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Original research article

Radiotherapy facilities, equipment, and staffing in Poland: 2005–2011

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ABSTRACT

Background and purpose: To evaluate the current status of radiotherapy facilities, staffing, and equipment, treatment and patients in Poland for the years 2005–2011 following implementation of the National Cancer Programme.
Methods: A survey was sent to the radiotherapy centres in Poland to collect data on available equipment, staffing, and treatments in the years 2005–2011.
Results: In 2011, 76,000 patients were treated with radiotherapy at 32 centres vs. 63,000 patients at 23 centres in 2005. Number of patients increased by 21%. In 2011, there were 453 radiation oncologists – specialists (1 in 168 patients), 325 medical physicists (1 in 215 patients), and 883 radiotherapy technicians (1 in 86 patients) vs. 320, 188, and 652, respectively, in 2005. The number of linear accelerators increased by 60%, from 70 units in 2005 to 112 in 2011. The current linac/patient ratio in Poland is 1 linac per 678 patients. Waiting times from diagnosis to the start of treatment has decreased.
Conclusion: Compared to 2005, there are more treatment facilities, more and better equipment (linacs), and more cancer care specialists. There are still large differences between the 16 Polish provinces in terms of equipment availability and ease of access to treatment. However, radiotherapy services in Poland have improved dramatically since the year 2005.

1. Background

In recent years, major technological advances have improved the effectiveness of radiotherapy. Radiotherapy has become ever more precise, making it possible to deliver highly targeted therapy that spares the normal healthy tissue surrounding the tumour.[1–3] As a result, radiotherapy is indicated in an increasing number of tumour locations and became highly complex.[4–8] All of these factors, together with the rising incidence of certain cancers, have increased demand for radiotherapy services.[7–12]

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According to the ESTRO (European Society for Radiation Oncology) and the OECI (Organization of European Cancer Institutes), approximately 70% of patients who undergo cancer treatment will receive radiotherapy (6). Delivery of radiotherapy services to so many patients obviously requires a large investment in infrastructure and personnel and the ESTRO recently published recommendations for appropriate levels of radiotherapy infrastructure and staffing.[9]

In the year 2011 approximately 76,000 patients underwent radiotherapy in Poland.[13] Due to expected increases in demand, it is estimated that at least 100,000 patients per year will require radiotherapy treatment in Poland in the coming years. To assess the preparedness of Poland to meet this growing demand for radiotherapy services, we carried out a survey of all radiotherapy treatment centres in Poland, requesting data on infrastructure, staffing, and treatments from 2005 to 2011.[13–18] We present the results here.

2. Materials and methods

The National Consultant for Radiotherapy, sent detailed, paper-based questionnaires to heads of departments of all radiotherapy centres providing radiotherapy in 2005–2011.[13–18] The national consultants are medical specialists nominated by Scientific Societies and the Chamber of Physicians and formally appointed by the Minister of Health to advise in various aspects of health delivery in particular medical specialities. All known radiotherapy centres, both public and private, located in the 16 provinces (vovoidships) in Poland were surveyed. The survey was sent to the all radiotherapy treatment centres in Poland, all of which completed and returned the survey (100% response rate).

The survey (see Appendix A – Tables 3–5) included questions on personnel, equipment (external radiotherapy, brachytherapy, simulators and treatment planning devices), type of the centre, and number of patients treated. Respondents were asked to provide data for years 2005–2011. All centres were asked to report the number of radiation oncologists, medical physicists and radiotherapy technicians.

To make analysis of the data easier we provide map of Poland with all provinces shown (Fig. 1) and structure of the Polish population in the years 2005–2010 (Fig. 2).[19,20]

2.1. Statistical analysis

In this descriptive study categorical variables were described as percentages and continuous variables by means ± standard error (SE). The Statistical Package for the Social Sciences, version 13.0 (SPSS Inc., Chicago, Illinois, USA) was used to perform the statistical analysis.

3. Results

3.1. Radiotherapy facilities

The number of cancer care centres in Poland increased from 23 in 2005 to 32 in 2011. Table 1 shows all centres that perform radiotherapy and the treatment methods (EBRT, BT, etc.) available at those centres. Almost all centres that offered external beam radiotherapy (EBRT) also provide brachytherapy. Some centres also provided selective radiotherapy in cooperation with the larger centres. Of the 32 centres that provide radiotherapy, 3 are scientific research institutes, 5 are university clinics specialising in radiotherapy, 8 are regional cancer centres, 10 are radiotherapy centres that are part of regional or municipal hospitals, and 6 are private.

Provinces (vovoidships) in Poland

1. Zachodniopomorskie (Szczecin)
2. Pomorskie (Gdansk)
3. Warmińsko-Mazurskie (Olsztyn)
4. Podlaskie (Bialystok)
5. Lubuskie (Zielona Gora)
6. Wielkopolskie (Poznan)
7. Kujawsko-Pomorskie (Bydgoszcz)
8. Mazowieckie (Warszawa)
9. Lubelskie (Lublin)
10. Dolnosląskie (Wroclaw)
11. Lodzkie (Lodz)
12. Swietokrzyskie (Kielce)
13. Opolskie (Opole)
14. Slaskie (Katowice)
15. Malopolskie (Krakow)
16. Podkarpackie (Rzeszow)

Fig. 1 – Provinces and province capital cities in Poland.

3.2. Equipment

As shown in Fig. 3, from 2005 to 2011, the number of accelerators increased by 60% (from 70 to 112 units) while installed Cobalt-60 units decreased by 75% (from 12 to 3). Of the 70 accelerators in use in 2005, only 1 was for intraoperative radiotherapy; by early 2012, there were 2 accelerators for intra-operative radiotherapy and 1 CyberKnife accelerator (particulars see Appendix A Table 3).

Table 2 shows population per 1 MV units (accelerators + cobalt units) for whole country. As the table clearly shows, the population/megavoltage units ratio improved (i.e.,

Table 1 – Methods used in oncology centres in Poland.

