

# Changes in the morbidity and costs of systemic lupus erythematosus in Poland in the years 2008–2012

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## Abstract

**Objectives:** The goal of the article is to present the changes in morbidity and costs of systemic lupus erythematosus (SLE) in Poland in the 2008–2012 period, depending on the province of residence of the patients based on data reported to the public payer – the National Health Fund.

**Material and methods:** Based on the ICD-10 code and the patient's personal identity number, the number of patients and medical costs (cost of hospitalization, pharmaceutical, medical procedures, dialysis and specialist consultations) were calculated by province (voivodeship) and urban or rural residence.

**Results:** Annually on average in the assessed period in Poland approximately 20 000 patients were diagnosed with SLE. The studied group was dominated by women (they were 5.2 times more numerous). The morbidity rate was 52.183 patients per 100 thousand inhabitants. Most patients were in the age range of 48–56 years. Average annual expenses for this group of patients over the examined period were USD 16,327 million. Two times more was expended on patients inhabiting cities, approximately 4 times more on women. Calculated per patient, the average cost of therapy was USD 810.63.

**Conclusions:** The population of SLE patients in Poland is highly stable. The results of analysis indicate 1.64 times more frequent occurrence in urban areas, which may be connected with availability of doctors. The SLE treatment costs in Poland are much lower than in other countries, which is related mainly to the fact that therapy with biological drugs is not financed.

**Key words:** epidemiology, systemic lupus erythematosus, regional differences, health economics.

## Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease with an aetiology that is not completely understood. It might be caused by immune system disorders leading to a generalised inflammatory process of multiple tissues and organs. The disease, in addition to conditions of direct risk to life during the aggravation period, with time will lead to disability and the patient's exclusion from professional life. It is accompanied by a series of coexisting diseases [1], and the direct ther-

apy-related costs, that is medical costs of hospitalisations, doctor's visits, medical products, the use of hospital emergency rooms, are very high. The impairment of social and professional life through work absences and care of other persons generates equally high social costs. The costs of treatment of SLE patients increase in particular in cases of renal lupus [2, 3].

There is a lack of analyses and studies in Poland which try to establish the amount of direct costs of used medical therapies (including hospitalisations) related to SLE. There is also no analysis of morbidity of the disease

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in individual areas of the country, including division into urban and rural areas. Creating a database of patients enabled the assessment of the impact on the public payer's finances, and in the future it will enable the simulation of costs related to introduction of new forms of therapy, e.g. biological treatment [4]. The study was based on WHO guidelines [5], and literature searches conducted by Zhu et al. [6] and Turchetti et al. [7].

## Material and methods

The databases of the public payer in Poland, the National Health Fund, were analysed. From the IT systems information on every treated patients who had the following ICD10 disease codes as the main or co-existing diagnosis in the settlement report of the hospital was obtained: M32.X (systemic lupus erythematosus) and L93.X (discoid lupus erythematosus). Based on the ICD-10 code and the provided patient's identifier (national identification [PESEL] number) the number of patients was established along with territorial indicators, including the division into urban and rural areas, based on the area code of the patient's place of residence. Protection provided for processing sensitive data, such as PESEL number, was conducted through the removal of personal data, and the results were prepared on sets which did not contain sensitive personal data [8]. SQL tools were used to extract the data (using a filter in accordance with the assumed scope of ICD-10 diagnoses). In the treatment costs of selected patients all the costs borne by the public payer in relation to the SLE diagnosis were included, including the costs of treatment of all types (the cost of basic medical care, calculated as a monthly lump sum, hospitalisations and drug therapies used within a hospital and not settled separately). Shortages of data noticed in the sets concern cases where services were provided to patients with an unidentified PESEL number or indefinite place of residence. Morbidity rates per 100,000 inhabitants of a given province were calculated based on demographic data obtained from the Central Statistical Office website [9] for each year separately. Excel, Statistica 10 and SAS Enterprise Guide 5.1 software was used to perform analyses. Converting the costs from PLN to USD was performed based on the currency exchange rate data for each year [10] taking into account the purchasing power parity (2008-2,02; 2009-2,01; 2010-1,96; 2011-1,94; 2012-1,93).

## Results

The number of patients treated in Poland for SLE in the period of 2008–2012 is stable (SD +/- 1 thousand) and is approximately 20,000 annually (Table I). The highest numbers of treated patients were in Śląskie

and Mazowieckie province (respectively on average 2,700 and 2,500 annually), the lowest in Lubuskie and Podlaskie province (average 350 and 383 patients). The majority of patients (71%) came from urban areas, and the ratio of urban to rural was 2.5 : 1. There were 5.2 times more women.

