VIA MEDICA

ORIGINAL ARTICLE

Journal of Transfusion Medicine
2020, tom 13, nr 1, 67–103
DOI:10.5603/JTM.2020.0002

ISSN 1689–6017

Retrospective analysis of selected aspects of public blood transfusion service as a starting point for assessment of the status of transfusion medicine in Poland Part 1: Demographic characteristics of the donor population reporting for blood donation to Polish Regional Blood Transfusion Centers in the period 2005–2017

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Summary

Background: *The ongoing demographic changes in Poland affect the number of donors and donations with direct impact on provision of blood and blood components for transfusion. With predicted population-decline, the number of potential donors is likely to decrease while the demand for blood is bound to increase as more people will require blood therapy. The structure of the Polish donor population reporting for blood donation is not uniform, moreover it has undergone additional changes within the study period. So it seems justified to perform in-depth analysis of the dynamics of changes in the number and structure of donor group as well as determine the direction and intensity of these changes in spatial and temporal terms. Identification of the possible causes of change is also important. Aim: presentation of the structure characteristics of the donor group who reported at the Polish regional blood transfusion centers (RBTCs) in the period 2005–2017 with the intention of donating blood/ blood components.*

Materials and methods: *Analyses of available data-sets — annual reports from 21 Polish RBTCs forwarded to the IHTM. The following tools were used for statistical analysis: Microsoft Office: Access and Excel, Microsoft Power Business Intelligence (Power BI) software and STATISTICA version 13.3 software (TIBCO Software Inc.).*

Results: *In 2005–2017 the total number of donors amounted to 8 691 611 including 2 542 621 (29.3%) women and 6 148 990 (70.7%) men. Voluntary non-remunerated donors were estimated at 8 684 069 (99.9%). The average annual number of donors per RBTC was 31 837 and included 31 809 voluntary non-remunerated donors; 22 524 men and 9314 women. Countrywide, the highest number was reported for the period 2011–2013; 701 882 (8.08%), 707 578 (8.14%) and 706 246 (8.13%) for respective years and for the period 2015–2016 the numbers were 718 887 (8.27%) and 706 476 (8.13%) respectively. The highest number for the period was reported by 5 RBTCs: Warsaw (951 068 — 10.94%), Katowice (748 841; 8.62%), Poznan (702 087; 8.08%), Krakow (651 057; 7.49%) and Wroclaw (556 357; 6.40%).*

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In the number of 2 352 099 donors who have recently reported for blood donation at the RBTCs the 25–44 age group was the largest (48%). The least numerous was the 45–65 age group — 548 885 (ca. 11%). There were 2 030 692 donors in the 18–24 age category (> 41% of the total donor-population). Trend-analysis demonstrated an upward tendency for the category of 25–44 age donors and a downward one for the 18–24 age category. No explicit trend was observed for the 45–65 age group.

Conclusion: *The number of blood donations in Poland has recently reached the limit of approximately 1 200 000 donations per year. To exceed this limit will be no easy task. All efforts must therefore be focused on promoting people's willingness to donate blood. The analysis indicates a falling tendency for the 18–24 age group and a rising one for higher age groups, which only raises concern for the future. The priority is therefore to motivate people of all age-groups to donate blood and become multiple donors with special emphasis however on the very young people as they are the potential source for many years to come. Promotion of voluntary non-remunerated blood-donation among children is equally important; in several years' time transfusion medicine will depend on their willingness to donate blood.*

Key words: *demographic changes, blood donors, blood transfusion, Regional Blood Transfusion Center*

J. Transf. Med. 2020; 13: 67–103

Introduction

In Poland, transfusion medicine is part of the public blood transfusion service (BTS) and an integral part of the national health care system.

The health care system is part of the public health system defined by World Health Organization (WHO) as: *"an organized effort by society, primarily through its public institutions, undertaken to improve, promote, protect and restore the health of the population through collective action. It includes services such as health situation analysis, epidemiological surveillance, health promotion, prevention, control of infectious diseases, environmental protection and sanitation, disaster and health preparedness and response, and occupational health, among others"* [1].

The fundamental goal of modern blood transfusion service worldwide is to provide adequate supplies of safe blood and blood components to meet transfusion needs as well as of raw material for manufacturing of blood products. It is also a precondition to effective functioning of the healthcare system.

According to the *"Population forecast for 2014–2050"* by the Central Statistical Office of Poland (GUS), in 2050 the population of the country will amount to 33 million 951 thousand, which is a decrease by 4.55 million (12%) as compared to the status for December 31, 2013 (adopted as starting point for assumptions and analyses of predicted directions in demographic changes) [2].

Ageing society and low birth rate are the main problems that Poland is currently facing. According to recent forecasts, no significant changes are to be expected in the nearest future. However, as compared to other member countries of the European Union (EU), Poland is still perceived as a relatively young society. According to Eurostat data, the median age of the Polish population in 2018 was 40.6 years, while for all EU member states combined, it was almost 43.1 years [3].

Demographic changes observed in the Polish population, especially ageing, have direct impact on the number of donors and donations, and ultimately on the supply of blood and blood components for transfusion therapy. The population-decrease may correlate with decrease in the number of potential blood donors. At the same time, the demand for blood and blood components is likely to increase as the number of people who may require blood and blood component transfusion will grow.

In Figure 1, the projected total population in Poland is compared with working-age population for the period 2020–2050. As the Central Statistical Office (GUS) had no available prognostic age-data broken down into individual years, the working-age group of 18 until retirement (65 years for women and 67 for men) was selected as closest to the eligibility age for blood donation (18–65). Data demonstrates that by 2050 the total population will decrease by over 4 million, while the number of working-age people by about 5 million.

Changes will be induced not only by lower birth rate but also by factors such as: emigration

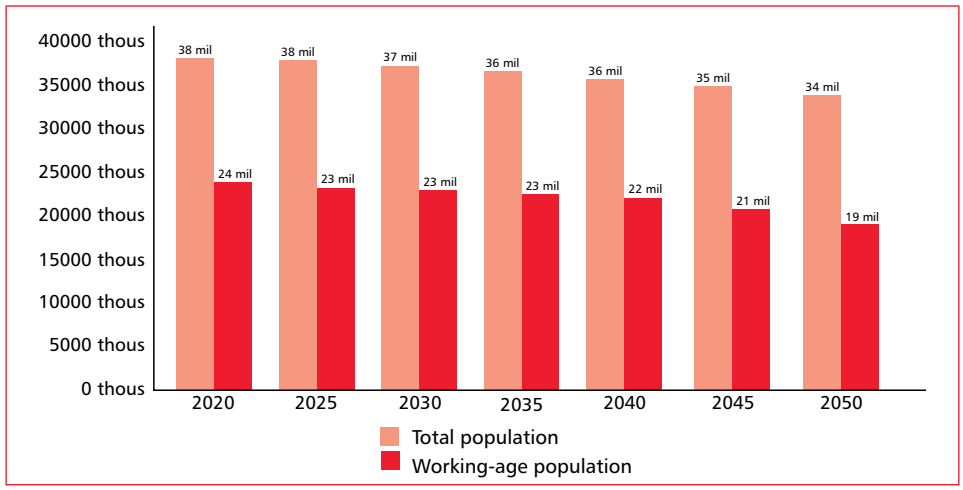

Figure 1. Projected total population vs working-age population in 2020–2050

of young people, pace of everyday life and health-affecting conditions, all of which contribute to narrowing the number of potential blood donors.

It is worth noting that people who reported in Regional Blood Transfusion Centers (RBTCs) with the intention of donating blood for clinical use were not all found eligible for donation. Restrictive donor qualification criteria is the first and extremely important step towards provision of safe blood and ultimately for safe-guard of the recipients.