Province	Total population as of 31.12.2010	City/center	EBRT	Brachytherapy	Intraoperative EBRT accelerator	Intraoperative EBRT X-ray	Gammaknife	Cyberknife	Cyclotron protons + brachytherapy eye	I-125 – seeds
POLAND	38,200,037									
DOLNOŚLĄSKIE	2,877,840	Wrocław DCO	■	■						
		Wrocław WSS				■				
		Wałbrzych MCO	■	■						
KUJAWSKO-POMORSKIE	2,069,543	Bydgoszcz	■	■						
LUBELSKIE	2,151,895	Lublin COZL	■	■						
		Lublin AM				■				
LUBUSKIE	1,011,024	Zielona Góra	■	■						
ŁÓDZKIE	2,534,357	Łódź	■	■						
MAŁOPOLSKIE	3,310,094	Kraków COOK	■	■						
		Kraków SU		■	■				■	
		Kraków USD	■							
		Tarnów	■	■						
MAZOWIECKIE	5,242,911	Warszawa CO	■	■						
		Warszawa CR Allenort					■			
		Wieliszew	■	■						
OPOLSKIE	1,028,585	Opole	■	■						
PODKARPACKIE	2,103,505	Rzeszów	■	■						
		Brzozów	■	■						
PODLASKIE	1,188,329	Białystok	■	■						
POMORSKIE	2,240,319	Gdańsk	■	■						
		Gdynia	■	■						
ŚLĄSKIE	4,635,882	Bielsko-Biała	■	■						
		Gliwice	■	■		■		■		
		Częstochowa	■	■						
		Jastrzębie Zdrój								■
		Katowice	■	■						
ŚWIĘTOKRZYSKIE	1,266,014	Kielce	■	■						
WARMIŃSKO-MAZURSKIE	1,427,241	Olsztyn	■	■						
WIELKOPOLSKIE	3,419,426	Poznań WCO	■	■	■					
		Poznań MCO	■	■						
ZACHODNIOPOMORSKIE	1,693,072	Szczecin	■	■		■				
		Koszalin	■	■						

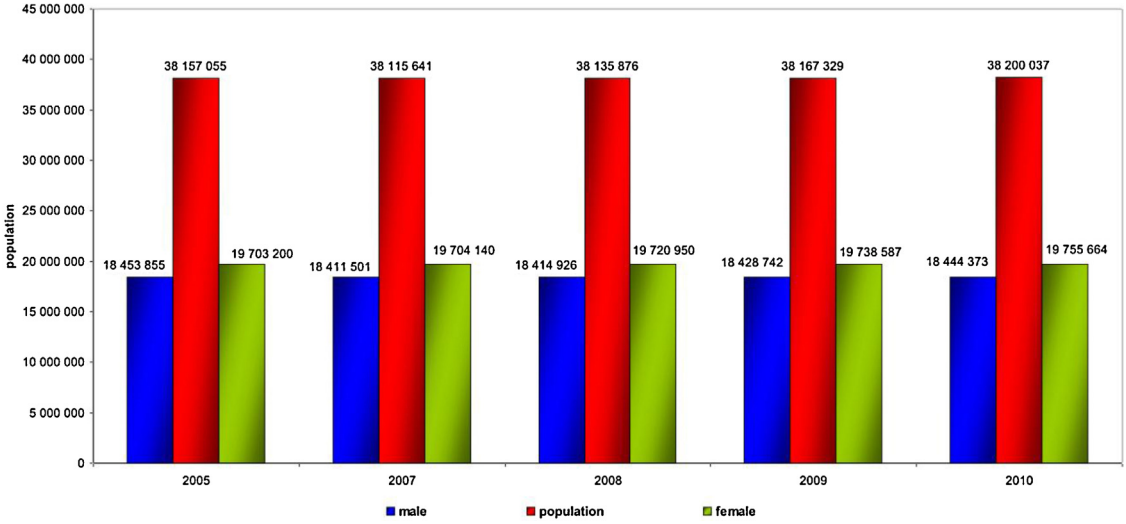

Fig. 2 – Structure of the Polish population in the years 2005–2010.[19,20]

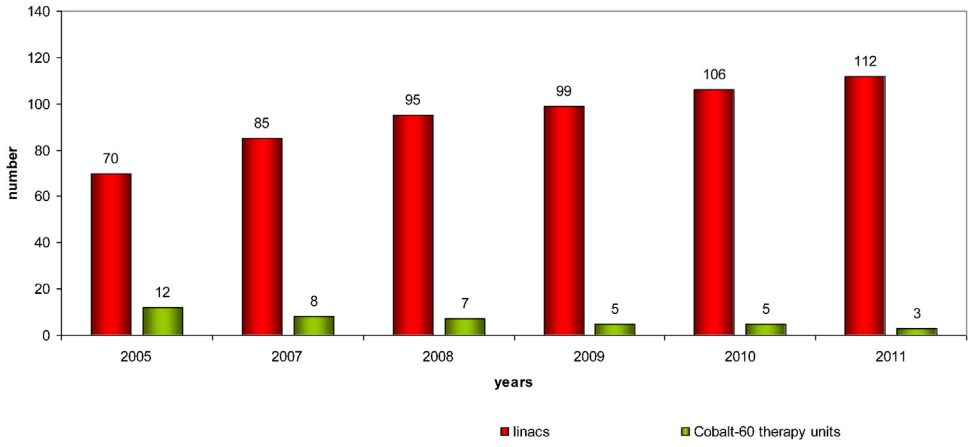

Fig. 3 – Total number of accelerators and Cobalt-60 units in the years 2005–2011.

declined from 471,127/megavoltage units to 338,053/megavoltage units) markedly over this period due to the large investment in new accelerators (particulars see Appendix A – Table 4).

Fig. 4 shows population per 1 MV units (accelerators + cobalt units) by province in Poland for the years 2005–2011.

Fig. 5 shows the number of megavoltage units (accelerators + cobalt units) and related equipment in use from 2005 to 2011. Over this time period, many existing accelerators were upgraded and many more new machines were purchased. Many of the new machines came fully equipped with multileaf collimators (MLC), micro multileaf collimations (microMLC), intensity modulated radiation therapy (IMRT), electronic portal imaging devices (EPID), Volumetric Modulated Arc Therapy (VMAT), image-guided radiation therapy (IGRT), and respiratory gating. Cobalt units were replaced by linear accelerators: in 2005 12 Cobalts were in operation and in 2011 only 3.

Linac indicates linear accelerator; MLC, multileaf collimator; EPID, electronic portal imaging devices; IGRT, image-guided radiotherapy; and IMRT, intensity-modulated radiotherapy.

The number of simulators increased by only 11% (from 36 in 2005 to 40 in 2011). This increase was smaller than might be expected due to (1) removal of old and worn simulators, and (2) a tendency to replace standard, dedicated radiotherapy

Table 2 – Population in Poland per 1 MV units (accelerators + cobalt units) in the years 2005–2011.

