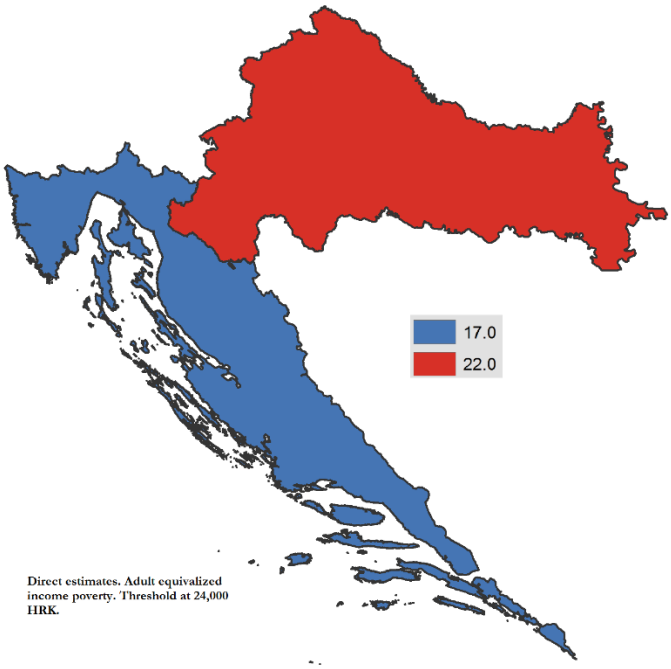
Small area estimates of income poverty in Croatia: methodological report

1 Introduction

The At-Risk-of-Poverty (AROP) rate indicates the percentage of individuals within a country who live on less than 60 percent of the median national equivalized disposable income after social transfers. It is one of the main indicators derived from the European Union Statistics on Income and Living Conditions Survey (EU-SILC). In Croatia the EU-SILC is representative at the NUTS[1]-1 level as well as at the NUTS-2. The National at-risk-of poverty rate for 2012[2] in Croatia is 20.4 percent. While regional poverty rates are considerably different between Continental and Adriatic Croatia, 22 and 17 percent respectively. Nevertheless it is possible that poverty levels within NUTS-2[3] spatial units, differ considerably.

Figure 1: EU-SILC poverty map at level of representativeness



[1] Nomenclature of territory units for statistics (NUTS) based on Regulation (EC) No 1059/2003 of the European Parliament and of the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics

[2] In the EU-SILC survey income information is gathered on the previously completed calendar year.

[3] Presently there are two regions under NUTS-2 level, Adriatic and Continental Croatia. During the pre-accession period time of the 2012 EU-SILC there were three statistical regions corresponding to NUTS-2 level in Croatia: Northwest, Central and Eastern, and Adriatic Croatia. The 2012 EU-SILC is representative for the three statistical regions corresponding to NUTS 2 level. Continental Croatia is composed of the Northwest, and the Central and Eastern statistical regions.

Poverty figures at lower levels of aggregation (for example NUTS-3, LAU-1, or LAU-2) for Croatia are not possible with the EU-SILC. Geographical levels at which direct estimates lack the required precision are referred to as small areas (Guadarrama et al., 2015). Small area estimation (SAE) methods are those which seek to overcome the lack of precision. SAE methods achieve this by incorporating data sources with larger coverage. These methods present a way to circumvent the low representativeness of household survey methods by taking advantage of larger coverage surveys such as a census. In practice household surveys provide a satisfactory measure of welfare but possess low coverage, while the census has the coverage but lacks a suitable welfare measure. SAE methods take advantage of the best attributes of each data source in order to obtain welfare measures at levels of aggregation below those of the household survey's representativeness. The use of SAE methods provides estimates of higher precision for small areas than those obtained using a household survey alone. Higher precision of welfare for smaller areas allows policy makers to better target assistance and interventions to the most disadvantaged communities.

The Census of Population, Households and Dwellings of 2011 for the Republic of Croatia when combined with the 2012 EU-SILC facilitates the estimation of welfare at the household level. This makes obtaining poverty rates for areas below those of the EU-SILC's representativeness possible. The small area estimation methodology used to obtain the estimates follows the one proposed by Elbers, Lanjouw, and Lanjouw (ELL) (2003).[4] The methodology is perhaps the most widely used for small area estimation, and has been applied to develop poverty maps in numerous countries across the globe. Through the application of the analysis predicted poverty rates at the NUTS-3,[5] as well as at the LAU-2[6] levels are obtained.

2 Modeling approach

The ELL method is conducted in 2 stages. The first stage consists in fitting a welfare model using the 2012 EU-SILC data via ordinary least squares (OLS), and correcting for various shortcomings of this approach to arrive at generalized least squares estimates (GLS). It should be noted that the variables included in the welfare model of the 2012 EU-SILC must be restricted to those variables that are also found on the 2011 Census. This allows us to generate the welfare distribution for any sub-population in the 2011 Census, conditional on the sub-population's observed characteristics (ELL, 2002).

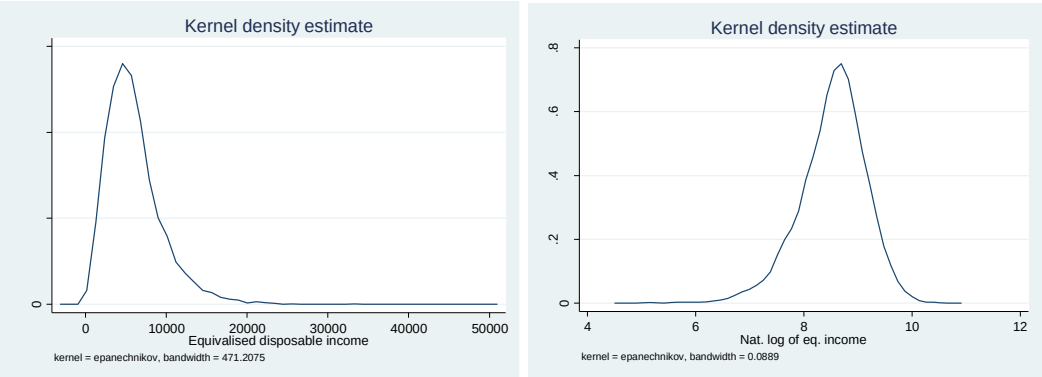
[4] The methodology is implemented via the World Bank developed software PovMap (accessed on August 1, 2016)
[5] There are currently 21 NUTS-3 spatial units (Counties) in Croatia
[6] There are 556 Local Administrative Units at level 2 (LAU-2). In Croatia LAU-2 level corresponds to municipalities and cities. Additionally, for the purposes of the analysis, the city of Zagreb is sub-divided into 19 districts.

After correcting for shortcomings, the estimated regression parameters, standard errors, and variance components from the EU-SILC model provide the necessary inputs for the second phase of the analysis. The second stage of the poverty mapping exercise consists in using the estimated parameters from the first stage, and applying these to the 2011 Census data in order to predict welfare at the household level. Finally, the predicted welfare measure is converted into a poverty indicator which is then aggregated in order to obtain poverty measures at the desired level of aggregation (NUTS-2, NUTS-3, or LAU-2).

Before fitting the welfare model, a comparison between the observable household characteristics from the EU-SILC and the Census is necessary. The purpose of the comparison is to ensure that variables have similar distributions, and that these have similar definitions across data sources. Because the exercise consists in predicting welfare in the census data using parameters obtained from EU-SILC observed characteristics, it is imperative that the observed characteristics across surveys are comparable.

The next step in the ELL methodology consists in estimating a log adult equivalized household income model which is estimated via *OLS*. The transformation to log income is done because income tends to not be symmetrically distributed (graph 1), taking the logarithm of income is done to make the data more symmetrical.

Figure 2: Adult equivalized income and natural logarithm of equivalized income



The household income model is:

$$ln\, y_{ch} = X'_{ch}\, \beta + u_{ch} \qquad (1)$$

where y_{ch} is the adult equivalized income of household h in municipality c, X_{ch} are the household and locality[7] characteristics, and u_{ch} is the residual. In the specified model the use of Households within a same municipality are usually not independent from one another and the following specification is used to account for this:

[7] As mentioned above, the locality in the case of the Republic of Croatia refers to LAU-2, and districts of Zagreb

$$u_{ch} = \eta_c + \varepsilon_{ch} \qquad (2)$$

where η and ε are assumed to be independent from each other and uncorrelated with the observables, X_{ch}. Households in the same location share the same η, and it is expected that $E[u_{ch}^2] = \sigma_\eta^2 + \sigma_\varepsilon^2$ the larger the variance of η the less precise the estimates of welfare will be when the spatial correlation of the residuals is ignored.

The estimation of σ_η^2 and σ_ε^2 is done utilizing Henderson's method III (Henderson, 1953).[8] In the case where the variance of the household specific error, σ_ε^2, is assumed to vary across households a parametric form of heteroscedasticity is assumed and modeled as:

$$ln\left[\frac{\hat{\varepsilon}_{ch}^2}{A - \hat{\varepsilon}_{ch}^2}\right] = Z'_{ch}\alpha + r_{ch} \qquad (3)$$

where $A = 1.05\max(\hat{\varepsilon}_{ch}^2)$. [9] Making use of these estimates it is possible to obtain an estimate for $\sigma_{\varepsilon,ch}^2$. The existence of the variance parameters require a re-estimation of the welfare model given that the *OLS* assumptions are unlikely to hold. The variance covariance matrix utilized for the GLS estimates is household cluster specific, and where the interrelatedness between households within a cluster is also allowed.[10]

Once GLS estimates are obtained it is possible to move on to the second stage of the exercise. Small area estimates of welfare (and standard errors) are obtained by applying the parameter and error estimates from the survey to the census data. In order to do this we must simulate welfare. Since poverty indices are based on non-linear forms of log adult equivalized income simulations are ideally suited for obtaining estimates of these measures. A value of log income per adult equivalent $\tilde{y}_{ch}$ for each household is simulated making use of the β, η, and the ε parameters from the first stage, where each simulation r is equal to:

$$\tilde{y}^r{}_{ch} = exp(X'_{ch}\tilde{\beta}^r + \tilde{\eta}_c^r + \tilde{\varepsilon}_{ch}^r) \qquad (4)$$

For each simulation a set of $\tilde{\beta}^r$ are drawn from bootstrapped versions of the EU-SILC sample.[11] On the other hand for the location and household disturbance terms we obtain their variance parameters, $\left(\sigma_{\varepsilon,ch}^2\right)^r$ and $\left(\sigma_\eta^2\right)^r$, from the r^{th} bootstrapped version of the EU-SILC. $\tilde{\eta}_c^r$ and $\tilde{\varepsilon}_{ch}^r$ are thus drawn from a normal distribution assuming mean zero and variances equal to $\left(\sigma_{\varepsilon,ch}^2\right)^r$ and $\left(\sigma_\eta^2\right)^r$, respectively. If we define $f(\tilde{y}^r{}_{ch})$ as a function that maps the estimated adult equivalized income measure to a poverty

[8] An additional method is the one proposed by ELL (2003)
[9] For a more detailed description, interested readers should refer to Elbers, Lanjouw and Lanjouw (2003) as well as Van der Weide (2014)
[10] For details on the structure of the variance covariance matrix refer to Van der Weide (2014).
[11] An alternative option is to draw the β from a multivariate normal distribution $\beta \sim N(\beta_{gls}, vcov(\beta_{gls}))$

measure such as the at-risk of poverty head-count-rate (FGT 0) then the estimated mean poverty rate for a municipality c is equal to:

$$FGT0_c = \frac{1}{R}\sum_{r=1}^{R}\sum_{h=1}^{H} f(\tilde{y}^r{}_{ch})w_{ch} \qquad (5)$$

where w_{ch} is the population expansion factor (number of household members in household h divided by the total population of Croatia in the census).

An alternative for the estimation of η is to use the information from the survey, Empirical-Best estimation (EB). The best estimate available to us of η, for a particular municipality is that which comes from the survey $(\ln y_{ch} - X'_{ch}\,\beta = u_{ch})$. Therefore making use of this information the estimates for the municipalities, cities, and districts of Zagreb that are present in the EU-SILC are tighter since more information is included into their drawing. For all locations that are not present in the EU-SILC, the use of EB makes no difference, since for these localities there is no additional information and thus their data generation process is still normal with mean zero and variance $(\sigma_\eta^2)^r$.

Within the estimated measures there are three main sources of error: model error, error due to the disturbance, and due to computation error. These three sources of error, as noted by ELL (2003) are not correlated.

The error in the welfare measure within a municipality due to the disturbance arises as a result of unobserved components of income within a particular locality. The smaller the population of the targeted municipality the larger this error will be, and thus limits the degree of disaggregation possible. The exact point at which this becomes unacceptable depends on how well the model fits the data.

The model error depends entirely on the properties of the first stage estimators it is independent from the population size of the municipality. Within a given municipality the magnitude of this error component will also depend on how different the X variables are in that municipality from those of the EU-SILC data.

Finally, computation error is due to the method used for computation. This error can be made as small as possible depending on computational resources at hand. Because often simulations are a finite number, the larger the number of simulations, the smaller the error due to computation will be.

3 Data description

The poverty mapping analysis requires two sources of data. In this instance the Croatian EU-SILC for 2012, and the Census of Population, Households and Dwellings of 2011 for the Republic of Croatia. The EU-SILC

for 2012 is an ideal household survey for the SAE analysis because incomes reported in the 2012 EU-SILC correspond to 2011 calendar year, and thus are for the same time period as the census.

Small area estimation is done under the assumption that the same underlying population is being captured by the survey and the census. This last assumption will be valid if both datasets are from the same time frame. Nevertheless, the inclusion or the use of datasets that are from differing time periods, or if the survey is not representative of the population, will break down this assumption. This last remark is more salient in instances where there have been considerable shocks in between the collection of the survey and the collection of the census (Bedi et al. 2007).

3.1 EU-SILC 2012, Croatia

The EU-SILC data is the EU reference source for comparative statistics on income and social exclusion. The 2012 EU-SILC for Croatia was made up of **5,853** households and is representative at the NUTS-2 level. The at risk of poverty threshold[12] in Croatia for 2012 (income year 2011) is 24,000 HRK. Using this poverty threshold, the at-risk-of-poverty head count rate is 20.4 percent.

The 2012 EU-SILC uses the 2001 Census as a sampling frame. The survey is performed as a stratified two-stage sample.

The at-risk-of-poverty threshold is obtained by including all households, among these **2** have reported negative net disposable incomes. For purposes of the analysis done these households are no longer included. The households included in the EU-SILC dataset come from 370 municipalities. Finally, all municipalities with less than 3 households in the EU-SILC must be removed for the analysis.[13] The final sample for the EU-SILC is made up of 5,618 households.

