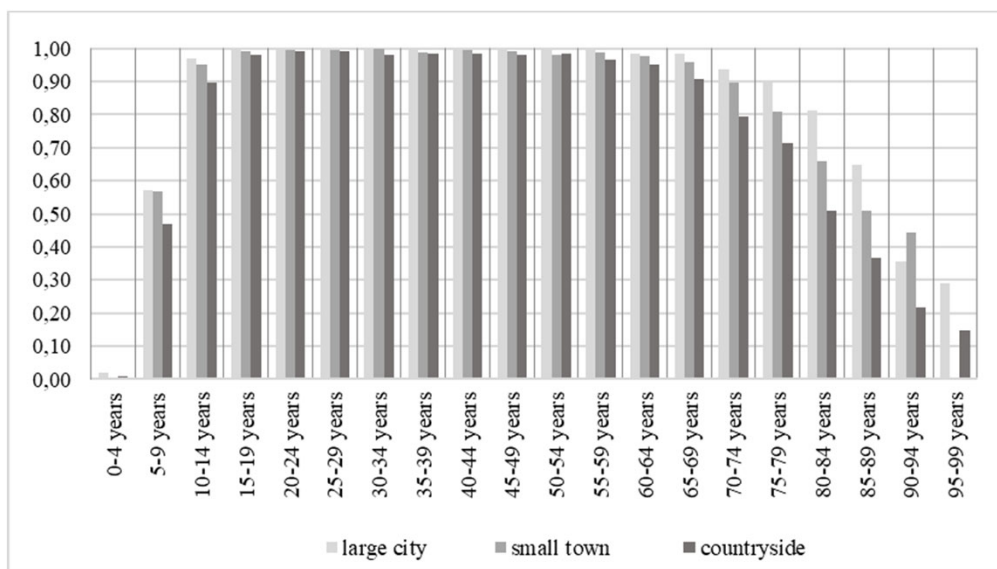
$$\hat{N}_{i,t} = \frac{1}{r_i \cdot S_i} \cdot \sum_{j=1}^3 M_{i,j,t},$$

where $\hat{N}_{i,t}$ – the estimate of the total number of people residing in the territory of macroregion i at the beginning of period t ; $M_{i,j,t}$ – the total number of subscribers (phone numbers) in macroregion i of provider j at the beginning of period t : $j = 1$ – *Kyivstar*, $j = 2$ – *Vodafone Ukraine*, $j = 3$ – *lifecell*; r_i – the share of population who use the services of providers, among the total population in the macroregion i ; S_i – the average number of SIM cards/mobile devices of persons who use the services of providers in the territory of the macroregion i .



Proportion of subscribers by the main mobile operators of Ukraine by geographical macroregions, 2019

MOBILE-OPERATOR-BASED POPULATION ESTIMATES (2)



