Territorial Distribution of Alcohol and Drug Addictions Mortality Concerning Regional Disparities in the Slovak Republic from Year 1996 to Year 2015

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BACKGROUND: This paper deals with the territorial distribution of alcohol and drug addiction mortality at the level of the districts of the Slovak Republic. **AIM:** The aim of the paper is to explore the relations within the administrative territorial division of the Slovak Republic, that is, between the individual districts, and hence, to reveal possibly hidden relations in alcohol and drug mortality. **METHODS:** The analysis is divided into two segments – for both the sexes individually. The computed standardised mortality rate is employed to calculate similarity through the Euclidean distance. Cluster analysis is performed with the clusters created by the mutual distances. The data comes from the database of the Statistical Office of the Slovak Republic and it covers the time span beginning in 1996 and ending in 2015. **RESULTS:** Substantially, the Slovak Republic possesses the mortality regional disparities expressed by the standardised mortality rate computed particularly for the diagnoses assigned to alcohol and drug addictions at a considerably high level. However, the outcomes for the sexes differ. The Bratislava III District keeps the most extreme position absolutely forming its own cluster for both the sexes, too. The Topoľčany District occupies a similar extreme position from the point of view of the male sex. All the Bratislava districts maintain a mutual notable dissimilarity. Contrariwise, the development of the regional disparities among the districts show notable heterogeneity. **CONCLUSIONS:** There are considerable regional discrepancies throughout the districts of the Slovak Republic. Hence, a common platform has to be established to help in tackling this issue.

Keywords | Addiction – Alcohol – Drug– Standardised mortality rate – Region – Regional disparity – Slovak Republic

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1 INTRODUCTION

The growing evidence shows that there is no level of alcohol without health consequences and that there are the significant health consequences of usage of the other types of the substances (Burton & Sheron, 2018; Griswold et al., 2018). A number of the significant studies address alcohol consumption and its health implications at global or national level (Nemtsov, Neufeld, & Rehm, 2019). From a point of view of an alcohol policy, the regional differences in alcohol consumption and the different health effects of alcohol need to be addressed too.

According to the another research, the regional differences in the numbers of the inhabitants assigned to alcohol-related harm exist across the United Kingdom of Great Britain and Northern Ireland. They also found that this figure is not entirely consistent with the differences in the numbers of the inhabitants related to alcohol consumption, so the other factors are also involved in this result (Robinson, Shipton, Walsh, Whyte, & McCartney, 2015).

The main aim of the paper is to explore the relations within the administrative territorial division of the Slovak Republic, that is, between the individual districts and hence, to reveal possibly hidden relations in mortality associated to mortality. This outcome is supposed to serve as a potential platform to probable further research in order to get a basement for joint health care service policy in a field of prevention of the diagnoses related to the alcohol and drug addictions.

2 LITERATURE REVIEW

The burden of disease attributable to alcohol and drug use vary substantially all over the countries and much of this burden is due to the effect of substance use on other health outcomes (Degenhardt et al., 2013). The substance use can have a various negative impact on health, economics cost and social aspect of the community. This recent study shows that burden attributable to alcohol and drug use is strongly associated with socioeconomic development of the territory. Another comprehensive study demonstrates that mean mortality rate related to drug use have been higher among the counties characterised by greater economic and family distress, including rates of poverty, unemployment, disability, no college degree, public assistance, rental stress, divorce or separation, and single-parent families (Monnat, 2018). Similarly, the study of the territory of Scotland shows higher alcohol and drug related deaths than in Europe, especially for the male sex in the most deprived areas (Parkinson, Minton, Lewsey, Bouttell, & McCartney, 2018). Correspondingly, the further work related to alcohol mortality in the Slovak Republic also confirm the concentration of the health problems in the regions that can be described as structurally disadvantaged (Gavurová, Korony & Barták, 2017; Gavurová, Tóth, Barták & Petruželka, 2018). Also, the risk periods are studied and they can perform as a key factor (Petruželka et al., 2017).

As stated above, there is a constant attention paid to the territorial distribution of alcohol and drug related mortality as well as to the international and regional disparities. There is a study that provides an analysis of decreases of life expectancy in a relation to the mortality linked to substance use in the United States of America (Rehm & Probst, 2018). They conclude that there is a clear link between the substance use and the stagnation in life expectancy in the country. They also describe clear social gradient as people with a lower socioeconomic status are more affected than the people with a higher socioeconomic status.

