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SPATIAL DIVERSIFICATION OF MUSCULOSKELETAL AND CONNECTIVE TISSUE INCIDENCE OF POLISH POPULATION

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Abstract

Introduction

Musculoskeletal and connective tissue disorders, which can be classified as civilization diseases, constitute an important element of a comprehensive analysis of health condition of people aged over 19. A comprehensive analysis of this component should not overlook the spatial aspect, i.e. the question of spatial diversification.

Aim of the paper

The purpose of the paper was presented in the article's title. It is an analysis of spatial diversification of the musculoskeletal and connective tissue disorder incidence by voivodeships and districts (poviats).

Materials and methods

In the paper, data from the following organisations were used: Centrum Systemów Informacyjnych Ochrony Zdrowia (CSIOZ) [Centre of Health Information Systems], Bank Danych Lokalnych Głównego Urzędu Statystycznego (BDL GUS) [Local Data Bank of Central Statistical Office], Centralny Ośrodek Dokumentacji Geodezyjnej i Kartograficznej (CODGiK) [National Surveying and Cartographic Documentation Centre] and from "Natural Earth. Free vector and raster map data". Within the scope of the paper, the crude incidence rate was calculated and choropleth maps were developed constituting a cartographic visualization of the calculated rates.

Results: The results of the carried out analysis were presented in the form of the cartographic visualisation and tables including change dynamics. It constituted the basis for identification of the areas of advantageous and disadvantageous epidemiological situation.

Conclusions
In light of the obtained results, among other things, the following has to be stated: the areas of disadvantageous epidemiological situation include northern Poland and some of the former Russian partition voivodeships.

Key words: musculoskeletal disorders, spatial approach, voivodeships, districts (poviats), Poland, medical geography.

Introduction

Among the civilisation and social diseases, musculoskeletal disorders deserve special attention now. In Poland in particular, they are a serious health issue among the working community [1]. These diseases are analysed together with other disorders in the context of professional diseases [2, 3, 4, 5] and health condition of elderly people [6, 7, 8, 9].

The purpose of the paper is to analyse the spatial diversification of the musculoskeletal and connective tissue disorders incidence among Polish population aged over 19 (codes ICD-10: M00-M99) in the years 2008-2013 by voivodeships and districts (poviats).

At this point, it has to be added that "musculoskeletal and connective tissue disorders (M00-MM99)" is a term (together with the scope) applied in MZ-11 reports (Reports on the activity and employees of the outpatient clinic health care system) [10]. Furthermore, it is a general division – singular within these reports. In ICD-10, this separation covers six categories such as: arthropathies (M00–M25), systemic connective tissue disorders (M30–M36), dorsopathies (M40–M54), soft tissue disorders (M60–M79), osteopathies and chondropaties (M80–M94) and other disorders of musculoskeletal system and connective tissue (M95–M99) [11][1].

Materials and methods

Used in the paper were statistical (medical and demographic) and cartographic data (units of territorial division: countries, voivodeships and districts). The medical data concerning the number of new incidences of musculoskeletal and connective tissues disorders (M00-MM99) by voivodeships and districts were obtained from Centrum Systemów Informacyjnych Ochrony Zdrowia (CSIOZ) [Centre of Health Information Systems]. These data are pooled by CSIOZ within the framework of MZ-11 reports (Reports on the activity and employees of the outpatient clinic health care system) [10]. Demographic data (population size in 2008, 2009, 2010, 2011, 2012 and 2013) were obtained from Bank Danych Lokalnych Głównego Urzędu Statystycznego (BDL GUS, https://bdl.stat.gov.pl/BDL/start) [Local Data Bank of Central Statistical Office] [13]. Cartographic data concerning the borders of territorial division of Poland (shapefiles: voivodeships and districts) were downloaded from the official website of Centralny Ośrodek Dokumentacji Geodezyjnej i Kartograficznej (CODGiK) [National Surveying and Cartographic Documentation Centre] (http://www.codgik.gov.pl/) [14], while the data concerning the borders of Poland's neighbouring countries (also the shapefiles) were downloaded from the "Natural Earth. Free vector and raster map data" (https://www.naturalearthdata.com/) [15].

Within the framework of the realisation of the paper's objective, the crude incidence rate was calculated based on the obtained medical and demographic data (rates for 2008, 2013 and a six-year period average, i.e. 2008-2013) per 10 000 of population. Furthermore, the dynamics was determined on the basis of an relative increment between 2008 and 2013.

