

QUALITY OF LIFE MODELLING FOR PERSONS WITH HEALTH DISABILITY IN THE CONTEXT OF REGIONAL STRATEGIC DOCUMENTS

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Abstract: *This contribution describes the possibilities of utilizing modelling for social policy focused on people with health disability planning and development. This is a case study which is based on the results of questionnaire survey done in the territory of Pardubice region that included people with hearing disability. Data mining methods were used for this modelling. The achieved results can be analyzed in the quality of life definitions context and thus extend the possibilities of their interpretation.*

Keywords: *Quality of Life, Modelling, Public Administration, Health Disability*

1. Introduction

Regional administrations have the obligation to plan social services. By doing this, they generally form and shape regional social policy. This obligation is given to regional administrations by Act no.108/2006 Collection, on Social Services, in the wording of later by-laws [26]. It is often discussed if such an obligation is obligatory also for other types of regional self-administration units and the opinions on this vary. However, municipalities of „tertiary type“ perform such activities in an active way.

Community planning, despite various criticisms, can be considered to be a method that has already found its use and is now widely respected. The base background material for this type of planning is various clients need analyses, social services providers situation, demographic analyses and similar materials. The modelling brings in another possible view on the interpretation of the collected data. It allows to create and analyze models, to derive so called „decision rules“ which may, jointly with other materials, serve as a guide for further process in fulfilling and implementing the goals and measures defined in such plans.

This contribution demonstrates on a concrete example the practical use of data mining methods in the interpretation of social reality. The example is demonstrated on a questionnaire survey done on people with hearing disability outputs analysis that was executed in the framework of midterm planning of social services in Pardubice region.

2. Quality of Life and Values as Key Factors Determining Social Policy Direction

Under the framework of midterm and community plans elaboration on the level of regions and municipalities there is created a lot of analyses and data material that becomes the background material for the drafting of concrete social policy strategic

development documents [25,11,19]. Next to these documents there exist other development plans (e.g. strategic, zoning plans, and similar).

Purposeful and effective social policy is such policy that reacts to the needs and opinions of those on whom such policy is generally targeted. Thus the research into needs, quality of life and to life habits represents the basic activities of empiric research in the given area. The findings of such research may be then considered to be certain indicators of the quality of the public policy decision making processes. The Quality of Life (QL) represents a value that is a subject to various measurements by researches from various research fields. This submitted text represents one of the many ways, however this way attempts to synthesize various approaches. The QL is composed of many elements that are in mutual connections.

For wider understanding of the QL notion is available the following definition. QL is a subjective and an objective evaluation of the existing life situation of a human individual, evaluation how such an individual perceives its position in live and how he/she seems himself/herself [18,24]. QL depends on age, sex, ethnical origin, health disability (physical health), mental health, spiritual situation, and environment and last but not least also on social relations (see Fig. 1). More in [2,7,8,9,10,13,17,20].