3.2 Census of Population, Households and Dwellings 2011, Population by Sex and Age

The 2011 Census for Croatia was provided by the Croatian Bureau of Statistics.[14] The census includes key information on demographics of the household, education, labor force status, economic activity, occupation type, and labor status in main job. Along with these characteristics, the census also has information on the type of dwelling, the status of the dwelling, number of rooms in the dwelling, living area of the dwelling, and the construction year.

[12] 60 percent of the median household equivalized income

[13] This is necessary in order to estimate the variance of the location effect, σ_{ch}^2, for every municipality.

[14] Access to the Census, as well as the EU-SILC (with excluded direct identifiers of persons and households) was provided in the Croatian Bureau of Statistics' safe room according to the Agreement and inclusion of this exercise in the Annual Implementation Plan 2016.

3.3 Variable comparison between EU-SILC and Census

Because small area methods require an estimation of a welfare model in the first stage which will then be applied to the census it is necessary that the choice of correlates matches across surveys. This not only requires variables to be similar, but requires that these have similar distributions. The selection of candidate variable is done in a two stage process:

1. Comparison of questionnaires between the EU-SILC and the Census. The comparison yields a first set of candidate variables for the estimation. Candidate variables must come from similar questions.
2. Comparison of the distribution of the candidate variables across datasets. The comparison is undertaken at the level of Republic of Croatia and at the NUTS-2 level. The comparability of the variables across surveys ensures that the welfare model from the 2012 EU-SILC can be applied to the Census such that reliable income estimates for the population can be derived.

Making use of all variables that meet the above criteria several welfare models are estimated via *OLS*. Unlike most of econometrics, the purpose of the model is not to find any causal relationships but to find a model that best reflects the income level of a household. The income of a household is assumed to be a function of the number of household members present in the household, and the age composition of the household members. Additionally, income is assumed to be a function of the marital status of individuals aged 15 and over, their level of education, their occupation, and the sector in which they are employed in. In addition, and while likely not a determinant of income, we include a variable which reports the area of the dwelling in square meters. This variable is expected to have reasonable correlation with welfare. Finally, the use of location means of household level variables are included.[15] This is done in order to explain the variation in welfare due to location as much as possible and thus improve precision of the welfare estimates.

Table 1 contains a listing of the candidate variables for use in the model. The EU-SILC and the Census contain a comprehensive set of variables which match the criteria for modelling income at the household level. Both datasets contain information on the number of household members present in a household. Given that the sampling frame for the 2012 EU-SILC is the previous Census (Census of Population, Households and Dwellings 2001) it is not unexpected that the first moments of the EU-SILC and Census are somewhat different. Nevertheless, at the national level the means of the candidate variables match up considerably well.

[15] This is recommended by ELL (2002). Variable means at the municipal level are included and come from the Census. These are the share of households in the municipality that were built between 1990 and 2000, share of household that have sewerage access, share of individuals that receive pension income, and the share of employed individuals in the municipality.

The mean values for the EU-SILC and for the Census are presented. The final choice of variables for the model is not only dependent upon how well the variables match up, but on how well they explain the variation of income.

As the numbers on Table 1 illustrate, the two datasets match up quite well. The age groups, proportion of males, and household size are very close to one another, even at the statistical area level the variables are comparable with one another (Table 1A).

Comparison between labor market variables also reveal that the datasets are close to each other with some differences arising in some of the occupations. Similarly these slight differences are also reflected at the regional level comparisons.

Given that the differences that arise are not considerable all of the variables are valid candidates for the welfare model to be estimated in the next stage. Variables that are highly correlated are not included simultaneously. Keeping this in mind the selected model is the one which maximizes the adjusted R-squared of the model, but at the same time conforms to prior beliefs of how should the variable be related to income.

Table 1: Population weighted candidate variable means in Census and EU-SILC

Variable name	Census	EU-SILC
Male	0.483	0.482
Age [0,5)	0.050	0.045
Age [5,15)	0.103	0.106
Age [15,30)	0.186	0.186
Age [30,65)	0.486	0.490
Age [65+)	0.174	0.172
Household size (Share of individuals living in household type)		
Households size of 1	0.088	0.088
Households size of 2	0.183	0.183
Households size of 3	0.202	0.202
Households size of 4	0.248	0.247
Households size of 5	0.143	0.143
Households size of 6	0.076	0.073
Household size of 7 or more	0.060	0.063
Occupation (15+) (Share of individuals in households with at least one member)		
Manager	0.051	0.032
Professionals	0.150	0.142
Technicians	0.182	0.132
Clerical support	0.129	0.118
Service and sales	0.223	0.214

Skilled agriculture	0.041	0.051
Craft and trade	0.153	0.167
Machine operators	0.112	0.117
Elementary occupations	0.091	0.071
Labor status, age 15-64 (Share of individuals in households with at least one member)		
Employed	0.742	0.724
Retired	0.497	0.503
Student	0.220	0.213
Disabled	0.038	0.024
Other	0.749	0.726
Industry, age 15-64 (Share of individuals in households with at least one member)		
Agriculture, mining, and fishing	0.065	0.068
Manufacturing	0.189	0.195
Services and Sales	0.630	0.572
Share of members with education in HH (age 15-64)		
Primary education	0.086	0.071
Lower secondary	0.199	0.196
Upper secondary	0.547	0.595
Tertiary education	0.169	0.138
Dwelling characteristics		
Square meters	87.542	88.942

4 Model results

The initial welfare model corresponding to equation (1) is presented in column 1 of Table 2. The adjusted R-Squared for the model is (**0.52**) reflecting that the chosen model explains the variation on income well. In addition to the variables present in both the Census and EU-SILC, variable means for municipalities, cities, and districts of Zagreb are obtained from the Census and introduced to the model; these variables are introduced to improve precision by reducing the unexplained variation in income due to location. With the inclusion of these variables the ratio of the variance of η over the model's MSE is 0.035. The low ratio illustrates the key role the variables play in improving precision of the estimates.

Table 2: Weighted OLS & GLS estimates for Income model: 2012 EU-SILC

	Coeff. WOLS	Coeff. GLS
Intercept	8.4124***	8.5379***
No children under 5	-0.104***	-0.0781***
No children between 5 and 15	-0.1322***	-0.1294***
One child between 5 and 15	-0.0795**	-0.0834**
No indiv. with lower secondary	0.0433**	0.045**
No indiv. with primary	0.2104***	0.1671***
One individual with primary	0.1113	0.0943
One person with tertiary education	0.1123***	0.0989***
Two people with tertiary education	0.1207***	0.1299***
1 member HH	0.8795***	0.9324***
2 member HH	0.7396***	0.8062***
3 member HH	0.533***	0.5899***
4 member HH	0.3815***	0.4271***
5 member HH	0.1972***	0.2414***
6 member HH	0.1801***	0.2069***
Nat. log Sq. M	0.1091***	0.0933***
No married ind. In HH	-0.1337***	-0.134***
Proportion of dwellings built 1990-2000	0.3398**	0.3602**
Proportion of dwellings with sewerage	0.0967***	0.0891***
Proportion of HH with pension income	1.0688***	0.994***
Municipal employment rates	0.9721***	0.9221***
No ind. is a clerk	-0.1071***	-0.1107***
No ind. is elementary teacher	0.0743*	0.0752**
No ind. is a manager	-0.2233***	-0.224***
No ind. is a professor	-0.174***	-0.1781***
No ind. is a technician	-0.1427***	-0.1298***
Northwest × no lower education	0.0966***	0.074**
Northwest × 2p retired	0.0101	0.0251
Central East × lnM2	0.1009**	0.1074***
Central East × 2p workers	-0.0755*	-0.0819**
Central Eastern	-0.3389*	-0.3659**
Adriatic	0.1142***	0.1063***
1 retiree	0.2299***	0.1921***
2 retirees	0.2733***	0.2303***
0 administrative workers	0.085*	0.0788**
0 public employees	-0.1317***	-0.1248***
1p working in HH	0.5493***	0.5428***
2p working in HH	0.3499***	0.3463***
3p working in HH	0.1464***	0.1529***
Adjusted R-squared	0.52	

Ratio of variance of η over Mean Sq. error	0.035	
Number of observations	5,618	5,618

*, **, *** significant at the 10, 5, 1 percent level respectively. All households which have inconsistent labor information are removed.

As noted in section 2, it is likely that income levels within a location are highly correlated and as a consequence $E[u_{ch}u_{ci}|X] \neq 0$. Additionally, error terms will likely have differing variances across observations ($E[u_{ch}^2|X] \neq \sigma^2$). Due to these issues the model is re-estimated using Generalized Least Squares (GLS). The results for the GLS fitted model are presented in column 2 of Table 2.[16]

Equivalized income is positively correlated to household size. The omitted group is households with 7 or more individuals. Furthermore, equivalized income is negatively correlated to the absence of children in the household. Under the modified OECD scale, when comparing two households with equal household income, the household with lower adult equivalents will have greater adult equivalized income. Thus, all else equal, a household with 2 adults and a child will have greater adult equivalized income than one with 3 adults. Households with retirees also have greater equivalized incomes, this is most likely due to pensions being received by these individuals. After labor the most important source of labor income in Croatia is pension income.

Education is also strongly correlated to equivalized income, households with members who have tertiary education have on average greater equivalized incomes. Also correlated to income is the presence of working members and most of the labor variables included are significantly correlated to equivalized income. Among these variables, the presence of working members have the greatest coefficients.

Location, and location variable means are also correlated to equivalized income. Adult equivalized income is negatively correlated to being located in Central and Eastern Croatia as opposed to being in the Northwest. On the other hand residing in the Adriatic is positively and significantly correlated to adult equivalized income. In addition, equivalized income is positive and significantly correlated to localities with higher shares of households with pension incomes, households with sewerage, and dwellings built between 1990 and 2000.

[16] The alpha model (equation 3) corresponding to the GLS is presented in Table 2A.

5 Poverty results

The coefficients estimated in the previous section provide the necessary inputs in order to estimate the first part of equation 4 ($X'_{ch}\hat{\beta}$) by combining coefficients with the Census variables. The vectors of disturbances for households are unknown, and must be estimated. As mentioned before, the error component is decomposed using Henderson's method III, and the coefficients, β, are obtained by bootstrapped samples of the EU-SILC data. The model chosen is where η and ε are drawn from a normal distribution, with their respective variance structures. Finally, empirical best methods are chosen since these incorporate more information and are thus expected to provide a better fit.

The clustering used for estimations is at the municipal, city, and districts of Zagreb level, the resulting poverty map aggregated to the NUTS-3 level is presented in Figure 3 and at the municipal, city, and districts of Zagreb level in Figure 4. The resulting poverty rates used for validation of the small area estimation undertaken are presented in Table 3. These compare the poverty rates obtained from the small area estimation to the direct estimates from the EU-SILC at the statistical area level. This provides support to the quality of the estimates obtained.

Table 3: Poverty rates from EU-SILC and from poverty map exercise

Statistical region	AROP EU-SILC					
	EU-SILC	95% CI		Predicted	95% CI	
Northwestern	**16.7%**	13.6%	20.4%	**14.1%**	12.8%	15.5%
Central & Eastern	**29.1%**	26.2%	32.2%	**28.0%**	25.7%	30.2%
Adriatic	**17.0%**	14.0%	20.6%	**17.4%**	15.8%	19.1%
Total	**20.4%**	18.5%	22.4%	**19.2%**	18.0%	20.4%

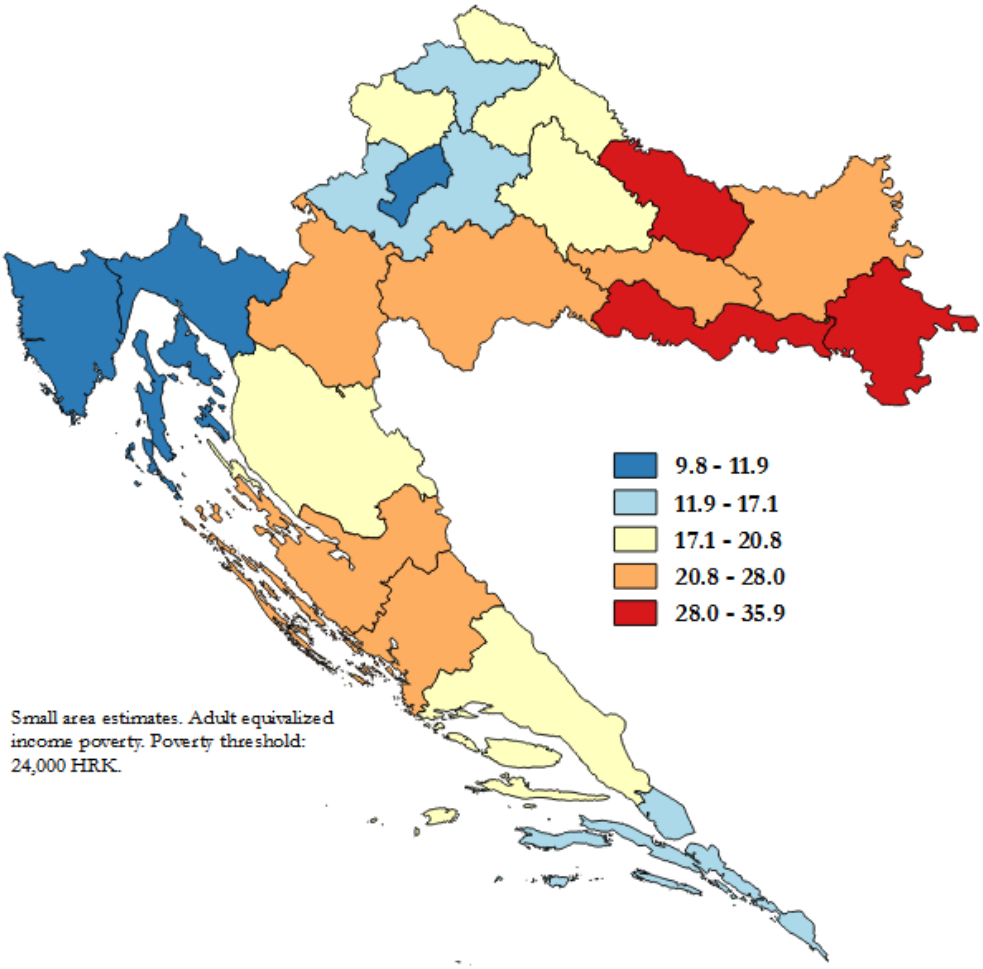
Note: Poverty line is at 24,000 HRK per adult equivalent

Results at the NUTS-3 spatial unit level are presented in Table 4. These estimates illustrate the heterogeneity within the country. Within the Adriatic region poverty rates range from 11.9 to 25.2 percent, within Continental Croatia (composed of the Northwestern, and Central and Eastern statistical area) poverty ranges from 9.8 percent in Grad Zagreb, to 35.9 percent in Brodsko-posavska. Poverty levels within the Central and Eastern statistical area are considerably greater than the country average.