	Population per 1 MV units (accelerators + cobalt units)				
Years	2005	2007	2009	2010	2011
POLAND	471,127	414,407	366,691	343,850	338,053

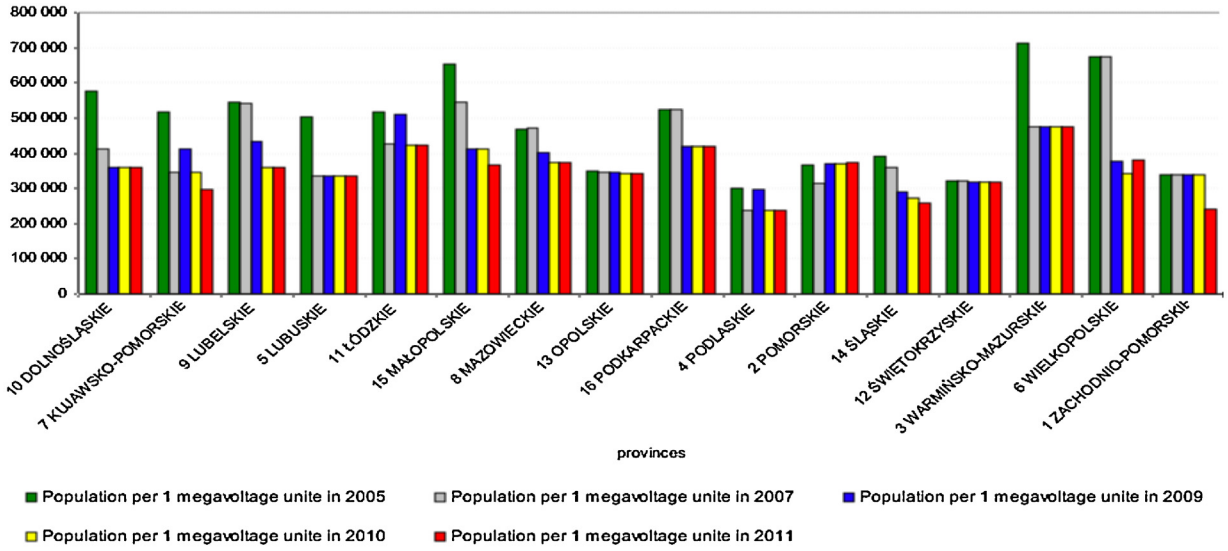

Fig. 4 – Comparison of the number of inhabitants per 1 MV units (accelerators + cobalt units) in the provinces in years 2005, 2007, 2009, 2010 and 2011 (see map in Fig. 1).

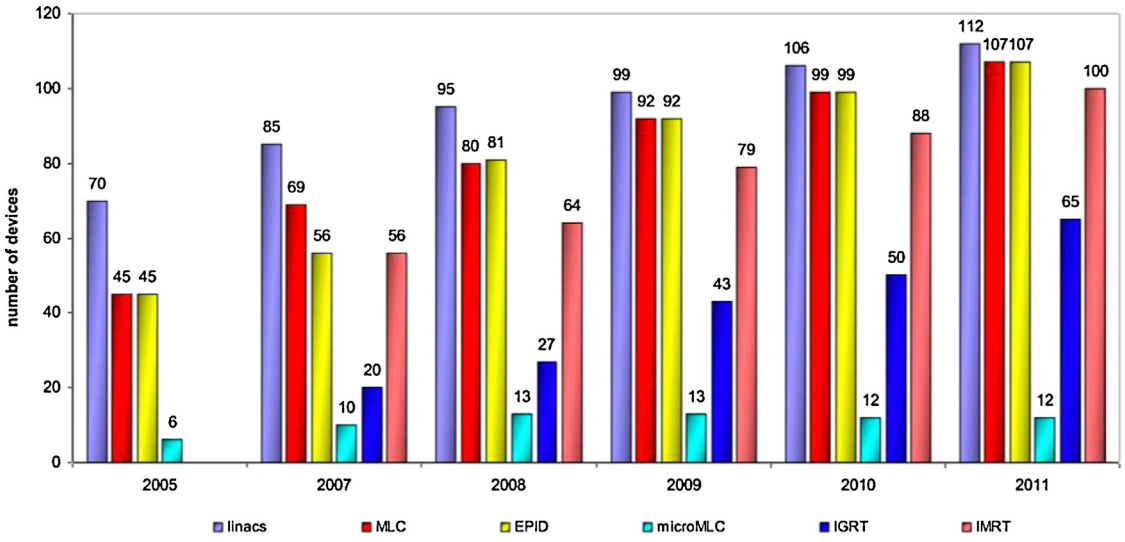

Fig. 5 – Number of linacs and related equipment in use from 2005 to 2011 (no data for year 2006).

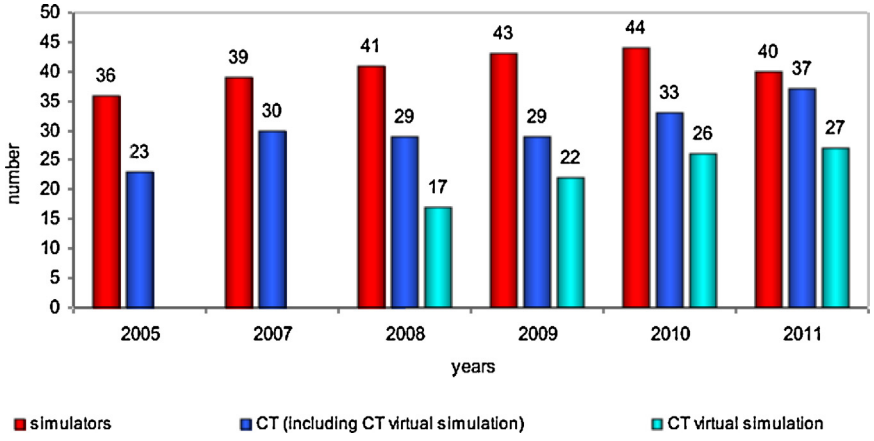

Fig. 6 – Features of radiotherapy centres in Poland in simulators and CT scanners for select years from 2005 to 2011.