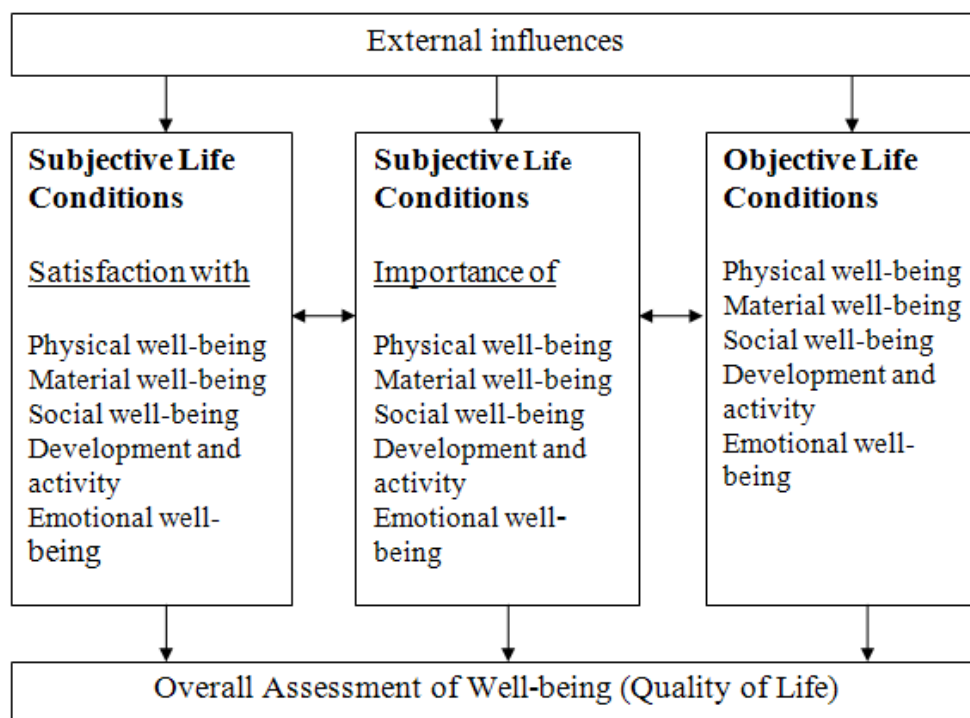


Fig. 1 Quality of Life [20]

QL (in a narrow view) is defined with respect to the subjective feeling of satisfaction of a concrete person with achieving his/her life goals and his/her orientation in life [12]. The direction is influenced by an individual person's value orientation. Values form an individual and unique personality system that is specific for each individual. Individual values in this system are then hierarchically ranked and the system, unless influenced by any situation with a major influence, is then highly stable in time [23]. Values can be considered to be the corner

stone of attitudes. Values show a tendency to their fulfilment. They can be considered to be standards, ideals that determine or route behaviour toward the implementation of the values [21]. According to [4] values represent not only the sought after, but also the conscious tendencies that constitute the bio- psycho - socio – spiritual essence of each individual existence.

From what is described above, it is clear, that the regional management, for the purpose to describe in a correct and exact way the social reality, cannot overlook the utilization of such an objective source of information as is an individual feeling of any single citizen of the relevant region. In the framework of community planning it is quite usual that the subjective feeling of the target group is mapped in the context of their individual needs. The issue of needs is, from a psychological point of view, very closely interlinked with values and this parallel cannot be ignored when drafting any realistic and functional plans.

3. Quality of Life Modelling for a Selected Group of Individuals

In this section, our work was focused on the collection and processing of data on the various aspects of hearing disability individuals in the Pardubice region and their QL. The essential data was collected by means of a questionnaire survey. The questionnaires were composed in such way that they met the needs of disabled persons and avoided any problems disabled persons could have had to fill in such questionnaires. The respondents were informed about the fact that this questionnaire should be used to map the needs and the QL of persons with hearing disability at the beginning of questionnaire. They were also informed about the fact that the outputs shall be used as a background material for the „Midterm Pardubice region social service development plan“.

The process how this model was created is demonstrated in Fig. 2. The first step was to put together the questionnaires, then followed the pilot survey and the modification of the questionnaires that was followed by the survey itself. The collected data were translated into an electronic form and edited (formatting, cleaning). Then the modelling itself started, the results interpretation was done and relevant recommendations were drafted.

3.1 Collection of Data and Pre-processing of Data

The data collection was done by means of a questionnaire survey in the territory of the entire Pardubice region. It covered Pardubice area, Svitavy area, Hlinsko area, Ústí nad Orlicí area and Chrudim area. These areas were covered because in these areas there were self-help groups operating. These groups to a certain extent organize persons with hearing disability and they have good information about those people. Any activities of such groups are voluntary and dependent on time availability. A complex system that would keep „any evidence“ of people with this disability is still missing.

We have managed to get returned 118 filled in questionnaires (unfortunately not all were suitable for further processing). The base analysis of this data, by the way of absolute and relevant frequencies and attitude scale, was published in [14].