At the municipal, city, and districts of Zagreb level further heterogeneity is revealed. In the Continental NUTS-2 region certain pockets of high poverty levels are detected, particularly in the Central and Eastern statistical region. In the Adriatic region some municipalities with higher poverty rates are also observed. The

results of the poverty map suggest an overall spatial clustering of poverty; this is further analyzed in section 6, where basic analysis of the spatial association is undertaken.

Figure 3: Poverty Map - NUTS-3 poverty headcount



Finally, the distribution of the Republic of Croatia's population that is at-risk-of-poverty is illustrated in Figure 5. The County with the lowest concentration of poor is in the Adriatic region, Ličko-senjska. The county is one of the least populated in the country, and although it has an at-risk-of-poverty rate which is close to 20 percent it has the fewest poor. On the other hand Grad-Zagreb which is the least poor county in the Republic of Croatia with an at-risk-of-poverty rate close to 10 percent has the third highest concentration of the country's poor.

Figure 4: Poverty Map - poverty headcount for municipalities, cities, and districts of Zagreb

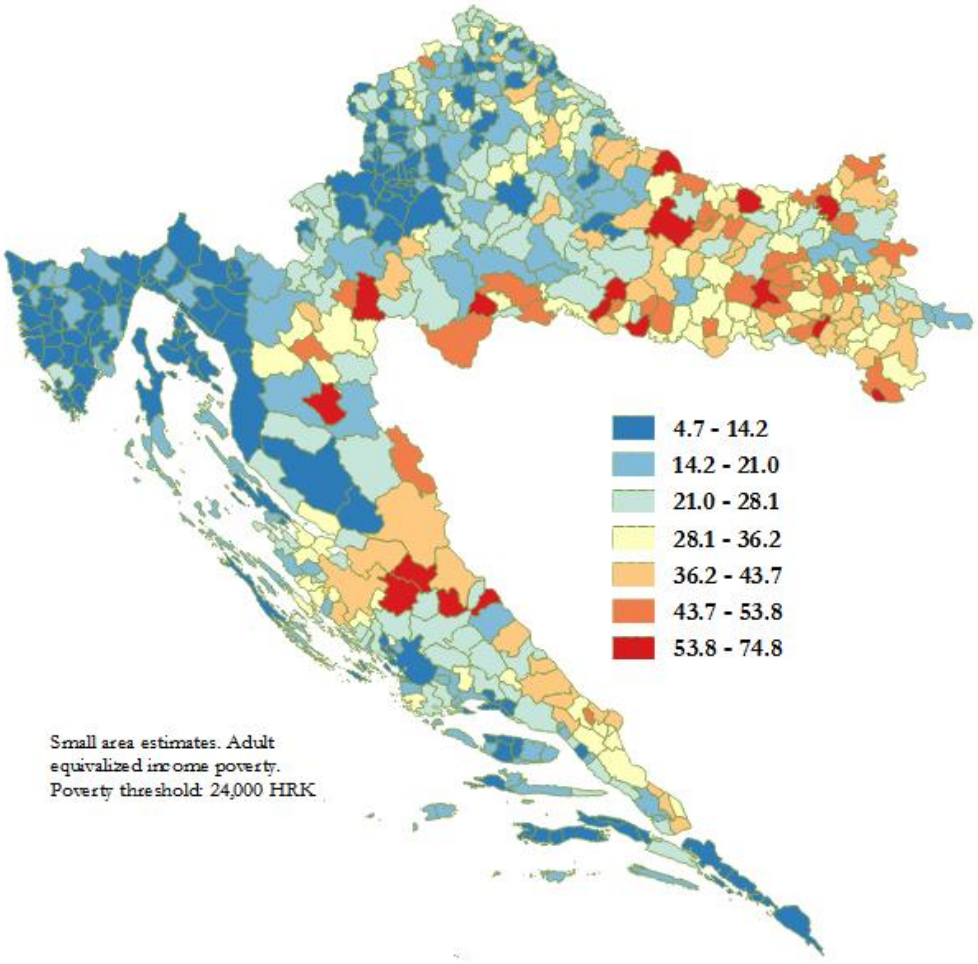
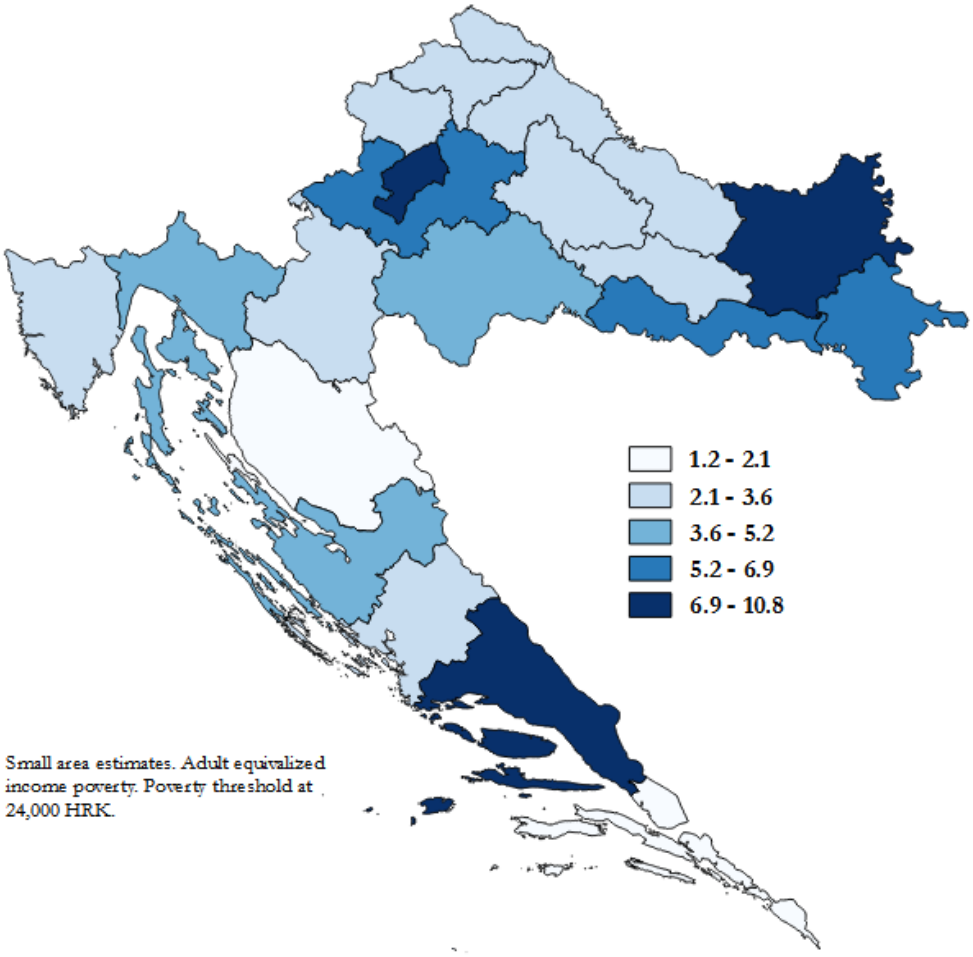


Table 4: County level poverty estimates

	EU-SILC direct estimates				H3-EB Model prediction			
Statistical Area	**AROP**	**95% CI**		**NUTS-3 (counties)**	**Population**	**AROP**	**95% CI**	
Northwestern	16.7%	13.6%	20.4%	Zagrebačka	311,918	16.7%	13.9%	19.5%
				Krapinsko-zagorska	129,393	18.8%	15.9%	21.7%
				Varaždinska	170,380	17.1%	14.6%	19.7%
				Koprivničko-križevačka	112,540	20.3%	17.4%	23.3%
				Međimurska	110,888	20.8%	17.5%	24.0%
				Grad Zagreb	772,340	9.8%	8.0%	11.6%
Central & Eastern	29.1%	26.2%	32.2%	Sisačko-moslavačka	168,534	23.7%	19.6%	27.8%
				Karlovačka	125,722	23.2%	19.4%	27.1%
				Bjelovarsko-bilogorska	117,420	20.0%	15.6%	24.5%
				Virovitičko-podravska	83,129	33.4%	28.7%	38.2%
				Požeško-slavonska	75,912	26.5%	21.1%	31.9%
				Brodsko-posavska	154,863	35.9%	31.6%	40.1%
				Osječko-baranjska	297,230	28.0%	24.8%	31.1%
				Vukovarsko-srijemska	174,324	31.9%	28.4%	35.3%
Adriatic	17.0%	14.0%	20.6%	Primorsko-goranska	290,446	11.9%	10.0%	13.8%
				Ličko-senjska	49,766	19.8%	15.7%	24.0%
				Zadarska	167,029	25.2%	20.9%	29.5%
				Šibensko-kninska	107,345	24.7%	20.7%	28.8%
				Splitsko-dalmatinska	445,049	19.5%	16.9%	22.0%
				Istarska	204,025	11.9%	9.6%	14.1%
				Dubrovačko-neretvanska	118,707	14.5%	11.3%	17.8%
Republic of Croatia	20.4%	18.5%	22.4%		4,186,960	19.2%	18.0%	20.4%

Note: Poverty line is at 24,000 HRK per adult equivalent

Figure 5: Distribution of the poor by NUTS-3 spatial units



6 The use of poverty maps

6.1 Local indicators of spatial association of poverty

Using the poverty map output we seek to determine if there is a pattern to how poverty rates of municipalities, cities, and districts of Zagreb are distributed within the Republic of Croatia. When analyzing geographical data it is assumed that things that are closer are more related to things that are farther away (Tobler, 1970). This supposes that two municipalities that are closer together will be more alike than municipalities which are farther away.

As noted in Section 5 and in Figure 4, there appears to be some spatial clustering in the results from the poverty maps. In fact the Central and Eastern statistical area seems to be lagging behind the Adriatic and Northwest. This illustrates a divergence within the Continental NUTS-2 region. Poverty rates in Central and Eastern regions are considerably greater than the rest of the country, and the region appears to be a hotspot for poverty. Furthermore, there appears to be a clear demarcation of low versus high poverty areas. Insofar as determining if there is in fact spatial correlation we rely on Global Moran's I as well as Local Moran's I statistic.

In order to obtain undertake analysis of spatial association it is necessary to establish a degree of spatial proximity between the locations in Croatia. In order to do this, a spatial weights matrix is used, which relies on the row-standardized inverse distances between the center of the municipalities and the surrounding municipalities. This ensures that nearer neighbors have a greater influence on the analyzed outcomes, in this instance poverty rates.

The presence of spatial association is confirmed by a global Moran's I index of 0.52 which is significant at the 1 percent level. Local Moran's I can aide in identifying which localities have a statistically significant relationship with its neighbors. Spatial autocorrelation facilitates the identification of high poverty areas noted in the map presented in Figure 4 (particularly in the Central and Eastern statistical area within the Continental NUTS-2), as well as low poverty areas (around Zagreb and the surrounding areas of Istarska). These results bring to light the challenges that arise for regional development, and add a new layer to the discussion.

Figure 6 presents the results for the Global and Local Moran's I statistics. The significant Global Moran's I of 0.52 suggest that there is spatial autocorrelation. Additionally, the map illustrates regions which are significantly different from their neighbors, and regions which are high-poverty areas and low poverty areas. All colored areas show a significant relationship to their neighbors. Those locations marked as "High – High" ("Low-Low") are areas where poverty is significantly greater (lower) than the neighborhood's poverty and are greater (lower) than the average poverty among municipalities, cities and districts of Zagreb.

A cluster of high poverty is clearly delineated in the Eastern Central statistical area (Figure 6 and 7). In Zagreb and surrounding areas a cluster of low poverty is highlighted, the same holds true for the north of the Adriatic region. Municipalities, cities, and/or districts of Zagreb marked as low-high outliers and the high-low outliers are particularly of interest. While poverty may be high (low) in particular areas, there are some municipalities that have a significantly lower (higher) level of poverty than its surroundings. These are mostly observed in the Adriatic and Eastern Central areas.

The hot spot analysis in Figure 8, brings to light a demarcation and separation between regions. This was also evident in the results from the OLS and GLS (see Table 2). All three statistical areas are different. Independently from the NUTS-2 classification which aggregates the Northwestern statistical area and the Eastern and Central statistical area, when it comes to welfare these areas are considerably different.