[1] The problem of existing assignations in MZ-11 was raised in the publication "Chorobowość na przewlekłe choroby układu trawiennego w Polsce – ujęcie przestrzenne" ["Morbidity due to chronic diseases of the gastrointestinal system in Poland – spatial approach"] [12].

The cartographic visualisation of the spatial diversification of crude incidence was based on the choropleth map method. In the choropleth map, three classes were identified (incidence intensity: “low”, “medium” and “high”) using the quantile method. The cartographic visualisation was made using the ArcGIS software from ESRI.

Excluded from the analysis presented in the paper was the city and district of Wałbrzych due to territorial changes occurring in the area in the years 2008-2013 [12].

Results

By voivodeships

According to the MZ-11 reports (Reports on the activity and employees of the outpatient clinic health care system), in 2008, the total of 178 625 new musculoskeletal and connective tissue disorders were noted in Poland [10]. In 2013, this number was 515 366 [10]. The crude incidence intensity was 59.07 and 165.90 new incidents per 10 thousand population respectively while the average intensity in the period 2008-2013 was 116.55. In the beginning of the analysed period, in three voivodeships, the crude incidence rate exceeded 100.00 new cases per 10 thousand population (Lubelskie-120.18, Zachodniopomorskie-115.19; Warmińsko-Mazurskie-112.26), while in 2013, in three voivodeships it exceeded 200.00 (Pomorskie-225.24; Warmińsko-Mazurskie-203.59; Małopolskie-202.49). Taking into account the average incidence growth in the period 2008-2013, disadvantageous epidemiological situation was observed not only in Warmińsko-Mazurskie (179.01) and Lubelskie (157.72) voivodeships but also in Łódzkie (156.30).

An interesting dependence was observed during the analysis of distribution of the lowest incidence rates. In the beginning and at the end of the analysed period and for six-year period i.e. 2008-2013, Śląskie voivodeship belonged to the group of voivodeships with the lowest musculoskeletal disorders and connective tissue rate which was (for this voivodeship) 32.92, 69.66 and 52.19 of new disorder incidents per 10 thousand population respectively. Beside Śląskie voivodeship, this group also comprised Lubuskie (2013 – 85.94, 2018-2013 – 69.58) and Podlaskie (the lowest factor in 2008, i.e. 30.24).

Figure 1 (A-C) represents a disadvantageous situation with respect to high crude incidence rates in northern Poland and in former Russian partition voivodeships.