Most patients were in the age range of 48–56 years (Fig. 1). The average morbidity rate for the studied period in Poland was 52.183 patients per 100,000 inhabitants; the highest was in Kujawsko-Pomorskie (77.783) and Pomorskie (67.295) provinces, the lowest in Podlaskie (32.052) and Lubuskie (34.302) provinces. Among women it was 84.738, among men 17.38. It was 1.64 times higher for patients from urban areas, almost 5 times more frequent for women (Table II, Fig. 2).

Within a period of 5 years the public payer has paid a total of PLN 160 million for the treatment of patients (Table III). The highest expenses were in 2011 (PLN 35.5 million), the lowest in 2008 (PLN 25.7 million). The annual average for the studied period was PLN 32 million (Table IV). The highest expenses were in Mazowieckie (approx. PLN 5 million annually) and Śląskie (approx. PLN 4 million annually) provinces, the lowest in Lubuskie (approx. PLN 250 thousand annually) and Świętokrzyskie (a little more than PLN 500 thousand annually). Expenses among urban patients were 2 times higher, in women 4 times higher.

The average cost of annual therapy per patient in this period was USD 789.46 (694 in 2008, 759 in 2009, 827 in 2010 and 878 in 2011) and was highest in Wielkopolskie (USD 1153.66 in 2011) and Zachodniopomorskie (USD 1124.43 in 2011) provinces, lowest in Lubuskie (USD 340.39 in 2011) and Świętokrzyskie (USD 450.93 in 2011) provinces. The expenses were comparable for inhabitants of urban and rural areas, and women and men.

## Discussion

As demonstrated by the presented data, approximately 20 thousand patients are treated annually in Poland for lupus. This amounts to 52.183 patients per 100,000 inhabitants and does not diverge from the morbidity of 25 to 91 cases per 100,000 given for the EU countries [11, 12]. The observed more than twofold difference in morbidity between provinces (77.783 per 100,000 inhabitants for the Kujawsko-Pomorskie province and 32.052 per 100,000 inhabitants for Podlaskie province) may be only explained by the availability of doctors in various areas of the country, since the inhabitants of Poland are ethnically homogeneous. The number of patients from urban areas was 2.5 times higher, which results from the larger number of inhabitants of cities, but the occurrence of SLE in cities is 1.64 times more frequent than in rural areas. We do not know the reason for

**Table I.** Number of patients with systemic lupus erythematosus in individual years, by gender and area

Province	2008	2009	2010	2011	2012
<b>Poland</b>	<b>18 390</b>	<b>20 218</b>	<b>19 967</b>	<b>20 351</b>	<b>21 049</b>
Dolnośląskie	1220	1391	1334	1358	1422
Kujawsko-Pomorskie	1449	1580	1695	1632	1735
Lubelskie	968	1028	1018	1005	1059
Lubuskie	262	393	326	353	408
Łódzkie	1203	1435	1425	1454	1421
Małopolskie	1506	1782	1692	1776	2069
Mazowieckie	2318	2406	2431	2619	2575
Opolskie	400	449	423	405	424
Podkarpackie	808	923	945	986	1109
Podlaskie	347	404	375	401	387
Pomorskie	1389	1518	1498	1627	1545
Śląskie	2731	2739	2758	2646	2652
Świętokrzyskie	527	554	564	579	624
Warmińsko-Mazurskie	873	893	835	853	895
Wielkopolskie	1402	1659	1666	1654	1666
Zachodniopomorskie	987	1064	982	1003	1058
<b>Type of area</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Lack of data	111	147	180	204	237
Urban	13 369	14 424	14 205	14 425	14 706
Rural	4910	5647	5582	5722	6106
<b>Poland</b>	<b>18 390</b>	<b>20 218</b>	<b>19 967</b>	<b>20 351</b>	<b>21 049</b>
Urban/rural ratio	2.72	2.54	2.54	2.52	2.41
<b>Gender</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Lack of data	3			1	
Men	2912	3406	3179	3216	3380
Women	15 475	16 812	16 788	17 134	17 669
Men/women ratio	1 : 5.31	1 : 4.94	1 : 5.28	1 : 5.33	1 : 5.23

this fact; it is probably explained by availability of doctors, which is surely worse in rural areas (based on our knowledge of literature from other countries where this problem was studied). The largest increase of treated patients in the period of 2008–2012 occurred in Małopolskie province, by 15.94 per 100,000; the reason for this is also unclear and requires further studies. Stability of the number of treated patients could be observed solely in Śląskie province, from 58,786 in 2008 to 57,395 in 2012 (the difference is statistically insignificant).

