SLOVENIAN VERSION OF THE EUROPEAN DEPRIVATION INDEX AT MUNICIPAL LEVEL

SLOVENSKA RAZLIČICA EVROPSKEGA KAZALNIKA PRIMANJKLJAJA NA RAVNI OBČIN

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ABSTRACT

Keywords:
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version, deprivation
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determinants

Introduction: Ecological deprivation indices belong to essential instruments for monitoring and understanding health inequalities. Our aim was to develop the SI-EDI, a newly derived European Deprivation Index for Slovenia. We intend to provide researchers and policy-makers in our country with a relevant tool for measuring and reducing the socioeconomic inequalities in health, and even at a broader level.

Methods: Data from the European survey on Income and Living Conditions and Slovenian national census for the year 2011 were used in the SI-EDI construction. The concept of relative deprivation was used where deprivation refers to unmet need(s), which is caused by lack of all kinds of resources, not only material. The SI-EDI was constructed for 210 Slovenian municipalities. Its geographical distribution was compared to the distribution of two existing deprivation scores previously applied in health inequality research in Slovenia.

Results: There were 36% of adults recognized as deprived in Slovenia in 2011. SI-EDI was calculated using 10 census variables that were associated with individual deprivation. A clear east-to-west gradient was detected with the most deprived municipalities in the eastern part of the country. The two existing deprivation scores correlate significantly with the SI-EDI.

Conclusions: A new deprivation index, the SI-EDI, is grounded on the internationally established scientific concept, can be replicated over time and, crucially, provides an account of the socioeconomic and cultural particularities of the Slovenian population. The SI-EDI could be used by the stakeholders and the governmental and nongovernmental sectors in Slovenia, with the goal of better understanding health inequalities in Slovenia.

IZVLEČEK

Ključne besede:
slovenska verzija
evropskega kazalnika
primanjkljaja,
kazalnik
primanjkljaja,
neenakosti v zdravju,
socialno-ekonomske
determinante

Uvod: Kazalniki, ki na ravni izbranih geografskih enot prikazujejo socialno-ekonomsko blagostanje oziroma primanjkljaj prebivalstva, so danes temeljno orodje za preučevanje in razumevanje neenakosti v zdravju. V prispevku predstavljamo SI-EDI, novo razvit kazalnik primanjkljaja na ravni slovenskih občin. SI-EDI je slovenska različica evropskega kazalnika primanjkljaja (European Deprivation Index – EDI), ki ga v javnozdravstvenih raziskavah že uspešno uporabljajo v Franciji, Španiji, Italiji, Angliji in na Portugalskem. Namen raziskave je tudi preveriti veljavnost SI-EDI in ga tako kot ustrezno orodje ponuditi raziskovalcem in odločevalcem.

Metode: Za izdelavo SI-EDI smo uporabili podatke za leto 2011 iz dveh virov: (1) podatke slovenske različice Ankete o življenjskih pogojih, ki jo na zahtevo Eurostata na reprezentativnem vzorcu posameznikov letno izvaja nacionalni statistični urad, in (2) podatke iz popisa prebivalstva. Izračun temelji na konceptu relativnega primanjkljaja, ki ga je prvi opisal Townsend, danes pa se v nekoliko prilagojeni obliki uporablja tudi v izračunu kazalnikov primanjkljaja na ravni Evropske unije. V konceptu relativnega primanjkljaja so pomanjkanju podvrženi posamezniki, ki jim ni omogočeno zadovoljevanje različnih vrst potreb, ne samo materialnih. SI-EDI za 210 slovenskih občin smo izračunali po enaki metodi, kot se uporablja za EDI. Njegovo veljavnost smo preizkušali s primerjavo z dvema obstoječima kazalnikoma, ki sta se v slovenskem prostoru v zadnjem obdobju uporabljala v raziskavah in prikazih socialno-ekonomske neenakosti v zdravju po občinah: koeficientom razvitosti občin, ki ga uporablja NIJZ, ter kazalnikom primanjkljaja, ki ga je v dosedanjih analizah bremena raka uporabljala naša raziskovalna skupina.

