

ARTICLES

**LIFE SATISFACTION AND SIZE OF SETTLEMENTS:
A CASE STUDY IN SLOVENIA**

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ABSTRACT

Life satisfaction and size of settlements: A Case study in Slovenia

An exploratory analysis of relations between the overall life satisfaction, selected specific aspects of the life satisfaction, and size of settlements in Slovenia in a case study from 2015 is presented. Analyses of variance and discriminant analysis show weak differences between group averages of life satisfaction in groups defined on the basis of settlement size. However, regression trees method reveals the settlements size as an important life satisfaction factor in specific circumstances, and that overall life satisfaction prediction rules are different for “bigger” (>10.000 inhabitants) and “smaller” settlements (<10.000 inhabitants).

KEY WORDS

Subjective well-being, life satisfaction, size of settlements, regression trees, exploratory analysis, Slovenia

1. Introduction

Since the times of »social indicators movement« in 1970s (see Smith, 1973; Krevs, 1998) quality of life or well-being research receives frequent attention in geography and spatial planning (Land, Michalos, 2015) and is going through a kind of revival recently, based mainly on availability of enormous quantities of relevant spatial data, on developments in technology and scientific methodology in general, and in geoinformatics in particular (Krevs, 2017). It is a development performed mainly in small steps, bringing pieces of new knowledge into theoretical backgrounds of the quality of life research, improvements of measuring certain aspects of it, contributing to better interpretations and understanding of the concept, or bringing new ways of its use outside academia, e.g. in planning and everyday life (ibid.). Despite the growing amounts of publications on the quality of life, geographical aspects are surprisingly rarely studied, especially on a local level, and in rural areas. With this paper we wish to make such a small step, by exploring the relation of the settlement size to a particular aspect of subjective well-being, the satisfaction with life, based on a case study in Slovenia.

2. Subjective well-being and life satisfaction

Subjective well-being is quite an elusive concept, containing such a subjective matter, that can only be partially and indirectly measured. Based on different philosophical points of view, the measurements of subjective well-being can be hedonic or eudemonic (more in OECD, 2013; Anič, 2012; Krevs, 2017). Life satisfaction is a typical example of hedonic measures of well-being, which are often used in big scale researches and data collections like OECD Better Life Index (OECD, 2015b), Eurostat Statistics on Income and Living Conditions EU-SILC (Eurostat, 2012; 2015; 2016), Eurofound European Quality of Life Survey EQLS (Eurofound, 2017). Some of these are performed regularly and contribute significantly to the standardization of several measures of quality of life and life satisfaction. Also in Slovenia such research (SURS-SILC, 2018) brings important and relevant data on this topic since 2012 (sample size about 28000 each year), but unfortunately does not allow to perform geographical analyses other than by statistical regions (NUTS 3) – which is far from local level, where quality of life research becomes more realistic and applicable (Krevs, 2017).

Only a few researches carried out in Slovenia so far took a specific, more local geographic aspects of quality of life into consideration, like comparing selected quality of life measurements between urban, suburban and rural areas (Verlič-Dekleva, 1996; Krevs, 1996, 1999), between cities (Tiran, 2017) or changes with distance from urban centres (Kozina, 2016).

3. Case study

The aim of the case study (Krevs, 2015) was to gather multidimensional evaluations of the subjective well-being together with different geographic characterizations of the places where respondents lived. The main intention was to explore and learn about the relations between different quality of life measures and geographic characteristics of the places, mainly to geographically enrich the knowledge based on the above mentioned statistical researches of well-being.

For this paper we use several variables from the abovementioned case study (see Table 1). So called “Cantril ladder” is probably the most widely used measure of overall life satisfaction (Cantril, 1965; OECD, 2015a; used e.g. also in SURS-SILC, 2018). Other more specific life satisfaction measures (SLSs) have been selected to present different aspects of the satisfaction with life and living environment (also used in previous geographic researches, e.g. Krevs, 1996; Tiran, 2016, 2017). Data about the sizes of the settlements, where respondents lived, are grouped into five classes. Due to quite specific settlement size distribution in Slovenia (less than 20 settlements have population exceeding 10.000, and only two above 100.000), the research actually focuses mainly on small and medium sized settlements.

All the mentioned variables are measured on ordinal scales, but all except the size of settlement are treated as numerical in the calculations. This kind of violation of the statistical requirements seems widely accepted in practice, not only in the subjective well-being research. Which is not necessarily a good enough argument for every research. But in our case we are dealing with soft subjective evaluations in exploratory analyses, which in our opinion makes enough sense to be tolerant regarding this methodological problem.