The global burden of alcohol and drug related diseases is substantial among a whole set of the addictions. According to the studies, regardless of a stage of economic development of the explored countries, the burden of these addictions disproportionately on the poor people and it is a source of the both health and economic disparities (Plümper, Laroze, & Neumayer, 2018; Zemore et al., 2018). The well documented disparities are also the ones in a case of alcohol both globally (Buajitti, Watson, Norwood & Rosella, 2018) and in many countries (Mühlichen, 2018). Recently, a big attention is paid to opioids in this context (Dart et al., 2015; Ruhm, 2017; Dasgupta, Beletsky, & Ciccarone, 2018) and to stimulants (Turner et al., 2018). The aim of the research corresponds to the current international public health policy strategies. Recently, the World Health Organization launched the so-called Safer action package that focuses on a relation among alcohol marketing, alcohol availability, drink-driving policies, taxation and pricing mechanisms, provision of accessible and affordable treatment for people with alcohol use disorder, implementation of screening and brief interventions programmes for hazardous and harmful drinking, and public awareness of health problems caused by harmful use of alcohol and ensuring support of effective alcohol policies (World Health Organization, 2018). The country success can lie also in strong monitoring system that has to support the alcohol policymaking and its implementation into practise. Monitoring based on territorial distribution of mortality related to alcohol and drug use at a regional level has a strong potential to track the progress and enable accountability of alcohol policy measures.

Also, the Organisation for Economic Co-operation and Development stresses the importance of a study of harmful alcohol use at a regional level. In the key publication, the trends in alcohol consumption in the Organisation for Economic Co-operation and Development member countries and social disparities in alcohol drinking are highlighted (Sassi et al., 2015). The European Union pays an attention to a development and a maintenance of common evidence base at a supranational level as well as an investigation of main areas for action (European Commission, 2015). According to the report on the implementation of the alcohol strategy, there is a continued commitment to work with partners to develop and to maintain an evidence base at supranational level, particularly in a relation to the development of the health indicators to monitor progress and the effectiveness of the applied approaches (European Commission, 2009).

All the relevant international organisations and institutions strongly support an investigation and a deeper understanding of harmful consequences of alcohol use and call for researches that will bring more evidence for the needed steps in an alcohol policy development.

3 MATERIALS AND METHODS

The methodology is selected according to the characteristics of the data set involved in the analysis. Because of the data nature, there is only a restricted number of ways to analyse two-dimensional data with a sole variable divided by its attributes into the several categories.

3.1 Data

The data comes from the database of the Statistical Office of the Slovak Republic (whose data is provided by the National Health Information Centre.

The covered time span begins in the year 1996 and ends in the year 2015. This is the whole available time period for such a data, because there are no records of the causes of the death before the year 1996 in the Slovak Republic in the comprehensive data set.