It is known for a fact that the structure of the population reporting to Polish RBTCs for blood donation is heterogeneous, furthermore, it was necessary to take into account certain changes that occurred during the period under study.

There is therefore a justified need for in-depth analysis of the dynamics of changes in the number and structure of donor population, both the people who expressed the will to donate as well as those who were found eligible for donation. It is important to determine the direction and intensity of the phenomenon in both spatial and temporal terms. Equally important are attempts at identification of the likely reasons for the changes.

Aim

This reviw is the first of a series of publications devoted to the description of selected activities of Polish public BTS with the aim of assessing the status of transfusion medicine in Poland. In preparation are articles on: demographic structure of the donor population eligible for donation of blood and blood components for clinical use, characteristics of the donations, blood management and analysis of the status of red blood cell inventories.

The purpose of this publication was to present the characteristics of donor-population which reported in RBTCs in the period 2005–2017 with the intention of donating blood/blood components, no matter whether the donation was finalized or not.

Materials and methods

The analyses were based on available data sets. The secondary statistical material were the reports from RBTCs sent each year to the Institute of Hematology and Transfusion Medicine (IHTM). All analyses referred to the territory of Poland.

The analyses included data from 21 RBTCs which — together with the Military Blood Transfusion Center and the Blood Transfusion Center of the Ministry of the Internal Affairs and Administration — are part of a more general collectivity. Although partial, the analysis of the data from 21 RBTCs is undoubtedly based on a sample that can be considered representative, as the field of activity of these 21 centers covers the territory of the whole country and the differences in the scope and schedule for implementation of legal and administrative changes are reduced to minimum due to identical organizational structure and legal subordination. The remaining two centers (Military Blood Transfusion Center and the Blood Transfusion Center of the Ministry of the Internal Affairs and Administration) are not subordinate to the Minister of Health, which imposed restrictions on access to information required for the study. According to available data, these two blood trans-

fusion centers are responsible for merely 3.8% of Polish donors, so disregarding them did not affect the analysis.

The raw material for statistical analysis, i.e. data assembled in its original form, was subjected to special processing and preparation. Initial verification was performed in terms of data completeness and accuracy; the data was then organized and grouped for the purpose of analysis and the results were presented in form of tables and diagrams. A detailed description of the steps taken to prepare the material for analysis will be published in a separate review, solely devoted to the issue.

MS Access and MS Excel of the Microsoft Office professional suite were used for the purpose of data-preparation and analysis of statistical material. Microsoft Power Business Intelligence (Power BI) software was also put to use. Additionally, *STATISTICA* software version 13.3 (TIBCO Software Inc.) was used to perform all descriptive statistics presented in this work.

Results

Working-age population

As already mentioned, in order to estimate the percentage of people who reported to RBTCs to donate blood versus the population of potential blood donors, we relied on GUS-data for the working-age population (18 until retirement i.e. 65 for women and 67 for men.); this group was considered closest to the 18–65 age-category eligible for blood donation.

Figure 2 and Table 1 compare the total population of Poland, the working-age population and population of people who reported for blood/blood component donations to Polish RBTCs in the period 2005–2017.

It follows that merely 3% of the population of potential blood donors reported at the RBTCs to donate blood/blood components; their characteristics are presented below.

Characteristics of donors who reported to donate blood/blood components in the period 2005–2017

Total donor-population

Table 2 presents the basic data referring to the population of donors who reported at RBTCs in 2005–2017 with the intention of donating blood/blood components. During the study period, the total number of donors (daw_zgl_krew) was estimated at 8 691 611 and included 2 542 621 (29.3%) women (daw_zgl_krew_K) and 6 148 990 (70.7%) men (daw_zgl_krew_M). The number of voluntary non-remunerated donors (daw_zgl_krew_h) amounted to 7 885 266, which is 90.7% of the total number of donors who reported at RBTCs with the intention of donating blood/blood components. In addition, there were also responders to donation appeal (previously named "family" donors) (daw_zgl_krew_r). The group of responders to donation appeal was reviewed separately, although people from this group are also classified as voluntary non-remunerated donors. According to Table 2, the total number of responders to donation appeals was estimated at 778 803 (i.e. 8.9% of the total number of donors).

The annual average total number of donors per RBTC was 31 837; 28 957 — voluntary non-remunerated donors, 2961 responders to donation appeal, 22 524 — male donors and 9314 female donors.

Table 3 presents the number of donors who reported in RBTCs with the intention of donating blood/blood components broken down into years. The highest numbers were reported for the period 2011–2013 [701 882 (8.08%), 707 578 (8.14%) and 706 246 (8.13%) respectively] as well as for 2015–2016 (718 887 (8.27%) and 706 476 (8.13%). The lowest number was recorded in 2005 for RBTC in Słupsk — 8365 and the highest in 2015 for RBTC in Warsaw — 76 177 donors (Table 4).

Characteristics of the whole donor population who reported to donate blood/blood components in 2005–2017 is presented in Table 4, broken down into RBTCs. The largest number of donors reported in 5 RBTCs: Warsaw (951 068; 10.94%), Katowice (748 841; 8.62%), Poznan (702 087; 8.08%), Krakow (651 057; 7.49% and Wroclaw (556 357; 6.40%) (Table 4).

Voluntary non-remunerated blood donors

Data referring to voluntary non-remunerated donors who reported in RBTCs with the intention of donating blood/blood components broken down into years of the study-period is presented in Table 5. Countrywide, the highest number of voluntary non-remunerated donors was recorded in 2011–2012 (645 435 (8.19%) and 647 479 (8.21%) and in 2014–2016 (643 180 (8.16%), 669 581 (8.49%) and 648 235 (8.22%) respectively. The lowest number was recorded in 2005 at RBTC in Słupsk — 8342, while the highest in 2015 — 66 000 at RBTC in Warsaw (Table 6).

Table 6 presents the characteristics of the total population of voluntary non-remunerated donors who reported for donation of blood/blood

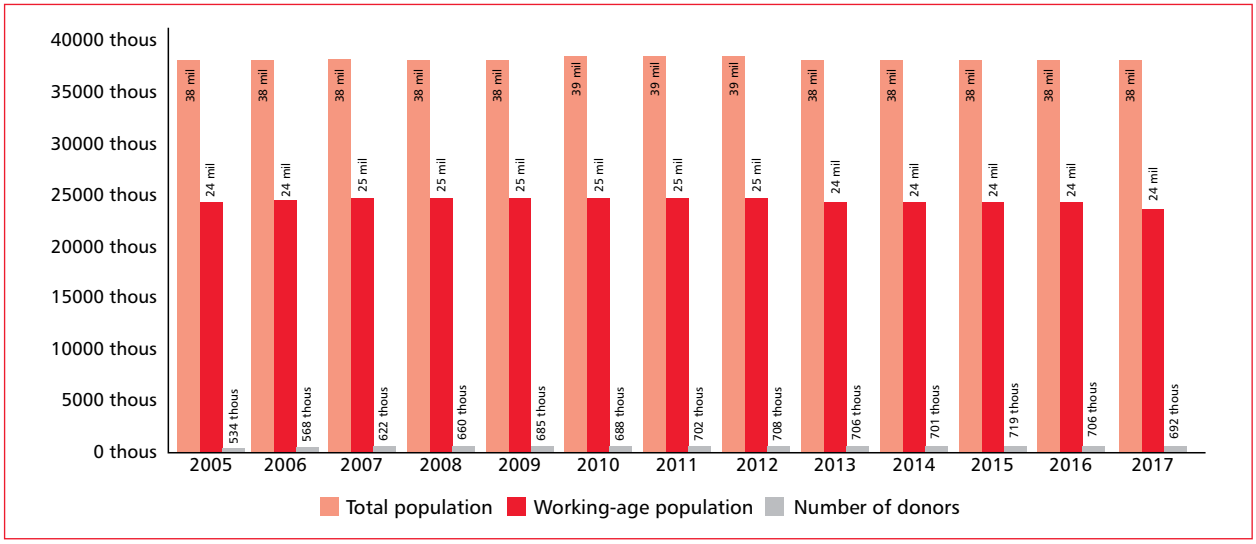

Figure 2. Total population, working-age population and population of people who reported to Polish RBTCs for donation of blood/blood components (2005–2017)