Table 1: The life satisfaction and size of the settlements data in the study.

OLS	overall life satisfaction (Cantril ladder) [0...10]
SLS _i	SLS ₁ satisfaction with material aspects of life [1...5] SLS ₂ satisfaction with health [1...5] SLS ₃ satisfaction with own achievements in life [1...5] SLS ₄ satisfaction with relations with other people [1...5] SLS ₅ satisfaction with circumstances in the family [1...5] SLS ₆ satisfaction with the feeling of safety [1...5] SLS ₇ satisfaction with personal feeling of belonging to local community [1...5] SLS ₈ satisfaction with the quality of local environment [1...5] SLS ₉ satisfaction with the safety of own future [1...5] SLS ₁₀ satisfaction with the time spent for the things respondent likes [1...5] SLS ₁₁ satisfaction with the quantity of free time [1...5]

	<p>SLS₁₂ satisfaction with the job [1...5] SLS₁₃ satisfaction with capability of national government to solve important and in respondent's opinion solvable problems [1...5] SLS₁₄ satisfaction with capability of local government to solve important and in respondent's opinion solvable problems [1...5] SLS₁₅ satisfaction with the possibility of respondent's impact on solving important and in respondent's opinion solvable problems in local community [1...5]</p>
SS	<p>Size of the settlements is grouped into the following classes: <200, 200-<1000, 1000-<5000, 5000-<10.000, 10.000 or more</p>

The sampling procedure was based on a snowball technique, guided by softly defined characteristics of the studied population based on age (only exceptions outside the range 20-65 years of age), gender (approximately balanced), and region of residence (approximately proportional to the regional share in total population of Slovenia; all 12 statistical regions, NUTS 3, have been taken as regions in our study). The sampling was performed in two phases. In the first phase about 100 “initiators” (students of geography) spread the link to a web questionnaire to “people they knew”, taking the abovementioned demographic characteristics of respondents into account. The second phase was a bit more controlled, targeting mainly the respondents from the age and gender groups, regions and settlements of sizes that did not get adequate relative representation in the first phase.

Relatively small sample size (n=815) and the unpredictability of the sample quality when using snowball technique could be major problems in cases of using the collected data to generalize the findings (like calculating population’s parameters), or in searching for good model predictions. Basic comparisons of the characteristics of the sample (gender, educational, regional structure) with the Slovenian population, as well as of the average life satisfaction in our sample (OLS=7.32) with the outcomes of the national research (SURs – SILC, 2018, results for 2015: OLS=7.1 for Slovenia, between 6,6 and 7,3 for individual statistical regions) give us confirmation that the sample is acceptable for our exploratory research. We assume that slightly higher OLS from our sample may be at least partly related to bit higher level of education of the respondents compared to Slovenian population.

Basic statistical analyses presented below have only descriptive and comparative value, because some of the assumptions related to the applied statistical methods are not strictly met (like the measurement scale of the independent variables, normal distribution of their measurements). But as a “traditional” research would often involve this way of presentation and argumentation, selected results using descriptive statistics, analysis of variance and discriminant analysis are presented.

As we see on Figure 1, specific life satisfaction measures are not just a mirror image of the overall life satisfaction. But as we will see in further discussion, it is not a surprise that “satisfaction with material aspects of life” on this graph is about where the overall life satisfaction would be (if transposed from 11 to 5 level scale). Among the highest specific life satisfactions are those related to family, safety, health. And the lowest satisfaction levels are very much related to the trust given to local and national governments to solve problems, and to local community empowerment (see Mandič, 2015; Krevs, 2017)

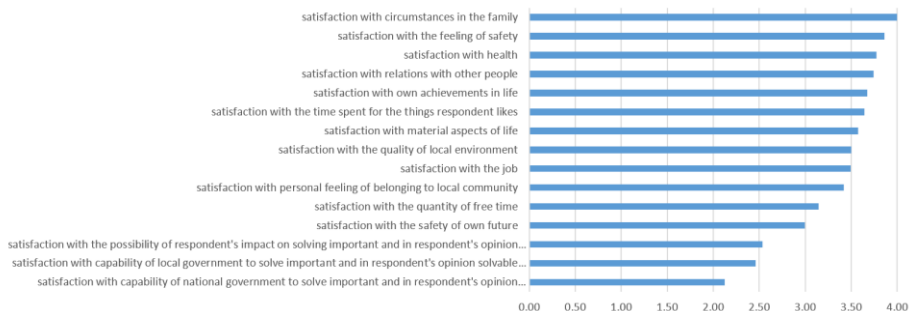


Figure 1: Overall and specific life satisfaction measures in the studied sample. Notes: all measures on the scale 1-5; see full names of the measures in Table 1.