From a territorial point of view, a level of the districts of the administrative territorial division is selected to be analysed. It represents the fourth level of the Nomenclature of Territorial Units for Statistics which serves as a basement for such spatial analysis in the documents of Eurostat – the main statistical office of the European Union. They are numbered according to the district numbering system of the Slovak Republic made public in the appropriate promulgation of the Statistical Office of the Slovak Republic (Štatistický úrad Slovenskej republiky, 2011). The list looks like as follows, whilst the districts are listed increasingly by their numerical designation – that is, divided into the self-governing regions: B1 – the Bratislava I District, B2 – the Bratislava II District, B3 – the Bratislava III District, B4 – the Bratislava IV District, B5 – the Bratislava V District, MA – the Malacky District, PK – the Pezinok District, SC – the Senec District, DS – the Dunajská Streda District, GA – the Galanta District, HC – the Hlohovec District, PN – the Piešťany District, SE – the Senica District, SI – the Skalica District, TT – the Trnava District, BN – the Bánovce nad Bebravou District, IL – the Ilava District, MY – the Myjava District, NM – the Nové Mesto nad Váhom District, PE – the Partizánske District, PB – the Považská Bystrica District, PD – the Prievidza District, PU – the Púchov District, TN – the Trenčín District, KN – the Komárno District, LV – the Levice District, NR – the Nitra District, NZ – the Nové Zámky District, SA – the Šaľa District, TO – the Topoľčany District, ZM – the Zlaté Moravce District, BY – the Bytča District, CA – the Čadca District, DK – the Dolný Kubín District, KM – the Kysucké Nové Mesto District, LM – the Liptovský Mikuláš District, MT – the Martin District, NO – the Námestovo District, RK – the Ružomberok District, TR – the Turčianske Teplice District, TS – the Tvrdošín District, ZA – the Žilina District, BB – the Banská Bystrica District, BS – the Banská Štiavnica District, BR – the Brezno District, DT – the Detva District, KA – the Krupina District, LC – the Lučenec District, PT – the Poltár District, RA – the Revúca District, RS – the Rimavská Sobota District, VK – the Veľký Krtíš District, ZV – the Zvolen District, ZC – the Žarnovica District, ZH – the Žiar nad Hronom District, BJ – the Bardejov District, HE – the Humenné District, KK – the Kežmarok District, LE – the Levoča District, ML – the Medzilaborce District, PP – the Poprad District, PO – the Prešov District, SB – the Sabinov District, SV – the Snina District, SL – the Stará Ľubovňa District, SP – the Stropkov District, SK – the Svidník District, VT – the Vranov nad Topľou District, GL – the Gelnica District, K1 – the Košice I District, K2 – the Košice II District, K3 – the Košice III District, K4 – the Košice IV District, KS – the Košice-okolie District, MI – the Michalovce District, RV – the Rožňava District, SO – the Sobrance District, SN – the Spišská Nová Ves District, TV – the Trebišov District. All the figures involved in the paper refer to this legend.

The analysis examines the particular diagnoses related to the alcohol and drug addictions. The codes are applied as stated in the International Statistical Classification of Diseases and Related Health Problems – according to its tenth revision named ICD-10 (World Health Organization, 2016).

This group covers the following set of the diagnoses – listed in the alphabetical order:

F10 – mental and behavioural disorders due to use of alcohol;
F11 – mental and behavioural disorders due to use of opioids;
F12 – mental and behavioural disorders due to use of cannabinoids;
F13 – mental and behavioural disorders due to use of sedatives or hypnotics;
F14 – mental and behavioural disorders due to use of cocaine;
F15 – mental and behavioural disorders due to use of other stimulants, including caffeine;
F16 – mental and behavioural disorders due to use of hallucinogens;
F17 – mental and behavioural disorders due to use of tobacco;
F18 – mental and behavioural disorders due to use of volatile solvents;
F19 – mental and behavioural disorders due to multiple drug use and use of other psychoactive substances;
K70 – alcoholic liver disease;
K73 – chronic hepatitis, not elsewhere classified.

As it is seen, the F10, K70, and K73 diagnoses are assigned to the alcohol addiction, whilst the remaining diagnoses – F11, F12, F13, F14, F15, F16, F18, and F19 – are related to the drug addiction.

3.2 Methodology

The whole analysis is substantially divided and executed into the two fragments – one belongs to the female sex, the other one belongs to the male sex.

The standardised mortality rate is computed according to a sequence of the mathematical relations (Wolfenden, 1923).

The major mathematical formula looks like:

$$SMR = \sum_{a=1}^{g} \left(\frac{M_a}{P_a} . ESP_a \right)$$

where the involved variables signify:

- SMR – the standardised mortality rate;
- g – a number of age groups;
- a – the particular age group;
- M_a – a number of deaths in the a-th age group;
- P_a – a number of inhabitants in the a-th age group;
- ESP_a – a number of inhabitants in the a-th age group according to the European standard population (Eurostat, 2013).

The Euclidean distance is employed to compute the similarity within each pair of a whole set of the districts of the Slovak Republic. Before calculation of the Euclidean distance, the data is normalised.

Its calculation is executed according to the successive mathematical formula:

$$D(d_1, d_2) = \sqrt{\left(d_{1_x} - d_{2_x}\right)^2 + \left(d_{1_y} - d_{2_y}\right)^2}$$

where the involved variables indicate:

- d_1 – the first district;
- d_2 – the second district;
- $D(d_1,d_2)$ – the mutual Euclidean distance of the d_1 district and the d_2 district;
- d_{1_x} – the x coordinate of the d_1 district;
- d_{2_x} – the x coordinate of the d_2 district;
- d_{1_y} – the y coordinate of the d_1 district;
- d_{2_y} – the y coordinate of the d_2 district.