Table 1. Numbers and percentage of people reporting for blood donation vs population of potential donors of blood/blood components in the consecutive years of 2005–2017

Year	Total population	Working-age population	Donors reporting for donation	% of donors reporting for donation
2005	38 157 055	24 405 034	534 342	2.19%
2006	38 125 479	24 481 670	567 760	2.32%
2007	38 115 641	24 545 254	622 357	2.54%
2008	38 135 876	24 590 475	660 056	2.68%
2009	38 167 329	24 624 443	684 908	2.78%
2010	38 529 866	24 831 001	688 272	2.77%
2011	38 538 447	24 738 527	701 882	2.84%
2012	38 533 299	24 605 558	707 578	2.88%
2013	38 495 659	24 422 146	706 246	2.89%
2014	38 478 602	24 230 162	700 666	2.89%
2015	38 437 239	24 002 168	718 887	3.00%
2016	38 432 992	23 767 614	706 476	2.97%
2017	38 433 558	23 517 643	692 181	2.94%
Total	**498 581 042**	**316 761 695**	**8 691 611**	**2.74%**

components in the period 2005–2017 broken down into RBTCs. The highest numbers were recorded for 5 RBTCs: in Warsaw (771 038; 9.78%), Katowice (731 392; 9.28%), Poznan (565 934; 7.18%), Krakow (646 802; 8.20%) and Wroclaw (505 304; 6.41%).

Responders to donation appeal

Table 7 presents data for responders to donation appeal who reported at RBTCs broken down into years. Countrywide, the highest number was reported in the period 2007–2010: 73 627 (9.45%), 79 470 (10.20%), 77 435 (9.94%), 64 335 (8.26%) respectively and in 2013 — 74 084 (9.51%). The highest number was 19 872 — recorded in RBTC in Warsaw in 2008 (Table 8).

Comparison between donor groups

Figure 3 compares donor population who reported at RBTCs (in the period 2005–2017) with the intention of donating blood/blood components with the group of voluntary non-remunerated

Table 2. Characteristics of the whole donor population who reported at RBTCs to donate blood/blood components (2005–2017)

Variable	Average	Median	Total	Min	Max
daw_zgl_krew	31 837	27 434	8 691 611	8365	76 177
daw_zgl_krew_h	28 884	26 546	7 885 266	8342	66 000
daw_zgl_krew_r	2961	944	778 803	0	19 872
daw_zgl_krew_K	9314	7590	2 542 621	958	26 300
daw_zgl_krew_M	22 524	19 964	6 148 990	7407	54 792

daw_zgl_krew — total number of donors; daw_zgl_krew_h — voluntary non-remunerated donors; daw_zgl_krew_r — responders to donation appeal; daw_zgl_krew_K — female donors; daw_zgl_krew_M — male donors

Table 3. Characteristics of the whole donor population who reported at RBTCs to donate blood/blood components, broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgl_krew	2005	25 445	21 490	534 342	8365	63 944	6.15%
daw_zgl_krew	2006	27 036	22 849	567 760	9840	66 888	6.53%
daw_zgl_krew	2007	29 636	25 924	622 357	12 022	74 451	7.16%
daw_zgl_krew	2008	31 431	26 661	660 056	12 645	75 888	7.59%
daw_zgl_krew	2009	32 615	26 062	684 908	10 915	73 813	7.88%
daw_zgl_krew	2010	32 775	25 932	688 272	12 415	74 164	7.92%
daw_zgl_krew	2011	33 423	26 046	701 882	12 136	74 710	8.08%
daw_zgl_krew	2012	33 694	26 914	707 578	12 250	75 079	8.14%
daw_zgl_krew	2013	33 631	27 557	706 246	12 752	75 019	8.13%
daw_zgl_krew	2014	33 365	28 953	700 666	12 891	75 651	8.06%
daw_zgl_krew	2015	34 233	31 779	718 887	13 897	76 177	8.27%
daw_zgl_krew	2016	33 642	31 428	706 476	12 730	72 894	8.13%
daw_zgl_krew	2017	32 961	31 047	692 181	12 573	72 390	7.96%
Total				**8 691 611**			**100%**

daw_zgl_krew — total number of donors

donors. The long-term trend line for both variables indicates an upward trend for both donor populations.

Figure 4 is a comparison between donors who reported at RBTCs to donate blood/blood components with the number of voluntary non-remunerated donors and responders to donation appeal. In the period 2005–2017, the average number of donors who came to donate blood/blood components per RBTC was 413 886, voluntary non-remunerated donors — 375 489 and 37 086 responders to donation appeal. In 9/21 RBTCs (Warsaw, Katowice, Poznan, Krakow, Wroclaw, Lodz, Bydgoszcz, Lublin and Gdansk) the number of donors willing to donate blood exceeded the average for the whole country. For voluntary non-remunerated donors, the number was higher than the national average in 10/21 RBTCs (Warsaw, Katowice, Poznan, Krakow, Wroclaw, Lodz, Bydgoszcz, Lublin, Gdansk and Bialystok). For responders to donation appeal, the number was higher than the national average in 8/21 RBTCs (Warsaw, Poznan, Wroclaw, Lodz, Bydgoszcz, Lublin, Gdansk and Kielce).

Female donors

Data for female donors who reported in RBTCs to donate blood/blood components, broken down into years is presented in Table 9. Countrywide, the highest number of women who reported for donation in the period 2013–2017 ranged from 8.73% (in 2013) to 9.28% (in 2015) as compared to the total population of women who reported in RBTCs during the whole study period. The lowest number

Table 4. Characteristics of the whole donor population who reported for donation of blood/blood components in 2005–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgl_krew	Bialystok	31 684	32 464	411 886	21 490	36 510	4.74%
daw_zgl_krew	Bydgoszcz	39 090	40 343	508 173	31 375	41 564	5.85%
daw_zgl_krew	Gdansk	33 637	35 597	437 287	25 883	36 757	5.03%
daw_zgl_krew	Kalisz	21 460	21 544	278 977	17 006	24 022	3.21%
daw_zgl_krew	Katowice	57 603	60 164	748 841	47 652	63 763	8.62%
daw_zgl_krew	Kielce	19 548	19 553	254 123	17 346	21 860	2.92%
daw_zgl_krew	Krakow	50 081	53 558	651 057	37 428	57 878	7.49%
daw_zgl_krew	Lublin	33 869	33 601	440 297	31 047	39 170	5.07%
daw_zgl_krew	Lodz	41 970	43 868	545 604	32 986	46 392	6.28%
daw_zgl_krew	Olsztyn	24 445	24 577	317 780	19 799	26 661	3.66%
daw_zgl_krew	Opole	16 666	16 038	216 664	11 898	20 342	2.49%
daw_zgl_krew	Poznan	54 007	56 958	702 087	38 883	58 916	8.08%
daw_zgl_krew	Raciborz	18 200	18 175	236 603	13 962	22 396	2.72%
daw_zgl_krew	Radom	13 223	13 456	171 902	10 844	14 504	1.98%
daw_zgl_krew	Rzeszow	26 628	26 046	346 165	19 317	35 838	3.98%
daw_zgl_krew	Slupsk	12 004	12 573	156 051	8 365	13 897	1.80%
daw_zgl_krew	Szczecin	25 665	25 932	333 639	22 522	28 930	3.84%
daw_zgl_krew	Walbrzych	15 436	15 117	200 674	14 485	16 875	2.31%
daw_zgl_krew	Warszawa	73 159	74 451	951 068	63 944	76 177	10.94%
daw_zgl_krew	Wroclaw	42 797	44 219	556 357	31 067	47 321	6.40%
daw_zgl_krew	Zielona Gora	17 414	17 970	226 376	12 537	19 895	2.60%
Total				**8 691 611**			**100%**

