

Estimation of the number of post-Soviet foreigners in Poland in 2015 and 2016 using capture-recapture methods

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1 INTRODUCTION

There is an urgent demand for information about the real size of the foreigner population residing temporarily in Poland, especially in the context of labour immigration. This is because foreigners can be treated as a hard-to reach population (Tourangeau et al. [1]).

Data on the number of immigrants are an important element in the implementation of cohesion policy, especially given the fact that the intensity of foreign immigration varies across the country.

The main aim of this study was to develop a method for estimating the number of foreigners staying temporarily in Poland, with special emphasis on foreigners working in Poland, based on administrative and statistical data and using capture-recapture methods. In the paper we focus on immigrant from post-Soviet countries, in particular Ukrainians, Belorussians and Russians and we use log-linear models as a basic statistical technique for estimating the number of foreigners in Poland.

This study is an innovative approach to the production of statistical outputs for purposes of official statistics in Poland. Results published as official statistical outputs of Statistics Poland.

2 METHODS

One well-known technique for estimating the size of a human population involves taking two or more registers of this population, linking individuals in these registers and estimating the number of individuals not found in either of the registers (Van der Heijden et al. [2]). For example, in the simplest case of two registers A and B , the linkage yields a count of individuals in A but not found in B , a count of individuals in B but not found in A , and a count of individuals occurring both in A and B . The main problem is how to estimate the number of individuals who are neither in register A nor B - n_{00} .

	Register B			
	Yes (1)	No (0)		\sum
Register A	Yes (1)	n_{11}	n_{10}	n_{1+}
	No (0)	n_{01}	n_{00}	n_{0+}
\sum		n_{+1}	n_{+0}	n

For the purpose of estimating n_{00} , one can fit a log-linear independence model using observed frequencies from the above contingency table:

$$\ln(m_{ij}) = \mu + \lambda_i^A + \lambda_j^B. \quad (1)$$

After fitting the log-linear model, the missing count n_{00} can be found as follows:

$$\hat{n}_{00} = \exp(\hat{\mu}). \quad (2)$$

Log-linear models have been used in the context of hard-to-survey population in many applications: for estimating people born in the Middle East but residing in the Netherlands (Van der Heijden et al. [2]) or for estimating homeless people in the Netherlands (Coumans et al. [3]).

To estimate the number of foreigners in Poland (including those from Ukraine, Belarus and Russia) and after a careful analysis of available data sources, the following statistical data sources were considered:

- Registers of the Office for Foreigners – the register of all foreigners who have applied for permission to stay in Poland,
- PESEL – Universal Electronic System of Population Register in Poland,
- Social Insurance Institution – the register of insured people,
- National Taxpayer Register – the register of tax payers.

Unfortunately, it was not possible to get access to police records in the course of the project. Finally, in order to estimate 95% confidence intervals of foreigners in Poland in specific domains the parametric bootstrap was used (Van der Heijden et al. [2]).

3 RESULTS

The estimated number of foreigners aged 18 and above staying in Poland at the end of 2015 was 507.7 thous. – it was in the range of 369.1 thous. up to 724.4 thous. (95% confidence interval). This number – apart from foreigners registered for temporary stay - also included foreigners registered for permanent residence (According to the PESEL register, there were 39.1 thous. of such persons).

Analogical estimates were calculated for 2016. The estimated number of foreigners aged 18 and above staying in Poland at the end of 2016 was 743.7 thous. The number was in the range of 600.7-943.1 thous. (95% confidence interval). This number – apart from foreigners registered for temporary stay – also included foreigners registered for permanent residence (according to the PESEL register, there were 41.4 thous. of such foreigners).

Table 1: Estimated size of foreign population in Poland

Year	\hat{N}	Confidence	Interval	Precision
		Lower	Upper	
2015	507 693	369 135	724 407	17,64
2016	743 665	600 796	943 124	11,70

The number of Ukrainian citizens increased in relation to the previous year and amounted to 455.0 thous. (95% confidence interval: 361.5 thous. – 584.7 thous.) In 2016 there was a clear increase in the number of foreigners from Ukraine, Belarus and Russia compared to the previous year.

Table 2: Estimates of selected foreign populations in Poland

Year	Country	\hat{N}	Confidence	Interval	Precision
			Lower	Upper	
2015	Belarus	19 868	14 429	27 951	17,38
2016	Belarus	25 813	20 832	32 569	11,81
2015	Russia	22 611	16 040	32 237	18,62
2016	Russia	25 534	20 685	32 344	12,07
2015	Ukraine	283 714	203 946	415 732	18,55
2016	Ukraine	454 974	361 512	584 696	12,27

4 CONCLUSIONS

Conclusions and recommendations formulated at the end of the study mainly concern the need to improve the estimation method in the following years.

However, it is essential that data from registers and databases should strictly meet the specified study goals. Therefore, it will be necessary to extend the scope of available data by including registers currently acquired by public statistics and by accessing new non-statistical sources (for example police registers containing information about foreigners who have committed a crime in Poland).

The results of the study in the form of output tables are available on the website of Statistics Poland in the Statistics for Cohesion Policy section. They can also be of relevance in other research areas, such as the labour market, national accounts, housing and construction.

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