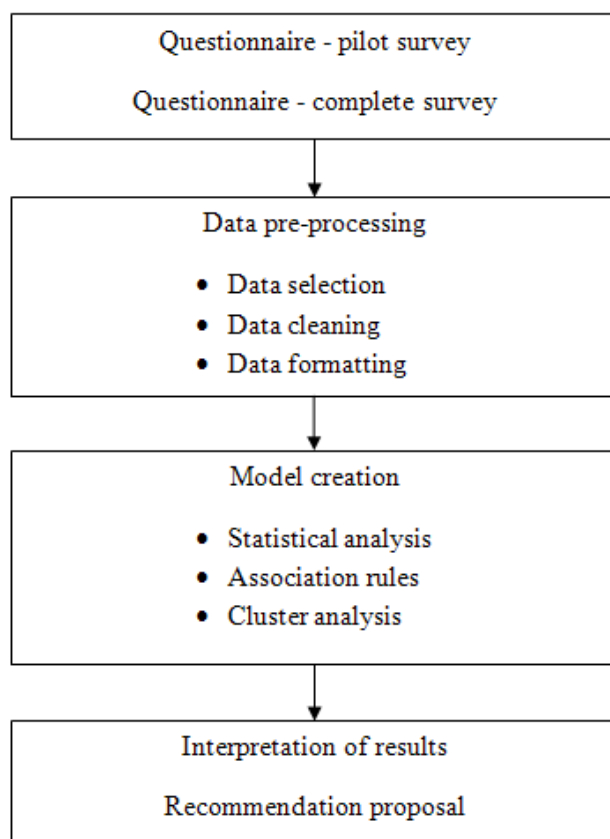


Fig. 2 Problem solution

In year 2006 there were about 5000 people with hearing disability in the territory of Pardubice region, out of that 739 persons were deaf [3]. Later data mention two other estimates of the number of such persons [14]:

- [1] There are from 200 to 600 persons with hearing disability. 60 persons use the services of translators in the territory of Svitavy and Česká Třebová area. At the same time the estimate warns that there are persons who communicate by means of oral methods or use hearing aids and such persons are not included in the registry kept for the two above mentioned areas.
- [2] There are 50 000 to 60 000 persons with hearing disability. This estimate is based on statistics and on demographic facts such as aging of the population (with older age hearing gets worse). This estimate does not differentiate persons according to the type of hearing disability and it covers majority of persons who have partial hearing and are in senior years. Persons suffering from the generative change in hearing have generally less problems than persons with other hearing handicaps.

To illustrate this demonstrated problem we have to add that the Pardubice region has 4519 km² (it is the fifth smallest region in the Czech Republic). Pardubice region comprising of 4 districts – Chrudim, Pardubice, Svitavy and Ústí nad Orlicí – included,

as of December 12, 2007, in total 451 municipalities (which is the sixth highest number of municipalities in a region among the 14 Czech Republic regions) As of the same date there lived 511 400 inhabitants in the region which represents 4,9 % of the total number of inhabitants in the CR. The district Pardubice is the district with the highest population density in the region. Then comes the districts Ústí nad Orlicí, then Svitavy and Chrudim. From the point of view of the age structure of inhabitants we could see in year 2007, compared to the previous year, continuing decline in the number of inhabitants younger than 15 years – compared to year 2006 by 0,9%, on the opposite we saw increase in the age group 65+ (by 1,6%). Old Age Index (the ratio of 65+ persons to 15 and younger persons) had in year 2007 the value 100,6 (98,1 in year 2006). While in year 2007 for women the Old Age Index was 125, for men it was mere 77,8. This difference is caused mainly by lower average age at death with men, but also by a higher rate of newly born men [6].

3.2 Data Analysis and Model Design Proposal

The next phase of the questionnaire processing that is described in this article used statistics tools and data mining methods that helped to mine further information included in the questionnaires. The questionnaires were ready in printed form for the pre-processing. The first step was to review the printed questionnaires, their contents, completeness and possible errors. In this phase we saw, unfortunately, that despite the fact that a pilot survey had been executed, number of questionnaires were filled in incorrectly and could not be used for the automatic processing. The respondents made mistakes mainly in the number of answers they were to mark. Also in many cases, the respondents wrote down their opinions instead of marking answers. Respondents' opinions are valuable source of information for the processing personnel, however, for the translation of the questionnaire into the data matrix for the machine processing this is an error. Nonetheless, it proved the finding that such a target group needs a different form of survey - instead of using questionnaire it would be better to carry structured interviews with this target group persons next time. During a structured interview it is possible to explain more the basic meaning of the asked question and thus to eliminate unclear responses. The error-free questionnaire rate of return shall thus be increased. For all the above-mentioned reasons 66 questionnaires were finally used. The questionnaires were translated in an electronic form in a proper shape. Data matrix $M(66 \times 35)$ was created in this way. The number of attributes 35 does not correspond to the number of questions since some questions (and the answers to these questions) were split to more than one attribute.