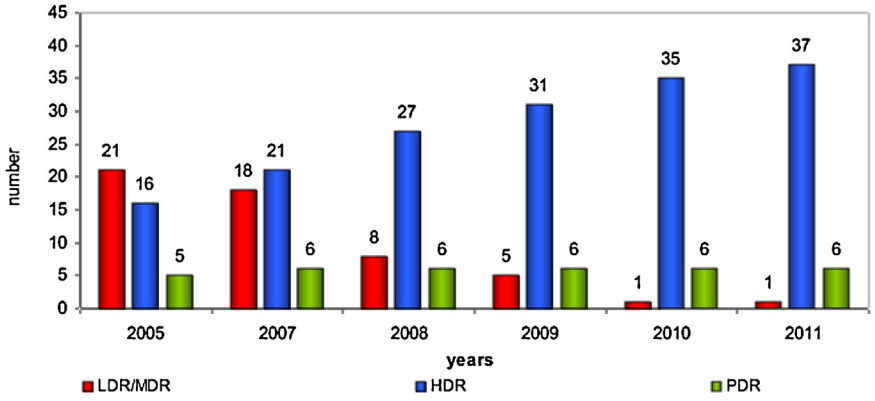

Fig. 7 – Features of radiotherapy centres in Poland – brachytherapy devices in the years 2005–2011.

computed tomography (CT) simulators with virtual simulation stations (CT-VSIM stations). In 2011, there were a total of 27 CT scan stations equipped with virtual simulation in the 32 oncology centres. Fig. 6 shows the available equipment for planning radiotherapy (simulators, CT scanners, and CT simulators) from 2005 to 2011. Note that no data is available on virtual simulation for the years 2005 and 2007.

The brachytherapy equipment available from 2005 to 2011 is shown in Fig. 7. As this graphic illustrates, the number of high-dose rate (HDR) afterloaders more than doubled between the years 2005 and 2011 (from 16 to 37, an increase of 131%). Although low-dose rate/medium-dose rate (LDR/MDR) machines were the most common equipment in 2005, by 2011 only 1 remained in service. The number of pulsed-dose rate (PDR) machines increased slightly (from 5 to 6) (particulars see Appendix A – Table 5).

Fig. 8 shows the population per brachytherapy device in 2011, by province. As is clear from the figure, the ratio varies widely by province.

3.3. *Personnel and staffing levels*

Between 2005 and 2011, the number of radiation oncologists in Poland increased by more than 40% (from 320 to 453), and the number of medical residents specialising in Radiation Oncology increased by 15% (from 149 to 171). The number of medical physicists increased by over 70% (from 188 to 325), and the number of radiotherapy technologists increased by almost 36% (from 652 to 883). Fig. 9 shows the number of radiation oncologists (specialists), medical physicists and radiotherapy technicians (RTTs) employed in radiotherapy centres.

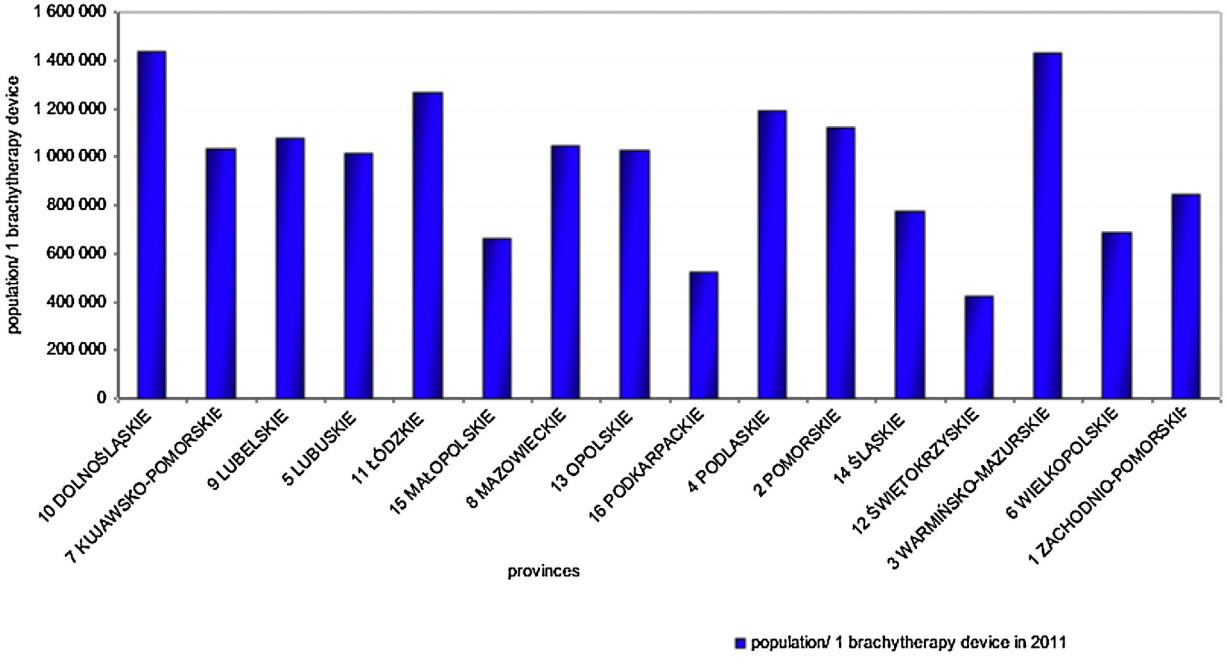

Fig. 8 – Population per brachytherapy device in 2011, by province (see map in Fig. 1).

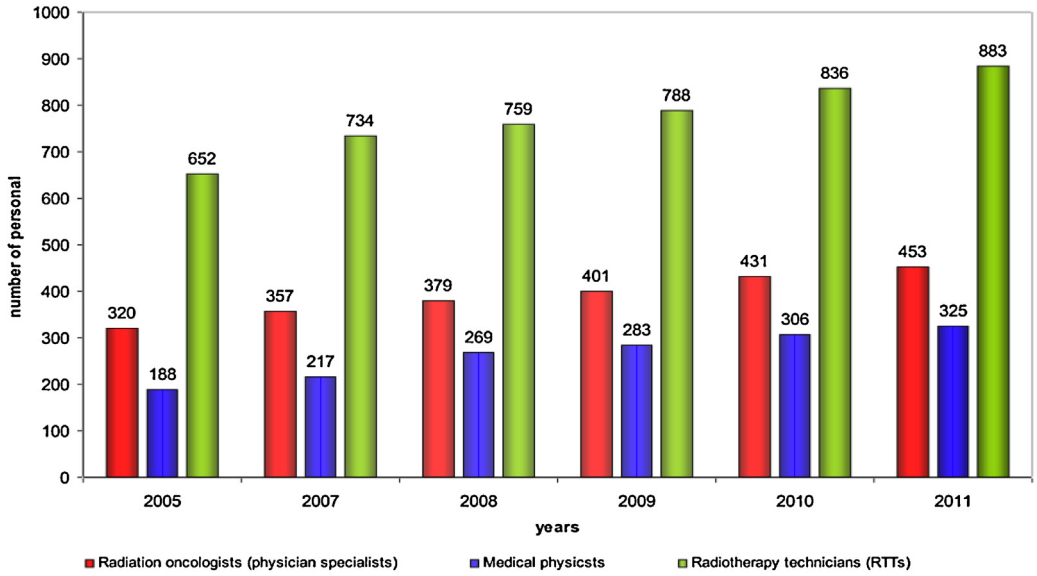

Fig. 9 – Personnel in radiotherapy centres from 2005 to 2011.