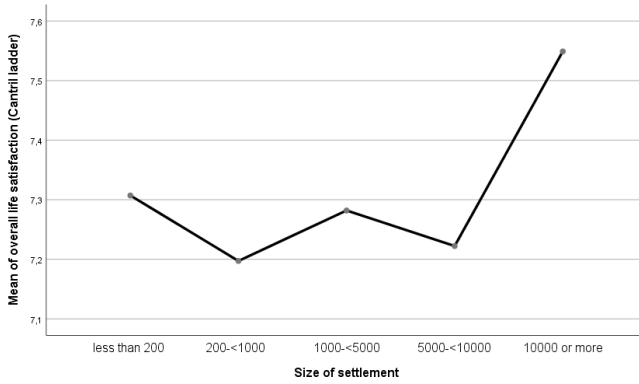
Comparisons of group averages (means) of OLS (Table 2) and SLSs (four selected on Figure 2) between the classes of settlement size shows that the differences are rather small. Graphs may be a bit misleading (see the scales of the ordinates), but at the same time warn us, that life satisfaction is not a homogenous entity, changing in the same way between gender, educational, economic, social groups, or between places. Each of the specific measures of life satisfaction (SLSs) may have different geography.

Table 2: Group averages of overall life satisfaction by settlement size of the respondents' residence.

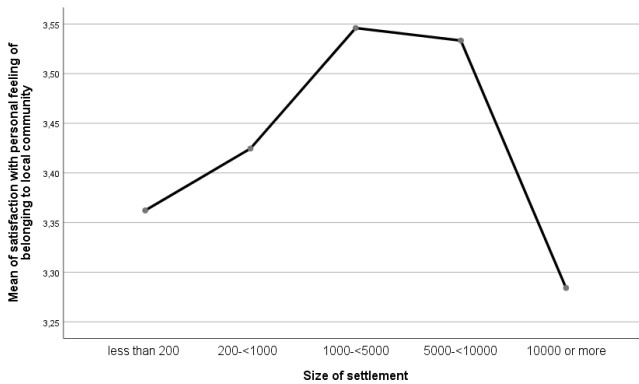
Size of the settlement where respondents reside	Average overall life satisfaction
<200	7,31
200-<1000	7,20
1000-<5000	7,28
5000-<10.000	7,22
10.000 or more	7,55
All respondents	7,32

Figure 2: Averages of selected life satisfaction measures by the size of settlements of residence of the respondents: a) overall, b) feeling of belonging to local community, c) satisfaction with the job, d) time spent for things respondent likes.

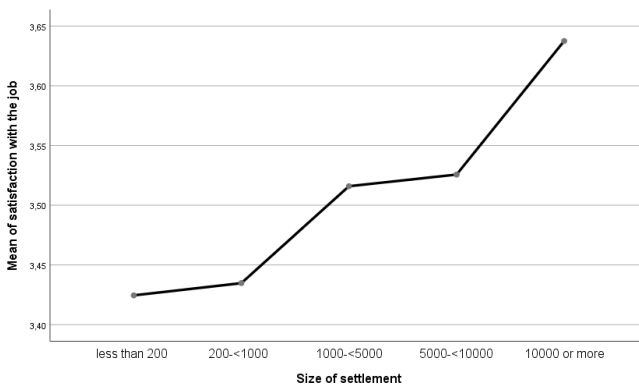
a)



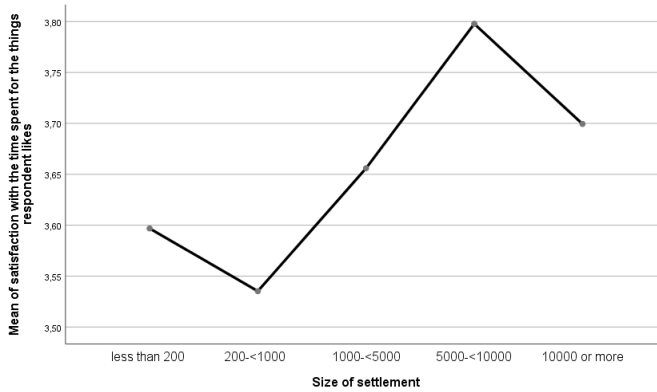
b)



c)



d)