daw_zgl_krew — total number of donors

Table 5. Characteristics of voluntary non-remunerated donors who reported at RBTCs to donate blood/blood components broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgl_krew_h	2005	23 645	21 458	496 538	8342	53 348	6.30%
daw_zgl_krew_h	2006	24 520	22 816	514 922	9505	55 084	6.53%
daw_zgl_krew_h	2007	25 950	23 490	544 960	10 681	55 482	6.91%
daw_zgl_krew_h	2008	27 526	26 616	578 053	11 105	55 684	7.33%
daw_zgl_krew_h	2009	28 870	26 055	606 273	10 569	57 923	7.69%
daw_zgl_krew_h	2010	29 612	25 910	621 847	11 090	60 487	7.89%
daw_zgl_krew_h	2011	30 735	26 039	645 435	11 943	62 932	8.19%
daw_zgl_krew_h	2012	30 832	26 903	647 479	12 021	61 772	8.21%
daw_zgl_krew_h	2013	30 036	27 417	630 762	12 541	62 539	8.00%
daw_zgl_krew_h	2014	30 628	28 900	643 180	11 829	64 172	8.16%
daw_zgl_krew_h	2015	31 885	29 619	669 581	12 897	66 000	8.49%
daw_zgl_krew_h	2016	30 868	27 930	648 235	11 599	59 928	8.22%
daw_zgl_krew_h	2017	30 381	27 485	638 001	12 226	60 669	8.09%
Total				**7 885 266**			**100%**

daw_zgl_krew_h — total number of voluntary non-remunerated donors

Table 6. Characteristics of voluntary non-remunerated-donor population who reported for donation of blood/ /blood components in the years 2005–2017, broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgl_krew_h	Bialystok	31 402	32 034	408 232	21 458	36 510	5.18%
daw_zgl_krew_h	Bydgoszcz	34 507	35 001	448 586	28 525	38 418	5.69%
daw_zgl_krew_h	Gdansk	30 031	31 818	390 401	23 490	33 732	4.95%
daw_zgl_krew_h	Kalisz	20 895	20 930	271 630	16 778	23 837	3.44%
daw_zgl_krew_h	Katowice	56 261	58 827	731 392	46 417	62 985	9.28%
daw_zgl_krew_h	Kielce	15 710	15 685	204 226	14 362	18 480	2.59%
daw_zgl_krew_h	Krakow	49 754	53 451	646 802	36 798	57 733	8.20%
daw_zgl_krew_h	Lublin	30 042	29 619	390 551	27 232	34 276	4.95%
daw_zgl_krew_h	Lodz	30 476	31 054	396 190	26 546	34 848	5.02%
daw_zgl_krew_h	Olsztyn	24 323	24 568	316 200	19 788	26 656	4.01%
daw_zgl_krew_h	Opole	15 897	15 542	206 656	11 767	18 638	2.62%
daw_zgl_krew_h	Poznan	43 533	46 006	565 934	31 068	50 324	7.18%
daw_zgl_krew_h	Raciborz	17 978	18 056	233 713	13 933	21 624	2.96%
daw_zgl_krew_h	Radom	11 702	11 599	152 123	10 407	12 937	1.93%
daw_zgl_krew_h	Rzeszow	26 601	26 039	345 818	19 310	35 691	4.39%
daw_zgl_krew_h	Slupsk	11 683	12 144	151 885	8342	13 661	1.93%
daw_zgl_krew_h	Szczecin	25 634	25 910	333 237	22 499	28 919	4.23%
daw_zgl_krew_h	Walbrzych	15 279	14 968	198 621	14 470	16 460	2.52%
daw_zgl_krew_h	Warszawa	59 311	59 928	771 038	53 348	66 000	9.78%
daw_zgl_krew_h	Wroclaw	38 870	40 995	505 304	27 389	42 804	6.41%
daw_zgl_krew_h	Zielona Gora	16 671	17 372	216 727	12 384	19 164	2.75%
Total				**7 885 266**			**100%**

daw_zgl_krew_h — total number of voluntary non-remunerated donors

(958) was reported in Slupsk, in 2005, while the highest (26 300) in Warsaw, in 2015 (Table 10).

Male donors

Countrywide, the highest number of men reported for donation in the period 2008–2012, from 7.89% (in 2011) to 8.07% (in 2009) as compared to the total population of men who reported in RBTCs to donate blood/blood components during the whole study period (Table 11). Like with female donors, the lowest number (7407) was recorded in 2005, in RBTC in Slupsk, while the highest (54 792) in 2008 in RBTC in Warsaw (Table 12).

Table 13 compares the number of men and women who reported in RBTCs to donate blood/ /blood components in the period 2005–2017. The highest percentage of men was recorded in 2005 (77.99%), while the highest percentage of women in 2016 (32.89%.) However, the proportions between male and female donors varied during the study period. In 2005, the men to women ratio was approximately 8:2, while in 2017 it was 7:3. The difference between the highest and lowest percentage in each group was about 11%.

Comparison of male and female populations

Figure 5 and Figure 6 are a comparison between the number of women and men who reported in RBTCs in the 2005–2017 period with the intention of donating blood/blood components. According to available data, the male population was significantly larger than the female one throughout the whole study period — 70.75% and 29.25%, respectively. The trend lines set out in Figure 6 indicate a growing tendency for both the male and female population, but the trend line for women is larger. The diagram demonstrates a mean value line for both male and female populations. According to the presented data, in 2008–2013 and 2015 the male population which reported at RBTCs was higher than the national average, while in 2014 and 2016 it approximated the average, and in 2017 it fell below the average value. The number of women who were willing to donate exceeded the average

Table 7. Characteristics of responders to donation appeal who reported at RBTCs to donate blood/blood components in the period 2005–2017, broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgl_krew_r	2005	1973	499	35 514	0	10 149	4.56%
daw_zgl_krew_r	2006	2626	1135	49 898	0	11 362	6.41%
daw_zgl_krew_r	2007	3875	1314	73 627	0	18 565	9.45%
daw_zgl_krew_r	2008	3974	1543	79 470	0	19 872	10.20%
daw_zgl_krew_r	2009	3872	1414	77 435	0	15 499	9.94%
daw_zgl_krew_r	2010	3217	1108	64 335	0	13 396	8.26%
daw_zgl_krew_r	2011	2597	770	54 547	0	11 500	7.00%
daw_zgl_krew_r	2012	2784	745	58 468	0	12 977	7.51%
daw_zgl_krew_r	2013	3528	991	74 084	0	17 143	9.51%
daw_zgl_krew_r	2014	2670	1715	56 067	0	12 752	7.20%
daw_zgl_krew_r	2015	2278	416	47 837	0	12 875	6.14%
daw_zgl_krew_r	2016	2650	557	55 647	0	16 883	7.15%
daw_zgl_krew_r	2017	2470	679	51 874	0	15 798	6.66%
Total				**778 803**			**100%**

daw_zgl_krew_r — responders to donation appeal

Table 8. Characteristics of responders to donation appeal who reported to donate blood/blood components in the period 2005–2017, broken down into RBTCs