Fig. 10 shows the number of employed physician staff in radiation oncology in radiotherapy centres during the years 2005–2011 (specialists in radiation oncology and physicians in training).

3.4. *Patients*

As the number of linacs and brachytherapy equipment increased, so too did the number of patients. From 2007 to 2011, the number of treated patients increased from 63,000 to 76,000, a 21% increase in 5 years (Fig. 11, particulars see Appendix A – Table 4).

Fig. 12 shows the number of treated patients, radiotherapy method utilized for treatment (i.e., brachytherapy and/or EBRT) by province for the years 2007–2011.

4. Discussion

In 2011, Poland had a total of 325 medical physicists and 453 radiation oncologists (physicians specialists) who treated 76,000 radiotherapy patients, a ratio of 1 medical physicist per 234 patients and 1 radiation oncologist per 168 patients. It should be noted that in the matter of staff situation

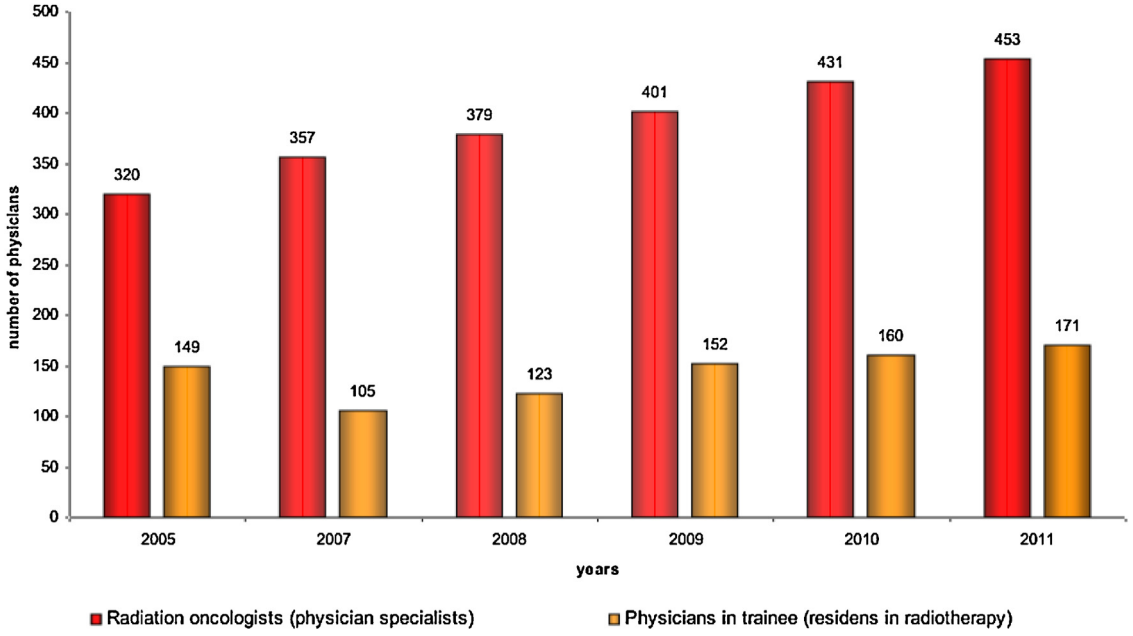

Fig. 10 – Radiation oncologists and physicians in trainee (residents in radiotherapy) employed in oncology centres in the years 2005–2011.

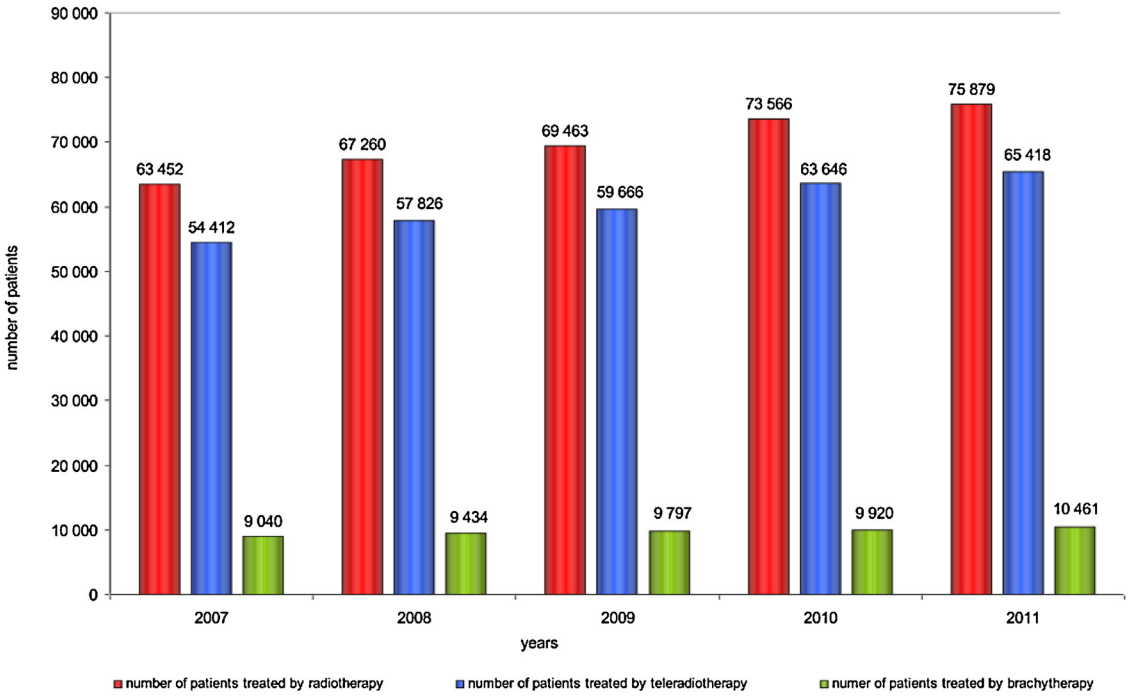

Fig. 11 – Number of patients treated by radiotherapy in radiotherapy centers in Poland in the years 2007–2011.