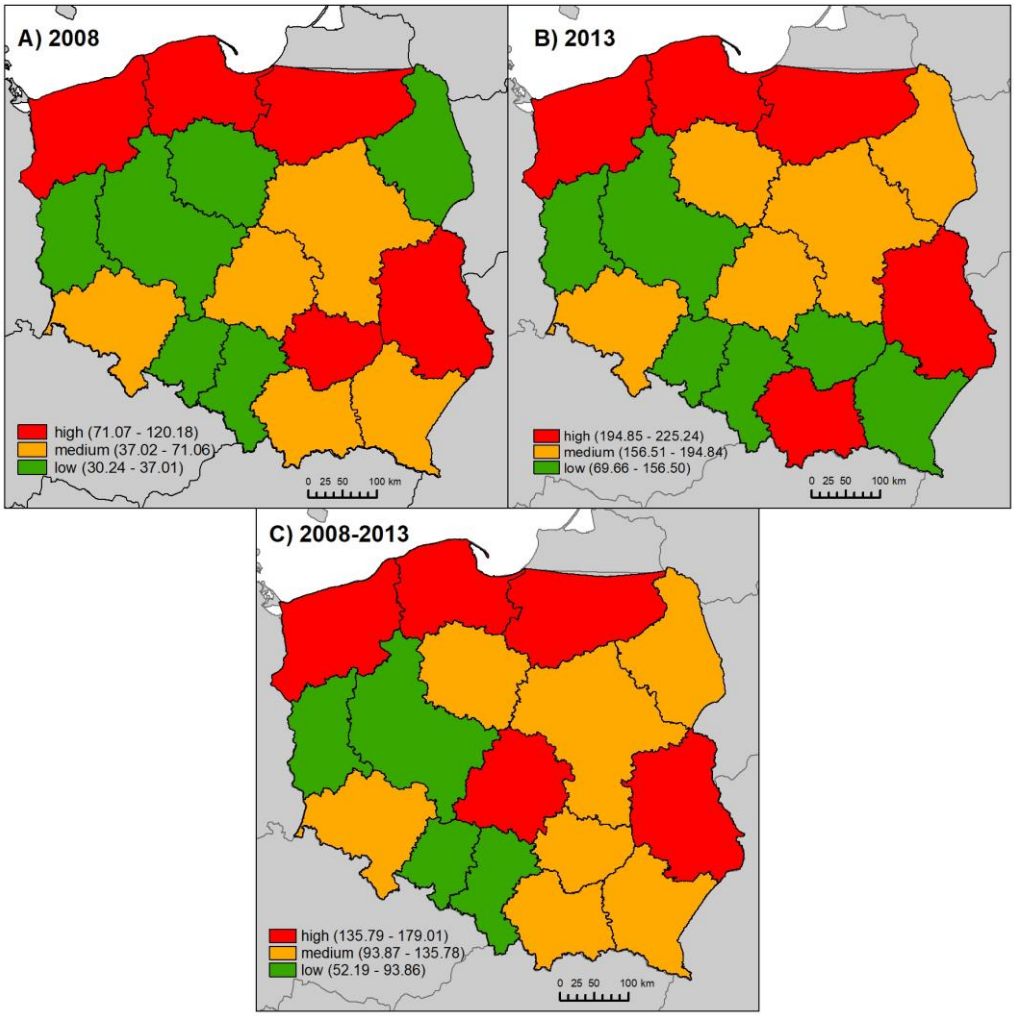

Figure 1. Spatial diversification of crude incidence (per 10 000) of musculoskeletal and connective tissue disorders by voivodeships in 2008-2013.
Source: Own elaboration based on MZ-11 Reports on the activity and employees of the outpatient clinic health care system using the shapefiles obtained from CODGiK and "Natural Earth. Free vector and raster map data" (Made with Natural Earth. Free vector and raster map data @ naturalearthdata.com)

In all voivodeships, an increased number of disorders was noted between 2008 and 2013 (Table 1). Despite advantageous situation in 2008, podlaskie voivodeship noted the highest relative incidence increase, i.e. 554.04%, between 2008 and 2013. Attention has to be drawn to Lubelskie voivodeship, which despite high incidence levels noted the second lowest incidence increase (after Świętokrzyskie voivodeship). In total, voivodeships with the highest incidence are characterised with low incidence increases while voivodeships with the low incidence are characterised with high incidence increases.

Table 1. Change dynamics of new incidents between 2008 and 2013 by voivodeships

Voivodeship	Relative increment (base-year 2008) [%]
Dolnośląskie	329.56
Kujawsko-pomorskie	497.03
Lubelskie	68.01
Lubuskie	147.04
Łódzkie	208.93
Małopolskie	463.54
Mazowieckie	179.16
Opolskie	242.64
Podkarpackie	202.67
Podlaskie	554.04
Pomorskie	198.80
Śląskie	112.22
Świętokrzyskie	59.11
Warmińsko-mazurskie	89.06
Wielkopolskie	245.11
Zachodniopomorskie	78.54
Poland	188.52

Source: Own elaboration and calculation based on MZ-11 Reports on the activity and employees of the outpatient clinic health care system

By districts (poviats)

Breakdown of districts with the highest and lowest crude incidence rates in 2008 and 2013 and average rate for the six-year period of 2008-2013 is given in Table 2.

Table 2. Districts with the highest and lowest crude incidence rate in 2008 and 2013 and in the six-year period of 2008-2013

Years	Code TERYT	District (poviat)	Incidence [per 10 000]
2008	**Lowest**		
	2007	Łomżyński	0.26
	0216	Polkowicki	0.85
	3016	Obornicki	1.38
	3028	Wągrowiecki	3.27
	1816	Rzeszowski	3.65
	Highest		
	2817	Szczycieński	401.22
	3006	Jarociński	311.09
	2661	Kielce	284.03
	0616	Rycki	282.54
	0663	Lublin	281.17
2013	**Lowest**		
	3028	Wągrowiecki	2.21
	3012	Krotoszyński	5.39
	1610	Prudnicki	6.86
	0613	Parczewski	7.23
	2818	Gołdapski	7.88
	Highest		
	2202	Chojnicki	886.44
	1464	Siedlce	745.05
	2819	Węgorzewski	612.75
	1861	Krosno	560.16
	0211	Lubiński	475.44
2008-2013	**Lowest**		
	3028	Wągrowiecki	2.28
	3001	Chodzieski	8.50
	3027	Turecki	10.68
	0619	Włodawski	10.89
	2406	Kłobucki	11.14
	Highest		
	3263	Świnoujście	410.35
	2817	Szczycieński	370.69
	2819	Węgorzewski	348.61
	1821	Leski	342.19
	2202	Chojnicki	336.13