Analysis of variance statistically tests the differences between the group averages, in our case averages of certain life satisfaction measure scores between the settlements of different size classes. Results confirm that almost for all of the studied life satisfaction measures there are no significant differences between group averages between the settlements of different size classes, including for the overall life satisfaction. The only two specific life satisfaction measures that show significant differences between the respondents from the settlements of different size are “satisfaction with personal feeling of belonging to local community” (see also Figure 2b, $p=0.5$) and “satisfaction with the time spent for the things respondent likes” (see also Figure 2d, $p=0.6$). Additional illustrative demonstration of the weak overall relation between the size of the settlements and the life satisfaction measures are the classification results of discriminant analysis, used to predict the membership in settlement size classes on the basis of the overall and specific life satisfaction measures. Only 27% of the respondents have been correctly classified into the settlement size classes, on the basis of their own life satisfaction responses.

Both, the results of the analysis of variance and of the discriminant analysis motivate us to use a method which does not search only for general relations, characteristic for the majority of the studied respondents. Regression trees are one of the machine learning methods that searches (also) for strong but specific relations within the data, occurring only in specific “situations” (combinations of data values). In methodological way of expressing they detect also local, not only global relations. After demonstrating that there are only weak global relations between the settlement size and the life satisfaction measures, regression trees method is used to explore if there are any specific, “local” relations, and how they are expressed.

4. Regression trees method

Regression trees method is used as an exploratory tool to reveal the »internal structure« of the inter-relations between the overall life satisfaction measure (OLS), selected specific life satisfaction measures (SLS_i) and the size of the settlement (SS). The method is performed in three ways:

1. to regress OLS on the basis of SLS_i;
2. to regress OLS on the basis of SLS_i and SS;
3. to regress OLS on the basis of SLS_i and SS, with the latter forced to be the first criteria in partitioning the studied sample.

The second and the third of the mentioned models involve size of settlements as independent variable. The second is more »honest« in showing the strength of the SS in partitioning the respondents into subgroups to obtain the best regression group estimations of the OLS. The third however provides a more illustrative demonstration of development of the regression subtrees. One major branch of the three provides the partitioning of the respondent into subgroups to get the best regression group estimations of the OLS for big settlements, and the second major branch of the regression tree provides the partitioning of the respondents from other (smaller) settlements. The first of the models is presented only for comparative reasons, without taking settlement size into account.

CRT algorithm was used in the design of the regression trees models, which recursively partitions the groups of studied items into more homogenous (»cleaner«) subgroups. In each step a group is divided into two subgroups, but only if it increases the level of homogeneity, measured by a certain criterion. As additional criterion we allowed a »parent group« to be divided if it had at least 25 items, but no »child subgroup« was allowed to have less than 10 items.

The final subgroups, that cannot be divided further using the selected criteria, are called terminal nodes (or terminal leaves in the regression tree). For each node the method produces a regression prediction, attributed to all items in that node. In our case these are predictions of overall life satisfaction. In each step of the partitioning all the independent variables are checked to select the one that gives the best division into two »cleaner« subgroups. Which means that each node in the regression tree has different path of partitioning, and all paths start in the node 0. Our interpretations of the results will actually focus on certain nodes (e.g. with the highest or lowest predicted life satisfaction scores, or resulting from partitioning based on the size of settlement), using paths (named also rules) to those nodes as a basis for description of the successive factors (independent variables) in the process of partitioning and prediction.

The relative importance of the independent variables in the regression trees models is very similar in all three models. By far the most important factor for predicting overall life satisfaction is “satisfaction with material aspects of life”, followed by “satisfaction with respondent’s achievements in life”. In both models using settlement size as independent variable (models 2 and 3), the latter ends up just above the bottom of the list of the independent variables’ importance in the model as a whole (Figure 3). The measure of overall success of the partitioning in a certain regression tree is the “estimate of risk”, or “level of non-homogeneity” of the nodes in certain tree. It is similar for all three models, but slightly higher (meaning a bit poorer results) when size of settlements is introduced as independent variable (models 2 and 3).



Figure 3: Normalized importance of independent variables in the third regression tree model.

Note: see full names of the variables in Table 1.