Each figure in the paper related to the Euclidean distance is rounded to four decimal places if it is necessary.

There is to note that the districts within all the pairs mentioned in the tables of the paper are ordered alphabetically in an ascending way.

The cluster analysis examines the computed similarity – the clusters are created by means of the mutual distances of the districts. The Ward's minimum variance method employed to cluster the objects as a dominant hierarchical clustering approach (Ward, 1963). Also, the dendrograms are constructed according to this method. However, the number of cluster is set by the τ clustering approach (Rohl, 1974).

This clustering method has the following computational formula:

$$\tau_i = \frac{CC_i - DS_i}{\sqrt{\frac{CD\,(CD-1)}{2} - C_i} \cdot \frac{CD\,(CD-1)}{2}}$$

where the involved variables mean:

- CC_i – a number of the concordant comparisons for the i-th district;
- DS_i – a number of the discordant comparisons for the i-th district;
- CD – a number of the compared districts;
- C_i – a number of the comparisons of two pairs of the districts, whilst the both pairs represent the within cluster comparison or the between cluster comparison.

The correct number of clusters is determined by the maximum value of τ in the hierarchy sequence.

4 RESULTS

The first step of the analytical part is to determine a number of clusters in order to get the groups of the similar districts. The τ clustering approach sets an optimal number of clusters equal to 6 for the both sexes, as the highest value of the statistic for the female sex is at level of 621.1879 that is assigned to the sixth computation in a row of all the districts and for the male sex stands at a level of 666.8056 that is assigned to the sixth computation too.

Because there is considerable different outcome of the analysis for the individual sexes, the results are presented separately firstly mentioning the female sex and subsequently the male sex.

The elementary view on the situation of the standardised mortality rate in a field of the observed diagnoses for the both sexes is offered by the first two figures which visualise the dendrograms for the individual sexes – the first dendrogram for the female sex and the second one for the male sex. They represent a mean value of the whole explored period from the year 1996 to the year 2015. (*Figure 1*.)

As the overall dendrogram of the female sex shows, the most specific district in the Slovak Republic is characterised by the Bratislava III District that creates the individual cluster solely. The first cluster involves 9 districts, the second one only 1 district, the third one 8 districts, the fourth one 35 districts, the fifth one 4 districts and finally, the sixth one 22 districts. (*Figure 2*.)

The situation in the male sex is partially different from the female sex. There is one more cluster with the sole district – besides the Bratislava III District that plays the same role, the Topoľčany District creates the individual cluster too. The first cluster comprises 2 districts, the second cluster is major with its 57 clusters, the third cluster contains 10 districts, the fourth one 8 clusters and finally, the last two ones are individual for the involved districts.

Another look at the similarity in a field of the standardised mortality rate on the explored diagnoses is offered by the heat maps which graphically demonstrate the situation in the whole Slovak Republic. Again, for the both sexes one heat map is created. The shading level of the discrete cells demonstrates similarity – the lighter colour is, the more