Proportion of mobile connection users by age group

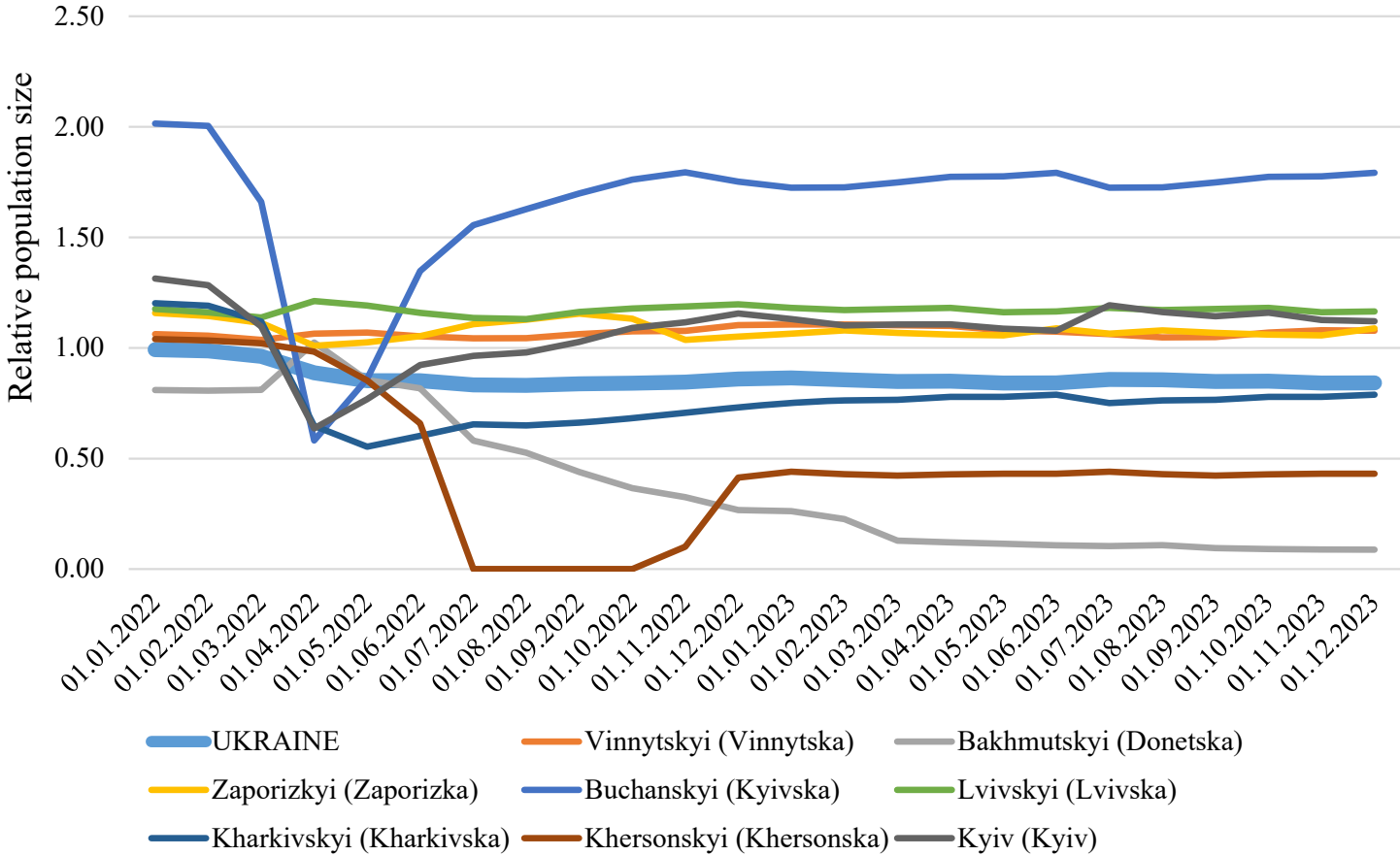
Estimates of the number of SIM-cards per mobile user aged 15-59 by macroregion and type of area

Geographical macroregion	City	Town	Rural area
NORTHERN	1.2781	1.2722	1.2680
CENTRAL	1.4376	1.2888	1.2057
EASTERN	1.3462	1.2674	1.2855
SOUTHERN	1.3775	1.3733	1.3110
WESTERN	1.2737	1.3016	1.2617

Share of population who use the services of providers, among the total population by macroregion

Geographical macroregion	City	Town	Rural area
NORTHERN	0,9164	0,9133	0,8433
CENTRAL	0,9246	0,9023	0,8645
EASTERN	0,9251	0,9044	0,8769
SOUTHERN	0,9210	0,9035	0,8731
WESTERN	0,9064	0,8770	0,8392