Figure 6: Poverty Map - Spatial association of headcount poverty

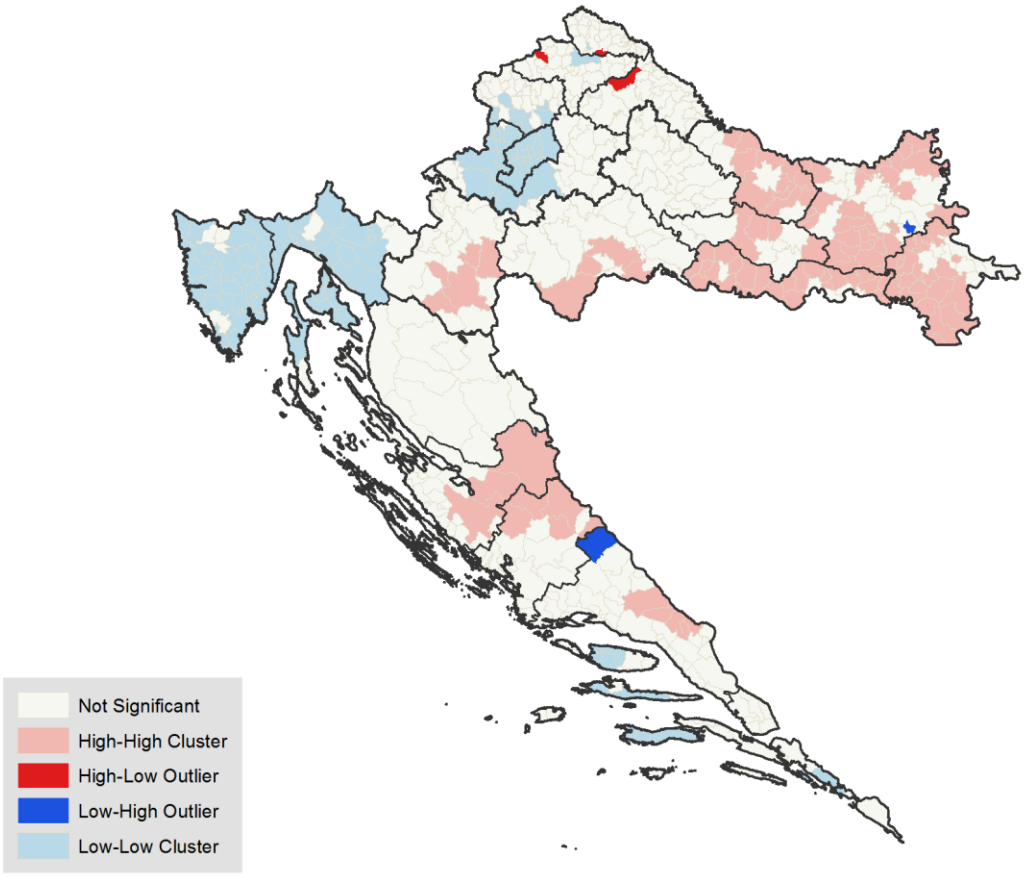
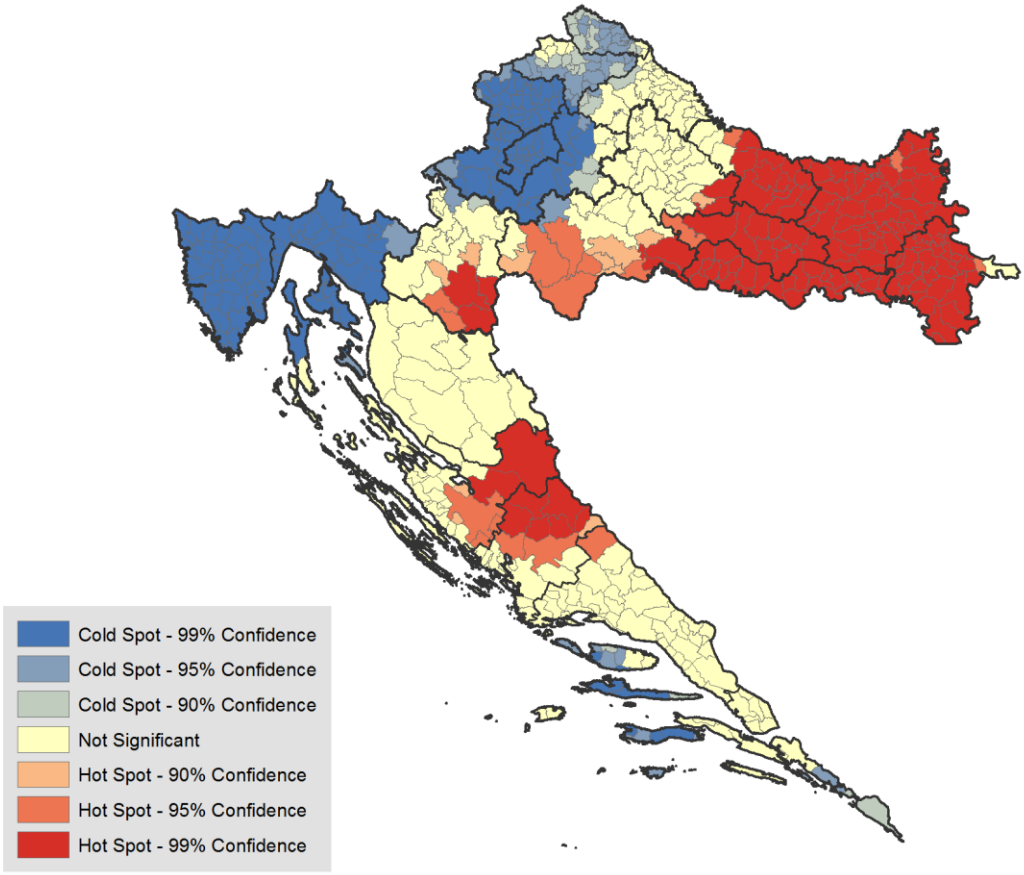


Figure 7: Poverty Map: hot spot analysis (Getis-Ord Gi)



7 Concluding remarks

Direct poverty estimates from the EU-SILC are only reliable at the statistical area level, and thus at the NUTS-2 level. This complicates the analysis of poverty at more disaggregated levels since the reliability of direct estimates are questionable. Data from the Census of Population, Households and Dwellings 2011 coupled with small area estimation techniques aide policy makers overcome the lack of precision at lower geographical levels. The results from the poverty mapping exercise, coupled with spatial analysis reveal the heterogeneity of poverty in Croatia.

Results from spatial analysis reveal that there is a cluster of high poverty in the Central and Eastern region of Croatia. There is a clear poverty demarcation in the country, where the Central and Eastern part of the country is clearly doing worse than the rest of the country. Results also reveal that while the Continental NUTS-2 spatial unit, may seem poorer than the Adriatic, the result is mainly driven by the aggregation of the two statistical regions (Northwest, and the Central and Eastern statistical regions).

The use of the poverty map in order to assist in the guidance of resource allocation can help policy makers achieve considerable gains in poverty reduction. Additionally, the visual format of the maps is simple to understand which makes it easy for the population at large to take notice of where their community stands compared to the rest of the country. Moreover, because the maps are based on established data sets, these are objective. As a consequence the maps may help prevent subjective decision making. Given the mentioned uses of the poverty maps these are valuable component of the policy maker's tool kit when trying to decide where limited funds can be distributed among the population which needs assistance.

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9 Appendix

9.1 Mathematical appendix

The discussion below presents the methodology detailed by ELL (2002 and 2003). Interested reader should refer to these documents for the full discussion.

From the estimation of equation 1 we obtain the residuals $\hat{u}_{ch}$, and by defining $\hat{u}_{c.}$ as the weighted average of $\hat{u}_{ch}$ for a specific cluster we can obtain $\hat{e}_{ch}$:

$$\hat{u}_{ch} = \hat{u}_{c.} + (\hat{u}_{ch} - \hat{u}_{c.}) = \hat{\eta}_c + \hat{e}_{ch}$$

The variance of the location effect (η_c) is given by:

$$\hat{\sigma}_\eta^2 = \max\left(\frac{\sum_c w_c(u_{c.} - u..)^2 - \sum_c w_c(1-w_c)\hat{\tau}_c^2}{\sum_c w_c(1-w_c)}; 0\right)$$

where $u.. = \sum_C w_c u_c.$ (where the w_c represents the cluster's weight) and:

$$\hat{\tau}_c^2 = \frac{\sum_h (e_{ch} - e_{c.})^2}{n_c(n_c - 1)}$$

where $e_{c.} = \frac{\sum_h e_{ch}}{n_c}$ (n_c is the number of households in the cluster). The parametric from of heteroscedasticity is presented as:

$$\sigma_{e_{ch}}^2 = \left[\frac{A\exp^{Z'_{bh}\alpha} + B}{1 + \exp^{Z'_{bh}\alpha}}\right]$$

This is simplified by setting $B = 0$ and $A = 1.05\max(e_{ch}^2)$, which leads to the simpler form that can be estimated via regular OLS:

$$\ln\left[\frac{e_{ch}^2}{A - e_{ch}^2}\right] = Z'_{ch}\alpha + r_{ch}$$

By defining $B = \exp(Z_{ch}\alpha)$ and using the delta method the household specific variance for e_{ch} is equal to:

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

The use of σ_η^2 and σ_ε^2 allows us to get the variance covariance matrix used for the OLS estimates:

$$\hat{\Omega}_c = \begin{pmatrix} \hat{\sigma}_\eta^2 + \hat{\sigma}_{e,ch}^2 & \hat{\sigma}_\eta^2 & \cdots & \hat{\sigma}_\eta^2 \\ \hat{\sigma}_\eta^2 & \hat{\sigma}_\eta^2 + \hat{\sigma}_{e,ch}^2 & \cdots & \hat{\sigma}_\eta^2 \\ \vdots & \vdots & \ddots & \vdots \\ \hat{\sigma}_\eta^2 & \hat{\sigma}_\eta^2 & \cdots & \hat{\sigma}_\eta^2 + \hat{\sigma}_{e,ch}^2 \end{pmatrix}$$

$$\Rightarrow \hat{\Omega} = \begin{pmatrix} \hat{\Omega}_1 & \mathbf{0} & \ldots & \mathbf{0} \\ \mathbf{0} & \hat{\Omega}_2 & \ldots & \mathbf{0} \\ \vdots & \vdots & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \hat{\Omega}_C \end{pmatrix}$$

The estimates for the GLS detailed by ELL (2003) are:

$$\hat{\beta}_{GLS} = \left(X'W\Omega^{-1}X\right)^{-1}X'W\Omega^{-1}Y$$

and

$$Var\left(\hat{\beta}_{GLS}\right) = \left(X'W\Omega^{-1}X\right)^{-1}\left(X'W\Omega^{-1}WX\right)\left(X'W\Omega^{-1}X\right)^{-1}$$

In response to criticisms of the methodology an extensive revision was made to the methods, including the addition of empirical best estimation, by Van der Weide (2014). For a detailed discussion on the EB approach and the other changes implemented readers are guided towards Van der Weide (2014).

The revisions include an improved GLS estimator:

$$\hat{\beta}_{GLS} = \left(X'\hat{\Omega}^{-1}X\right)^{-1}X'\hat{\Omega}^{-1}Y$$

and a new variance covariance matrix:

$$\text{var}\left[\hat{\beta}_{GLS}\right] = \left(X'\hat{\Omega}^{-1}X\right)^{-1}\left(X'\hat{\Omega}^{-1}\hat{\text{V}}\hat{\Omega}^{-1}X\right)\left(X'\hat{\Omega}^{-1}X\right)^{-1}$$

These are the estimates used for the second stage of the estimation (detailed in the methods section).

9.2 Poverty mapping software

One of the most common small area methods used for poverty mapping was proposed by Elbers, Lanjouw, and Lanjouw (2003). This methodology has been widely adopted by the World Bank and has been applied in numerous poverty maps conducted by the institution. In its efforts to make the implementation of the ELL methodology as simple as possible, the World Bank created a software package that could be easily used by anyone. The software, PovMap (Zhao, 2006), has proven to be an invaluable resource for the World Bank as well as for many statistical agencies seeking to create their own poverty maps. The software is freely available and has a graphical user interface which simplifies its use.

Poverty map results produced in this document have all made use of the PovMap software. The PovMap software can be downloaded, free of charge, at http://iresearch.worldbank.org/PovMap/PovMap2/.

9.3 Additional tables and graphs

Table 1A: Population weighted candidate variable means in Census and EU-SILC at the Statistical Area levels

	Northwest		Central & Eastern		Adriatic	
Variable name	**Census**	**EU-SILC**	**Census**	**EU-SILC**	**Census**	**EU-SILC**
Male	0.4777	0.4771	0.4843	0.4832	0.4873	0.4870
Age [0,5)	0.0515	0.0442	0.0476	0.0512	0.0483	0.0400
Age [5,15)	0.1021	0.1079	0.1082	0.1050	0.0992	0.1059
Age [15,30)	0.1872	0.1873	0.1897	0.1897	0.1817	0.1817
Age [30,65)	0.4937	0.4964	0.4764	0.4801	0.4899	0.4920
Age [65+)	0.1655	0.1642	0.1782	0.1740	0.1810	0.1805
Household size (Share of individuals living in household type)						
Households size of 1	0.086	0.087	0.086	0.087	0.088	0.090
Households size of 2	0.175	0.173	0.181	0.183	0.195	0.196
Households size of 3	0.200	0.199	0.189	0.189	0.215	0.217
Households size of 4	0.243	0.244	0.237	0.238	0.260	0.257
Households size of 5	0.144	0.143	0.154	0.147	0.133	0.140
Households size of 6	0.083	0.089	0.085	0.081	0.061	0.046
Household size of 7 or more	0.070	0.065	0.067	0.074	0.047	0.053
Occupation (15-64) (Share of individuals in households with at least one member)						
Manager	0.066	0.032	0.031	0.015	0.052	0.048
Professionals	0.188	0.173	0.107	0.103	0.145	0.140
Technicians	0.214	0.151	0.140	0.095	0.183	0.140
Clerical support	0.150	0.129	0.103	0.072	0.127	0.145
Service and sales	0.220	0.192	0.192	0.187	0.254	0.263
Skilled agriculture	0.035	0.037	0.064	0.106	0.025	0.021
Craft and trade	0.169	0.202	0.145	0.151	0.140	0.141
Machine operators	0.122	0.135	0.118	0.112	0.093	0.099
Elementary occs.	0.090	0.067	0.103	0.069	0.081	0.080
Labor status, age 15-64 (Share of individuals in households with at least one member)						
Employed	0.793	0.762	0.689	0.671	0.732	0.727
Retired	0.497	0.513	0.515	0.527	0.492	0.470
Student	0.223	0.226	0.220	0.192	0.221	0.216
Disabled	0.036	0.016	0.052	0.045	0.030	0.016
Other	0.727	0.725	0.794	0.754	0.745	0.703
Industry, age 15-64 (Share of individuals in households with at least one member)						
Agriculture, mining, and fishing	0.052	0.047	0.112	0.130	0.041	0.040
Manufacturing	0.225	0.241	0.191	0.177	0.147	0.158
Services and Sales	0.684	0.605	0.532	0.469	0.655	0.624

Share of members with education in HH (age 15-64)						
Primary education	0.075	0.067	0.107	0.074	0.081	0.074
Lower secondary	0.184	0.195	0.263	0.252	0.162	0.149
Upper secondary	0.536	0.569	0.521	0.580	0.578	0.639
Tertiary education	0.206	0.170	0.110	0.093	0.179	0.139
Dwelling characteristics						
Square meters	90.711	87.120	92.523	95.296	83.187	85.564

Table A2: Alpha model

	Coeff.	Std Err.
1 Retiree	-0.2663**	0.1066
No service sector workers	0.3921***	0.1407
1 working person	-0.289**	0.147
2 working persons	-0.2543**	0.1208
Constant	-5.5976***	0.1786
Adj. R2	0.0019	
Observations	2,229	