Rezultati: Med štirimi temeljnimi življenjskimi potrebami (dostopnost počitnic, zmožnost ogrevati bivališče, osebnega računalnika in avtomobila), ki so se v raziskavi izkazale za povezane z objektivno ali subjektivno revščino, vsaj ene izmed njih ni zadovoljilo 36 % odraslih. Ti so bili opredeljeni kot prikrajšani na individualni ravni. Njihove lastnosti so bile prenesene na populacijsko raven v agregirani obliki, tako da smo za izračun SI-EDI uporabili 10 ustreznih popisnih spremenljivk. Na zemljevidu SI-EDI po občinah je jasno viden trend večanja socialno-ekonomskega primanjkljaja od zahoda proti vzhodu države. Največje vrednosti SI-EDI imajo področja na skrajnem severovzhodu in jugovzhodu države. Povezava SI-EDI z dvema obstoječima kazalnikoma primanjkljaja je bila statistično značilna.

Zaključki: Nov kazalnik primanjkljaja SI-EDI je zasnovan na mednarodno priznanem znanstvenem konceptu, lahko se replicira v času in prostoru, ter kar je najpomembnejše, odraža socialno-ekonomske in kulturne posebnosti populacije. Prepričani smo, da lahko služi kot ustrezno orodje pri razumevanju socialno-ekonomskih razlik v zdravju, zagotovo pa je lahko uporaben tudi drugod, ne samo na javnozdravstvenem področju.

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1 INTRODUCTION

People's health is intimately linked with the social and economic conditions in which they live. For the World Health Organisation, the concept of health pertains not only to the absence of disease or infirmity, but also to the state of complete physical, mental and social well-being (1). Since health starts long before illness in our families, homes, schools and workplaces, health inequalities arise from the conditions in which people are born, grow, live, work and age. These conditions are shaped by political, social and economic forces. The social determinants of health include our early life experiences which start before birth, the formal support received by our parents, our network of social support at home and within the community, social exclusion, poverty and discrimination, unemployment and the lack of job security, the amount of control we have at work, the type and quality of food to which we have access and the type of transport available to us (2–4). Socioeconomic problems are now seen as health problems that must be addressed to ensure that everyone has an equal chance for a healthy life (5, 6).

Tackling social inequalities in health is an ongoing priority for international health authorities and for many national governments in Europe (6). In Slovenia, the Ministry of Health coordinates all intersectoral action aiming to reduce health inequalities by improving the accessibility and use of health care services, including preventive and other public health-care programmes. It specifically focuses on vulnerable target groups (7). Evidence-based health policies require reliable and accurate measures of the socioeconomic environment of populations. Several approaches exist for measuring the socioeconomic status. Since individual socioeconomic data are often absent or poorly collected in large routine health databases, ecological measures based on aggregated census data are typically applied in such studies. They are commonly known as deprivation indices and are now available in many European countries (8–12) and worldwide (13–15). In Slovenia, however, there is still no standard deprivation measure for revealing socioeconomic inequalities at the local level (16).

Townsend pioneered the definition of poverty in terms of relative deprivation. Accordingly, the deprived are those who lack the necessities and activities that are widely encouraged or approved in the society to which they belong. Such unmet needs are due to a lack of resources of all kinds, not just financial. Needs differ between societies and periods (17, 18). By following the Townsend philosophy of relative deprivation and its extension to population level on an ecological scale, a European Deprivation Index (EDI) was proposed by two French teams in 2012 (19). They suggested a method for constructing a country-specific ecological deprivation index that best reflects individual experience of deprivation by using the European Union Statistics on Income and Living Conditions survey (EU-SILC) and selects ecological variables from national censuses that are most closely related to the individual deprivation indicator specific for each country. The procedure can be used to construct an ecological deprivation index using the smallest available geographical levels in a replicable way for all European Union members. So far, the EDI has been developed for France, Italy, Portugal, Spain and England (20, 21), and has since then been used in several studies on social inequalities in cancer burden (22–24), screening uptake (25) and health care access (26), orthopaedic care (27) and even environmental exposure (28).

The aim of our study was to develop the SI-EDI, a newly derived EDI for Slovenia. It was designed at the municipal level, the smallest administrative units where local policy is conducted, with the intention to provide researchers and policymakers in our country with a relevant tool for measuring and reducing socioeconomic inequalities in health, and even at a broader level.

2 METHODS

2.1 Data Sets

Information from two databases was combined in our analysis: EU-SILC and national census. In Slovenia, both databases are managed by the Statistical Office of the Republic of Slovenia and were supplied for our research in an anonymised version for the year 2011. The EU-SILC survey is organised by Eurostat and is based on a standardised questionnaire for interviewing a representative panel of households and individuals. It is specially designed to study deprivation and provides data on income, poverty, social exclusions and living conditions in the EU (29). To ensure the population is appropriately represented, all the EU-SILC responses were weighted on the survey sample design, response rate and population size for this report. The Slovenian national census 2011 was registry-based; the existing statistical and administrative data sources were linked (30). The census provides data on individual characteristics, features of households/ families and dwellings traits for all 2 million inhabitants in Slovenia.