Source: Own elaboration and calculation based on MZ-11 Reports on the activity and employees of the outpatient clinic health care system

In light of the data given in Table 2, a certain spatial regularity in the distribution of the low incidence rates can be observed. Primarily the districts of Wielkopolskie voivodeships (Wągrowiecki, Obornicki, Krotoszyński, Chodzieski, Turecki) noted low rates. In particular, attention has to be drawn to a favourable situation of the Wągrowiecki district across all analysed time profiles.

A similar spatial regularity cannot be observed with regard to high rates. In 2008, high incidence was noted in two districts of Lubelskie voivodeship (i.e. Rycki and Lublin district); high average was in two districts of Warmińsko-Mazurskie voivodeship (Szczycieński and Węgorzewski) noted in 2008-2013. In 2013, districts from different voivodeships noted the highest rates.

Figure 2 (A-C) is a supplement to the analysis of spatial diversification of crude incidence intensity by districts. As the areas with a disadvantageous situation with respect to musculoskeletal and connective tissues disorders incidence should also be regarded some of the districts of Zachodniopomorskie, Pomorskie and Łódzkie voivodeships.

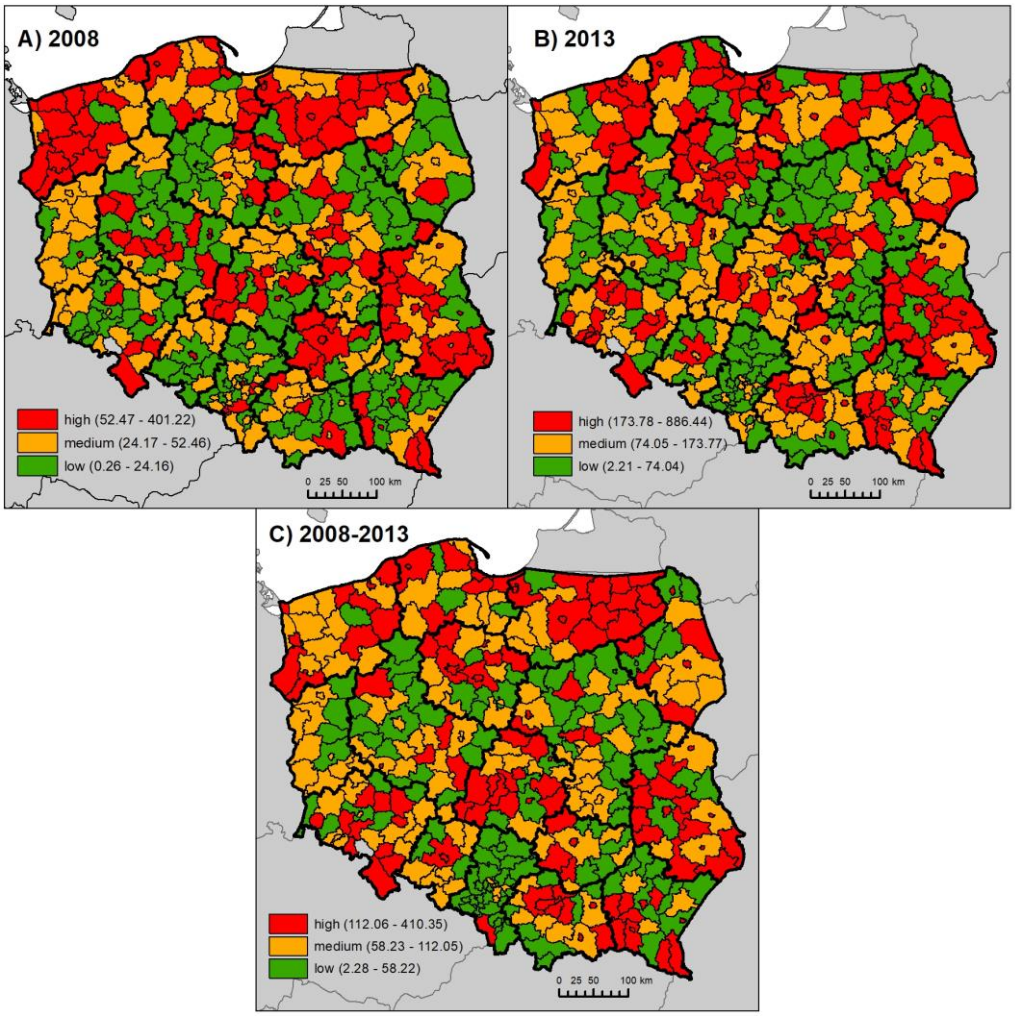

Figure 2. Spatial diversification of crude incidence (per 10 000) of musculoskeletal and connective tissue disorders by districts in 2008-2013.