Figure A1: NUTS 3 Poverty estimates and 95% confidence intervals

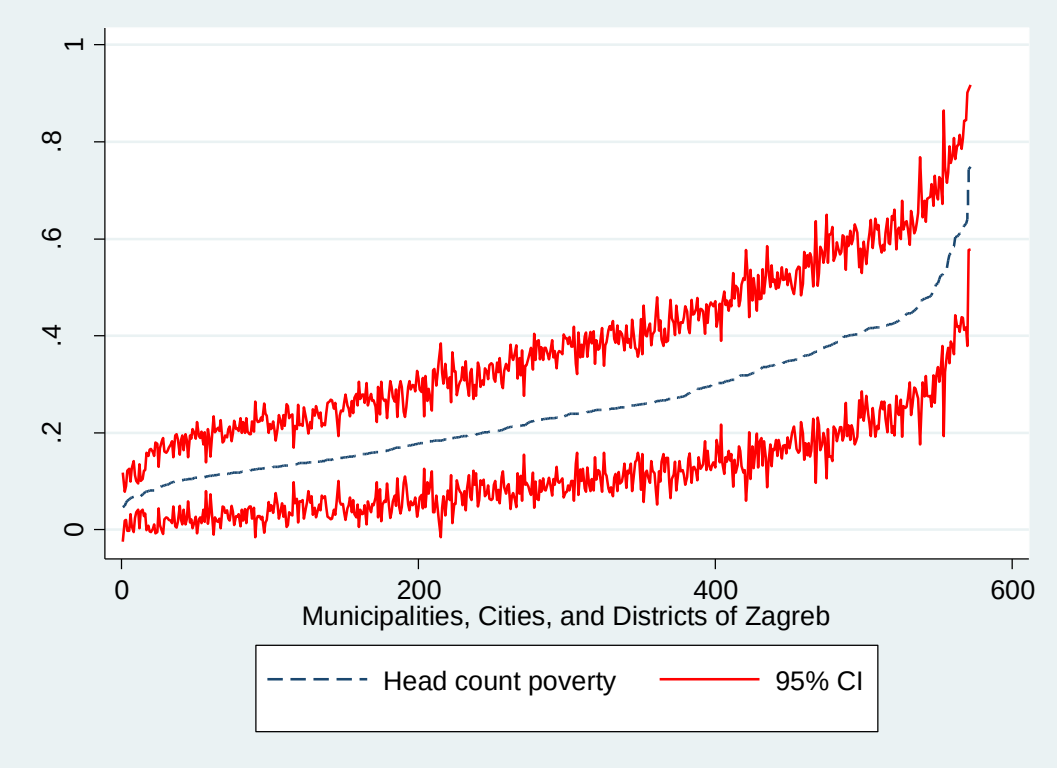

Figure A2: Poverty in the districts of Zagreb

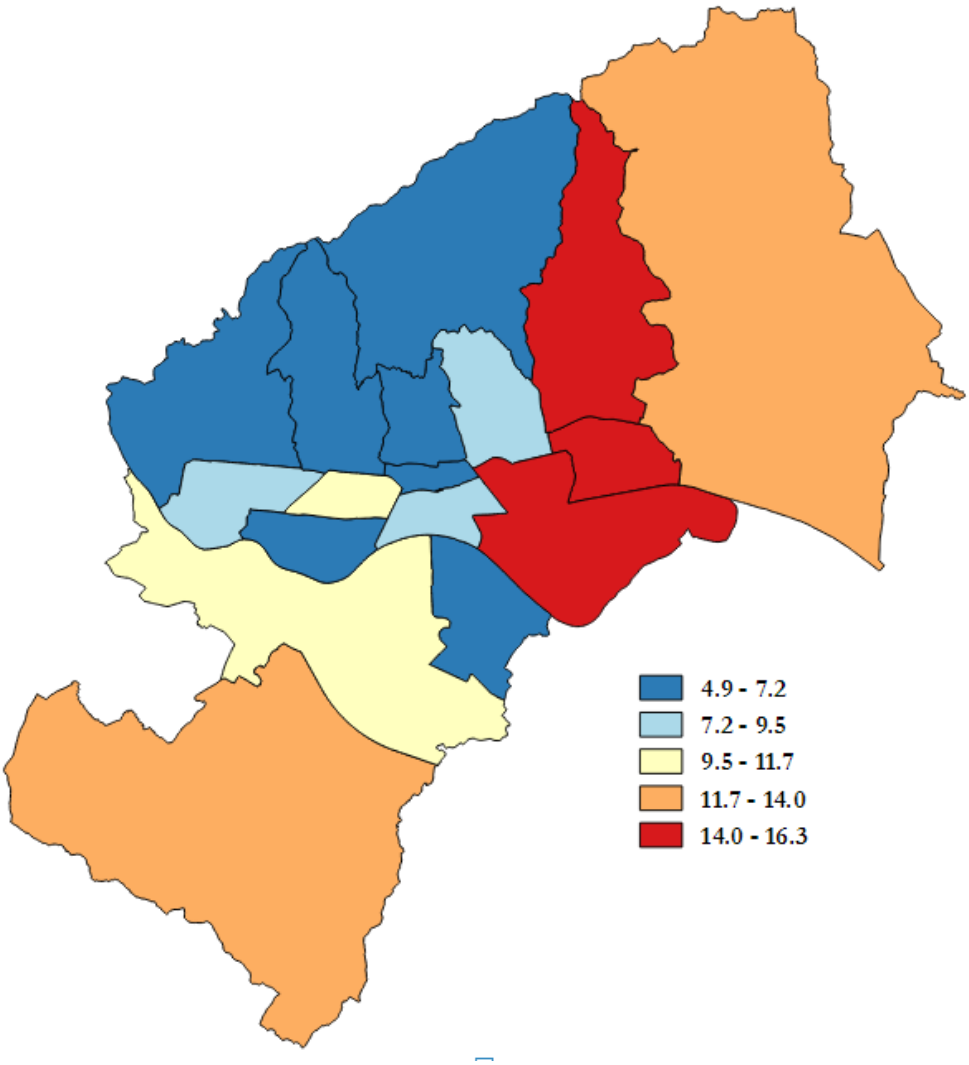

Table 3A: Poverty indicators by LAU-2

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Donji Grad	35,609	6.90	1.60	1.60	0.40	0.50	0.20	0.30
Gornji Grad-Medveščak	29,750	5.50	1.80	1.20	0.40	0.40	0.20	0.20
Trnje	41,021	7.30	1.60	1.70	0.40	0.60	0.20	0.30
Maksimir	47,362	7.50	2.40	1.70	0.60	0.60	0.20	0.40
Pešćenica-Žitnjak	55,057	16.00	3.20	4.40	1.00	1.80	0.40	1.00
Novi Zagreb-istok	58,052	6.60	1.70	1.40	0.40	0.50	0.20	0.40
Novi Zagreb-zapad	56,647	10.40	2.30	2.50	0.60	0.90	0.30	0.70
Trešnjevka-sjever	54,197	9.90	2.60	2.40	0.70	0.90	0.30	0.60
Trešnjevka-jug	65,555	6.80	1.70	1.50	0.40	0.50	0.20	0.50
Črnomerec	37,577	6.80	2.20	1.50	0.60	0.50	0.20	0.30
Gornja Dubrava	60,882	16.10	3.90	4.20	1.20	1.70	0.50	1.10
Donja Dubrava	35,871	16.30	3.50	4.30	1.10	1.80	0.50	0.70
Stenjevec	50,678	8.70	2.20	2.10	0.60	0.80	0.20	0.50
Podsused-Vrapče	44,580	6.80	1.40	1.50	0.40	0.50	0.10	0.30
Podsljeme	18,858	4.90	1.50	1.10	0.40	0.40	0.10	0.10
Sesvete	68,924	12.70	6.80	3.30	2.00	1.30	0.90	1.00
Brezovica	11,720	12.30	3.80	2.90	1.10	1.10	0.40	0.20
Grad Zagreb	**772,340**	**9.80**	**0.90**	**2.40**	**0.30**	**0.90**	**0.10**	**8.60**
Andrijaševci	4,020	37.50	8.90	11.10	3.20	4.80	1.60	0.20
Antunovac	3,610	21.30	7.80	5.70	2.50	2.30	1.10	0.10
Babina Greda	3,516	42.60	10.90	13.10	4.20	5.70	2.10	0.20
Bakar	8,211	16.00	4.80	4.00	1.40	1.50	0.60	0.10
Bale - Valle	1,125	13.80	4.80	3.30	1.30	1.20	0.50	0.00
Barban	2,688	10.70	5.80	2.50	1.70	0.90	0.70	0.00
Barilović	2,967	23.90	8.60	6.60	2.80	2.70	1.30	0.10
Baška	1,658	12.60	4.90	2.90	1.40	1.00	0.60	0.00
Baška Voda	2,773	21.60	6.30	5.70	1.90	2.20	0.80	0.10
Bebrina	3,185	40.30	10.70	12.40	4.30	5.50	2.20	0.10
Bedekovčina	7,759	20.00	5.50	5.30	1.70	2.10	0.80	0.20
Bednja	3,954	31.60	7.30	9.30	2.70	4.00	1.30	0.10
Beli Manastir	9,459	32.50	6.40	10.50	2.60	4.80	1.40	0.30
Belica	3,150	12.30	5.10	2.90	1.30	1.00	0.50	0.00
Belišće	10,509	36.20	10.20	11.60	4.00	5.30	2.10	0.40
Benkovac	10,934	42.30	8.60	13.20	3.50	5.80	1.80	0.50
Berek	1,437	39.90	10.50	13.10	4.20	6.10	2.20	0.10
Beretinec	2,117	18.30	7.50	4.40	2.10	1.70	0.90	0.00
Bibinje	3,969	30.30	8.50	8.50	3.00	3.50	1.50	0.10
Bilje	5,590	23.00	6.40	6.50	2.10	2.70	1.00	0.10
Biograd Na Moru	5,501	17.00	6.30	4.30	1.90	1.60	0.80	0.10
Bizovac	4,456	23.00	7.00	6.00	2.20	2.40	1.00	0.10
Bjelovar	39,061	15.80	5.00	4.20	1.60	1.70	0.70	0.70
Blato	3,460	6.00	3.10	1.10	0.70	0.40	0.20	0.00
Bogdanovci	1,877	24.20	8.40	6.30	2.70	2.40	1.20	0.10
Bol	1,576	16.50	5.90	4.00	1.60	1.50	0.70	0.00

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Borovo	4,857	41.80	7.80	13.00	3.30	5.80	1.80	0.20
Bosiljevo	1,253	24.70	6.30	7.00	2.20	2.90	1.10	0.00
Bošnjaci	3,748	43.00	9.90	14.20	4.40	6.50	2.40	0.20
Brckovljani	6,432	26.20	7.20	7.40	2.40	3.10	1.10	0.20
Brdovec	11,048	13.70	4.00	3.30	1.10	1.20	0.40	0.20
Brestovac	3,691	40.20	11.60	12.20	4.50	5.20	2.20	0.20
Breznica	2,188	27.70	9.40	7.60	3.10	3.10	1.40	0.10
Brinje	3,180	33.30	7.30	9.70	2.70	4.10	1.40	0.10
Brod Moravice	849	20.30	5.60	7.00	2.10	3.50	1.20	0.00
Brodski Stupnik	2,950	47.20	15.10	15.40	6.60	6.90	3.50	0.20
Brtonigla - Verteneglio	1,622	14.60	5.90	3.30	1.50	1.20	0.60	0.00
Budinščina	2,390	36.10	10.70	10.50	3.90	4.40	1.90	0.10
Buje - Buie	5,102	10.70	4.40	2.50	1.20	0.90	0.50	0.10
Buzet	6,048	6.90	3.40	1.50	0.90	0.50	0.30	0.00
Cerna	4,489	37.30	8.00	11.20	3.10	4.80	1.50	0.20
Cernik	3,562	40.10	9.40	12.40	3.90	5.40	2.00	0.20
Cerovlje	1,650	12.20	5.50	2.70	1.30	1.00	0.50	0.00
Cestica	5,504	34.90	6.90	10.70	2.40	4.90	1.20	0.20
Cetingrad	1,921	32.10	11.00	9.40	4.20	3.90	2.10	0.10
Cista Provo	2,310	42.40	11.40	13.10	4.70	5.70	2.40	0.10
Civljane	226	64.00	13.30	22.50	7.00	10.60	4.00	0.00
Cres	2,777	10.70	4.60	2.40	1.20	0.80	0.50	0.00
Crikvenica	10,947	13.00	2.80	3.10	0.80	1.20	0.30	0.20
Crnac	1,445	41.80	8.80	12.80	3.70	5.50	1.90	0.10
Čabar	3,748	4.70	3.70	0.90	0.90	0.30	0.30	0.00
Čačinci	2,758	37.90	8.80	11.30	3.30	4.80	1.60	0.10
Čađavica	1,983	33.90	10.60	9.70	3.80	4.00	1.80	0.10
Čaglin	2,363	46.30	9.80	15.20	4.40	6.90	2.40	0.10
Čakovec	26,422	17.20	3.10	5.30	1.00	2.50	0.50	0.50
Čavle	7,071	12.20	4.10	2.90	1.10	1.00	0.50	0.10
Čazma	7,926	13.20	4.20	3.20	1.10	1.20	0.40	0.10
Čeminac	2,780	27.40	6.80	7.30	2.20	2.90	1.00	0.10
Čepin	11,299	19.50	6.50	5.10	2.00	2.00	0.90	0.30
Darda	6,746	45.50	8.40	16.00	3.70	7.80	2.10	0.30
Daruvar	11,482	10.80	3.40	2.50	0.90	0.90	0.30	0.10
Davor	2,967	33.70	10.20	9.60	3.70	3.90	1.80	0.10
Delnice	5,747	12.90	3.70	3.40	1.10	1.40	0.40	0.10
Desinić	2,604	26.40	9.30	7.00	2.90	2.80	1.30	0.10
Dežanovac	2,706	37.80	13.90	11.30	5.80	4.90	3.00	0.10
Dicmo	2,753	29.90	8.50	8.50	3.00	3.50	1.40	0.10
Dobrinj	2,051	14.00	5.30	3.20	1.50	1.10	0.60	0.00
Domašinec	2,217	24.70	7.60	7.40	2.50	3.30	1.20	0.10
Brela	1,698	14.50	5.30	3.50	1.50	1.30	0.60	0.00
Donja Dubrava	1,895	17.60	6.20	4.30	1.80	1.60	0.80	0.00
Donja Stubica	5,375	15.00	5.10	3.70	1.40	1.40	0.60	0.10
Donja Voća	2,392	44.60	7.20	14.30	3.00	6.40	1.60	0.10