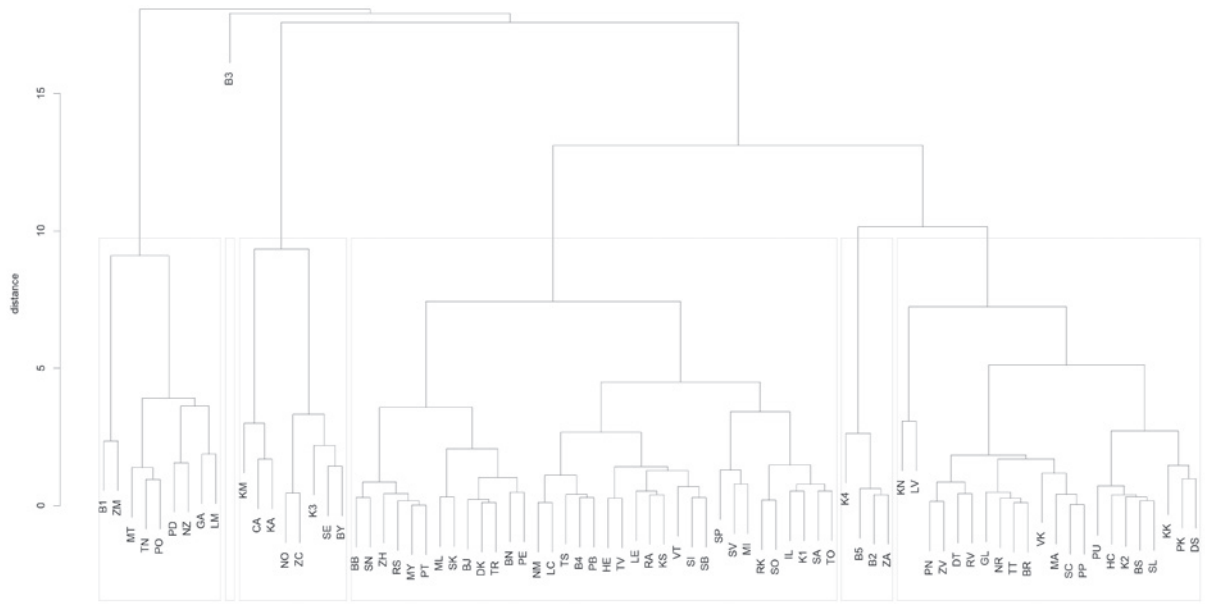

Figure 1 | The mean female sex dendrogram of the districts for the whole explored period

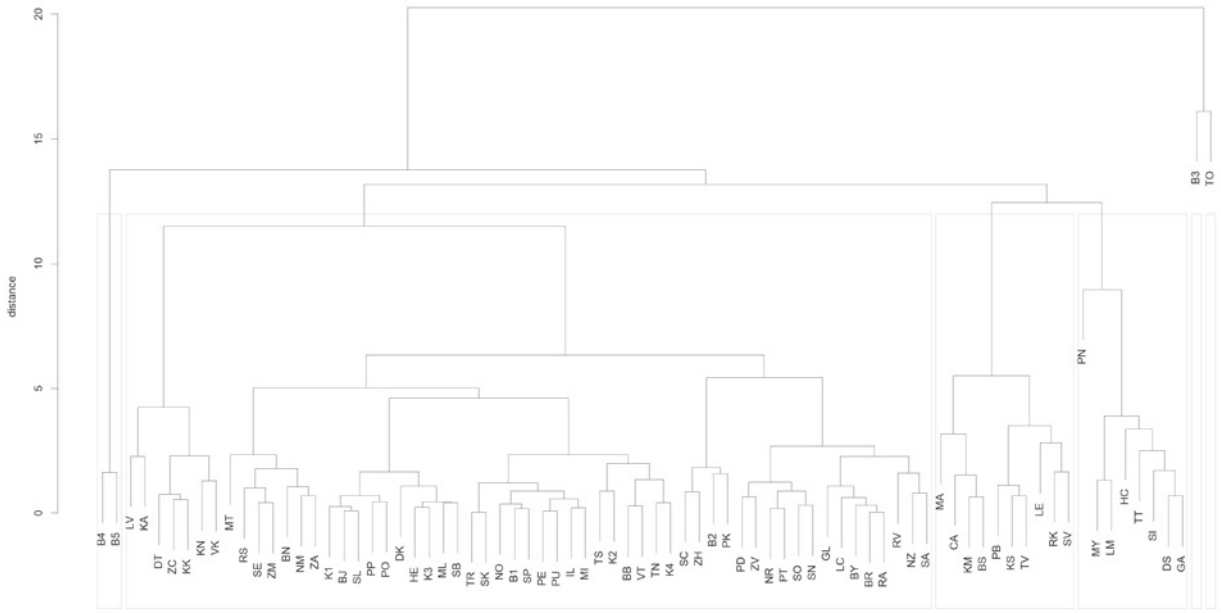

Figure 2 | The mean male sex dendrogram of the districts for the whole explored period

similar district pair is and vice versa, the darker colour is, the most dissimilar district pair is. (*Figure 3*.)

The specific district represented by the Bratislava III District is clearly visible by the darkest coloured strip meaning it is the outermost district. The Bratislava I District possesses a situation very similar to the previously mentioned district. Generally, there are noticeably evident the darker stripes demonstrating the outlying areas. (*Figure 4*.)

Correspondingly, the male sex situation is characterised by the two outlying districts represented by the Bratislava II District and the Topoľčany District. Besides this couple, the cluster consisting of the several Bratislava districts is undoubtedly detectible and in a wider way some adjacent districts of the Bratislava Self-governing Region and some nearby districts Trnava Self-governing Region can be added – notably, the Bratislava IV District, the Bratislava V District, the Piešťany District, the Hlohovec District and so on.