POPULATION CHANGES FROM JANUARY 1, 2022 TO DECEMBER 1, 2023



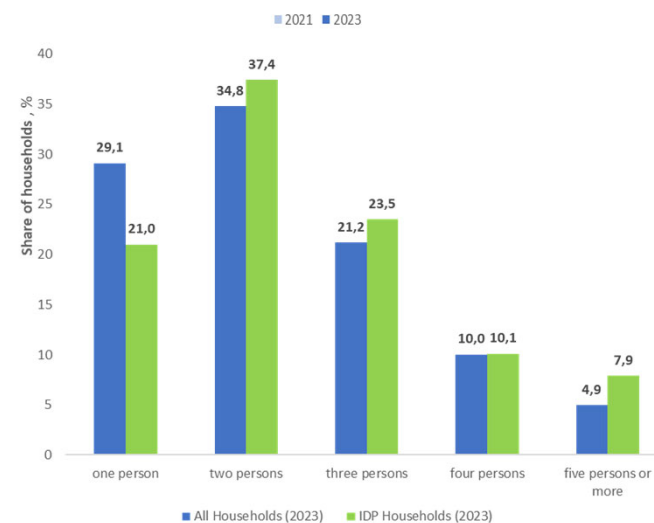
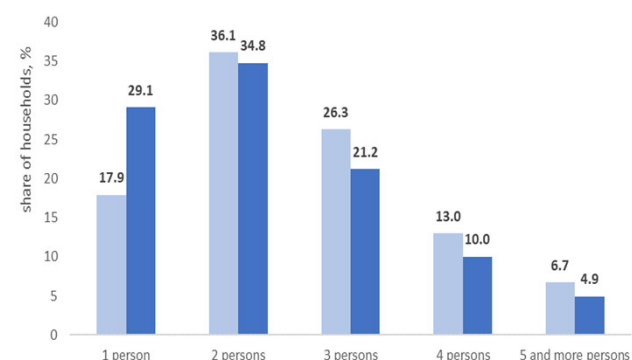
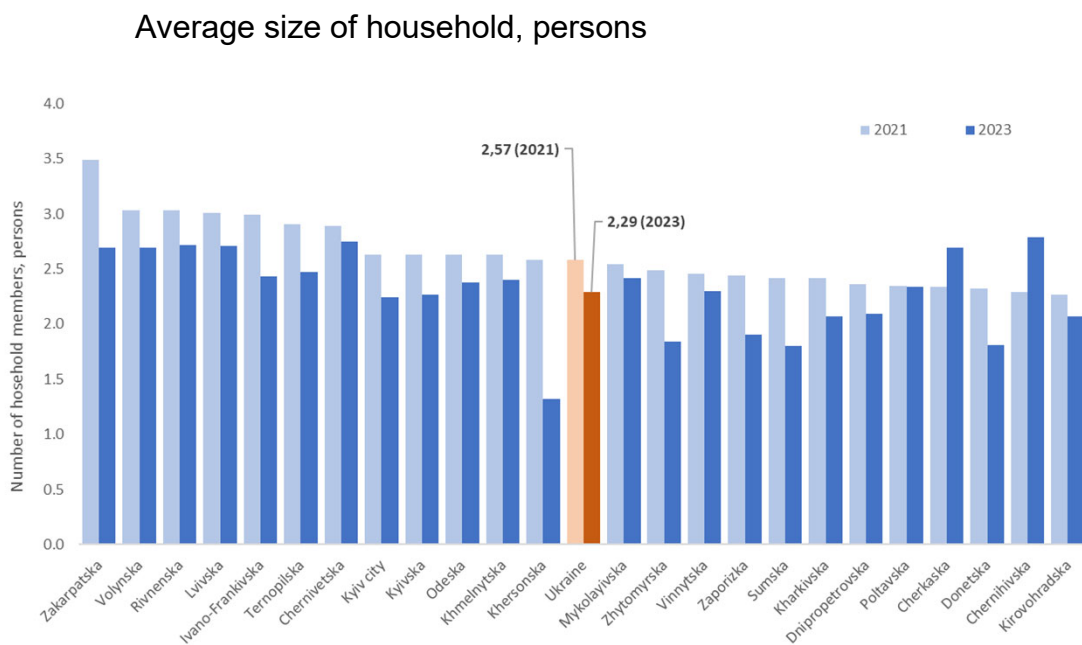
NATIONWIDE HOUSEHOLD SOCIO- ECONOMIC STATUS SURVEY

conducted in December 2023 - February 2024 (1)

The average size of households in Ukraine as a whole is 2.3 people, households with IDP - 2.5 people;

The share of households with children in Ukraine as a whole is 26.9%, in IDP households – 35.8%.

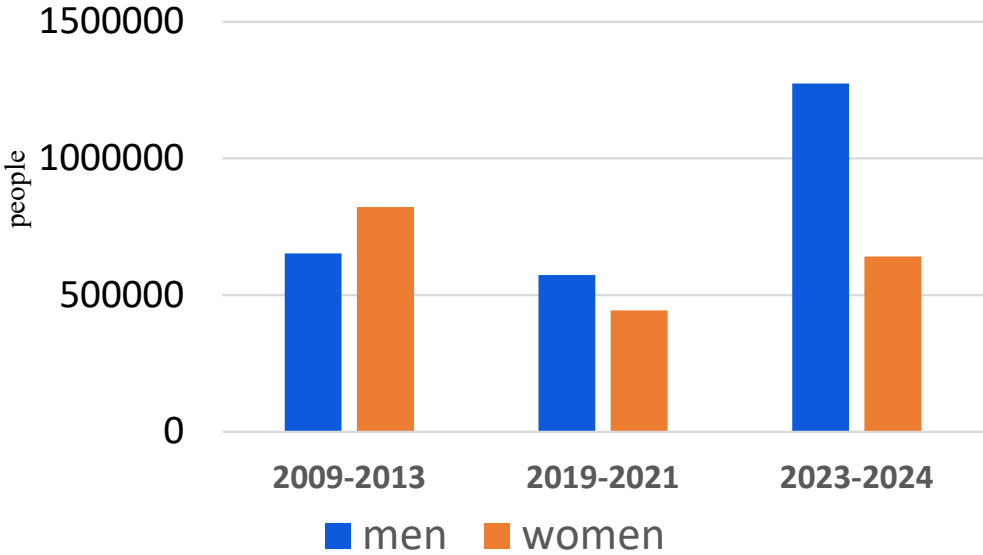
Distribution of households by the number of members, %