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Donji Andrijevci	3,666	32.30	7.70	9.50	2.90	4.00	1.40	0.10
Donji Kraljevec	4,527	12.90	4.80	3.00	1.30	1.10	0.50	0.10
Donji Kukuruzari	1,634	61.20	8.80	21.90	5.00	10.50	3.00	0.10
Donji Lapac	2,028	47.20	11.70	15.70	5.30	7.20	2.90	0.10
Martijanec	3,788	16.60	6.60	3.90	1.80	1.40	0.80	0.10
Donji Miholjac	9,275	29.30	5.70	8.20	1.90	3.40	0.90	0.30
Muć	3,838	25.50	7.10	6.60	2.30	2.50	1.00	0.10
Proložac	3,491	38.30	8.70	11.70	3.40	5.10	1.70	0.20
Donji Vidovec	1,378	21.10	6.00	6.10	1.90	2.60	0.90	0.00
Draganić	2,665	23.10	6.70	7.00	2.30	3.10	1.10	0.10
Draž	2,681	47.90	10.40	16.10	4.70	7.50	2.60	0.10
Drenovci	4,969	44.60	8.90	14.60	4.00	6.60	2.10	0.30
Drenje	2,592	51.60	10.80	17.30	4.90	8.00	2.70	0.20
Drniš	7,422	22.80	6.20	5.90	2.10	2.30	0.90	0.20
Drnje	1,832	19.20	5.80	5.90	1.90	2.70	1.00	0.00
Dubrava	5,023	31.80	9.60	8.80	3.40	3.50	1.60	0.20
Dubrovnik	41,417	7.80	2.30	1.80	0.60	0.60	0.20	0.40
Duga Resa	11,120	19.00	7.00	4.90	2.30	1.90	1.00	0.20
Dugi Rat	6,982	26.00	7.10	7.10	2.30	2.80	1.00	0.20
Dugo Selo	17,201	16.80	4.90	4.30	1.50	1.70	0.60	0.30
Dvor	5,478	45.20	8.10	14.80	3.70	6.70	2.00	0.30
Đakovo	26,790	30.20	6.00	8.70	2.10	3.70	1.00	0.90
Đelekovec	1,490	18.70	5.40	4.90	1.70	1.90	0.80	0.00
Đulovac	3,171	43.50	12.40	14.10	5.10	6.50	2.70	0.20
Đurđenovac	6,598	36.50	7.00	10.80	2.50	4.60	1.20	0.30
Đurđevac	8,090	23.90	5.30	7.70	1.90	3.60	1.00	0.20
Đurmanec	4,150	17.80	6.90	4.20	2.00	1.50	0.80	0.10
Erdut	7,108	48.30	11.70	16.00	5.20	7.30	2.80	0.40
Ernestinovo	2,064	14.40	6.00	3.30	1.60	1.10	0.60	0.00
Ervenik	1,098	62.80	11.00	22.70	6.00	10.80	3.50	0.10
Farkaševac	1,889	30.90	11.30	9.40	4.10	4.20	2.00	0.10
Ferdinandovac	1,739	22.40	9.20	6.30	2.90	2.60	1.40	0.00
Feričanci	2,093	39.00	9.10	12.10	3.70	5.30	1.90	0.10
Fužine	1,570	10.40	4.20	2.30	1.10	0.80	0.40	0.00
Garčin	4,729	41.70	10.30	13.30	4.10	5.90	2.10	0.20
Garešnica	10,258	26.70	5.70	7.90	2.00	3.40	1.00	0.30
Generalski Stol	2,586	23.90	7.10	6.10	2.10	2.40	0.90	0.10
Glina	8,757	28.10	6.30	8.10	2.20	3.40	1.10	0.30
Gola	2,389	22.90	6.80	6.00	2.00	2.40	0.90	0.10
Goričan	2,777	17.80	5.40	4.30	1.50	1.60	0.60	0.10
Gorjani	1,564	40.10	11.00	12.10	4.20	5.20	2.00	0.10
Gornja Stubica	5,258	23.30	6.70	6.00	2.00	2.30	0.90	0.10
Gornji Bogićevci	1,957	52.60	7.50	18.70	3.70	9.00	2.20	0.10
Gornji Kneginec	5,252	20.70	6.10	5.30	1.80	2.00	0.70	0.10
Gospić	12,320	14.10	3.60	3.50	1.00	1.30	0.40	0.20
Gračac	4,661	43.40	8.40	13.80	3.60	6.10	1.80	0.20

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Gračišće	1,416	11.50	4.70	2.60	1.20	0.90	0.50	0.00
Gradac	3,237	25.80	9.00	7.30	3.10	3.00	1.50	0.10
Gradec	3,601	25.70	7.80	7.10	2.60	2.90	1.20	0.10
Gradina	3,799	55.60	9.20	19.20	4.60	9.00	2.60	0.20
Gradište	2,627	34.20	8.00	10.00	3.00	4.20	1.50	0.10
Grožnjan - Grisignana	733	19.10	5.40	4.60	1.60	1.70	0.70	0.00
Grubišno Polje	6,383	19.40	4.20	5.30	1.30	2.10	0.60	0.10
Gundinci	2,013	58.50	11.40	20.50	5.80	9.70	3.30	0.10
Gunja	3,637	60.30	8.20	23.20	4.50	11.80	2.70	0.20
Hercegovac	2,378	15.90	6.20	4.00	1.80	1.50	0.80	0.00
Hlebine	1,271	23.20	6.90	6.60	2.30	2.90	1.10	0.00
Hraščina	1,535	22.10	6.80	5.30	2.00	1.90	0.80	0.00
Hrvace	3,595	39.60	10.80	11.80	4.20	5.00	2.10	0.20
Hrvatska Dubica	2,070	47.60	8.10	15.60	3.60	7.00	2.00	0.10
Hrvatska Kostajnica	2,734	27.40	7.80	7.40	2.70	2.90	1.30	0.10
Brezničk Hum	1,314	25.00	9.20	6.70	2.90	2.60	1.30	0.00
Hum Na Sutli	4,851	11.80	5.70	2.80	1.60	1.00	0.70	0.10
Hvar	4,218	12.10	4.00	2.80	1.00	1.00	0.40	0.10
Ilok	6,500	19.30	5.80	5.00	1.80	1.90	0.80	0.10
Imotski	10,671	39.20	9.20	12.70	3.80	5.70	2.00	0.50
Ivanec	13,447	16.90	3.20	4.20	0.90	1.60	0.40	0.30
Ivanić-Grad	14,292	20.60	4.40	5.60	1.40	2.30	0.60	0.30
Ivankovo	7,762	36.70	6.90	10.50	2.60	4.40	1.20	0.30
Ivanska	2,908	24.50	8.40	7.00	2.70	3.00	1.30	0.10
Jakovlje	3,813	15.00	5.40	3.60	1.50	1.30	0.60	0.10
Jakšić	3,986	26.70	7.50	7.50	2.60	3.10	1.20	0.10
Jalžabet	3,120	23.40	6.50	6.20	2.00	2.50	0.90	0.10
Jarmina	2,440	31.10	9.80	8.50	3.30	3.40	1.50	0.10
Jasenice	1,395	25.60	9.00	6.60	2.80	2.50	1.20	0.00
Jasenovac	1,987	34.40	10.10	10.00	3.70	4.10	1.80	0.10
Jastrebarsko	15,625	13.10	3.90	3.20	1.10	1.20	0.40	0.20
Jelenje	5,277	19.20	6.00	4.70	1.70	1.80	0.70	0.10
Jelsa	3,556	16.10	6.90	4.00	2.10	1.50	0.90	0.10
Josipdol	3,723	30.00	8.80	9.10	3.10	4.10	1.50	0.10
Kali	1,628	18.90	9.00	4.50	2.80	1.60	1.20	0.00
Kanfanar	1,541	8.10	3.60	1.80	0.90	0.60	0.40	0.00
Kapela	2,939	37.50	10.20	11.50	4.00	5.00	2.00	0.10
Kaptol	3,446	40.20	10.00	12.70	4.00	5.60	2.00	0.20
Karlobag	915	25.90	10.30	7.00	3.70	2.80	1.70	0.00
Karlovac	54,120	18.00	2.80	4.80	0.90	1.90	0.40	1.10
Kastav	10,346	9.20	3.40	2.10	0.90	0.70	0.30	0.10
Kaštela	38,044	20.30	5.20	5.20	1.60	2.00	0.70	0.90
Kijevo	415	24.40	8.40	5.90	2.50	2.10	1.00	0.00
Kistanje	3,429	74.80	8.60	32.50	6.40	17.80	4.40	0.30
Klakar	2,251	29.60	8.30	8.10	2.90	3.30	1.40	0.10
Klana	1,966	9.70	4.00	2.20	1.00	0.80	0.40	0.00

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Klanjec	2,911	8.90	4.00	2.00	1.00	0.70	0.40	0.00
Klenovnik	2,006	20.30	7.20	5.20	2.20	2.00	0.90	0.00
Klinča Sela	5,108	14.50	6.30	3.50	1.80	1.30	0.70	0.10
Klis	4,738	23.10	5.20	6.00	1.60	2.30	0.70	0.10
Kloštar Ivanić	5,990	27.50	7.70	7.70	2.70	3.20	1.30	0.20
Kloštar Podravski	3,200	41.00	8.30	15.40	3.70	8.00	2.10	0.10
Kneževi Vinogradi	4,517	41.50	9.10	13.30	3.80	6.00	2.00	0.20
Knin	15,011	42.70	7.70	14.00	3.40	6.30	1.80	0.70
Komiža	1,519	16.30	5.40	3.90	1.50	1.40	0.60	0.00
Konavle	8,549	10.40	4.60	2.40	1.20	0.90	0.50	0.10
Končanica	2,340	11.20	6.20	2.70	1.70	1.00	0.70	0.00
Konjščina	3,658	18.60	8.00	4.80	2.50	1.80	1.10	0.10
Koprivnica	29,930	14.70	2.30	3.80	0.70	1.50	0.30	0.50
Koprivnički Bregi	2,270	20.50	4.90	5.20	1.50	2.00	0.70	0.10
Koprivnički Ivanec	1,972	19.70	7.60	5.00	2.30	1.90	1.00	0.00
Korčula	5,585	12.70	5.70	2.90	1.60	1.10	0.60	0.10
Koška	3,889	34.80	8.40	10.30	3.20	4.40	1.60	0.20
Kotoriba	3,080	25.80	5.70	9.40	2.20	4.80	1.30	0.10
Kraljevec Na Sutli	1,727	10.30	4.20	2.10	1.00	0.70	0.40	0.00
Kraljevica	4,490	11.50	3.90	2.60	1.00	0.90	0.40	0.10
Krapina	12,105	13.00	3.90	3.10	1.00	1.20	0.40	0.20
Krapinske Toplice	5,249	14.00	5.60	3.50	1.60	1.30	0.70	0.10
Križ	6,794	26.90	6.20	7.30	2.00	2.90	0.90	0.20
Križevci	20,631	15.10	4.60	3.70	1.30	1.40	0.60	0.40
Krk	5,951	10.50	5.20	2.30	1.30	0.80	0.50	0.10
Krnjak	1,826	48.20	10.50	16.20	4.80	7.50	2.70	0.10
Kršan	2,913	15.90	5.40	4.00	1.60	1.50	0.70	0.10
Kula Norinska	1,608	37.70	9.60	11.60	3.80	5.10	2.00	0.10
Kutina	22,337	19.70	4.00	5.50	1.30	2.30	0.60	0.50
Kutjevo	6,165	30.70	8.50	8.70	3.00	3.60	1.40	0.20
Labin	11,497	6.70	3.10	1.40	0.80	0.50	0.30	0.10
Lanišće	328	17.80	6.90	4.00	2.00	1.40	0.90	0.00
Lasinja	1,612	15.00	6.60	3.80	1.90	1.50	0.80	0.00
Lastovo	792	16.50	7.20	4.00	2.10	1.50	0.90	0.00
Legrad	2,185	11.80	4.60	3.00	1.30	1.10	0.50	0.00
Lekenik	5,885	22.90	6.20	6.10	1.90	2.50	0.90	0.20
Lepoglava	7,437	22.70	6.40	6.10	2.10	2.40	1.00	0.20
Levanjska Varoš	1,016	60.50	9.50	23.40	5.60	11.90	3.60	0.10
Lipik	6,002	22.50	6.40	6.10	2.10	2.40	0.90	0.20
Lipovljani	3,450	17.50	6.30	4.30	1.80	1.60	0.80	0.10
Lišane Ostovičke	686	32.30	10.00	9.70	3.90	4.20	2.00	0.00
Ližnjan - Lisignano	3,806	14.10	4.60	3.40	1.30	1.30	0.50	0.10
Lobor	2,818	25.50	6.10	6.60	1.90	2.50	0.80	0.10
Lokve	1,004	15.60	5.40	3.60	1.50	1.30	0.60	0.00
Lovas	1,207	15.70	7.50	3.80	2.10	1.40	0.90	0.00
Lovinac	995	13.20	6.30	3.30	1.80	1.30	0.80	0.00

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Lovran	4,033	9.50	3.80	2.20	1.00	0.80	0.40	0.00
Lovreć	1,691	35.10	9.80	10.50	3.80	4.50	1.90	0.10
Ludbreg	8,223	10.70	4.20	2.60	1.10	1.00	0.50	0.10
Lukač	3,568	41.30	6.90	12.80	2.70	5.60	1.40	0.20
Lupoglav	918	13.70	6.20	3.10	1.60	1.10	0.60	0.00
Ljubešćica	1,837	21.80	6.20	5.60	1.90	2.20	0.80	0.00
Mače	2,511	30.60	8.00	8.20	2.80	3.30	1.30	0.10
Makarska	13,684	11.60	3.40	2.80	1.00	1.10	0.40	0.20
Mala Subotica	5,274	24.80	4.60	9.40	1.80	5.00	1.10	0.10
Mali Bukovec	2,185	21.40	7.10	5.80	2.20	2.40	1.00	0.10
Mali Lošinj	7,916	14.70	4.50	3.40	1.20	1.20	0.50	0.10
Malinska-Dubašnica	3,050	13.40	5.20	3.10	1.40	1.10	0.60	0.00
Marčana	4,199	13.70	4.00	3.30	1.10	1.20	0.50	0.10
Marija Bistrica	5,889	18.30	4.80	4.60	1.40	1.70	0.60	0.10
Marijanci	2,358	28.60	8.10	7.50	2.50	2.90	1.10	0.10
Marina	4,496	24.00	5.90	6.20	1.90	2.40	0.80	0.10
Martinska Ves	3,393	26.30	7.50	7.10	2.50	2.80	1.10	0.10
Maruševec	6,275	15.00	4.30	3.70	1.10	1.40	0.50	0.10
Matulji	11,121	11.10	4.10	2.60	1.10	1.00	0.50	0.10
Medulin	6,374	6.20	3.20	1.40	0.80	0.50	0.30	0.00
Metković	15,956	29.00	7.20	8.40	2.50	3.50	1.20	0.50
Mihovljan	1,921	35.00	8.10	10.10	3.00	4.20	1.40	0.10
Mikleuš	1,449	47.60	10.30	15.40	4.60	6.90	2.50	0.10
Milna	1,022	14.50	6.30	3.40	1.80	1.20	0.70	0.00
Mljet	1,061	20.10	6.40	5.30	2.10	2.10	0.90	0.00
Molve	2,147	23.70	8.10	6.10	2.50	2.40	1.10	0.10
Podravska Moslavina	1,153	35.10	9.40	10.20	3.40	4.30	1.60	0.00
Mošćenička Draga	1,526	10.10	4.30	2.30	1.10	0.80	0.40	0.00
Motovun - Montona	916	19.60	6.90	5.10	2.10	1.90	0.90	0.00
Mrkopalj	1,205	12.80	5.50	2.90	1.40	1.00	0.60	0.00
Mursko-Središće	6,209	24.90	7.00	7.90	2.40	3.70	1.20	0.20
Našice	15,912	24.30	5.80	7.00	1.90	3.00	0.90	0.40
Nedelišće	11,700	23.90	4.10	8.40	1.50	4.20	0.80	0.30
Nerežišća	845	13.80	5.80	3.00	1.50	1.00	0.50	0.00
Netretić	2,791	22.20	7.30	5.70	2.20	2.20	0.90	0.10
Nin	2,710	23.00	6.90	6.00	2.40	2.30	1.10	0.10
Nova Bukovica	1,769	50.50	9.70	17.00	4.50	7.80	2.50	0.10
Nova Gradiška	13,880	26.70	6.10	7.90	2.10	3.40	1.00	0.40
Nova Kapela	4,108	35.20	9.70	10.00	3.50	4.00	1.70	0.20
Nova Rača	3,391	20.20	7.20	5.20	2.10	2.00	0.90	0.10
Novalja	3,613	16.20	5.30	3.80	1.40	1.40	0.60	0.10
Novi Marof	13,103	14.20	3.80	3.40	1.00	1.30	0.40	0.20
Novi Vinodolski	4,976	13.90	4.30	3.40	1.20	1.30	0.50	0.10
Novigrad - Cittanova	4,145	9.30	3.50	2.10	0.90	0.70	0.40	0.00
Novigrad Podravski	2,758	32.90	7.50	10.10	2.70	4.60	1.30	0.10
Novska	13,404	25.20	7.80	7.10	2.70	2.90	1.30	0.40