The base statistics data analysis was the first step. It appeared that the data in the data matrix are, from the point of view of the important attributes, distributed in the following way. Regarding the hearing disability type there were 53% hard of hearing, 35% deaf and 12% with lost hearing. Regarding the sex category there were 50% women and 45% men (5% did not state the sex). Regarding the age there were 3% under 20, 23% were between 21 to 35, 24% between 36 -50, 23% between 51 -65 and 27% were older than 65 years of age. 26% respondents lived in a village, 67% lived in a city (7% did not respond to this question)

Pearson's pair coefficient was used to illustrate the tightness of the stochastic bonding between individual attributes. For those attributes where strong correlation was found we executed further calculations and we interpreted the results. However we must keep in mind that when interpreting these results we must be very cautious since even a strong pair correlation is not yet any prove of a causal connection, it can be a random phenomenon [16]. In total we found a strong correlation in 37 cases. Interesting pair correlations are stated in the following Table 1.

Table 1 Selected Correlation Coefficients

Parameter 1	Parameter 2	Pearson correlation – coefficient values
Type_disability	ZP_Communication	-0.377
Type_disability	Achieved education	-0.342
Achieved education	Internet Utilisation	-0.355
Age_resp	Internet Utilisation	+0.470
Type_disability	Age_resp	-0.271

For the selected parameters (parameter 1 and 2) the following coding was used: Type of disability - 1 is hard of hearing, 2 is deaf , 3 lost hearing; Manner of communication - 1 is Sign Czech language , 2 is Sign language, 3 is /mouth observing, 4 is other; Achieved education - 1 is primary education, 2 is secondary education without school leaving exam, 3 is secondary education with school leaving exam, 4 is higher professional, 5 is college/university ; Age - 1 stands for age under 20 let, 2 is age from 21 to 35, 3 is from 36 to 50, 4 from 51 to 65, 5 older than 66; Internet utilization (the rate of utilization of this technology) - 1 is frequent use,.... 5 means does not use, is not interested to use.

Table 1 can be interpreted in the following way: persons with light hearing disability – hard-of-hearing use for communication more mouth observing and other means; on the other hand deaf people use more the sign language, Czech sign language. Persons with more serious disability have lower achieved education than people with less serious disability. Further on person with hearing disability with higher education use Internet services as a new technology to a higher degree than those with lower education. And last but not least younger persons with hearing disability use Internet much more often than the older persons. The last line in the Table means that older persons have hearing disability „hard-of-hearing“ – that reflects hearing deteriorating with age.

In the next modelling phase association rules were used. There exist many methods for their derivation [15]. In this model the method „Generalized Rule Induction“ [22] was used. This method generates association rules with the highest information content in the form *if antecedent(s) then consequent(s)*. In table 2 there are the outputs for selected attributes, while in columns 3 and 4 are stated also values support and confidence for the individual rules.

Association rules proved the correctness of the correlations between the type of disability and the age and the manner of communication calculated in Table 1.

Table 2 Acquired Association Rules

Antecedent	Consequent	Support	Confidence
Type_disability = 1.0	Age_resp = 5.0	27.27	83.33
Type_disability = 2.0	Age_resp = 3.0	24.24	56.25
Type_disability = 2.0	ZP_communication = 2.0	28.79	73.68
Type_disability = 1.0	ZP_communication = 4.0	10.61	100.0
Type_disability = 2.0	ZP_communication = 1.0	9.09	83.33
Type_disability = 1.0	ZP_communication = 3.0	50.0	69.7

Another used method was the cluster analysis (CA). In simple words it can be stated that the CA looks for objects or group of objects (clusters) that are mutually similar and at the same time differ from objects in other groups (clusters). The analysis itself has usually 5 steps – data acquisition, standardization, creation of input matrix, application of cluster method, calculation and comparison with correlation coefficient. CA methods can be divided into hierarchical and non-hierarchical (however there are also other divisions, e.g. in [1]). In this case the method called „Two Step Clustering“ was used. The outputs are for better understanding illustrated in a graphic way in Fig. 3 and 4 (the parameters are marked similarly as in Table 1). From the Fig.s it issues that clusters are markedly visible both in the case of parameters „type of disability – education“ and parameters „type of disability – manner of communication“. Those correspond to the findings acquired by correlation analysis as well as by association rules. Thus the type of disability influences achieved education of persons with hearing disability (more serious disability means usually lower achieved education) and the type of disability influences manners of communication (deaf and lost hearing persons usually use the sign language, hard-of-hearing persons usually do mouth observing or use other means). The model was designed and analyzed in programme Clementine 10.1.