Women treated for SLE were 5.2 times more numerous than men, and the incidence among women was 84.738 cases per 100,000 inhabitants, whereas among men it was 17.38. This differs somewhat from the data provided by Zhu et al. [6], since they established that women are affected 9 times more frequently than men;

this difference may be explained by ethnic differences in studied populations. The largest number of patients was in the age range of 48–56 years; data which would enable the assessment of the age when the disease first occurred (first symptoms appeared) is lacking. According to the literature, the incidence of SLE is highest among young women in reproductive age [13], and the peak is observed from the late teens to the 40<sup>th</sup> year of age [14]. The domination of an older age group in the studied population may confirm the thesis [12] that the advancement of medicine increases the survival of SLE patients, and at the same time with age the rate of SLE detection increases due to more frequent doctor visits.

In the studied period in Poland there was high variation in annual expenses for the treatment of a single SLE patient in individual areas. The average costs of

**Table II.** Morbidity per 100,000 inhabitants divided by area in Poland during the period 2008–2012

Province/year	2008	2009	2010	2011	2012	Average
<b>Poland</b>	<b>48.222</b>	<b>52.972</b>	<b>52.288</b>	<b>52.807</b>	<b>54.625</b>	<b>52.183</b>
Dolnośląskie	42.404	48.355	46.366	46.561	48.778	46.493
Kujawsko-Pomorskie	70.07	76.362	81.901	77.775	82.705	77.763
Lubelskie	44.777	47.654	47.241	46.274	48.833	46.956
Lubuskie	25.967	38.909	32.255	34.501	39.879	34.302
Łódzkie	47.198	56.455	56.137	57.387	56.196	54.675
Małopolskie	45.815	54.028	51.205	53.066	61.755	53.174
Mazowieckie	44.538	46.073	46.46	49.55	48.647	47.054
Opolskie	38.721	43.546	41.072	39.943	41.885	41.033
Podkarpackie	38.485	43.916	44.941	46.32	52.092	45.151
Podlaskie	29.124	33.957	31.534	33.389	32.257	32.052
Pomorskie	62.581	68.069	67.009	71.25	67.563	67.295
Śląskie	58.786	59.021	59.459	57.194	57.395	58.371
Świętokrzyskie	41.405	43.618	44.47	45.301	48.922	44.743
Warmińsko-Mazurskie	61.174	62.574	58.49	58.722	61.641	60.52
Wielkopolskie	41.264	48.676	48.796	47.866	48.166	46.954
Zachodniopomorskie	58.3	62.84	57.986	58.241	61.435	59.76
<b>Region/year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Average</b>
Urban	57.407	61.964	61.008	61.683	62.954	61.003
Rural	33.069	37.927	37.455	37.762	40.241	37.291
Urban/rural ratio	1.73	1.63	1.62	1.63	1.56	1.64
<b>Gender/year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Average</b>
Men	15.813	18.482	17.241	17.24	18.122	17.38
Women	78.47	85.173	85.011	86.17	88.868	84.738
Men/women ratio	1 : 4.96	4.61	1 : 4.93	1 : 4.5	1 : 4.9	1 : 4.88

treatment of 1 patient for Poland in the 2008–2011 period were, respectively: USD 694, USD 759, USD 827, USD 878. The costs were lowest in Lubuskie province – only USD 275.06 per patient in 2008 (USD 292.46 on average in the 2008–2012 period). The highest costs per patient in SLE treatment were present in Wielkopolskie province – USD 1153.66 in 2012 (USD 986.5 on average in the 2008–2012 period). In the 2008–2012 period the highest increase of costs occurred in Kujawsko-Pomorskie province, USD 317.75, and the highest decrease of costs in Łódzkie area, USD 17.47. The authors have no justification for such a large difference of costs in individual areas. Chiu et al. state that the average annual cost per patient in 2007 in Taiwan was USD 1,660 [13] and was almost 2 times higher than in Poland. Significantly higher differences occur when comparing the average direct costs of therapy of one patient in Poland with the ones obtained in a study conducted in Canada, the United States and the UK: USD 15,845 in Canada, USD 20,244 in the US and USD 17,647 in the UK [14]; the costs of

therapy are much lower in Poland. The increase of direct health care costs was described in particular for patients with flares [15] and with renal damage [16]. Clarke et al. compared the treatment costs of SLE patients with and without renal damage by analysing subgroups studied in three countries [17].