Variable	RBTC	Average	Median	Total	Mini	Max	% total
daw_zgl_krew_r	Bialystok	313	0	3125	0	2517	0.40%
daw_zgl_krew_r	Bydgoszcz	4429	4252	57 582	1661	7610	7.39%
daw_zgl_krew_r	Gdansk	3566	3556	46 361	1715	6138	5.95%
daw_zgl_krew_r	Kalisz	538	533	6997	146	978	0.90%
daw_zgl_krew_r	Katowice	983	792	12 783	285	2277	1.64%
daw_zgl_krew_r	Kielce	3830	3855	49 788	2583	6108	6.39%
daw_zgl_krew_r	Krakow	87	51	1131	0	246	0.15%
daw_zgl_krew_r	Lublin	3691	3495	47 980	1489	6279	6.16%
daw_zgl_krew_r	Lodz	11 155	11 488	145 018	3639	16 883	18.62%
daw_zgl_krew_r	Olsztyn	135	0	1485	0	714	0.19%
daw_zgl_krew_r	Opole	651	416	8464	0	1574	1.09%
daw_zgl_krew_r	Poznan	10 364	10 155	134 732	7196	15 229	17.30%
daw_zgl_krew_r	Raciborz	288	239	3451	14	874	0.44%
daw_zgl_krew_r	Radom	1490	1349	19 369	411	2497	2.49%
daw_zgl_krew_r	Rzeszow	3	0	27	0	19	0.00%
daw_zgl_krew_r	Slupsk	318	331	4131	0	655	0.53%
daw_zgl_krew_r	Szczecin	18	14	231	2	72	0.03%
daw_zgl_krew_r	Walbrzych	140	128	1819	0	474	0.23%
daw_zgl_krew_r	Warsaw	13 566	12 893	176 360	10 079	19 872	22.65%
daw_zgl_krew_r	Wroclaw	3766	3810	48 954	1756	4993	6.29%
daw_zgl_krew_r	Zielona Gora	693	587	9015	246	1379	1.16%
Total				**778 803**			**100%**

daw_zgl_krew_r — responders to donation appeal

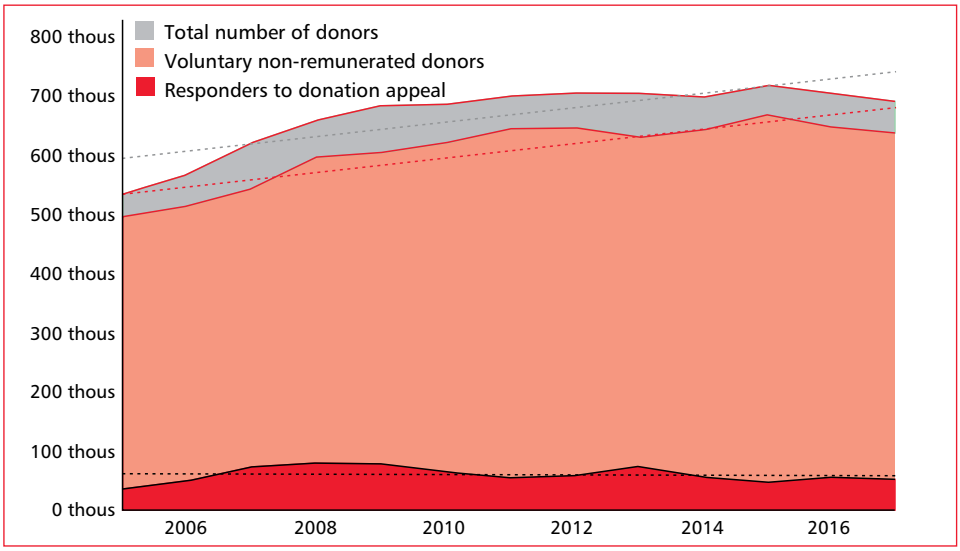

Figure 3. Total number of donors who reported at RBTCs to donate blood/blood components in 2005–2017; including non-remunerated donors and responders to donation appeal

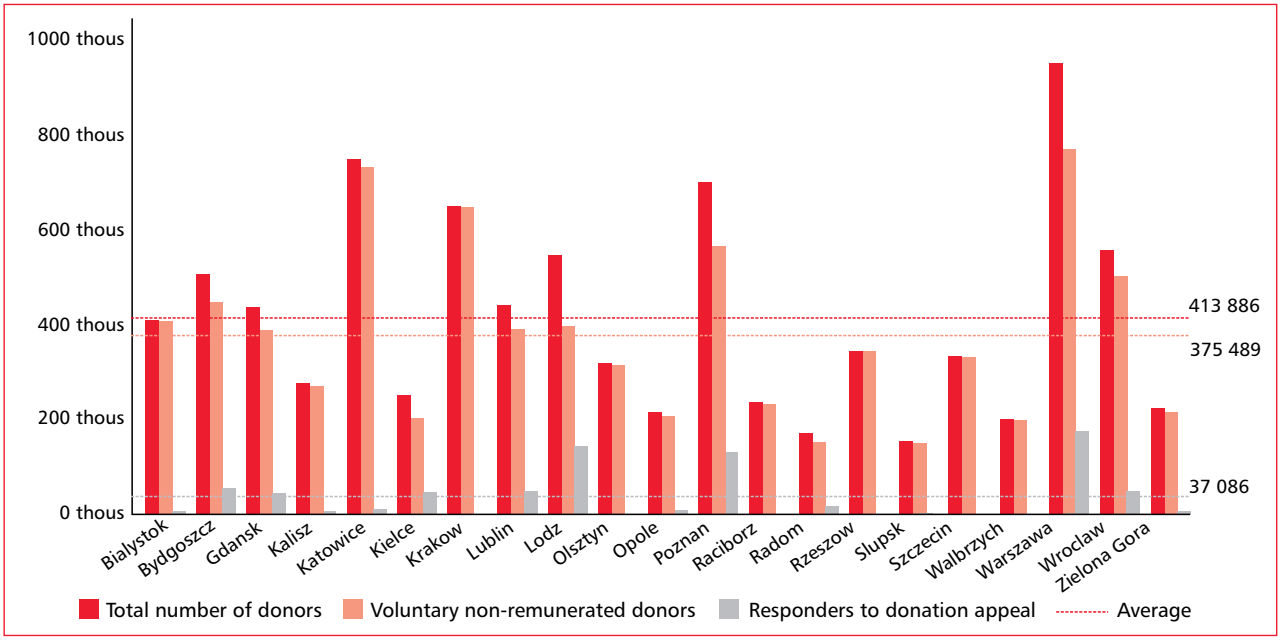

Figure 4. Number of donors who reported at RBTCs to donate blood vs number of non-remunerated donors (total for 2005–2017)

value in 2010 and this trend was observed until the end of the study period, i.e. until 2017.

Comparison of the number of women and men broken down into RBTCs is presented in Figure 7.