Regional differentiating is visible also from a point of view of the mutual similarity of the districts. The mean distance between all the pairs of the districts for the female sex is at a level of 3.8688. This figure is higher than a median value of the set of all the distances that is equal to 3.2880. Though, a mean value would be the 1863rd in a row of all the 3081 distances ordered in an ascending way. In a case of the male sex, this disparity is even more considerable, as

Figure 3 | The mean female sex heat map of the districts for the whole explored period

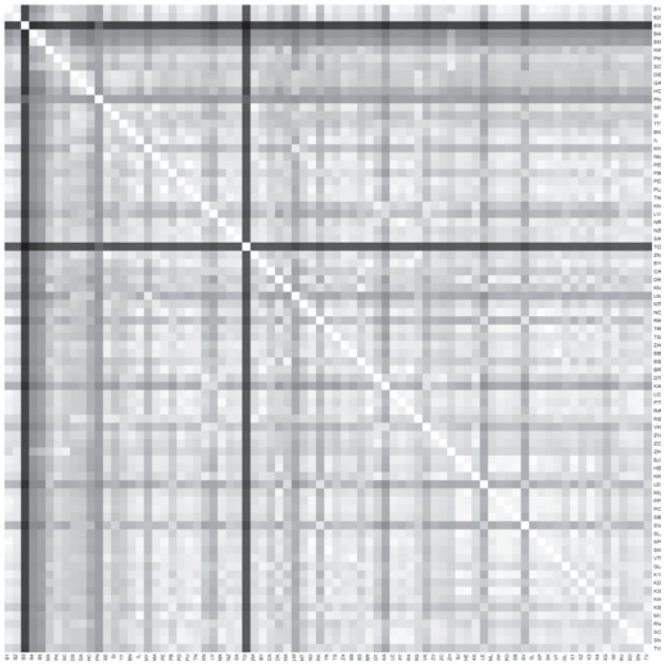

Figure 4 | The mean male sex heat map of the districts for the whole explored period

a median value is equal to only 2.9550, whilst a mean value stands at 3.7120 meaning it would be the 1949th in a row of all the distances ordered in an ascending way. To illustrate the exact mean pair of the districts, the nearest value to it is represented by a pair of the Medzilaborce District and the Senica District for the female sex and by a pair of the Košice II District and the Skalica District for the male sex. Nevertheless, the numerical differences between the pairs are very low here.

Another look at the point of the regional disparities can be offered by the extreme pairs of the districts throughout the whole explored period. The two subsequent tables demonstrate these extreme pair for the both sexes – firstly, the female sex and secondly, the male sex. (*Table 1*.)

Order	District 1	District 2	Distance
1.	Bratislava I District	Bratislava III District	15.6194
2.	Bratislava III District	Zlaté Moravce District	15.5221
3.	Bratislava III District	Kysucké Nové Mesto District	15.4251
4.	Bratislava III District	Čadca District	14.4125
5.	Bratislava III District	Krupina District	14.1764
6.	Bratislava III District	Košice III District	14.1598
7.	Bratislava III District	Levice District	13.9841
8.	Bratislava III District	Galanta District	13.9262
9.	Bratislava III District	Bytča District	13.8847
10.	Bratislava III District	Liptovský Mikuláš District	13.7655

Table 1 | The most extreme pairs of the districts of the Slovak Republic for the female sex throughout the whole explored period

As it is understandable from the previous table, the top of the extreme pairs is quite balanced. The absolutely most extreme pair of the female sex or in another words said the outermost pair of the districts is created by the Bratislava I District and the Bratislava III District demonstrating that there are not only the regional disparities in a point of view of the whole country, but also in a smaller point of view regarding the smaller area as the city of Bratislava is. The extreme situation of the Bratislava III District is underlined by the fact that it is involved in all of the pair mentioned in the table. (*Table 2*.)