In the **model 1** »overall life satisfaction« (OLS) is regressed on the basis of all specific life satisfaction measures (see Table 1), with no spatial independent variable involved. Partitioning starts with a very strong factor – “satisfaction with material aspects of life”. Those respondents evaluating that aspect of life as average or worse (3 or less on a scale 1-5) have quite low prediction also for OLS (6.3). Further subdivisions show, that OLS can come near the total average for all respondents (7.3) only in case where respondents have shown very high level of “satisfaction regarding their own achievements in life” (OLS=7.1), but can fall as low as 3.7 in respondents with low level of “satisfaction with the feeling of safety” and “satisfaction with the possibility of respondent's impact on solving important and in respondent's opinion solvable problems in local community”. Quite opposite situation is presented in the branch starting with high (4 or higher) evaluation of the material aspects of life, with average prediction of OLI 7.9.

The highest OLI (8.8) is predicted for respondents that declare either extreme (5 of 5) “satisfaction with own achievements in life” or “satisfaction with material aspects of life”. The lowest predictions of OLI (6.1) in that branch of the regression tree are consequences of below average (3 or less) “satisfaction with own achievements in life” and low (2 or less) “satisfaction with circumstances in the family”.

In the **model 2** »overall life satisfaction« (OLS) is regressed on the basis of all specific life satisfaction measures and settlement size as independent variables. The regression tree is almost identical to the tree in model 1. The only major change is on the branch starting with high (4 or higher) “satisfaction with material aspects of life”, where size of settlements becomes the factor for further division of a node. That node groups 115 respondents with high (4 or higher) “satisfaction with material aspects of life”, below average (3 or lower) “satisfaction regarding their own achievements in life” and above average (3 or higher) “satisfaction with circumstances in the family”. If residents live in settlements with 10.000 or more, 1000-5000, or less than 200 inhabitants, then the prediction of OLS is above the average for all respondents (7.6), while for those residing in settlements with populations 200-500 or 5000-10.000 the prediction is below average (6.9). Although the result may not be so easy to explain, it does not seem to be a result of “overfitting” the model to the data (the above presented terminal nodes do not seem to small, with 70 and 45 respondents respectively).

Model 3 starts quite differently from the other two, as the first division is not based on the strongest factor for division, but on the basis of the size of settlements, one of the weakest division factors (see Figure 3). Actually we may interpret two main branches as two separate trees (Figures 4 and 5) – one for respondents from small settlements with populations up to 10.000, and the other for respondents from “bigger” (including some medium sized) settlements with more than 10.000 inhabitants (only two settlements in Slovenia have populations above 100.000). The latter, “urban” branch of the regression tree contains about 22% of all respondents. Its further division is not as “statistically efficient” (see low measures of “improvements” on Figure 4), as within the other branch, or within the trees in models 1 and 2. But the logic is quite straightforward. If the “satisfaction with material aspects of life” is above average (3 or higher), then the predicted OLS is above average. The highest predictions of OLS result either from extremely high (5 of 5) “satisfaction with material aspects of life” (OLS=9.1), or high “satisfaction with material aspects of life” (4 of 5), above average (3 or higher) “satisfaction with own achievements in life” and extremely high (5 of 5) “satisfaction with health” (OLS=8.6); but in both cases nodes contain small amount of respondents (less than 20) and might be prone to “overfitting”.

The worst prediction of OLI for “urban respondents” is also calculated for a node with small number of respondents (21), but gives quite obvious outcome: respondents expressing very low (2 or less) “satisfaction with material aspects of life” have a prediction of OLI 6.0. More than three quarters of all respondents live in settlements with populations smaller than 10.000. This branch of the tree is statistically much more efficiently partitioned (see measures of “improvements” on Figure 5). The “satisfaction with material aspects of life” is again by far the strongest division factor. If its score is below average (3 or less), so is the prediction of OLS. The worst predictions of OLS (3.6) are linked to extremely low (1 of 5) “satisfaction with material aspects of life”. If the latter score is high (4 or higher), then it almost certainly leads to average or high predictions of OLS. The highest predictions of OLS occur either in situations with high “satisfaction with material aspects of life” (4 or higher) and extremely high “satisfaction with own achievements in life” (5 of 5) (OLS=8.7), or high “satisfaction with material aspects of life” (4 of 5), high “satisfaction with own achievements in life” (4 or higher) and high “satisfaction with circumstances in the family” (4 or higher) (OLS=7.9). The only exception with low OLS prediction (6.4) despite high “satisfaction with material aspects of life” (4 or higher) occurs when combined with below average “satisfaction with own achievements in life” (3 or lower) and extremely low (1 of 5) “satisfaction with capability of national government to solve important and in respondent’s opinion solvable problems”.