In a study conducted in 6 clinics over a period of July 1995 to February 1998 they included 715 patients (231 in Canada, 269 in the US and 215 in the UK), assessing costs in groups established on the basis of renal damage assessed with SLICC/ACR DI (Systemic Lupus International Collaborating Clinics/ACR Damage Index), which is in the range of 0 to 3. The average 4-year total direct costs per patient were from USD 20,337 for SLICC/ACR DI = 0, up to USD 99,544 for SLICC/ACR DI = 3. The average 4-year accumulated indirect costs per patient vary from USD 62,828 in group 0 up to USD 73,750 in group 3. In patients with disorders of the sub-scale result 3, most of the total costs are generated by hospitalisation and dialysis. Li et al. [18] assessed the long-term

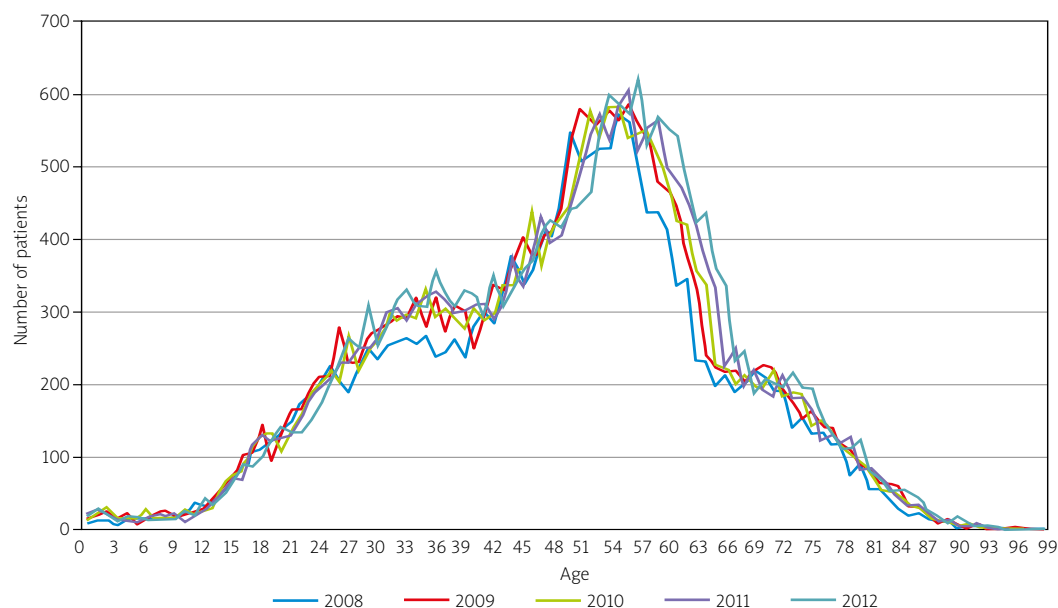


Fig. 1. Age structure of SLE patients hospitalised in Poland for the 2008–2012 period.

Table III. Expenses for the treatment of SLE in the years 2008–2012 by province, area and gender (currency = PLN)