Order	District 1	District 2	Distance
1.	Bratislava III District	Topoľčany District	16.1201
2.	Bratislava III District	Bratislava IV District	14.9981
3.	Bratislava III District	Levoča District	14.8793
4.	Bratislava III District	Krupina District	14.8283
5.	Bratislava III District	Bratislava V District	14.6264
6.	Bratislava III District	Ružomberok District	14.6001
7.	Bratislava III District	Snina District	14.5946
8.	Bratislava III District	Hlohovec District	14.5891
9.	Bratislava III District	Levice District	14.5367
10.	Bratislava IV District	Topoľčany District	14.5289

Table 2 | The most extreme pairs of the districts of the Slovak Republic for the male sex throughout the whole explored period

A situation in for the male sex is little bit more clear for the outermost pair of the districts than for the female sex. The first pair is 1.1220 Euclidean unit away from the second one, whilst previously it is only 0.0973 in a female sex case. One more important point is that the Bratislava III District is again involved in the first nine pairs demonstrating its extreme situation another time. An interesting circumstance

appears, as the Bratislava III District is distant and thus, dissimilar, to the Topoľčany District and to the Bratislava V District too, but the Topoľčany District and the Bratislava V District are also mutually very dissimilar – almost at the same level. This fact likewise underlines the regional differentiation of the districts. (*Table 3*.)

Year	District 1	District 2	Distance
1996	Tvrdošín District	Veľký Krtíš District	16.8485
1997	Košice II District	Prešov District	22.4191
1998	Bratislava III District	Levice District	18.7934
1999	Komárno District	Žarnovica District	12.7774
2000	Stropkov District	Veľký Krtíš District	17.0499
2001	Kysucké Nové Mesto District	Žarnovica District	18.0950
2002	Bratislava III District	Levice District	17.7118
2003	Čadca District	Krupina District	18.0275
2004	Bytča District	Sobrance District	16.8015
2005	Košice III District	Stará Ľubovňa District	20.5861
2006	Kysucké Nové Mesto District	Žarnovica District	16.9338
2007	Levoča District	Žarnovica District	15.1251
2008	Kysucké Nové Mesto District	group of zero mortality districts	18.0827
2009	Bytča District	Čadca District	20.5969
2010	Kysucké Nové Mesto District	group of zero mortality districts	19.2360
2011	Kysucké Nové Mesto District	group of zero mortality districts	18.3885
2012	Kežmarok District	Košice III District	19.4573
2013	Kysucké Nové Mesto District	group of zero mortality districts	17.4770
2014	Banská Štiavnica District	Zlaté Moravce District	19.2608
2015	Bratislava I District	Senec District	19.7363

Table 3 | The most extreme pairs of the districts of the Slovak Republic for the female sex in the individual years of the explored period

The outermost pairs of the districts for the individual years of the explored period reveal the most extreme areas that keep their position throughout the observed period. The Kysucké Nové Mesto District appears in the list six times and the Žarnovica District four times showing their extreme position throughout the whole observed period, although their first mention is in the year 1999 and the last mention in the year 2013. The other recurring districts are the Bytča District, the Čadca District, the Košice III District, and the Veľký Krtíš District. There is to note that in the years 2008, 2010, 2011, and 2013 the outermost pair is created by a group of the zero mortality districts meaning this distance expresses similarity between the areas with the highest standardised mortality rate and the lowest standardised mortality rate. Composition of this group alternates in the individual years. (*Table 4*.)

Year	District 1	District 2	Distance
1996	Ružomberok District	Topoľčany District	19.3022
1997	Piešťany District	Topoľčany District	18.8067
1998	Myjava District	Žiar nad Hronom District	18.459
1999	Košice IV District	Malacky District	15.0431
2000	Bratislava III District	Bratislava IV District	20.3585
2001	Levoča District	Senec District	21.2747
2002	Bratislava IV District	Pezinok District	19.5071
2003	Krupina District	Ružomberok District	18.726
2004	Piešťany District	Rožňava District	20.3281
2005	Košice-okolie District	Veľký Krtíš District	14.8888
2006	Kežmarok District	Piešťany District	14.4109
2007	Stropkov District	Žarnovica District	18.4586
2008	Čadca District	group of zero mortality districts	16.1701
2009	Pezinok District	Prievidza District	19.5416
2010	Malacky District	Medzilaborce District	15.0503
2011	Revúca District	Rožňava districts	19.1044
2012	Kysucké Nové Mesto District	Liptovský Mikuláš III District	22.0642
2013	Bratislava III District	Bratislava V District	16.9910
2014	Hlohovec District	Kysucké Nové Mesto District	20.1958
2015	Lučenec District	Skalica District	15.1771

Table 4 | The most extreme pairs of the districts of the Slovak Republic for the male sex in the individual years of the explored period

The male sex table of the outermost districts partially duplicate the female sex results. Possibly, the highest resemblance is seen in the year-to-year differences of the numerical values. But, there is a visible territorial relation too. Apart from the female sex results, none of the involved district appear more than twice in the list of the outermost pairs. The Kysucké Nové Mesto District and the Žarnovica District reprise their role from the table related to the female sex.