in Poland improved significantly over last eight years and reached the level that meets, ESTRO, QUARTS recommendations for staffing (1 radiation oncologist per 200–250 patients, and 1 physicist per 450–500 patients).[8,9,12] However there is some concern about these figures. Particularly the QUARTS study referred to the level of radiotherapy before 2005. Since that time complexity of all procedures has increased thus more staff is required.[2,3,21–29] This is why ESTRO launched new project on Health Economics in Radiation Oncology (HERO).[28] Medical physicists in Poland are still more involved in treatment planning than in West European countries, where dominantly these duties are carried by dosimetrists or physics assistants.[7,8,21] Moreover residency programme in medical physics speciality has started in Poland only few years ago and total number of physicists working in radiotherapy does not portrait well staffing level in this category, as only small portion was able to pass the required certification up to date. In some of the cancer centres staff participate in undergraduate teaching and research, which reduces time dedicate to clinical work.[2,21,27,30] We have not revised these factors for the current analysis and further study is required.

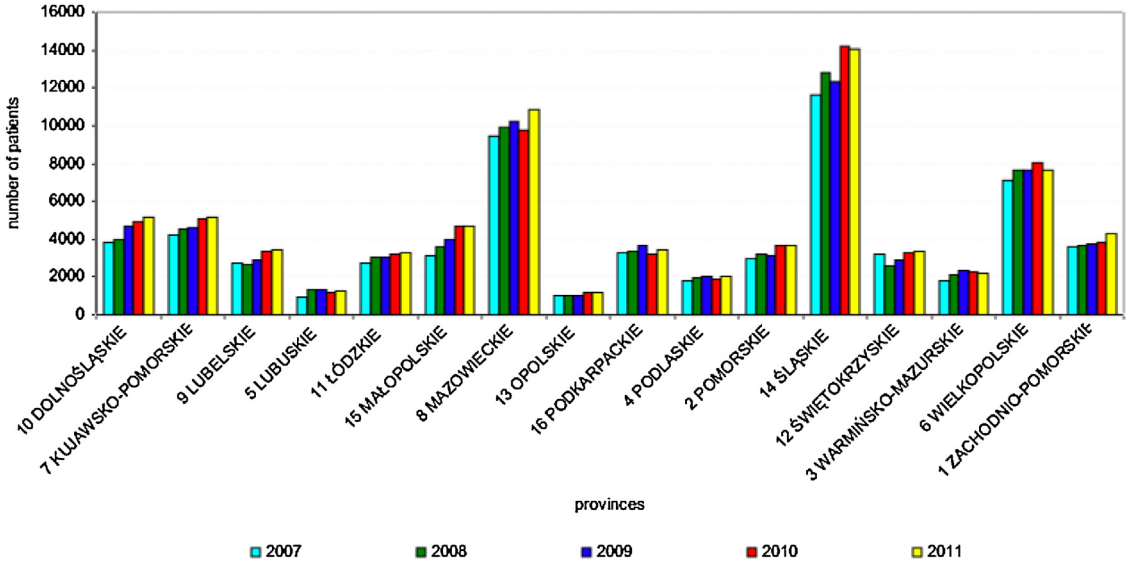

Fig. 12 – Number of patients treated with radiotherapy in the provinces in years 2007, 2008, 2009, 2010 and 2011 (see map in Fig. 1).

The current linac/patient ratio in Poland (1 linac per 678 patients) does not comply with the ESTRO recommendation of 1 linac per 450 patients.[8] In general, however, it is safe to say that radiotherapy services, facilities, and staffing have made major progress since the year 2005.[25,26]

The government of Poland has made a concerted effort in recent years to improve cancer care and prevention in order to bring Poland in line with other European countries. To this end, the National Cancer Programme (NCP) was approved by the Polish parliament on July 1, 2005. The NCP is an ambitious and well-financed plan 3 billion zloty (approximately €715 million allocated for the years 2006–2015) and encompasses a multipronged approach to cancer prevention, treatment, and awareness. One of the major thrusts of the NCP involves significant funding to equip and modernize radiotherapy departments throughout the country. As the results of our survey show, the additional investments made by the NCP have dramatically improved access to care in Poland and quality of care. In fact, one of the biggest improvements is still to come with the planned launch, in the year 2014, of the National Centre for Hadron Therapy at the Institute of Nuclear Physics in Cracow. This is an exciting and important development, as hadron therapy has several advantages that promises to further improve treatment outcomes in some tumour localizations.[23]

4.1. *Radiotherapy equipment*

The World Health Organization (WHO) recommends a standard of 250,000–300,000 inhabitants per linac.[7,10,18] Viewed in this way, the number of linacs in Poland is still insufficient. The current ratio is 1 MV linac per 338,053 inhabitants. However, this is a major improvement from 2005, when there were 471,127 inhabitants per linac. Under the NCP, a total of 60 linacs were purchased and installed between 2008 and 2011 at public centres (8 linacs at private centres). Nevertheless, the number of linacs in use actually increased by only 42 machines over this period due to decommissioning of outdated machines, including Cobalt-60 therapy units (of which only 2 are still in use in Poland). Likewise, newer technologies, including the GammaKnife and CyberKnife, have been added. Currently, there are 112 linacs for a treatment population of 76,000 patients (1 linac per 678 patients). To meet the ESTRO QUARTS guidelines of 1 linac per 450 patients (for a patient population of 76,000, this implies 168 linacs), Poland would need a net increase (after accounting for decommissioned units) of at least 44 linacs. That is, under these standards, there is a current shortfall of 56 linac units in Poland without taking into consideration the expected increase in demand in the next few years. In terms of equipment, Poland has made vast improvements in a very short time, but more will need to be done in coming years. The demand for new radiotherapy machines may exceed the current estimate, which is based on the models of staffing revised in 2005, so it is likely that introduction of new technologies will require more staff and more equipment to be dedicated to radiotherapy. Fortunately, NCP funding is scheduled to continue through 2016 and we will be able to continue modernising and expanding radiotherapy facilities and equipment during this period.

4.2. *Regional differences*

There are still large differences between the 16 provinces in terms of equipment availability and ease of access to treatment. For example, in terms of brachytherapy devices per million population, some provinces have more than 1.4 million inhabitants per device while others have as few as 400,000 inhabitants per device. The same is true for linacs. In some provinces, the population to linac ratio is over 422,000:1 (Lodzkie and Podkarpackie provinces) and in one province the ratio is 476,000:1 (Warminsko-Mazurskie). In contrast, in other regions, such as Slaskie, Podlaskie, and Zachodniopomorskie, this ratio does not exceed 258,000:1. The reasons for such wide regional differences are the same as observed in most countries: population density and wealth. Notwithstanding these regional differences, access to advanced radiotherapy has been improved since 2005 and will continue improving.