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Nuštar	5,486	25.00	6.90	7.00	2.30	2.90	1.00	0.20
Nijemci	4,643	38.30	12.30	11.80	4.80	5.20	2.40	0.20
Obrovac	4,254	43.70	9.30	14.50	4.10	6.70	2.30	0.20
Ogulin	13,687	19.60	5.30	5.20	1.60	2.10	0.70	0.30
Promina	1,048	27.20	9.70	6.90	3.10	2.60	1.30	0.00
Okučani	3,362	63.10	10.90	24.00	6.60	12.10	4.20	0.20
Omiš	14,654	27.10	6.70	7.50	2.30	3.00	1.00	0.50
Omišalj	2,973	14.00	4.90	3.70	1.50	1.50	0.70	0.00
Opatija	11,369	12.40	4.00	2.90	1.10	1.10	0.40	0.20
Oprisavci	2,481	24.70	7.30	6.50	2.20	2.60	1.00	0.10
Oprtalj - Portole	850	19.30	7.80	5.00	2.40	1.90	1.00	0.00
Opuzen	3,133	18.60	6.50	4.70	2.00	1.80	0.90	0.10
Orahovica	5,090	25.40	6.70	6.90	2.30	2.80	1.00	0.10
Orebić	4,031	9.00	5.00	2.00	1.30	0.70	0.50	0.00
Oriovac	5,719	33.50	7.80	9.80	2.90	4.20	1.40	0.20
Biskupija	1,688	56.70	11.40	18.90	5.60	8.50	3.10	0.10
Oroslavje	6,039	14.20	4.00	3.50	1.10	1.30	0.50	0.10
Osijek	105,841	18.30	3.20	4.90	1.00	1.90	0.40	2.20
Otočac	9,516	17.30	4.00	4.50	1.20	1.80	0.50	0.20
Otok	5,401	41.70	11.50	12.90	4.70	5.70	2.40	0.30
Ozalj	6,537	27.00	10.40	7.40	3.30	3.00	1.50	0.20
Pag	3,802	11.30	4.60	2.50	1.20	0.90	0.40	0.00
Pakoštane	4,090	39.90	10.50	12.50	4.40	5.50	2.30	0.20
Pakrac	8,345	24.10	5.90	6.60	2.00	2.60	0.90	0.20
Pašman	2,069	29.00	9.60	7.80	3.30	3.10	1.50	0.10
Pazin	8,570	18.40	10.20	4.60	3.00	1.80	1.30	0.20
Perušić	2,636	25.00	8.30	7.00	2.80	2.90	1.30	0.10
Peteranec	2,648	29.50	6.70	10.10	2.50	5.00	1.30	0.10
Petlovac	2,350	45.70	9.00	14.60	3.90	6.50	2.00	0.10
Petrijanec	4,695	24.10	7.20	8.40	2.50	4.30	1.40	0.10
Petrijevci	2,761	30.20	8.30	8.50	2.80	3.50	1.30	0.10
Petrinja	23,896	19.00	4.50	5.10	1.50	2.00	0.70	0.50
Petrovsko	2,643	25.20	8.00	6.70	2.40	2.70	1.10	0.10
Pićan	1,805	12.60	5.40	2.80	1.40	0.90	0.50	0.00
Pisarovina	3,661	10.40	4.70	2.40	1.20	0.90	0.50	0.00
Pitomača	9,782	40.80	6.20	13.50	2.50	6.30	1.40	0.50
Plaški	2,057	52.40	10.20	17.10	4.80	7.70	2.60	0.10
Pleternica	11,115	28.70	8.10	8.00	2.90	3.20	1.30	0.40
Ploče	9,776	21.00	6.20	5.50	2.00	2.10	0.90	0.20
Podbablje	4,679	35.30	6.70	10.90	2.60	4.80	1.30	0.20
Podcrkavlje	2,544	33.80	8.30	10.20	3.20	4.40	1.60	0.10
Podgora	2,505	25.10	6.70	6.80	2.20	2.70	1.00	0.10
Podgorač	2,834	53.80	9.10	19.40	4.20	9.70	2.40	0.20
Podstrana	8,932	11.40	3.40	2.80	0.90	1.10	0.40	0.10
Podturen	3,810	29.20	8.30	8.80	2.70	4.00	1.30	0.10
Pojezerje	896	38.00	11.70	10.90	4.40	4.50	2.10	0.00

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Polača	1,452	31.50	9.30	8.70	3.30	3.50	1.50	0.10
Poličnik	4,454	29.60	8.80	8.00	3.00	3.10	1.30	0.10
Popovac	2,044	43.00	9.50	14.00	4.30	6.30	2.30	0.10
Popovača	11,394	25.70	6.00	7.70	2.10	3.40	1.00	0.30
Poreč - Parenzo	16,438	11.50	3.50	2.80	1.00	1.00	0.40	0.20
Posedarje	3,565	32.50	8.70	9.20	3.10	3.80	1.40	0.10
Postira	1,542	11.80	4.40	2.70	1.20	1.00	0.50	0.00
Požega	25,406	18.80	3.80	4.90	1.20	1.90	0.50	0.50
Pregrada	6,485	24.70	6.50	6.30	2.00	2.40	0.80	0.20
Preko	3,339	17.40	5.90	4.10	1.70	1.50	0.70	0.10
Prelog	7,638	14.60	4.60	3.50	1.30	1.30	0.50	0.10
Preseka	1,413	11.80	5.50	2.50	1.30	0.80	0.50	0.00
Primošten	2,794	18.40	5.80	4.40	1.70	1.60	0.70	0.10
Pučišća	2,144	14.90	5.00	3.50	1.30	1.20	0.50	0.00
Pula - Pola	55,918	11.20	2.00	2.60	0.50	0.90	0.20	0.70
Punat	1,907	10.50	4.30	2.30	1.10	0.80	0.40	0.00
Punitovci	1,750	36.60	9.50	10.40	3.40	4.30	1.60	0.10
Pušća	2,615	13.40	5.30	3.30	1.50	1.30	0.60	0.00
Rab	7,942	15.20	6.10	3.60	1.70	1.30	0.70	0.10
Radoboj	3,339	25.30	6.00	6.60	1.80	2.50	0.80	0.10
Rakovica	2,368	23.00	8.20	6.10	2.60	2.30	1.20	0.10
Rasinja	3,171	40.50	7.00	13.10	2.80	6.00	1.40	0.10
Raša	3,074	14.90	4.90	3.50	1.40	1.30	0.50	0.10
Ravna Gora	2,426	8.10	4.00	1.70	1.00	0.50	0.40	0.00
Ražanac	2,900	32.70	10.10	9.20	3.60	3.80	1.70	0.10
Rešetari	4,653	52.90	17.10	18.80	8.80	9.00	5.20	0.30
Rijeka	125,857	10.90	1.50	2.60	0.40	0.90	0.20	1.60
Rovinj	13,942	12.90	4.00	3.00	1.10	1.10	0.50	0.20
Rovišće	4,749	30.20	6.70	8.90	2.30	3.90	1.10	0.20
Rugvica	7,661	25.30	7.10	6.90	2.20	2.80	1.00	0.20
Ružić	1,559	22.60	8.40	5.60	2.60	2.10	1.10	0.00
Saborsko	626	33.60	12.70	10.10	4.80	4.30	2.40	0.00
Sali	1,672	14.00	5.90	3.00	1.60	1.00	0.60	0.00
Samobor	37,186	13.90	3.60	3.40	1.00	1.30	0.40	0.60
Satnica Đakovačka	2,082	44.70	10.70	14.10	4.50	6.30	2.40	0.10
Seget	4,787	26.00	7.30	6.90	2.30	2.70	1.00	0.10
Selca	1,786	17.80	5.70	4.30	1.70	1.60	0.70	0.00
Selnica	2,885	26.10	6.10	6.90	2.00	2.70	0.90	0.10
Semeljci	4,219	44.20	9.80	15.20	4.20	7.30	2.30	0.20
Senj	7,095	13.50	3.70	3.20	1.00	1.10	0.40	0.10
Sibinj	6,815	35.90	9.20	10.60	3.60	4.50	1.80	0.30
Sinj	24,471	24.30	7.70	6.70	2.60	2.70	1.20	0.70
Sirač	2,201	23.40	8.60	6.10	2.70	2.40	1.20	0.10
Sisak	46,762	17.00	3.70	4.50	1.20	1.80	0.50	0.90
Skrad	1,054	8.60	4.70	1.70	1.10	0.50	0.40	0.00
Skradin	3,701	25.00	7.30	6.70	2.40	2.60	1.10	0.10

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Slatina	13,529	25.90	5.30	7.40	1.80	3.10	0.90	0.40
Slavonski Brod	57,296	30.30	4.40	9.10	1.60	4.00	0.80	2.00
Slavonski Šamac	2,112	41.50	10.10	13.30	4.20	5.90	2.20	0.10
Slivno	1,906	22.80	7.50	6.00	2.20	2.40	1.00	0.00
Slunj	5,012	36.00	9.30	10.70	3.60	4.50	1.80	0.20
Smokvica	874	8.00	3.70	1.60	0.90	0.50	0.30	0.00
Sokolovac	3,346	34.00	9.00	10.10	3.40	4.30	1.70	0.10
Solin	23,670	12.00	4.00	2.90	1.10	1.10	0.40	0.30
Sopje	2,242	49.50	11.90	15.70	5.40	6.90	2.90	0.10
Split	173,163	13.40	1.80	3.30	0.50	1.20	0.20	2.60
Sračinec	4,689	18.50	5.90	4.80	1.70	1.90	0.70	0.10
Stankovci	1,982	31.90	10.00	8.60	3.50	3.40	1.60	0.10
Stara Gradiška	1,349	42.10	11.20	13.20	4.60	5.80	2.40	0.10
Stari Grad	2,744	15.60	6.20	3.70	1.80	1.30	0.70	0.00
Stari Jankovci	4,322	40.90	9.40	12.80	3.80	5.60	1.90	0.20
Stari Mikanovci	2,864	38.10	11.70	11.70	4.80	5.10	2.50	0.10
Starigrad	1,869	29.30	8.10	8.00	2.80	3.10	1.30	0.10
Staro Petrovo Selo	5,090	47.40	8.70	15.70	3.90	7.20	2.10	0.30
Ston	2,287	24.90	8.80	6.80	3.00	2.70	1.40	0.10
Strizivojna	2,494	42.00	7.90	12.90	3.00	5.60	1.50	0.10
Stubičke Toplice	2,736	14.10	5.20	3.50	1.50	1.30	0.60	0.00
Sućuraj	458	21.40	8.50	5.00	2.50	1.80	1.00	0.00
Suhopolje	6,477	36.00	10.50	11.50	4.30	5.10	2.20	0.30
Sukošan	4,533	31.80	7.90	8.80	2.80	3.60	1.30	0.20
Sunja	5,709	44.50	9.80	14.30	4.30	6.40	2.30	0.30
Supetar	3,997	12.60	5.00	2.90	1.40	1.10	0.50	0.10
Sveti Filip I Jakov	4,434	30.70	7.30	8.70	2.50	3.60	1.20	0.20
Sveti Ivan Zelina	15,623	19.90	4.90	5.10	1.50	2.00	0.70	0.40
Sveti Križ Začretje	6,037	19.40	5.50	4.80	1.70	1.80	0.70	0.10
Sveti Lovreč	1,014	10.10	4.90	2.10	1.20	0.70	0.50	0.00
Sveta Nedelja	2,880	8.60	4.80	1.90	1.20	0.60	0.50	0.00
Sveti Petar U Šumi	1,052	8.10	4.40	1.60	1.00	0.50	0.40	0.00
Svetvinčenat	2,184	13.20	5.40	3.40	1.60	1.30	0.70	0.00
Sveta Nedelja	17,785	11.00	5.00	2.60	1.30	0.90	0.50	0.20
Sveti Đurđ	3,763	27.20	7.90	7.80	2.60	3.40	1.20	0.10
Sveti Ilija	3,357	15.50	6.30	3.80	1.80	1.40	0.70	0.10
Sveti Ivan Žabno	5,086	21.20	7.30	5.30	2.10	2.00	0.90	0.10
Sveti Juraj Na Bregu	4,909	31.90	13.20	9.10	4.70	3.80	2.20	0.20
Sveti Martin Na Muri	2,586	21.40	5.00	5.50	1.50	2.10	0.60	0.10
Sveti Petar Orehovec	4,449	12.50	5.30	2.80	1.30	1.00	0.50	0.10
Šestanovac	1,849	38.70	10.50	11.50	4.10	4.80	2.00	0.10
Šibenik	45,426	13.90	3.00	3.40	0.90	1.20	0.40	0.70
Škabrnja	1,770	23.90	8.10	6.40	2.60	2.60	1.20	0.00
Šolta	1,668	20.40	7.60	5.00	2.30	1.80	0.90	0.00
Špišić Bukovica	4,171	41.90	8.60	13.20	3.50	5.90	1.80	0.20
Štefanje	1,988	23.60	8.10	7.40	2.90	3.40	1.50	0.10