Another pattern identifiable from the previous two tables is a development of the maximum distance between the outermost districts. The higher distance is, the more complicated the situation for the policymakers is. Hence, the extreme areas are under a higher level of supervision and they can be considered by their specialty. On the other hand, the very similar likeness can cause an opposite situation with no aiming at specific needs of the particular areas. This approach may have a negative influence later.

Because of recurrence of the several districts throughout the whole observed period in the most dissimilar pairs, it would be expected that the both sexes can retain the same district in the particular year. However, such a situation happens only twice during the whole period. Firstly, the Krupina District in the 2003 and secondly, the Žarnovica District in the year 2007 are the only incidences of the same district being a part of the outermost pair for the both sexes.

There is one considerable difference between the sexes regarding the mentioned extreme pairs of the districts. Oppositely to the female sex results, the male sex has only one occurrence of a group of the zero mortality districts and though, this group contains only the two districts. Such an outcome can reveal a specific situation related to the particular areas.

5 DISCUSSION

There are several results included in the outcome of this analysis. The most substantial point is that the Slovak Republic possesses the regional disparities in a field of mortality expressed by the standardised mortality rate computed particularly for the base diagnoses assigned to the alcohol and drug addictions at a considerably high level. However, the female sex and the male sex have the different outcomes themselves. When looking at the whole explored period from the year 1996 to the year 2015, the Bratislava III District owns absolutely the most extreme position among all the districts of the Slovak Republic. It forms an own cluster for the both sexes too. The Topoľčany District bears a similar extreme position from a point of view of the male sex. On the other hand, this district is very similar to the other ones in a case of the female sex. Generally, all the Bratislava districts keep their mutual notable dissimilarity which seems to be an interesting fact regarding it is the most developed urban area in the Slovak Republic. Contrariwise, evaluation of a development of the regional disparities among the districts looks like notably heterogeneously. The Kysucké Nové Mesto District and the Žarnovica District appear for most times in the most dissimilar pair of the districts. It is valid mainly for the female sex, whilst there are more districts recurring in the outcome for the male sex. On contrary to the other studies, the other variables that can explain the differences in more details are not employed. Many countries are analysed at a national level, but analysis of the regional disparities is not common. The future research may focus on a role of the factors including social and economic situation in the regions, the differences in alcohol consumption and the patterns of drinking alcohol, availability of healthcare and the other aspects as it is presumed by several studies (Monnat, 2018; Plümper et al., 2018). A potential important contribution to the future research and policy debate might also cover ethnicity of the examined population. Such a study concludes that the disparities need to be explored also from this point of view and this can add another imperative dimension to the current research (Zemore et al., 2018). The researches on the regional disparities also find the regional differences and their correlation with some factors in a socio-economic field (Plümper et al., 2018). This will perform as an important next step in the analysis of the regional disparities of the Slovak Republic.

The documents issued by the European Union, the Organisation for Economic Co-operation and Development, and the World Health Organization together with the applied policies of these organisations highlight the importance of an evidence based policy in a relationship to the national and regional specifics. The above mentioned outcome is required for an alcohol policy development in the Slovak Republic and for a direction of the research to be in a line with the recommendations of the international institutions. The methodology performed in this paper can be also applied for another investigation of the regional disparities in the other countries.

6 CONCLUSION

The elementary findings of the analysis are aimed at the process of construction of a platform in order to prepare a unified policy related to the regional disparities in a treatment of the addictions to alcohol and drugs. As it can be seen from the analysis outcome, there are considerable regional discrepancies throughout the districts of the Slovak Republic. Hence, it is necessary to create a public health policy to proceed with a solution of the explored issues both at a preventive as well as a treatment level. The management of these differences and a reduction of the related health inequalities can be assessed as one of the main challenges of the future Slovak Republic health policy.

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