5. Conclusion

As this survey shows, radiotherapy facilities in Poland have been substantially improved and upgraded. Although there is still a gap between Poland and western EU countries in many health measures, including life expectancy, the gap is closing quickly as Poland has invested heavily in improving health care services. Nevertheless the National Cancer Programme has to be continued after year 2015 as a support to regular reimbursement for the radiotherapy procedures.

Compared to 2005, there are more comprehensive centres (32 vs. 23), more equipment with improved technology, and more cancer care specialists. As a result, access to treatment has improved markedly. Moreover, investment in advanced technologies and techniques (IMRT, tomotherapy, and SBRT-CyberKnife) now allows us to offer patients the most effective treatments to improve outcomes. Finally, one important, and perhaps underappreciated, improvement resulting from the increase in available human and technological resources is in waiting times from diagnosis to the start of treatment has decreased. Waiting time is an important indicator of quality, and this dramatic reduction confirms that radiotherapy services in Poland have improved dramatically in recent years. For both patients and cancer care professionals, this is welcome news.

Continuous study is needed to estimate the required number of therapeutic machines and staff, as the rapid development in science and technology modifies the techniques used.

To our knowledge, this is the first comprehensive study of radiotherapy facilities and staffing in Poland. A follow-up study should be performed to identify changes in infrastructure, human resources, and treatments that are sure to occur in the next few years.

Conflict of interest

None declared.

Financial disclosure

None declared.

Appendix A

See Tables 3–6.

Table 3 – Number of megavoltage units (linacs + cobalt units) in radiotherapy centers in the years 2005–2011.

Province	Population as of 31.12.2010	Cities	LINACS/Cobalt-60 units					
			2005	2007	2008	2009	2010	2011
POLAND	38,200,037		70/12	85/8	95/7	99/5	106/5	112/3
DOLNOŚLĄSKIE	2,877,840	Wrocław	5	7	6	6	6	6
		Wałbrzych	–	–	2	2	2	2
KUJAWSKO-POMORSKIE	2,069,543	Bydgoszcz	3/1	5/1	5	5	6	7
LUBELSKIE	2,151,895	Lublin	3/1	4	5	5	6	6
LUBUSKIE	1,011,024	Zielona Góra	1/1	2/1	2/1	2/1	2/1	3
ŁÓDZKIE	2,534,357	Łódź	4/1	6	6	5	6	6
MAŁOPOLSKIE	3,310,094	Kraków COOK	4	4	4	4	4	4
		Kraków SU	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
		Kraków USD	1	1	1	2	2	2
		Tarnów	–	1	2	2	2	3
MAZOWIECKIE	5,242,911	Warszawa CO	10/1	11	11	11	12	11
		Wieliszew	–	–	–	2	2	2
		Warszawa Allenort	–	–	–	–	–	0/1
OPOLSKIE	1,028,585	Opole	2/1	2/1	2/1	2/1	2/1	2/1
PODKARPACKIE	2,103,505	Rzeszów	1/1	1/1	2/1	2	2	2
		Brzozów	1/1	1/1	2/1	3	3	3
PODLASKIE	1,188,329	Białystok	3/1	4/1	4/1	3/1	4/1	4/1
POMORSKIE	2,240,319	Gdańsk	3	3	3	3	3	3
		Gdynia	3	4	4	3	3	3
ŚLĄSKIE	4,635,882	Bielsko-Biała	2	2	2	3	3	3
		Gliwice	7	8	9	9	10	11
		Katowice	2	2	2	2	2	2
		Częstochowa	1	1	1	2	2	2
ŚWIĘTOKRZYSKIE	1,266,014	Kielce	3/1	4	4	4	4	4
WARMIŃSKO-MAZURSKIE	1,427,241	Olsztyn	2	3	3	3	3	3
WIELKOPOLSKIE	3,419,426	Poznań WCO	4/1	4/1	5/1	6/1	7/1	7
			–	–	1[a]	1[a]	1[a]	1[a]
		Poznań MCO	–	–	2	2	2	2
ZACHODNIOPOMORSKIE	1,693,072	Szczecin	4/1	4/1	4/1	4/1	4/1	5
		Koszalin	–	–	–	–	–	2

[a] LINACS used only for intra-operative radiotherapy (the calculation not included the population for 1 MV units).

Table 4 – Number of population for 1 MV units (linacs + cobalt units) in the years 2005, 2007, 2009, 2010, 2011.

Province	City/center	Population per 1 MV units				
		2005	2007	2009	2010	2011
POLAND		471,127	414,407	366,691	343,850	338,053
DOLNOŚLĄSKIE	Wrocław Wałbrzych	578,089	411,760	359,632	359,578	359,730
KUJAWSKO-POMORSKIE	Bydgoszcz	516,927	344,395	413,584	344,847	295,649
LUBELSKIE	Lublin	545,547	543,192	432,366	359,534	358,649

Table 4 (*Continued*)

Province	City/center	Population per 1 MV units				
		2005	2007	2009	2010	2011
LUBUSKIE	Zielona Góra	504,596	336,173	336,321	336,682	337,008
ŁÓDZKIE	Łódź	516,427	427,700	509,772	423,639	422,393
MAŁOPOLSKIE	Kraków COOK Kraków SU Kraków USD Tarnów	652,588	545,201	410,892	412,284	367,788
MAZOWIECKIE	Warszawa CO Warszawa CR Allenort Wieliszew	468,203	470,155	400,346	373,012	374,494
OPOLSKIE	Opole	349,847	347,314	344,347	343,699	342,862
PODKARPACKIE	Rzeszów Brzozów	524,449	524,391	419,899	420,346	420,701
PODLASKIE	Białystok	300,250	239,220	297,868	237,946	237,666
POMORSKIE	Gdańsk Gdynia	366,167	314,799	369,919	371,683	373,387
ŚLĄSKIE	Bielsko-Biała Gliwice Katowice Częstochowa	391,121	359,164	290,354	272,984	257,549
ŚWIĘTOKRZYSKIE	Kielce	321,596	319,960	318,196	317,530	316,504
WARMIŃSKO-MAZURSKIE	Olsztyn	714,240	475,628	475,691	475,706	475,747
WIELKOPOLSKIE	Poznań WCO Poznań MCO	672,505	675,700	377,513	340,828	379,936
ZACHODNIO-POMORSKIE	Szczecin Koszalin	338,856	338,568	338,591	338,640	241,867

Table 5 – Features of radiotherapy centers in the brachytherapy devices in the years 2005–2011.