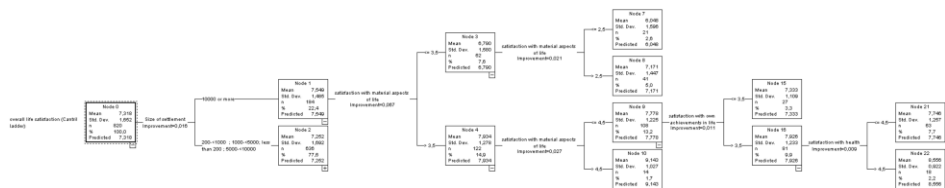


Figure 4: Regression tree for predicting overall life satisfaction for respondents from settlements with more than 10.000 inhabitants.

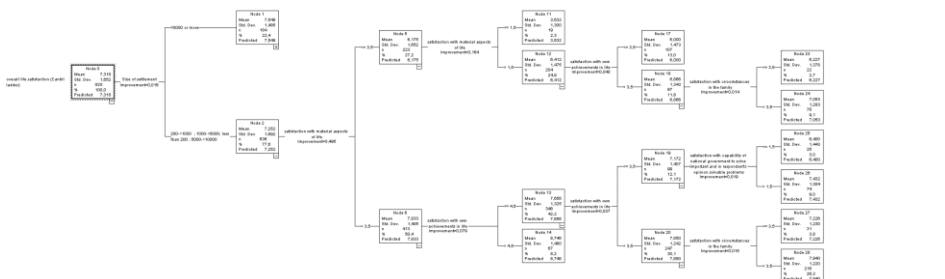


Figure 5: Regression tree for predicting overall life satisfaction for respondents from settlements with less than 10.000 inhabitants.

5. Conclusion

The study shows that the settlement size does not seem to be a major factor in explaining general geographical differences in life satisfaction measures in Slovenia in 2015. Descriptive statistics, analysis of variance and discriminant analysis of the data from our case study support the above interpretation. However, the regression trees method allows us to learn that settlement size may be important factor in specific circumstances, demonstrated in “local results” of the regression tree model (model 2) and that overall life satisfaction prediction rules are different for “bigger”, with more than 10.000 inhabitants, and “smaller” settlements with population below 10.000 (model 3). Methodological conclusion could be that the simultaneous use of diverse methods can improve the answers to our (geographical) research question.

Seemingly not so (statistically) convincing results should not deter us from further research of geographical aspects of (subjective) well-being or quality of life (see Krevs, 2000). Many new studies demonstrate the continuing interest in the subject. Actually, the presented study may be taken as an example of a topic, for which we can be quite sure that results should be more convincing than they are. Among major reasons for blurred life satisfaction differences between classes of settlement size may be high level of adaptation of people to places, wherever they live, and analysing data for the whole country (and besides, on a small sample). A more locally performed study, or simulating local studies using a kind of geographically – weighted regression (GWR) might lead us to more clearly expressed relations we studied.

6. References

- Anić, P. 2012: How to find happiness: adolescent's life goals and free time activities. Dissertation. Department of psychology, Faculty of Arts, University of Ljubljana, 195 p. Internet https://bib.irb.hr/datoteka/629215.Anic_P_2012._How_to_find_happiness_Adolescents_life_goals_and_free_time_activities.pdf (17. 2. 2017).
- Cantril, H. 1965: The pattern of human concerns. Rutgers University Press, 427 p.
- Eurofound, 2017: Evropska raziskava o kakovosti življenja EQLS izvedena v letih 2003, 2007, 2012. Internet <https://www.eurofound.europa.eu/sl/surveys/european-quality-of-life-surveys> (20. 10. 2018).
- Eurostat, 2012: EU-SILC 2013 Module on Well-being. Internet http://ec.europa.eu/eurostat/documents/1012329/6071326/2013_Module_Well-being.pdf/93ac2517-f6ac-4ed5-8c42-ca89568ea5c9 (17. 1. 2017).