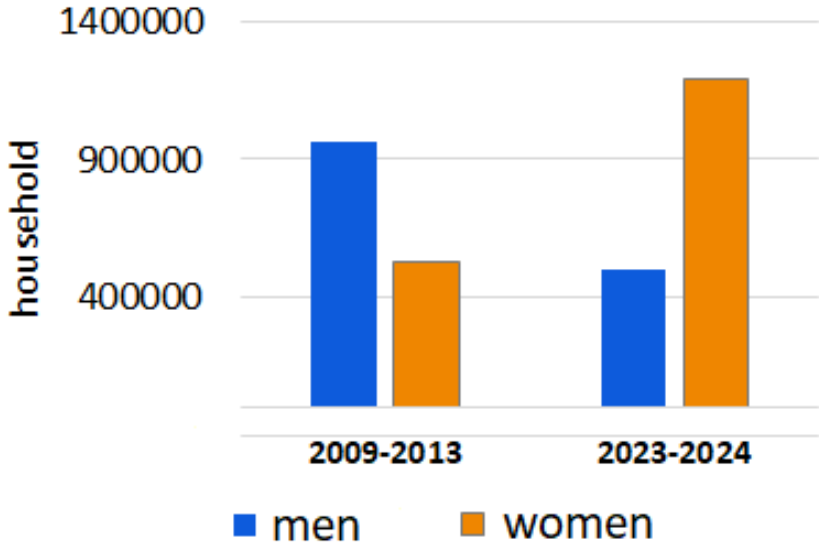
The number of private households is estimated to be about 13574.5 thousand (as of the beginning of 2022 - 14549.2 thousand)

NATIONWIDE HOUSEHOLD SOCIO- ECONOMIC STATUS SURVEY (2)

Population distribution for singles by gender



Distribution of the number of households consisting of spouses depending on the gender of the head of the household



PROBLEM OF UNDERCOVERAGE OF WEALTHY HOUSEHOLDS IN SAMPLE SURVEYS

In Ukraine, the differentiation of household incomes measured by the State Statistics Service of Ukraine is very low. This raises more and more questions from both national and international users and, in general, significantly reduces the credibility of national income statistics. Accordingly, the problem of low reliability of official income estimates and adjusting them if necessary is relevant.

Income statistics is the basis for developing and implementing effective and efficient measures in the areas of social policy, housing and communal services, tariff policy, fiscal policy, etc. The level of income and income inequality are important determinants of living standards, as well as inequality in other aspects of people's lives: education, health, living conditions, etc.

METHODOLOGICAL APPROACHES TO IMPROVING THE RELIABILITY OF HOUSEHOLD INCOME AND EXPENDITURES ESTIMATES

Increasing the efficiency of the field stage of surveys through the use of CAPI, CAWI, CATI technologies and methods of controlling the characteristics of respondents during the implementation of the field stage

Use of external information at the stage of survey data processing, in particular, methods of data imputation and methods of calibration of the statistical weighting system