2.2 The Construction of the Ecological Deprivation Index

The development of the EDI was based on the thinking of Townsend, for whom deprivation refers to unmet need, which is due to the lack of all kinds of resources (17, 18). The full methodological and theoretical concepts have been reported previously (19). The construction of EDI can be summarised in three steps:

1. Construction of an individual deprivation indicator (EU-SILC data);
2. Identification and dichotomization of variables available at both aggregate (census data) and individual levels (EU-SILC data);
3. Construction of an ecological deprivation index, the EDI (EU-SILC and census data).

First, the objective and subjective poverty for a specific population are defined. Next, the fundamental needs associated with both types of poverty are identified. Individuals lacking those fundamental need(s) are defined as deprived. The information from the sample (individual) level is then transferred to the population (aggregated) level and, finally, the EDI is calculated for each geographical unit denoted as a simple weighted sum of z-scored percentages (=normalized to the national mean) of a deprived category of each EDI component (equation 1):

$$EDI_i = \sum_{j=1}^{J} w_j \cdot V_j \qquad [1]$$

where V1, … VJ are the variables that compose the EDI and w represents their weights. Statistical analysis was performed with IBM SPSS Statistics Version 24, using the Complex Samples module. Results with a p-value of less than 0.05 were considered statistically significant.

2.3 Results Presentation and Validation

The SI-EDI was constructed for 210 Slovenian municipalities as defined in 2011. First, the anonymised individual census data were aggregated at municipal level. In the aggregated dataset, exact individual values were replaced by categorized variables. The resulting SI-EDI was mapped in ArcGIS 10.4.1, using the quintile scale. The geographical distribution of SI-EDI was compared to two deprivation scores that were recently used for explaining inequalities in health in Slovenia: [1] the deprivation index developed by Zadnik et al. in 2006 for explaining the spatial trend of the cancer burden in Slovenia (31, 32) and [2] the Development Deficiency Index, which is routinely provided by the Slovenian Ministry of Finance to facilitate the attribution of governmental financial aid to the municipalities (33, 34). Visual inspections of the three maps provided insight into the similarities and differences between the three deprivation indices. Visual impressions were tested numerically by calculating Spearman correlation coefficients.

3 RESULTS

3.1 Individual Deprivation Indicator

There were 9,247 households and 24,600 individuals aged 16 and over included in the EU-SILC survey in Slovenia in 2011. According to their household income, 18.7% of individuals aged over 16 could be considered poor in Slovenia in 2011. The objective poverty threshold of 600€ equalised income per month per household member was applied in accordance with the EUROSTAT at-risk-of-poverty threshold definition. It corresponds to 60% of the national median equalised disposable income (29). Together with objective poverty, perceived (subjective) poverty was estimated by comparing responses to the item 'ability to make ends meet' (Table 1) with objective poverty. In Slovenia in 2011, almost one third (32%) of individuals who made ends meet 'with great difficulty' or 'with difficulty' perceived themselves as poor.

Table 1. Ability to make ends meet – weighted response to question HS120, EU-SILC 2011, Slovenia.

Ability to make ends meet	Weighted response (%)
With great difficulty	11.0
With difficulty	21.0
With some difficulty	38.7
Fairly easily	19.3
Easily	8.7
Very easily	1.2

Of the nine items where people were asked whether certain goods/services were within their means, eight were recognised as reflecting the goods/services considered necessary in a specific context of Slovenian society, while 'capacity to face unexpected financial expenses' was not considered essential by Slovenian residents. Table 2 presents the eight fundamental needs for Slovenians and indicates the proportion of households that did not possess/utilise them in 2011, because they could not afford them. Four of them: 'capacity to afford paying for one-week annual holiday away from home,' 'ability to keep home adequately warm,' 'possessing a computer' and 'possessing a car' were associated with objective and subjective poverty.

Table 2. Fundamental needs with the proportion of households who indicated that certain goods/services were not within their means, EU-SILC 2011, Slovenia.