- Eurostat, 2015: Quality of life indicators - overall experience of life. Internet http://ec.europa.eu/eurostat/statistics-explained/index.php/Quality_of_life_indicators_overall_experience_of_life (17. 1. 2017).
- Eurostat, 2016: Analytical report on subjective well-being, 2016 edition, 38 p. Internet <http://ec.europa.eu/eurostat/web/products-statistical-working-papers/-/KS-TC-16-005> (17. 1. 2017).
- Kozina, J. 2016: Življenjsko okolje ustvarjalnih ljudi v Sloveniji. Geografija Slovenije, 35, 137 p.
- Krevs, M. 1996: Geografski vidiki življenjske ravni prebivalstva. In: Pak, M. (ed.). Spodnje Podravje s Prlekijo: možnosti regionalnega in prostorskega razvoja. Zveza geografskih društev Slovenije, p. 335–349.
- Krevs, M. 1998: Geografski vidiki življenjske ravni prebivalstva v Sloveniji. Dissertation. Oddelek za geografijo, Filozofska fakulteta, Univerza v Ljubljani, 234 p.
- Krevs, M. 1999: Glavne razlike v življenjski ravni med slovenskimi mestnimi, obmestnimi in podeželskimi območji. Dela, 14, p. 151–162.
- Krevs, M. 2000: Geographical contribution to the level of living research. V: Zbornik referatov. II. Kongres na geografite od Republika Makedonija so strucen seminar za nastavnice po geografija, Ohrid, 3.–5.11.2000. Makedonsko geografsko društvo; p. 354–361.
- Krevs, M. 2015: Geografija kakovosti življenja 2015 (Geography of quality of life 2015). Research involving students of geography, Department of Geography, Faculty of Arts, University of Ljubljana. Unpublished materials.
- Krevs, M. 2017: Trajnostna regionalna kakovost življenja (Sustainable regional quality of life). In: Lampič, B. (ed.), Zupančič, J. (ed.). Raziskovalno-razvojne prakse in vrzeli trajnostnega razvoja Slovenije. E-GeograFF, 9. Ljubljana: Znanstvena založba Filozofske fakultete; p. 84-101 Internet http://geo.ff.uni-lj.si/sites/default/files/e-geograff_9.pdf.
- Land, K. C., Michalos, A. C. 2015: Fifty years after the social indicators movement: has the promise been fulfilled? An Assessment and an Agenda for the Future. Internet <http://www.miqols.org/howb/wp-content/uploads/2016/06/LandAndMichalos-50YearsPaper-Draft7.pdf> (17. 2. 2017).
- Mandič, S. 2015: Opolnomočenje kot nova paradigma spreminjanja družbe in potencial v Sloveniji. Teorija in praksa, 52, 5, p. 825–843.
- OECD, 2013: Guidelines on measuring subjective well-being. OECD Publishing. Internet <https://www.oecd.org/statistics/Guidelines%20on%20Measuring%20Subjective%20Well-being.pdf> (17. 1. 2017).
- OECD, 2015a: How's Life. Measuring well-being. Internet http://www.keepeek.com/Digital-Asset-Management/oecd/economics/how-s-life-2015_how_life-2015-en#page44 (17.1.2017).

- OECD, 2015b: Better Life Index. Internet <http://www.oecdbetterlifeindex.org/> (17.1.2017).
- Smith, D.M. 1973: A geography of social well-being in the United States. McGraw-Hill.
- SURS - SILC, 2018: Samoocena splošnega zadovoljstva z življenjem – SILC, data by Statistical regions – NUTS 3, yearly, 2012–2017. SI-STAT. Internet https://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=0872040S&ti=&path=../Database/Dem_soc/08_zivljenjska_raven/18_08720_silc_zadovol_zivljenje/&lang=2 (20. 10. 2018).
- Tiran, J. 2016: Measuring urban quality of life : case study of Ljubljana = Merjenje kakovosti življenja v mestu : primer Ljubljane. *Acta geographica Slovenica* 56, št. 1, p. 57–73. Internet <http://ojs.zrc-sazu.si/ags/article/view/828/4006> (28.1.2017).
- Tiran, J. 2017: Kakovost bivalnega okolja v Ljubljani. *Georitem* 28. 110 p.; Internet <http://zalozba.zrc-sazu.si/p/1398> (28. 1. 2017).
- Verlič-Dekleva, B. 1996: Prostor in kakovost življenja. In: Svetlik, I. (ed.), *Kakovost življenja v Sloveniji*. Fakulteta za družbene vede, Ljubljana; p. 233–252.