Donor age

For the purpose of analysis, data with regard to donor age was divided into two groups: data for 2005–2010 (Group 1) and data for 2011–2017 (Group 2). Otherwise, a reliable comparison of data (i.e. for the entire study period) would not be possible due to differences in determined age-categories. In the period 2005–2010, the age of donors who reported at RBTCs to donate blood/blood components was broken down into the following categories: 18–30, 31–45, 46–65 and one group of donors below 18 and above 65. In 2011–2017 how-

Table 9. Number of women who reported at RBTCs to donate blood/blood components broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgl_krew_K	2005	5601	4429	117 616	958	14 788	4.63%
daw_zgl_krew_K	2006	6291	4316	132 109	1372	16 759	5.20%
daw_zgl_krew_K	2007	7432	5562	156 069	2173	20 576	6.14%
daw_zgl_krew_K	2008	8213	6035	172 481	2466	21 096	6.78%
daw_zgl_krew_K	2009	8976	6686	188 498	2724	21 064	7.41%
daw_zgl_krew_K	2010	9641	6691	202 457	3483	22 201	7.96%
daw_zgl_krew_K	2011	10 322	7402	216 762	3561	23 116	8.53%
daw_zgl_krew_K	2012	10 345	7472	217 245	3556	23 895	8.54%
daw_zgl_krew_K	2013	10 573	8131	222 035	3676	24 398	8.73%
daw_zgl_krew_K	2014	10 825	8575	227 319	3939	25 438	8.94%
daw_zgl_krew_K	2015	11 234	9780	235 913	4138	26 300	9.28%
daw_zgl_krew_K	2016	11 065	9660	232 362	3818	24 834	9.14%
daw_zgl_krew_K	2017	10 560	9417	221 755	3752	23 877	8.72%
Total				**2 542 621**			**100%**

daw_zgl_krew_K — total number of female donors

Table 10. Number of women who reported for donation of blood/blood components in the period 2005–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Minimum	Maximum	% total
daw_zgl_krew_K	Bialystok	9804	10 857	127 458	5562	13 265	5.01%
daw_zgl_krew_K	Bydgoszcz	12 316	13 668	160 108	6829	14 598	6.30%
daw_zgl_krew_K	Gdansk	9968	11 185	129 590	5359	11 883	5.10%
daw_zgl_krew_K	Kalisz	6188	6343	80 438	3712	7669	3.16%
daw_zgl_krew_K	Katowice	15 288	16 006	198 747	11 021	18 265	7.82%
daw_zgl_krew_K	Kielce	5486	5461	71 324	3759	7739	2.81%
daw_zgl_krew_K	Krakow	15 473	18 029	201 155	8888	19 430	7.91%
daw_zgl_krew_K	Lublin	9638	9780	125 288	7203	10 967	4.93%
daw_zgl_krew_K	Lodz	13 473	14 487	175 155	8282	16 795	6.89%
daw_zgl_krew_K	Olsztyn	6722	7373	87 388	3061	8628	3.44%
daw_zgl_krew_K	Opole	5095	4857	66 231	3429	6185	2.60%
daw_zgl_krew_K	Poznan	16 535	18 095	214 952	8449	19 733	8.45%
daw_zgl_krew_K	Raciborz	4185	4119	54 406	2863	5669	2.14%
daw_zgl_krew_K	Radom	3923	4371	51 005	2433	4785	2.01%
daw_zgl_krew_K	Rzeszow	6659	6695	86 573	3483	10 406	3.40%
daw_zgl_krew_K	Slupsk	3065	3556	39 840	958	4143	1.57%
daw_zgl_krew_K	Szczecin	6539	6799	85 011	2954	9156	3.34%
daw_zgl_krew_K	Walbrzych	4597	4965	59 767	2842	5371	2.35%
daw_zgl_krew_K	Warsaw	22 180	23 116	288 342	14 788	26 300	11.34%
daw_zgl_krew_K	Wroclaw	13 941	14 691	181 233	8172	15 867	7.13%
daw_zgl_krew_K	Zielona Gora	4508	4836	58 610	1456	6231	2.31%
Total				**2 542 621**			**100%**

daw_zgl_krew_K — total number of female donors

Table 11. Number of men who reported at RBTCs to donate blood/blood components broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgl_krew_M	2005	19 844	16 738	416 726	7407	49 156	6.78%
daw_zgl_krew_M	2006	20 745	18 472	435 651	8468	50 129	7.08%
daw_zgl_krew_M	2007	22 204	20 419	466 288	9210	53 875	7.58%
daw_zgl_krew_M	2008	23 218	20 626	487 575	10 146	54 792	7.93%
daw_zgl_krew_M	2009	23 639	19 997	496 410	8191	52 749	8.07%
daw_zgl_krew_M	2010	23 134	19 241	485 815	8932	51 963	7.90%
daw_zgl_krew_M	2011	23 101	19 351	485 120	8575	51 594	7.89%
daw_zgl_krew_M	2012	23 349	19 964	490 333	8694	51 184	7.97%
daw_zgl_krew_M	2013	23 058	20 321	484 211	9076	50 621	7.87%
daw_zgl_krew_M	2014	22 540	21 073	473 347	8952	50 213	7.70%
daw_zgl_krew_M	2015	22 999	21 999	482 974	9268	49 877	7.85%
daw_zgl_krew_M	2016	22 577	21 768	474 114	8573	48 060	7.71%
daw_zgl_krew_M	2017	22 401	21 630	470 426	8790	48 513	7.65%
Total				**6 148 990**			**100%**

daw_zgl_krew_M — total number of male donors

ever, the age ranges for donors were determined as follows: below 18, 18–24, 25–44, 45–65 and above 65. The change referred to the population of both women and men (Table 14).

Group 1

According to available data, in the period 2005––2010 a total of 3 757 695 donors reported in RBTCs to donate blood/blood components; 3 754 731 were donors of 18–65 (i.e. age-range eligible for blood donation). A separate group were donors under 18 and over 65 (daw_zgł_krew_m18_w65_K+M) eligible for blood/blood component donation only in special circumstances. The latter was by far the least numerous group — only 2964 donors reported during the whole study period. Accordingly, further analyses were performed for the group of donors aged 18–65 and the group "under 18 and above 65" was disregarded.

Among donors who reported at RBTCs in 2005–2010 and could routinely donate blood, by far the most numerous group were donors aged 18–30 (> 60% of the total number of donors); on average — 18 002 donors per RBTC per year. The least numerous category were donors aged 46–65 (daw_zgł_krew_4665_K+M) — less than 500 000 (slightly above 13%). Donors aged 31–45 (daw_zgł_krew_3145_K+M) constituted a group of 991 813 (over 26% of the total donor population) (Table 15).

Tables 16, 17 and 18 present the basic numerical data which describe the donor population of various age categories.

According to Table 16, in the 18–30 age-category, the highest number of donors (423 687) reported for donation in 2010 (> 18% of the overall donor number in this age-category). The lowest number (6019) was recorded in 2005, in Słupsk; the highest (41 290) in 2010, in Warsaw (Table 17).

According to Table 18, most donors aged 31–45 reported for blood/blood component donation in 2009 (186 637 i.e. > 18% of the total donor population in this age-category). The lowest number (1536) was recorded in 2005; the highest (23 956) in 2009. The number of donors aged 31–45 who reported to RBTCs in the period 2005–2010 is presented in Table 19.

The least numerous was the 46–65 age-group. Most donors (86 885) reported for donation in 2008 (> 17% of the total number of donors in this age — category). The lowest number (808) was recorded in 2005 at the RBTC in Slupsk; the highest (11 739) in 2007 at the RBTC in Warsaw (Table 20, Table 21).

Summary of data on specific age categories is presented in the Figure 8. The trend lines for each variable indicate a clear upward trend for donor-age 18–30 and 31–45, and no distinctive trend for 46–65. It can therefore be presumed that if the structure of the collected data had remained unchanged, a further increase of donor population in the first two age-groups would have been observed and the population of the 46–65 group would have been relatively constant (app. 80 thousand donors per year).