Fundamental needs for people in Slovenia in 2011	goods/services were not within their means
*Capacity to afford paying for one week annual holiday away from home	35.4
Capacity to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day	12.4
*Ability to keep home adequately warm	6.4
*Possessing a computer	5.6
*Possessing a car	5.5
Possessing a TV	0.7
Possessing a washing machine	0.5
Possessing a phone	0.3

* Fundamental needs that were associated with objective and subjective poverty

Only 0.6% of households lacked all four fundamental needs that were associated with both types of poverty, 2.8% lacked at least three needs, 11.0% at least two needs and 38.0% at least one need. Individuals who lived in a household that lacked at least one of the fundamental needs associated with both types of poverty were recognized as deprived in our analysis. There were 36.0% of individuals aged 16 and over recognised as deprived in Slovenia in 2011.

3.2 The Ecological Deprivation Index at Municipal Level

First, information from the EU-SILC was transferred to the national census. Sixteen socioeconomic variables were phrased and coded in the same way in both the EU-SILC 2011 and the Slovenian census 2011. However, age and sex are not appropriate for the construction of a deprivation index on the ecological level as they are essentially connected with individual deprivation and have a direct influence on health. Two other variables were omitted as the same information was already captured in other variables included. The dichotomisation of plurimodal variables was performed by applying the threshold where the best fit between the individual deprivation indicator and one of the categories of the corresponding variable was obtained. From the 12 dichotomous variables included, 10 were associated with the individual deprivation indicator calculated for the EU-SILC data by the multivariate logistic model in the previous step. Table 3 presents these 10 variables applied as the basic components in the SI-EDI calculation. In the adjusted Equation [1], they were included as a weighted sum of z-scored (=normalized to the national mean) percentages of a deprived category of each EDI component, for each geographical unit. The regression coefficients of the multivariate logistic model represent the weights for each component (also shown in Table 3).

Table 3. Components and its weights included in the calculation of the Slovenian European Deprivation Index (SI-EDI) for the year 2011.

SI-EDI component	Privileged category	Deprived category	Deprived in Slovenia 2011 (%)	Regression coefficient (weight)
Country of birth	Slovenia	Other	11.1	0.321
Citizenship	Slovenian	Other	4.0	0.368
Tenure status	Owner	Not owner	27.7	0.215
Household size (Members in household)	3+ members	<3 members	4.0	0.322
Access to bathroom or shower	Yes	No	3.1	2.423
Marital status	Married	Not married	60.0	0.362
Education	Achieved (upper) secondary education or more	Achieved lower secondary education or less	30.8	0.870
Current economic status (Activity)	Employed and self-employed	Other	56.6	0.554
Months unemployed	<3 months	3+ months	3.9	0.806
Occupation (ISCO-08 (COM))	Other	Elementary occupations	4.0	0.698

Figure 1 presents the map of the SI-EDI for the 210 municipalities in 2011, classified into quintiles. The SI-EDI score has the following distribution: minimum: -7.55, maximum: 17.17, median: -0.86, quintiles: 20%: -3.10, 40%: -1.44, 60%: 0.21, 80%: 2.44. A clear east-to-west gradient can be observed on the map with the most deprived municipalities in the north-eastern and south-eastern part of the country.
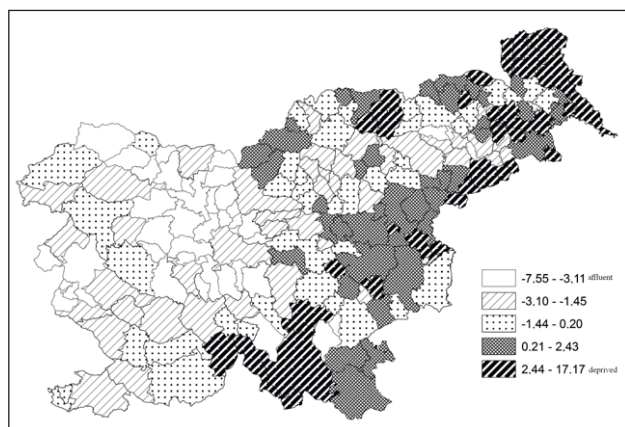

Figure 1. The European Deprivation Index for Slovenia (SI-EDI) for the year 2011, with municipalities classified into quintiles.

Figure 2. Up: Deprivation index suggested by (6).
Down: National Development Deficiency Index (33).