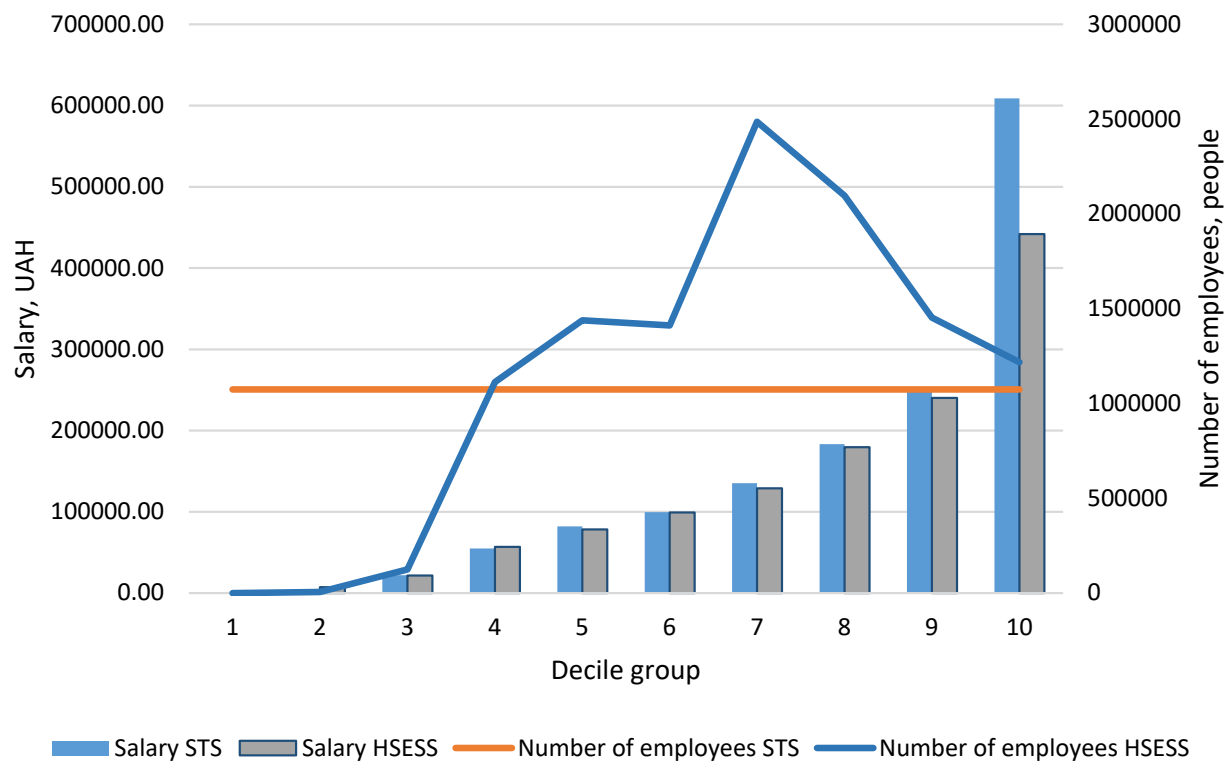
Application of modeling methods in assessing the most important indicators



METHODOLOGICAL APPROACH

The proposed approach envisages the formation of an adjusted microdata set based on the reconciliation of the household survey data as the main source of information and specially prepared data from the State Tax Service of Ukraine (hereinafter - STS) as auxiliary data, based on the procedure of calibration of statistical weights of households and individuals. Auxiliary information is cleaned for the purpose of its methodological comparability with the household survey data. The creation of the adjusted microdata set makes it possible to calculate the main indicators of the living standards taking into account the impact of the income of the wealthy strata of population on the overall level of income differentiation and poverty.

COMPARISON OF AVERAGE WAGES BASED ON STS AND HSESS DATA BY DECILE GROUPS, WITH DECILES CONSTRUCTED USING STS DATA



CALIBRATION PROCEDURE

$$\sum_{i=1}^n \frac{(w_i' - d_i)^2}{d_i} \rightarrow \min,$$

$$\sum_{i=1}^{n_{10}} w_i' sl_i = \overline{SL}_{STS\ 10} \cdot \sum_{i=1}^{n_{10}} d_i ,$$

where d_i – is the statistical weight of the i -th household before calibration, $i = 1, \dots, n$;

n_{10} – the sample size in the 10th decile group;

w_i' – statistical weight of the i -th household after calibration;

sl_i – salary of person i ;

$\overline{SL}_{STS\ 10}$ – is the average level of labor income according to the STS in the 10th decile group.

INCOME ESTIMATES BEFORE AND AFTER CALIBRATION USING DATA FROM THE STS

Households' cash income in urban and rural areas

Urban area		Rural area	
on average per household, UAH		on average per household, UAH	
before calibration	after calibration	before calibration	after calibration
5596,87	6209,12	4896,66	5060,09

Reliability of estimate for urban area

CV,%	B^2	SE	V	$MSE=V+B^2$	RRMSE, %
1,00	374850,06	55,97	3132,50	377982,56	10,98

CONCLUSIONS

Population estimates on base of Mobil Operators' data are very helpful in large-scale processes of external and internal migration, as well as the lack of opportunities for traditional censuses and surveys

The developed approaches can be used to estimate and monitor the number and location of the population of Ukraine, provided the availability and proper preparation of data of mobile operators, the availability of estimates on the peculiar use of mobile communications by the population, the availability of administrative records containing information about the population

In Ukraine, there are additional data sources to improve the reliability of income estimates. In particular, these are data from the State Tax Service's register of personal income tax payers

The modern statistical methodology allows for the possibility of taking into account auxiliary data, including data from administrative registers, when processing data from sample population surveys. This can be done, under certain conditions, on the basis of control of the field stage of data collection, imputation of registry data when forming primary data sets based on the results of surveys, methods of calibration of statistical weights of surveyed households (individuals), application of statistical modeling methods

For Ukraine, it is important to implement methodological approaches that will ensure the possibility of increasing the reliability of income estimation and income differentiation based on the results of state sample surveys

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Thank you for your attention!