Province	2008	2009	2010	2011	2012
<b>Poland</b>	<b>25 797 209,51</b>	<b>31 137 673,83</b>	<b>32 849 811,83</b>	<b>35 557 121,78</b>	<b>34 632 497,35</b>
Dolnośląskie	2 511 000.19	2 824 984.57	2 705 208.32	2 568 117.52	2 992 893.78
Kujawsko-Pomorskie	1 569 265.54	2 327 716.22	2 471 632.50	2 773 179.14	2 809 189.50
Lubelskie	1 543 088.70	1 701 918.95	2 028 144.82	2 177 845.87	2 309 280.56
Lubuskie	145 571.56	263 064.89	145 739.05	239 110.40	299 234.89
Łódzkie	1 286 977.91	1 304 402.38	1 281 389.82	1 481 840.02	1 375 298.89
Małopolskie	2 479 199.62	3 042 259.40	3 186 000.97	3 758 571.95	3 306 218.26
Mazowieckie	3 784 301.84	4 785 683.59	5 327 228.66	5 554 620.07	4 979 392.29
Opolskie	434 885.24	556 614.89	507 166.64	582 217.24	693 697.89
Podkarpackie	1 156 885.04	1 405 598.03	1 145 936.59	1 677 444.31	1 199 243.25
Podlaskie	563 327.25	708 353.51	771 830.24	740 873.95	706 735.40
Pomorskie	1 239 750.69	2 041 409.22	2 066 188.03	2 417 332.67	1 970 361.12
Śląskie	3 607 898.52	4 124 899.66	4 235 621.06	4 199 670.32	3 880 880.29
Świętokrzyskie	541 889.87	506 546.35	488 286.71	519 570.72	601 656.71
Warmińsko-Mazurskie	591 633.87	604 246.51	761 511.48	825 173.91	1 042 323.69
Wielkopolskie	2 638 836.64	2 918 423.87	3 295 580.63	3 797 233.87	4 481 144.87
Zachodniopomorskie	1 702 697.03	2 021 551.79	2 432 346.31	2 244 319.82	1 984 945.96
<b>Region</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Lack of data	121 707.64	190 584.15	273 585.36	338 449.17	382 500.23
Urban	17 584 066.44	21 596 417.63	22 791 386.19	24 337 047.97	22 177 626.61
Rural	8 091 435.43	9 350 672.05	9 784 840.28	10 881 624.64	12 072 370.51
<b>Gender</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Lack of data	544.00			74.70	
Men	3 594 613.71	4 693 395.25	4 876 597.45	5 349 085.52	6 096 783.30
Women	22 202 051.80	26 444 278.58	27 973 214.38	30 207 961.56	28 535 714.05

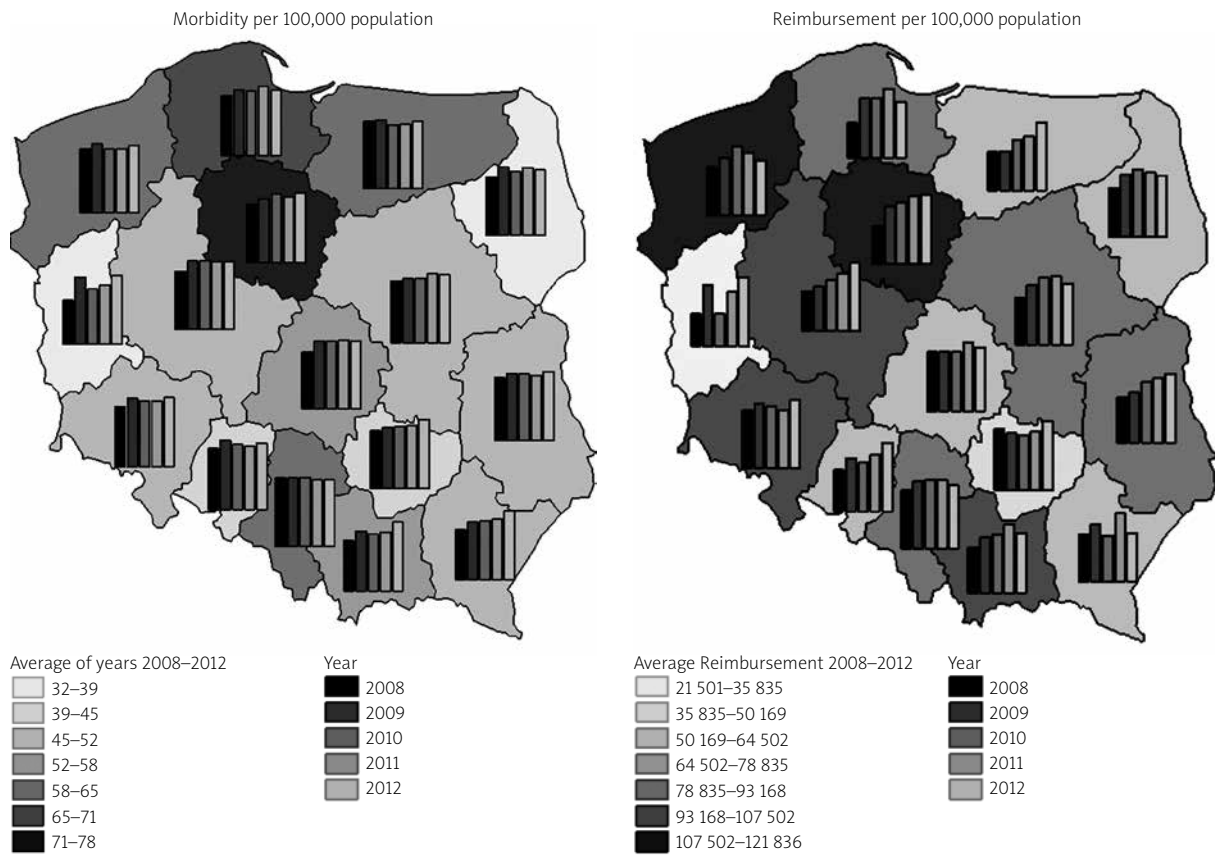


Fig. 2. Morbidity and reimbursement per 100,000 population.