Source: Own elaboration based on MZ-11 Reports on the activity and employees of the outpatient clinic health care system using the shapefiles obtained from CODGiK and "Natural Earth. Free vector and raster map data" (Made with Natural Earth. Free vector and raster map data @ naturalearthdata.com)

In the vast majority of the districts, there occurred an increase of new incidents between 2008 and 2013. Only in 49 districts, a decrease was noted. One of the highest drops in the new incidents number was noted in two districts of Warmińsko-Mazurskie voivodeship (Gołdapski and Nidzicki) while the highest increases in two districts of Kujawsko-Pomorskie (Tucholski and Sępoleński) (Table 3).

Table 3. Change dynamics of new incidents between 2008 and 2013 by districts

Years	Code TERYT	District (poviat)	Relative increment (base-year 2008) [%]
2008/2013	**Highest drops**		
	2818	Gołdapski	-93.31
	3012	Krotoszyński	-87.69
	1424	Pułtuski	-87.02
	0613	Parczewski	-81.90
	2811	Nidzicki	-80.00
	Highest increases		
	0216	Polkowicki	30800.00
	3016	Obornicki	14066.67
	2007	Łomżyński	9300.00
	0416	Tucholski	7925.00
	0413	Sępoleński	5047.37

Source: Own study and calculation based on MZ-11 Reports on the activity and employees of the outpatient clinic health care system

Discussion and conclusions

The purpose of the paper is not an attempt at explaining differences in the spatial diversification of the musculoskeletal and connective tissue incidence as the data collected with the scope of MZ-11 reports do not allow to calculate the incidence rates standardized by age [12][2]. Data concerning the number of new incidents are not pooled by age groups but as a general category (by voivodeships and districts).

In general, among other things, the influence of the age structure and more particularly the share of 65+ age group and the economic situation of the analysed voivodeships can be emphasised. According to research by E. Grzelak – Kostulska (2016), the older voivodeship in a demographic sense is Łódzkie voivodeship [16]. It is no relation to Warmińsko-Mazurskie voivodeship, which in light of the mentioned above research results is regarded as the voivodeship with the lowest share of elderly people [16]. However, as regards research by P. Dykas, P. Kościelniak and T. Tokarski (2013), in the years 2002-2009, the lowest level of economic development was noted among other things in Warmińsko-Mazurskie and Lubelskie voivodeship with the highest observed in Śląskie voivodeship [17].

Based on the foregoing paragraphs, even a general attempt at identifying the causes of spatial incidence diversification poses multiple problems due to lack of possibilities of conducting the analysis based on aged standardized rates.

The results of the analysis presented in this article lead to the following conclusions:

1. From voivodeship perspective, the areas characterised with a low crude incidence level are Śląskie and Lubuskie while the district with the same characteristics is Wągrowiecki district.
2. From voivodeship perspective, the areas characterised with a high crude incidence level are Warmińsko-Mazurskie and Lubelskie voivodeships while the district with the same characteristics are Szczycieński and Węgorzewski districts.
3. In a detailed spatial approach, in the context of disadvantageous epidemiological situation, the most alarming epidemiological situation is observed in northern Poland and in the former Russian partition voivodeships.
4. Cities with the district rights: Kielce, Lublin, Siedlce, Krosno and Świnoujście are also characterized with disadvantageous epidemiological situation.
5. Between 2008 and 2013, an increase of new incidents was noted in all voivodeships with a decrease observed in 49 districts. In general, the increase for Poland was ca. 188%.

[2] The problem linked with the manner of collection of data in the MZ-11report was raised in the publication "Chorobowość na przewlekłe choroby układu trawiennego w Polsce – ujęcie przestrzenne" ["Morbidity due to chronic diseases of the gastrointestinal system in Poland – spatial approach"] [12].

6. Generally, the voivodeships with the high incidence level are characterised with its low increase and the voivodeships with low incidence are characterised with high sharp increases.

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