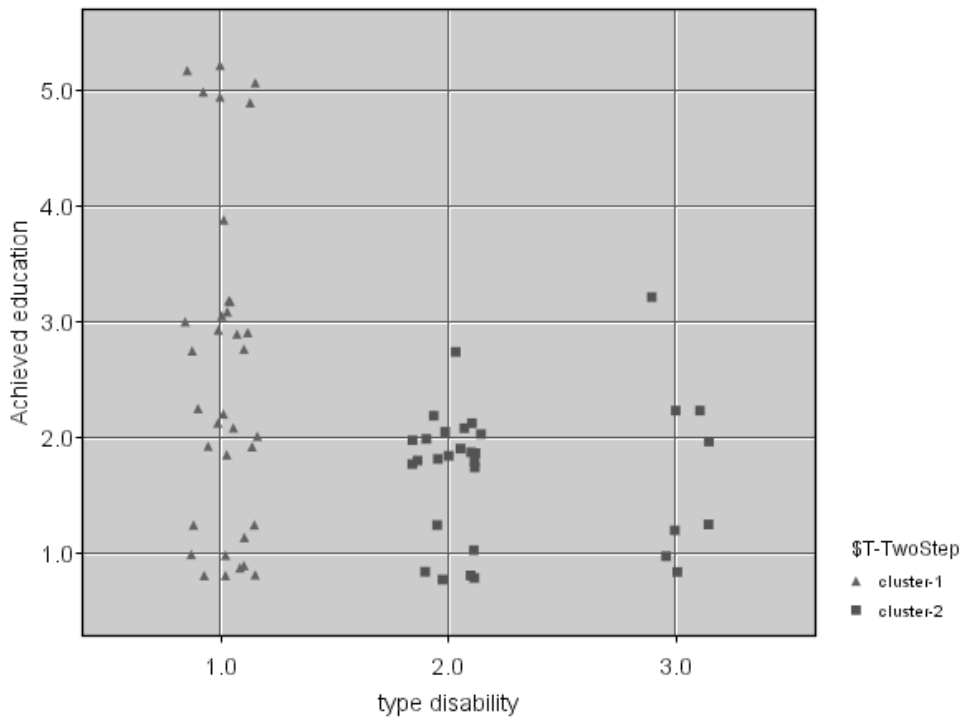


Fig. 1 CA Outputs – dependence of the achieved education on the disability type

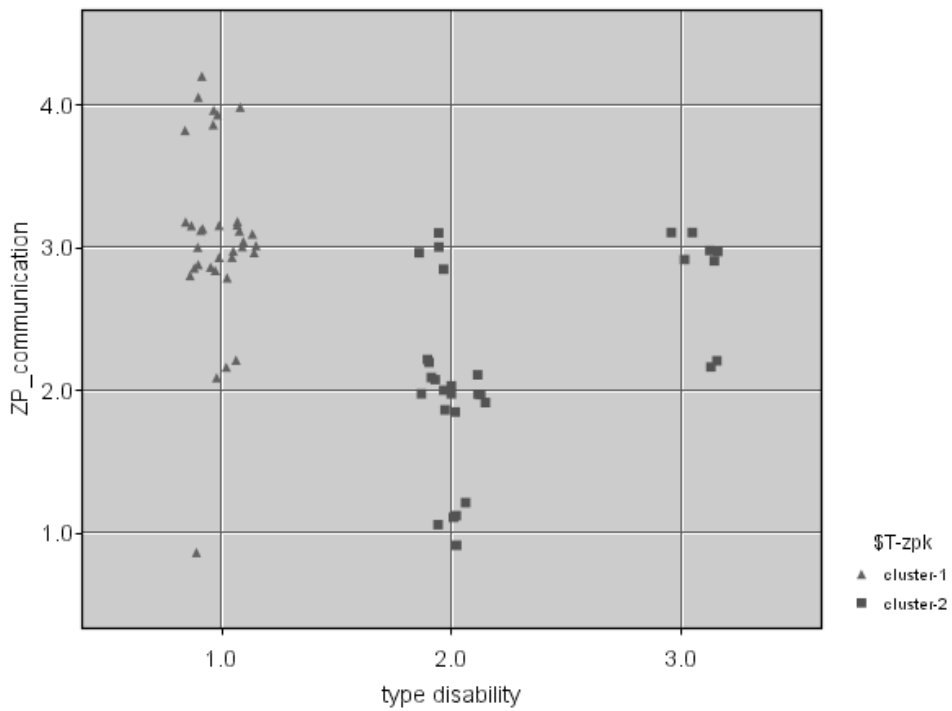


Fig. 2 CA Outputs – dependence of the manner of communication on the disability type

4. Conclusion

QL represents an important indicator [5] that supports the execution of decision making processes. Despite its subjective side it is a very precious source of data. It serves to complete the existing analysis and it helps more detailed interpretation of such analysis. In case the qualitative analysis is used (e.g. structured interview) we may consider the achieved statements to be the representative Fig. of the regional situation. However, by its nature it is a very expansive research method that requires trained inquirers. On the other hand it gives the guarantee that the acquired data have high validity and the utilization of such data is broader than the community planning framework.

In the submitted text subjective sides of the persons with hearing disabilities QL is researched into. The method how the data on their quality of life was collected was described as well as the data processing and the data interpretation by means of up to date data mining methods. Data collected directly from the executed survey respondents are a highly valuable source of information on the respondents problems and needs and can be well used as a background material for the development of social services. Some information