3.3 Comparison with Other Deprivation Scores

Municipalities are the smallest geographical units for which the association between socioeconomic inequalities and health has been explored in Slovenia in the last 20 years. Only two deprivation indices have been applied in these studies. Zadnik et al. developed a socioeconomic deprivation index by applying factorial analysis to the data of the national census 2001 (31, 32). This index classified into quintiles is presented in the upper part of Figure 2 and shows a clear east-to-west gradient. From the year 2016, the National Institute of Public Health has provided a variety of health indicators at municipal level (34). To describe socioeconomic inequalities, they have chosen to use the Development Deficiency Index, which is calculated by the Slovenian Ministry of Finance (33). This index classified into quintiles for 2011 and 2012 is presented in the lower part of Figure 2. The east-to-west gradient is only indicated here. Both maps correlate significantly with the newly developed SI-EDI, although the correlation is stronger for the deprivation index developed by Zadnik et al. (Spearman rho: 0.822 vs 0.622).
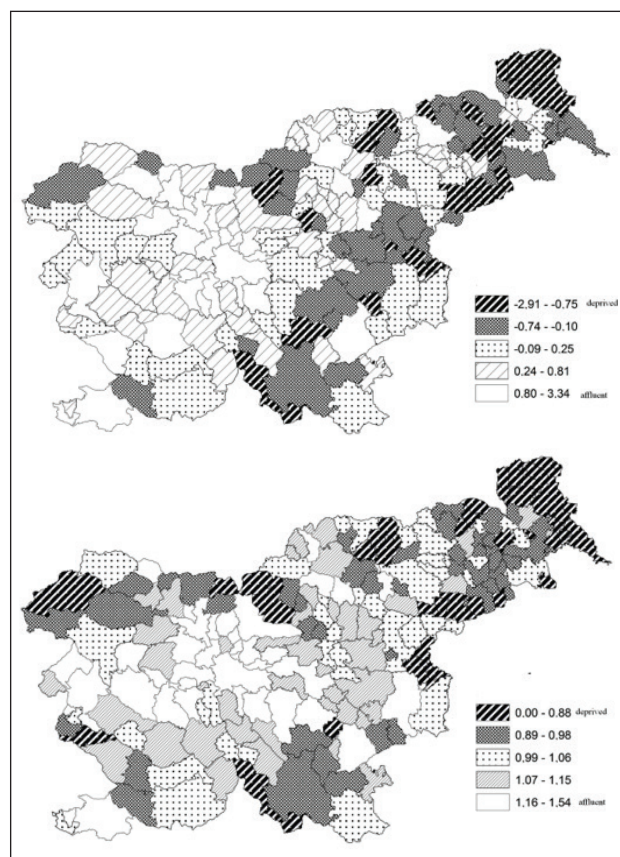
4 DISCUSSION

This paper reports the development and validation of the SI-EDI, a newly derived ecological deprivation index for Slovenia. The SI-EDI classifies 210 Slovenian municipalities according to their level of socioeconomic deprivation. The method for its construction is based on a solid theoretical framework – the concept of relative deprivation - which was initially proposed by Townsend in the 1980s (17, 18) and has since heavily influenced both scientific and social thinking across the developed world (35). It was adopted as the official concept of poverty by the European Council in 1975 and has been retained with some modifications ever since (35–37).

The concept of relative poverty defines poverty on the individual level, individuals who lack necessities and activities that are widely encouraged or approved in the society to which they belong being described as deprived (17, 18). The EDI is an ecological deprivation

index, which summarises the socioeconomic status of individuals according to the level of deprivation assigned to the geographical area they live in. The ecological bias induced by this type of assessment is inevitable, its extent depending on the size of the population in the areas concerned (19). To address the issue of ecological fallacy, the methodology proposed for constructing the EDI includes two steps: [1] only the variables that are associated with subjective and objective poverty on the individual level are included in the EDI calculation; and [2] the EDI could be calculated for very fine geographical resolution concerning areas with extremely small populations, the only scale restriction being the area level for which the census data are available (19). To date, the EDI on the smallest available level has been developed for France, Italy, Portugal, Spain and England. The average population per unit applied in these analyses ranged from 170 inhabitants in Italy to 2,000 inhabitants in France (20, 21).

There were almost 10,000 inhabitants living on average in Slovenian municipalities in 2011. The SI-EDI reflects the average deprivation at municipality level where the socioeconomic heterogeneity of the population is wide. To study the influence of social inequalities and health in more detail, the SI-EDI should be prepared for smaller geographical areas. Our team believes that the 3,104 national polling station areas with the average population size of 600 inhabitants would be the most appropriate geographical division for investigating social inequalities and health in Slovenia.