Provinces	Total population as of 31.12.2010	City/center	Total number of BT devices																			Population/BT device in 2011
			2005			2007			2008			2009			2010			2011				
Poland	38,200,037		42 devices, 21 LDR/MDR, 16 HDR, 5 PDR			45 devices, 18 LDR/MDR, 21 HDR, 6 PDR			41 devices, 8 LDR/MDR, 27 HDR, 6 PDR			42 devices, 5 LDR/MDR, 31 HDR, 6 PDR			42 devices, 1 LDR/MDR, 35 HDR, 6 PDR			44 devices, 1 LDR/MDR, 37 HDR, 6 PDR			868,183
			LDR/MDR	HDR	PDR	LDR/MDR	HDR	PDR	LDR/MDR	HDR	PDR	LDR/MDR	HDR	PDR	LDR/MDR	HDR	PDR	LDR/MDR	HDR	PDR		
DOLNOŚLĄSKIE	2,877,840	Wrocław DCO		1			1			1			1			1			1			
		Wrocław SPSK				1			1			1										1,438,920
		Wałbrzych MCO								1			1			1			1			
KUJAWSKO-POMORSKIE	2,069,543	Bydgoszcz	1	1	1	1	1	1		1	1		1	1		1	1		1	1		1,034,772
LUBELSKIE	2,151,895	Lublin	1	1			1			1			1			2			2			1,075,948
LUBUSKIE	1,011,024	Zielona Góra	1				1			1			1			1			1			1,011,024
ŁÓDZKIE	2,534,357	Łódź	2	1		2	1			1			2			2			2			1,267,179
MAŁOPOLSKIE	3,310,094	Kraków COOK	1	1	1	1	1	2		1	2		2	1		2	1		2	1		
		Kraków SU Gin.											1			1			1			662,019
		Tarnów											1			1			1			
MAZOWIECKIE	5,242,911	Warszawa	2	2			3	1		3	1		3	1		3	1		3	1		1,048,582
		Wieliszew											1			1			1			
OPOLSKIE	1,028,585	Opole	2	1		2	1			1			1			1			1			1,028,585
PODKARPACKIE	2,103,505	Rzeszów	2			2			2			2				1			1			525,876
		Brzozów		1			1			1			1			2	1		2	1		
PODLASKIE	1,188,329	Białystok		1			1			1			1			1			1			1,188,329
POMORSKIE	2,240,319	Gdańsk	1		1	1		1	1		1	1		2			1				1	1,120,160
		Gdynia	1			1				1			1			1			1			
ŚLĄSKIE	4,635,882	Bielsko-Biała								1			1			1			1			772,647
		Gliwice		2	1		2			2			2			3			3			
		Katowice		1			1			1			1			1			1			
		Częstochowa	1				1			1			1			1			1			
ŚWIĘTOKRZYSKIE	1,266,014	Kielce	1	1		1	2		1	2		1	2		1	2		1	2			422,005
WARMIŃSKO-MAZURSKIE	1,427,241	Olsztyn	1			1	1		1	1			1			1			1			1,427,241
WIELKOPOLSKIE	3,419,426	Poznań WCO	2	1	1	2	1	1	2	2	1		2	1		2	1		2	1		
		Poznań MCO								1			1			1			2			683,885
		Poznań PSK UM				1				1												
ZACHODNIOPOMORSKIE	1,693,072	Szczecin	2	1		2	1			1			1			1			1			846,536
		Koszalin																	1			

Table 6 – Number of patients treated with radiotherapy in provinces in 2007–2011.

Province	Population as of 31.12.2010	City	Number of patients treated				
			2007	2008	2009	2010	2011
Poland	38,200,037		63,452	67,260	69,463	73,566	75,879
DOLNOŚLĄSKIE	2,877,840	Wrocław	3801	3931	3782	3616	3736
		Wrocław SPSK	17	–	–	–	–
		Wrocław WSS	–	–	–	–	10
		Wałbrzych	–	32	865	1277	1435
KUJAWSKO-POMORSKIE	2,069,543	Bydgoszcz	4228	4489	4638	5086	5156
LUBELSKIE	2,151,895	Lublin	2674	2586	2887	3309	3444
		Lublin UM	54	43	34	40	16
LUBUSKIE	1,011,024	Zielona Góra	932	1291	1289	1177	1265
ŁÓDZKIE	2,534,357	Łódź	2728	3072	3071	3199	3314
MAŁOPOLSKIE	3,310,094	Kraków COOK	2602	2821	2532	2852	2544
		Kraków SU	211	189	315	336	374
		Kraków USD	321	286	325	384	477
		Tarnów	–	316	813	1107	1325
MAZOWIECKIE	5,242,911	Warszawa	9423	9911	10,198	9287	9177
		Wieliszew	–	–	–	469	1392
		Warszawa Allenort	–	–	–	–	243
OPOLSKIE	1,028,585	Opole	1021	1022	989	1157	1206
PODKARPACKIE	2,103,505	Rzeszów	1409	1303	1798	1361	1154
		Brzozów	1892	2057	1853	1830	2258
PODLASKIE	1,188,329	Białystok	1833	1947	2025	1893	2064
POMORSKIE	2,240,319	Gdańsk	1695	1750	1748	1949	2198
		Gdynia	1290	1441	1382	1699	1488
ŚLĄSKIE	4,635,882	Bielsko-Biała	1224	1320	1415	1558	1594
		Częstochowa	1113	1662	1728	1959	1879
		Gliwice	7020	7381	7104	8137	8036
		Jastrzębie Zdrój	–	–	–	14	31
		Katowice	2275	2418	2085	2532	2489
ŚWIĘTOKRZYSKIE	1,266,014	Kielce	3170	2557	2900	3268	3368
WARMIŃSKO-MAZURSKIE	1,427,241	Olsztyn	1806	2132	2353	2236	2219
WIELKOPOLSKIE	3,419,426	Poznań WCO	7003	7528	6929	6371	5709
		Poznań PSK UM	110	88	–	–	–
		Poznań MCO	–	–	693	1651	1964
ZACHODNIOPOMORSKIE	1,693,072	Szczecin	3600	3687	3712	3812	3847
		Koszalin	–	–	–	–	467

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