issuing from the questionnaires is obvious and easily derived, other was derived by means of suitable statistics and data mining methods. Correlation analysis was selected, association rules, CA. The most distinctive relationship was found between the attributes type of disability and manner of communication – it was confirmed by all three methods. There is also a relation between the type of disability and the achieved education, between the age and the type of disability, the age and the rate of Internet usage and last but not least the achieved education and Internet usage rate.

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References:

- [1] ARABIE, P., HUBERT, L.J., DE SOETE, G. (Ed.). (1996) *Clustering and classification*. Singapore: World Scientific Publishing.
- [2] BLAŽEJ, A. Kvalita života z aspektu udržateľného rozvoja v 21. storočí. In *Kvalita života a rovnosť príležitostí - z aspektu vzdelávania dospelých a sociálnej práce*. Prešov: Filozofická fakulta Prešovskej univerzity v Prešove; 2005, s. 21–26. ISBN 80-8068-425-1
- [3] BOROVIČKA, K. a kol. Studie sektoru nestátních neziskových organizací v Pardubickém kraji (Svazek II.). [on line] 2006 [cit. 20-10-2010]. Dostupné na: <http://www.rozvoj-pk.cz/studie_nno.php>
- [4] CAKIRPALOGLU, P. *Psychologie hodnot*. Olomouc: Votobia s.r.o., 2004. 428 s. ISBN 80-7220-195-6.
- [5] CENTRUM PRO OTÁZKY ŽIVOTNÍHO PROSTŘEDÍ. 2010, [cit. 20-05-2010]. Dostupné na: <<http://www.cozp.cuni.cz/COZP-13.html>>