Table 12. Number of men who reported for donation of blood/blood components in the years 2005–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Minimum	Maximum	% total
daw_zgl_krew_M	Bialystok	21 879	22 312	284 428	15 777	25 382	4.63%
daw_zgl_krew_M	Bydgoszcz	26 774	26 675	348 065	24 546	29 116	5.66%
daw_zgl_krew_M	Gdansk	23 669	23 935	307 697	20 524	25 434	5.00%
daw_zgl_krew_M	Kalisz	15 272	15 339	198 539	13 294	16 432	3.23%
daw_zgl_krew_M	Katowice	42 315	43 812	550 094	36 631	45 937	8.95%
daw_zgl_krew_M	Kielce	14 061	14 030	182 799	13 571	14 750	2.97%
daw_zgl_krew_M	Krakow	34 608	35 529	449 902	28 540	38 773	7.32%
daw_zgl_krew_M	Lublin	24 231	23 758	315 009	21 630	28 203	5.12%
daw_zgl_krew_M	Lodz	28 496	28 754	370 449	24 704	30 463	6.02%
daw_zgl_krew_M	Olsztyn	17 722	17 175	230 392	16 136	20 626	3.75%
daw_zgl_krew_M	Opole	11 572	11 140	150 433	7 469	14 192	2.45%
daw_zgl_krew_M	Poznan	37 472	38 412	487 135	30 434	41 416	7.92%
daw_zgl_krew_M	Raciborz	14 015	14 037	182 197	11 099	16 727	2.96%
daw_zgl_krew_M	Radom	9300	9338	120 897	8411	10 146	1.97%
daw_zgl_krew_M	Rzeszow	19 969	19 964	259 592	15 834	25 432	4.22%
daw_zgl_krew_M	Slupsk	8939	8 790	116 211	7 407	10 469	1.89%
daw_zgl_krew_M	Szczecin	19 125	19 238	248 628	18 310	19 774	4.04%
daw_zgl_krew_M	Walbrzych	10 839	10 759	140 907	9702	11 937	2.29%
daw_zgl_krew_M	Warsaw	50 979	50 621	662 726	48 060	54 792	10.78%
daw_zgl_krew_M	Wroclaw	28 856	29 501	375 124	22 895	32 217	6.10%
daw_zgl_krew_M	Zielona Gora	12 905	12 591	167 766	11 081	15 928	2.73%
Total				**6 148 990**			**100%**

daw_zgl_krew_M — total number of male donors

Table 13. Numbers of men and women who reported to donate blood/blood components in 2005–2017 vs the total number of donors

Year	daw_zgl_krew_	daw_zgl_krew_M	daw_zgl_krew_K	% M	% K
2005	534 342	416 726	117 616	77.99%	22.01%
2006	567 760	435 651	132 109	76.73%	23.27%
2007	622 357	466 288	156 069	74.92%	25.08%
2008	660 056	487 575	172 481	73.87%	26.13%
2009	684 908	496 410	188 498	72.48%	27.52%
2010	688 272	485 815	202 457	70.58%	29.42%
2011	701 882	485 120	216 762	69.12%	30.88%
2012	707 578	490 333	217 245	69.30%	30.70%
2013	706 246	484 211	222 035	68.56%	31.44%
2014	700 666	473 347	227 319	67.56%	32.44%
2015	718 887	482 974	235 913	67.18%	32.82%
2016	706 476	474 114	232 362	67.11%	32.89%
2017	692 181	470 426	221 755	67.96%	32.04%
Total	**8 691 611**	**6 148 990**	**2 542 621**		

daw_zgl_krew — total number of donors; daw_zgl_krew_M — total number of male donors; daw_zgl_krew_K — total number of female donors; % M — % male donors; % K — % female donors

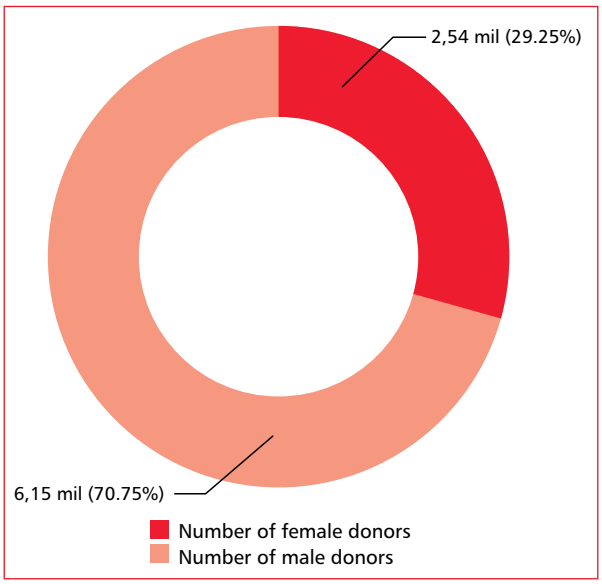

Figure 5. Percentage of women and men in the general donor population (2005–2017)

Female donors

The most numerous group were women aged 18–30, the least numerous were women aged 46–65 (Figure 9). The highest number of women aged 18–30 (143 771) was reported in 2010 (> 21% of the donor population in this age-category). The lowest number was recorded in 2005 in RBTC in Słupsk (787), the highest in 2010 in the RBTC in Warsaw (14 611) (Table 22, Table 23).

During the study period a total of 203 392 women aged 31–45 reported at RBTCs to donate blood/blood components (Table 24). Most women (43 524 — 21.04%) reported in 2010 in RBTC in Warsaw (Table 24). The minimum number (132) was recorded in 2005 for RBTC in Slupsk, the maximum number (5925) was recorded in 2009 for RBTC in Warsaw (Table 24, Table 25).

The highest number of women aged 46–65 reported in RBTCs in 2008; it was estimated at 16 066, almost 19% of the overall women population of this age who volunteered to donate blood/ /blood components (Table 26). The highest value was recorded in 2007 — 2457 women, and the lowest in 2005 — 39 women who, like in the other age categories, reported in RBTC in Warsaw and RBTC in Słupsk respectively (Table 27).

Summary of data referring to specific age categories of women who reported in RBTCs in the period 2005–2010 with the intention of donating blood/blood components is presented in Figure 9. As for the general donor population (Figure 8), the trend line for each variable indicates a clear upward tendency for 18–30 and 31–45, and no distinctive tendency for 46–65. It can therefore be assumed that, if the structure of the collected data had remained unchanged, a further increase in the population of women in the first two age groups

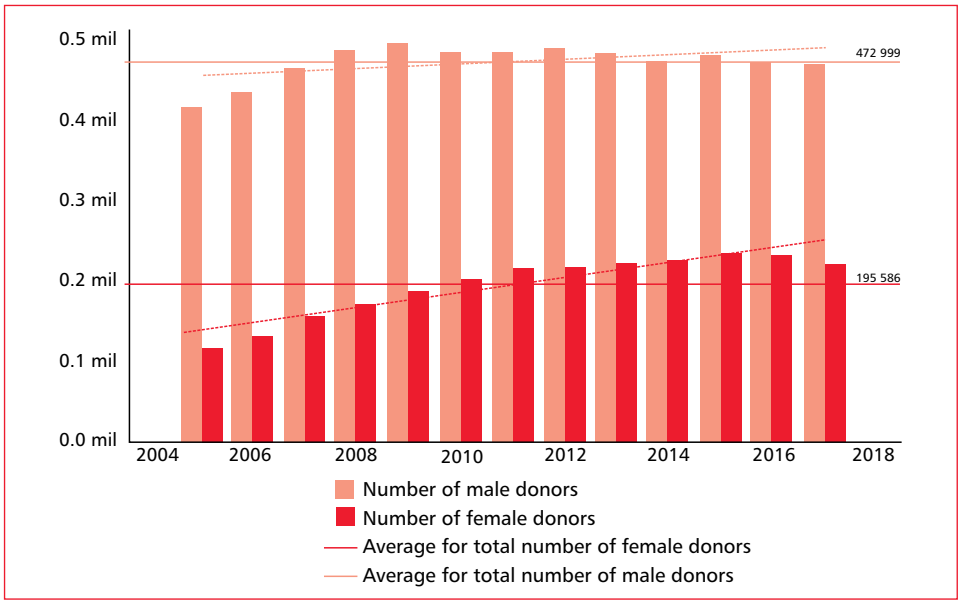

Figure 6. Comparison of the number of women and men who reported in RBTCs to donate blood/blood components (2005–2017)