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Štrigova	2,526	24.90	6.80	6.70	2.10	2.70	1.00	0.10
Tinjan	1,660	11.30	4.90	2.60	1.30	0.90	0.50	0.00
Tisno	3,089	22.80	7.50	5.70	2.30	2.10	0.90	0.10
Plitvička Jezera	4,299	15.40	5.20	3.70	1.50	1.40	0.60	0.10
Tompojevci	1,523	37.40	10.70	11.00	4.20	4.60	2.10	0.10
Topusko	2,956	23.70	7.40	6.70	2.60	2.70	1.20	0.10
Tordinci	2,004	33.50	10.30	9.60	3.70	4.00	1.70	0.10
Tovarnik	2,736	26.10	7.80	7.20	2.60	2.90	1.20	0.10
Trilj	8,801	42.30	8.40	13.00	3.40	5.60	1.70	0.40
Trnava	1,568	53.70	10.80	18.50	5.00	8.80	2.80	0.10
Trnovec Bartolovečki	6,470	11.70	4.10	2.70	1.10	0.90	0.40	0.10
Trogir	12,784	20.10	5.60	5.10	1.70	2.00	0.70	0.30
Trpinja	5,386	41.60	8.40	12.80	3.40	5.60	1.80	0.30
Tuhelj	1,973	18.20	5.50	4.40	1.60	1.70	0.60	0.00
Udbina	1,791	23.90	9.20	6.10	2.90	2.30	1.20	0.00
Umag	13,383	13.00	4.00	3.10	1.10	1.20	0.40	0.20
Unešić	1,637	24.10	8.00	5.90	2.40	2.10	1.00	0.00
Valpovo	11,216	21.50	5.30	5.70	1.70	2.30	0.80	0.30
Varaždin	45,378	10.20	2.70	2.40	0.70	0.90	0.30	0.50
Varaždinske Toplice	6,316	17.30	6.20	4.30	1.80	1.60	0.80	0.10
Vela Luka	4,059	13.00	5.50	3.00	1.50	1.10	0.60	0.10
Velika	5,393	34.80	8.00	10.40	3.10	4.50	1.50	0.20
Velika Kopanica	3,258	47.90	10.50	15.40	4.60	6.90	2.40	0.20
Velika Ludina	2,614	27.00	8.00	7.80	2.70	3.30	1.30	0.10
Velika Pisanica	1,775	11.30	4.90	2.50	1.20	0.80	0.40	0.00
Veliki Grđevac	2,808	18.40	7.10	4.90	2.10	1.90	0.90	0.10
Veliko Trgovišće	4,856	26.90	8.70	7.20	2.80	2.80	1.30	0.10
Veliko Trojstvo	2,687	29.90	8.20	8.40	2.70	3.40	1.20	0.10
Vidovec	5,325	16.60	5.50	4.00	1.50	1.50	0.60	0.10
Viljevo	2,038	61.10	10.40	22.30	5.20	11.00	3.00	0.10
Vinica	3,336	15.90	5.50	3.90	1.60	1.50	0.70	0.10
Vinkovci	34,453	21.50	3.10	5.90	1.00	2.40	0.50	0.80
Vinodolska Općina	3,539	13.80	4.10	3.20	1.10	1.20	0.40	0.10
Vir	2,972	26.60	8.50	7.20	2.80	2.90	1.30	0.10
Virje	4,451	30.90	7.80	9.00	2.80	3.80	1.40	0.20
Virovitica	20,924	18.20	4.30	4.70	1.30	1.80	0.60	0.40
Vis	1,842	14.90	5.80	3.40	1.60	1.20	0.70	0.00
Visoko	1,498	35.30	7.90	9.40	2.70	3.60	1.30	0.10
Viškovci	1,885	36.70	13.80	11.70	5.70	5.30	3.00	0.10
Viškovo	14,235	12.20	3.80	2.90	1.00	1.10	0.40	0.20
Višnjan - Visignano	2,261	11.80	4.70	2.60	1.20	0.90	0.50	0.00
Vižinada - Visinada	1,146	10.80	4.80	2.40	1.20	0.80	0.50	0.00
Voćin	2,274	74.30	8.40	31.20	6.00	16.70	4.10	0.20
Vodice	8,784	24.60	4.90	6.50	1.60	2.50	0.70	0.20
Vodnjan - Dignano	5,943	23.90	7.10	6.70	2.30	2.80	1.10	0.20
Vojnić	4,524	57.20	9.40	20.50	4.90	9.90	2.90	0.30

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Vratišinec	1,953	20.20	7.00	4.80	2.00	1.70	0.80	0.00
Vrbanja	3,815	34.40	8.70	9.80	3.10	4.00	1.50	0.10
Vrbje	2,162	60.70	9.50	22.10	5.00	10.80	2.90	0.10
Vrbnik	1,244	9.00	4.70	2.00	1.20	0.70	0.50	0.00
Vrbovec	14,406	22.40	5.40	6.00	1.70	2.40	0.80	0.40
Vrbovsko	5,025	17.60	5.60	4.50	1.70	1.70	0.70	0.10
Gvozd	2,889	42.10	9.80	12.80	4.20	5.50	2.10	0.10
Vrgorac	6,336	34.10	7.90	10.10	2.90	4.30	1.40	0.20
Vrhovine	1,378	57.50	10.10	20.30	5.20	9.60	3.00	0.10
Vrlika	1,968	15.80	5.60	3.90	1.60	1.40	0.70	0.00
Vrpolje	3,457	41.60	9.70	13.10	4.00	5.80	2.00	0.20
Vrsar - Orsera	2,152	9.80	4.30	2.20	1.10	0.80	0.40	0.00
Vuka	1,145	29.40	8.70	8.00	2.90	3.20	1.30	0.00
Vukovar	26,975	25.80	5.10	7.20	1.80	2.90	0.80	0.80
Zabok	8,938	12.60	5.00	3.10	1.40	1.10	0.60	0.10
Zadar	73,680	19.60	3.80	5.10	1.20	2.00	0.50	1.60
Zagorska Sela	990	12.50	7.10	2.80	1.80	0.90	0.70	0.00
Zagvozd	1,186	30.70	8.40	8.50	2.90	3.40	1.40	0.00
Zažablje	720	38.60	9.20	12.50	3.90	5.60	2.10	0.00
Zdenci	1,869	44.90	9.90	13.90	4.00	6.00	2.00	0.10
Zemunik Donji	1,885	19.80	6.90	5.00	2.10	1.90	0.90	0.00
Zlatar	6,014	20.10	5.00	5.20	1.50	2.00	0.70	0.10
Zlatar Bistrica	2,562	13.40	4.10	3.30	1.10	1.20	0.40	0.00
Zmijavci	2,038	29.10	8.40	8.00	2.80	3.20	1.30	0.10
Žakanje	1,856	13.10	4.90	3.10	1.30	1.10	0.50	0.00
Žminj	3,462	7.90	4.10	1.70	1.00	0.60	0.40	0.00
Krašić	2,511	21.30	7.00	5.50	2.20	2.10	1.00	0.10
Županja	11,622	34.70	9.70	11.00	3.90	5.00	2.10	0.50
Otok	6,218	35.90	10.90	10.70	4.20	4.50	2.10	0.30
Rakovec	1,238	15.50	7.60	3.50	2.10	1.20	0.80	0.00
Novigrad	2,365	25.80	5.80	6.80	1.80	2.70	0.80	0.10
Kostrena	4,152	10.70	4.10	2.60	1.10	0.90	0.50	0.10
Marija Gorica	2,214	16.90	6.10	4.40	1.80	1.70	0.80	0.00
Žumberak	830	24.40	7.10	6.00	2.10	2.30	0.90	0.00
Velika Gorica	62,711	13.80	3.90	3.50	1.10	1.30	0.50	1.00
Orle	1,924	28.10	6.80	8.10	2.30	3.50	1.10	0.10
Zaprešić	24,935	10.30	3.10	2.50	0.80	0.90	0.30	0.30
Pokupsko	2,210	40.50	8.90	12.60	3.50	5.60	1.80	0.10
Kravarsko	1,966	34.20	9.00	9.90	3.30	4.10	1.60	0.10
Bistra	6,389	15.30	6.50	3.70	1.80	1.40	0.80	0.10
Luka	1,323	20.10	6.70	5.10	2.00	2.00	0.90	0.00
Dubravica	1,425	18.80	6.50	4.80	2.00	1.90	0.90	0.00
Bedenica	1,424	17.70	7.70	4.30	2.30	1.60	1.00	0.00
Stupnik	3,652	12.10	5.20	3.00	1.50	1.20	0.60	0.10
Jesenje	1,512	21.50	7.90	5.40	2.40	2.00	1.00	0.00
Kumrovec	1,587	16.20	5.60	4.00	1.60	1.50	0.70	0.00

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Novi Golubovec	971	31.90	10.00	9.00	3.50	3.70	1.60	0.00
Majur	1,185	33.90	8.80	10.00	3.30	4.20	1.60	0.00
Ribnik	473	18.40	8.40	4.40	2.60	1.60	1.10	0.00
Tounj	1,143	38.80	9.80	11.60	3.90	5.00	2.00	0.10
Veliki Bukovec	1,411	22.60	8.30	6.10	2.60	2.50	1.20	0.00
Kalinovac	1,596	13.30	4.90	3.40	1.50	1.30	0.60	0.00
Kalnik	1,351	28.80	8.60	8.20	2.90	3.40	1.40	0.00
Novo Virje	1,169	18.40	7.60	4.30	2.10	1.60	0.80	0.00
Severin	873	21.20	8.70	5.40	2.60	2.10	1.10	0.00
Šandrovac	1,742	14.40	5.00	3.70	1.50	1.50	0.70	0.00
Velika Trnovitica	1,356	27.50	8.30	7.90	2.90	3.30	1.40	0.00
Zrinski Topolovac	861	27.00	8.40	7.70	2.70	3.30	1.30	0.00
Bukovlje	3,018	34.80	7.60	10.50	2.80	4.50	1.30	0.10
Dragalić	1,340	30.30	9.60	8.90	3.50	3.80	1.70	0.00
Gornja Vrba	2,478	34.50	8.70	10.10	3.20	4.20	1.60	0.10
Sikirevci	2,461	41.60	11.30	12.30	4.30	5.20	2.10	0.10
Galovac	1,226	25.30	8.60	6.60	2.70	2.50	1.20	0.00
Kukljica	686	16.20	7.30	3.90	2.20	1.40	0.90	0.00
Povljana	756	17.00	7.00	4.10	2.00	1.50	0.80	0.00
Privlaka	2,211	25.10	8.70	6.70	2.70	2.60	1.20	0.10
Tkon	754	27.90	8.70	7.50	2.90	3.00	1.30	0.00
Donja Motičina	1,637	42.70	11.90	12.90	5.00	5.50	2.50	0.10
Magadenovac	1,904	26.60	10.90	7.60	3.60	3.20	1.70	0.10
Vladislavci	1,836	40.20	9.50	11.90	3.50	5.00	1.70	0.10
Pirovac	1,850	26.60	7.40	7.00	2.50	2.70	1.10	0.10
Rogoznica	2,339	31.10	8.50	8.90	3.00	3.70	1.50	0.10
Privlaka	2,754	33.60	9.60	9.60	3.40	4.00	1.60	0.10
Vođinci	1,931	34.80	9.20	9.90	3.30	4.10	1.50	0.10
Dugopolje	3,439	24.80	8.60	6.30	2.60	2.40	1.10	0.10
Lećevica	577	34.10	9.70	9.80	3.60	4.00	1.80	0.00
Lokvičići	783	50.80	8.80	16.30	4.20	7.20	2.30	0.00
Okrug	3,326	26.70	6.40	7.30	2.10	2.90	1.00	0.10
Prgomet	665	14.40	6.10	3.40	1.80	1.20	0.70	0.00
Primorski Dolac	769	19.30	7.30	4.80	2.10	1.70	0.90	0.00
Runovići	2,373	28.50	9.60	8.40	3.50	3.60	1.80	0.10
Sutivan	800	11.60	4.90	2.50	1.30	0.80	0.50	0.00
Tučepi	1,925	20.20	7.00	5.40	2.30	2.10	1.00	0.00
Zadvarje	250	15.00	5.90	3.80	1.70	1.40	0.80	0.00
Karojba	1,427	12.90	4.60	2.90	1.20	1.00	0.50	0.00
Kaštelir-Labinci - Castelliere-S. Domenica	1,463	17.30	6.80	4.30	2.00	1.60	0.90	0.00
Dubrovačko Primorje	2,081	11.30	4.50	2.70	1.20	1.00	0.50	0.00
Janjina	544	8.10	4.30	1.70	1.10	0.50	0.40	0.00
Lumbarda	1,211	11.40	5.70	2.60	1.40	0.90	0.60	0.00
Trpanj	705	13.20	6.50	3.00	1.70	1.00	0.70	0.00
Župa Dubrovačka	8,056	10.90	4.70	2.50	1.20	0.90	0.40	0.10

Location	Population	Head count poverty	Std. Err. Head count poverty	Poverty Gap	Std. Err. Poverty Gap	Poverty Gap Sq.	Std. Err. Poverty Gap Sq.	Share of poor
Dekanovec	735	18.40	7.10	4.50	2.00	1.60	0.80	0.00
Gornji Mihaljevec	1,911	24.90	8.30	6.50	2.70	2.50	1.20	0.10
Orehovica	2,478	39.90	7.00	16.30	3.50	8.90	2.30	0.10
Strahoninec	2,653	10.30	4.70	2.30	1.20	0.80	0.50	0.00
Sveta Marija	2,284	11.20	4.60	2.40	1.20	0.80	0.40	0.00
Šenkovec	2,795	6.80	3.80	1.50	0.90	0.50	0.40	0.00
Jagodnjak	1,969	62.20	9.40	24.30	5.60	12.60	3.50	0.10
Markušica	2,524	49.30	8.90	16.70	4.00	7.70	2.10	0.10
Negoslavci	1,370	40.20	11.20	12.30	4.30	5.30	2.20	0.10
Šodolovci	1,598	31.80	10.30	9.30	3.80	3.90	1.80	0.10
Podravske Sesvete	1,616	20.40	6.20	5.30	1.90	2.10	0.80	0.00
Murter - Kornati	2,040	20.80	6.80	5.20	2.10	1.90	0.90	0.00
Gornja Rijeka	1,753	22.40	7.80	5.40	2.20	2.00	0.90	0.00
Fažana - Fasana	3,491	11.50	4.10	2.70	1.10	1.00	0.40	0.00
Pribislavec	3,096	32.00	6.10	13.10	2.70	7.20	1.70	0.10
Bilice	2,255	18.20	6.90	4.70	2.10	1.80	0.90	0.00
Kolan	789	10.10	4.80	2.10	1.20	0.70	0.40	0.00
Kamanje	855	17.00	6.30	3.90	1.70	1.40	0.70	0.00
Lopar	1,233	22.70	7.60	6.00	2.40	2.30	1.10	0.00
Vrsi	2,036	26.10	8.40	6.60	2.60	2.50	1.10	0.10
Tribunj	1,534	19.00	7.00	4.50	2.00	1.60	0.80	0.00
Štitar	2,049	41.80	10.70	12.60	4.30	5.30	2.10	0.10
Funtana - Fontane	907	15.50	5.90	3.70	1.60	1.40	0.60	0.00
Tar-Vabriga - Torre-Abrega	1,982	9.10	3.60	2.20	0.90	0.80	0.40	0.00