- [6] ČESKÝ STATISTICKÝ ÚŘAD. Charakteristika Pardubického kraje. [on line] 2009 [cit. 20-10-2010]. Dostupné na: [<http://www.pardubice.czso.cz/x/redakce.nsf/i/charakteristika_pardubickeho_kraje_\(udae_za_rok_2007\)>](http://www.pardubice.czso.cz/x/redakce.nsf/i/charakteristika_pardubickeho_kraje_(udae_za_rok_2007))
- [7] DVOŘÁKOVÁ, Z., DUŠKOVÁ, L., SVOBODOVÁ, L. a kol. *Svět práce a kvalita života. Vliv změn světa práce na kvalitu života*. Praha: Výzkumný ústav bezpečnosti práce, 2006. 117 s. ISBN 80-86973-08-5
- [8] FRK, B. Možnosti komunitnej práce pry zvyšování kvality života komunity. In. *Kvalita života ve spektre andragogických a sociálnopsychologických disciplín*. Prešov: Filozofická fakulta Prešovské univerzity v Prešově; 2003. Str. 28 – 34. ISBN 80-968367-7-3
- [9] HALEČKA, T. Kvalita života a jej ekologicko-environmentálny rozmer. In *Kvalita života a ľudské práva v kontextoch sociálnej práce a vzdelávania dospelých*. Prešov: Filozofická fakulta Prešovské univerzity v Prešově; 2002. Str. 65 – 81. ISBN 80-8068-088-4
- [10] JIRAVA, P., MANDYS, J., KAŠPAROVÁ, M., KŘUPKA, J. System Approach to Determinants of Quality of Life within a Region. WSEAS Transaction on Systems, 2010, Issue 3, Vol. 9, s. 243-252. ISSN 1109-2777
- [11] KOLEKTIV AUTORŮ. *Průvodce procesem komunitního plánování*. [online] MPSV. Praha, 2004. [cit. 20-04-2010]. Dostupné na: [<http://www.komplan.cz/soubory/procesy_kp.pdf>](http://www.komplan.cz/soubory/procesy_kp.pdf)
- [12] KŘIVOHLAVÝ, J. *Psychologie zdraví*. Praha: Portál, 2009. 280s. ISBN 978-80-7367-568-4
- [13] KUBÁTOVÁ, H. *Sociologie životního způsobu*. Praha: Grada Publishing a.s., 2010. 272 s. ISBN 978-80-247-2456-0
- [14] MANDYS, J. *Průzkum potřeb sluchově postižených osob na území Pardubického kraje*. Podkladový výzkum pro Střednědobý plán rozvoje sociálních služeb pardubického kraje 2008 – 2010. Pardubice: Univerzita Pardubice, 2009. 40 s.
- [15] MAŘÍK, V., ŠTĚPÁNKOVÁ, O., LAŽANSKÝ, J. a kol. *Umělá inteligence (1)*. Academia, Praha, 1993. ISBN 80-200-0502-1.
- [16] MELOUN, M., MILITKÝ J.: *KOMPENDIUM STATISTICKÉHO ZPRACOVÁNÍ DAT, Metody a řešené úlohy včetně CD*, Academia Praha 2006, 985 s., ISBN 80-200-1396-2.
- [17] MŮHLPACHR, P. Měření kvality života jako metodologická kategorie. In *Kvalita života a rovnost příležitostí - z aspektu vzdelávania dospelých a sociálnej práce*. Prešov: Filozofická fakulta Prešovské univerzity v Prešově; 2005. Str. 59 - 70. ISBN 80-8068-425-1
- [18] PHILLIPS, D. *Quality of Life: Concept, Policy and Practice*. London: Routledge; 2006. 276 s. ISBN 978-0-415-32355-0
- [19] PROGRAMOVÝ TÝM PROJEKTU EQUAL 0076; *Deset kroků procesem komunitního plánování. Metodický sešit 1: Deset základních kroků v procesu komunitního plánování a příprava prostředí pro pořízení komunitního plánu..* Centrum komunitní práce. Ústí nad Labem; 2006. [cit. 20-04-2010]. Dostupné na: [<http://www.komunitniplanovani.com/kp-metodiky_11/>](http://www.komunitniplanovani.com/kp-metodiky_11/)
- [20] RAPLEY, M. *Quality of Life Research: A Critical Introduction*. London: SAGE, 2003. 286 p. ISBN 978-0-7619-5456-9

- [21] ŘEHAN, V.; CAKIRPALOGLU, P. Sociální status a hodnotová orientace mladé generace. In *Československá psychologie*. 2000, r. XLIV, č. 3, s. 202 – 215.
- [22] SPSS. SPSS Inc. *Clementine® 7.0 User's Guide*. 2002
- [23] TONDL, L. *Hodnocení a hodnoty. Metodologické rozměry hodnocení*. Praha. Filosofia, 1999. 178 s. ISBN 80–7007-131–1
- [24] VAĎUROVÁ, H., MŮHLPACHR, P. *Kvalita života: teoretická a metodologická východiska*. Brno: Masarykova univerzita, 2005. 145 s.
- [25] VASKOVÁ, V., ŽEŽULA, O. *Komunitní plánování – věc veřejná. Jak zjistit co lidé opravdu chtějí? Jak zlepšit život v obci?* Praha: MPSV, 2002. ISBN 80-86552-30-6
- [26] Zákon číslo 108/2006 Sb., o sociálních službách ve znění pozdějších předpisů

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