treatment costs for SLE patients in a sub-group with kidney involvement and an appropriate control group with the same number of patients without kidney complications. The average annual medical expenses in the first year in the SLE group are USD 16,089, compared to USD 27,463 for patients with lupus nephritis (LN) inflammation, and USD 9,258 in the group without the disease. Average costs fall in the 2<sup>nd</sup> year, and then increase during the year at an average rate of 16%, up to the fifth year (up to USD 23,860). Similarly in the group of LN patients, the cost decreases by 10% in the 2<sup>nd</sup> year, during the year it increases by 31%, and in the 5<sup>th</sup> year the annual treatment costs increase to USD 50,578 [18]. The reasons for such a large difference of Polish data may be differences in the selection of used drug and non-drug therapies, in the selection of used therapeutic products and the degree of reimbursement of the price by the payer (the public payer, single in Poland), but mainly from a different selection of patients. In our study we took into account all the patients, regardless of the medical specialty which diagnosed the disease and conducted its therapy, including those treated by dermatologists and other specialists, who did not use aggressive treatment.

In the literature there are no data for comparing the results obtained in such a manner, since we have to agree with Turchetti et al. [7] that in the health care systems with a single public payer, like in Poland, there is no significant interest in the collection and analysis of data concerning the social costs of SLE, for the following reasons: a) low frequency of occurrence of the disease, compared to other chronic rheumatoid diseases, such as rheumatoid arthritis, b) relatively low costs of drugs currently used in the treatment of lupus (with the exception of belimumab), c) the impact of high indirect costs, which have no impact on the operation of the health care system [7]. The current study also did not include indirect and social costs, and thus the total cost of illness (COI) was not analysed. Inclusion of social costs of disease based on the results already obtained, and analyses after including additional databases of social payers, will emphasise the scale of the problem and will provide a better justification for more expensive therapies, e.g. using biological drugs.

In summarising the study it should be emphasized that its advantage is including the full data concerning the number of patients diagnosed with SLE in Poland

**Table IV.** Average cost of therapy per patient in the period 2008–2012 (currency = USD)

Province	2008	2009	2010	2011
<b>Poland</b>	<b>694.45</b>	<b>758.67</b>	<b>826.74</b>	<b>877.98</b>
Dolnośląskie	1018.91	1000.44	1019.04	950.3
Kujawsko-Pomorskie	536.14	725.73	732.76	853.89
Lubelskie	789.16	815.55	1001.15	1088.95
Lubuskie	275.06	329.74	224.65	340.39
Łódzkie	529.61	447.78	451.87	512.14
Małopolskie	814.96	841	946.22	1063.47
Mazowieckie	808.2	979.83	1101.19	1065.77
Opolskie	538.22	610.68	602.50	722.40
Podkarpackie	708.81	750.18	609.36	854.90
Podlaskie	803.67	863.72	1034.28	928.43
Pomorskie	441.86	662.46	693.12	746.61
Śląskie	654	741.87	771.74	797.58
Świętokrzyskie	509.03	450.41	435.06	450.93
Warmińsko-Mazurskie	335.5	333.33	458.29	486.12
Wielkopolskie	931.78	866.58	994.04	1153.66
Zachodniopomorskie	854.02	935.94	1244.69	1124.43
<b>Region</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Urban	651.13	737.57	806.26	847.81
Rural	815.82	815.70	880.87	955.64
Rural/urban ratio	1.25	1.11	1.09	1.13
<b>Gender</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Men	611.09	678.81	770.85	835.81
Women	710.25	774.85	837.32	885.95
Women/men ratio	1.16	1.14	1.09	1.06

and the costs of their therapies in all types of medical care over a period of 5 years, and their diversification depending on the area and place of residence. Additionally, a database was created enabling the further analysis, using data sources belonging to other Polish institutions financing social needs (health services provided by the Social Insurance Institution), in order to calculate the social costs of the disease, and in consequence total SLE costs.

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