Nevertheless, even though municipalities in Slovenia vary greatly in size, population density, infrastructure and other characteristics, they are the smallest administrative units where local policy is conducted in Slovenia. The disparities in well-being in Slovenian municipalities has been investigated by Malešič – this research shows a prevailing higher level of well-being in the west, while lower well-being was observed in the east of Slovenia (38). The municipalities are also the smallest geographical areas for which the Slovenian National Institute of Public Health presents and compares a selection of the most important health indicators within the project Health in the Municipalities, a yearly programme that began in 2016 (34). The National Development Deficiency Index is currently included as a deprivation index in the project Health in the Municipalities. The SI-EDI geographical distribution patterns show a satisfactory correlation with it as well as with the deprivation index suggested by Zadnik (6). The EDI is based on an established concept that is also recognised on the level of the European Union. Furthermore, it incorporates the social and cultural specifics of our population as it is based on the population specific survey. It also presents the socioeconomic inequalities existing in Slovenia; the same southwest-

northeast pattern has been observed for mortality in Slovenia (39). Therefore, we believe it could possibly be used to improve future issues of the publication Health in the Municipalities and could serve as a relevant tool for policymakers for measuring and reducing socioeconomic inequalities in health.

One of the major advantages of the EDI is that it is both population-specific and fully replicable in all EU member states, thereby allowing direct cross-country comparisons. Comparison of EDIs developed for France, Italy, Portugal, Spain and England demonstrated that the impact of cultural differences may be lesser than expected: the fundamental needs for all five countries were practically identical, although there were other differences on the census variables that were included in the final EDI calculation (20). By using our results, we can extend this comparison to the SI-EDI. In Slovenia, we share the same fundamental needs as in the other five countries. The exception was the variable 'capacity to face unexpected financial expenses,' which was not recognised as a fundamental need only in Slovenia. In Slovenia, individuals who lived in households that lacked at least one of the fundamental needs associated with objective and subjective poverty were recognized as deprived, whereas in the other five countries at least two needs had to be lacking. Further studies are required to elucidate this difference. Ten census variables were included in the final SI-EDI calculation, nine in the French, Italian, Spanish and English EDI versions and eight in the Portuguese one (20). Three of them were shared by all countries, namely: occupation, education and tenure status. Considering the census variables included in the EDI, the SI-EDI is most like the French version with seven identical variables, whereas there were only four identical variables between the Slovenian and Portuguese EDI. A limited number of variables appearing at the same time in the EU-SILC and census data is one of the major limitations of the existing EDI.

The SI-EDI presented reflects the socioeconomic inequalities in Slovenia in the year 2011. Owing to the dynamic cohort of the EU-SILC system, the index can be replicated over time, since the 2014 EU-SILC survey data on deprivation are updated annually. Thus, the frequency of EDI upgrading could be annual even if the census data are collected only every ten years. In addition, the number of variables that reflect deprivation has been increased in EU-SILC surveys recently: new variables related to individual deprivation have been added to the existing variables that were related to deprivation at household level (37). The methodology for constructing the EDI can easily be adopted to include additional variables. The EDI with newly adopted variables reflecting individual perception would improve its power, particularly for measuring social inequalities.

5 CONCLUSIONS

Despite a universal healthcare system, inequalities in health in Slovenia are considerable. People further down the social ladder are at higher risk of serious illness and premature death than those closer to the top. A 30-year-old man with a university degree can expect to live 7.3 years longer than a man who has completed primary education or less (5). On the other hand, the risk of malignant melanoma and breast cancer is higher for women living in the economically privileged areas of central and western Slovenia (31).

Tackling social inequalities in health is a priority for Slovenian national policy, but so far, no standardised tool for their measurement has been developed. The new deprivation index described here has been constructed at municipal level. It is based on an established scientific concept, it can be replicated over time in other European countries and, most importantly, it provides an account of the socioeconomic and cultural particularities of the Slovenian population. We believe that the SI-EDI could be used by stakeholders and governmental and non-governmental sectors in Slovenia with the goal of better understanding health inequalities in Slovenia.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ETHICAL APROVAL

The data for this study was derived from the EU-SILC 2011 for Slovenia and from the Slovenian national census 2011. All the analyses were performed on anonymised and aggregated data. The results do not include personal information.

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