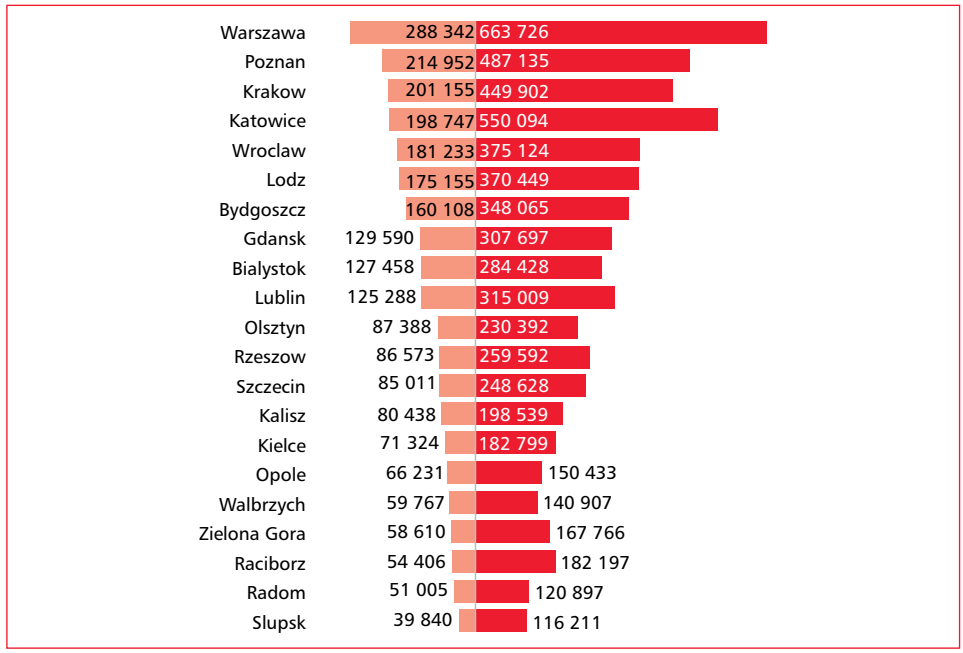

Figure 7. Number of women and men who reported for donation of blood/blood components in 2005–2017 broken down into RBTCs

Table 14. Age categories in group 1 and group 2

Years	Age — category								
	18–30	31–45	46–65	< 18 i > 65	< 18	18–24	25–44	45–65	> 65
2005–2010 (group 1)	x	x	x	x					
2011–2017 (group 2)					x	x	x	x	x

Table 15. Characteristics of donors who reported at RBTCs to donate blood/blood components in 2005–2010, broken down into age-categories

Variable	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_K+M	18 002	16 270	2 268 193	6019	41 290	60.36%
daw_zgł_krew_3145_K+M	7872	5998	991 813	1536	23 956	26.39%
daw_zgł_krew_4665_K+M	3926	3028	494 725	808	11 739	13.17%
daw_zgł_krew_m18_w65_K+M	24	10	2964	0	145	0.08%
Total			**3 757 695**			**100%**

daw_zgl_krew_1830_K+M — total number of donors (male +female) in the 18–30 age category
daw_zgl_krew_3145_K+M — total number of donors (male +female) in the 31–45 age category
daw_zgl_krew_4665_K+M — total number of donors (male +female) in the 46–65 age category
daw_zgl_krew_m18_w65_K+M — total number of donors (male +female) below 18 and above 65

would have been observed and the population of the 46–65 group would have been relatively constant (app. 15 thousand donors per year).

Male donors

As for women, the most numerous was the 18–30 group and the least numerous, the group of men aged 46–65 (Figure 10); a total of 1 588 581 donors in the 18–30 age group reported to donate blood/blood component. In 2009, the number of men in this age category was the highest — 282 794 (> 17% of the donor population in this age category). The lowest value was recorded in 2005 (3295) at the RBTC in Opole, and the highest in 2007 (27 652) at the RBTC in Warsaw (Table 28, Table 29).

Table 16. Characteristics of the donor population aged 18–30 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_K+M	2005	15 101	14 567	317 115	6019	34 373	13.98%
daw_zgł_krew_1830_K+M	2006	16 212	14 434	340 459	7309	36 427	15.01%
daw_zgł_krew_1830_K+M	2007	17 801	17 482	373 824	7696	40 580	16.48%
daw_zgł_krew_1830_K+M	2008	19 010	16 413	399 202	8611	41 042	17.60%
daw_zgł_krew_1830_K+M	2009	19 710	17 332	413 906	7590	39 859	18.25%
daw_zgł_krew_1830_K+M	2010	20 176	17 142	423 687	8441	41 290	18.68%
Total				**2 268 193**			**100%**

daw_zgł_krew_1830_K+M — total number of donors (male +female) in the 18–30 age category

Table 17. Number of donors aged 18–30 who reported for donation of blood/blood components in the years 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_K+M	Bialystok	17 635	17 698	105 809	15 371	20 632	4.66%
daw_zgł_krew_1830_K+M	Bydgoszcz	22 239	22 613	133 434	18 449	24 451	5.88%
daw_zgł_krew_1830_K+M	Gdansk	18 601	18 245	111 606	14 977	22 306	4.92%
daw_zgł_krew_1830_K+M	Kalisz	11 406	11 874	68 438	9580	12 310	3.02%
daw_zgł_krew_1830_K+M	Katowice	28 754	28 139	172 522	24 510	34 302	7.61%
daw_zgł_krew_1830_K+M	Kielce	10 762	10 605	64 571	9782	11 628	2.85%
daw_zgł_krew_1830_K+M	Krakow	26 384	25 923	158 301	21 969	31 253	6.98%
daw_zgł_krew_1830_K+M	Lublin	24 322	24 287	145 932	22 407	26 612	6.43%
daw_zgł_krew_1830_K+M	Lodz	22 931	22 199	137 583	19 355	27 486	6.07%
daw_zgł_krew_1830_K+M	Olsztyn	16 504	16 730	99 022	13 540	18 980	4.37%
daw_zgł_krew_1830_K+M	Opole	10 450	10 997	62 699	6102	13 457	2.76%
daw_zgł_krew_1830_K+M	Poznan	29 019	29 931	174 113	22 095	34 098	7.68%
daw_zgł_krew_1830_K+M	Raciborz	9605	9436	57 631	7292	12 287	2.54%
daw_zgł_krew_1830_K+M	Radom	7985	8084	47 910	6754	8720	2.11%
daw_zgł_krew_1830_K+M	Rzeszow	14 800	14 942	88 801	13 071	16 646	3.92%
daw_zgł_krew_1830_K+M	Slupsk	8017	8016	48 100	6019	9508	2.12%
daw_zgł_krew_1830_K+M	Szczecin	15 285	15 062	91 707	14 431	17 142	4.04%
daw_zgł_krew_1830_K+M	Walbrzych	8733	8664	52 399	7600	9998	2.31%
daw_zgł_krew_1830_K+M	Warsaw	38 929	40 220	233 571	34 373	41 290	10.30%
daw_zgł_krew_1830_K+M	Wroclaw	24 395	25 165	146 368	18 129	28 878	6.45%
daw_zgł_krew_1830_K+M	Zielona Gora	11 279	11 230	67 676	8866	14 180	2.98%
Total				**2 268 193**			**100%**

daw_zgł_krew_1830_K+M — total number of donors (male +female) in the 18–30 age category

In the period 2005–2010 a total of 788 421 donors of the 31–45 age group reported to donate blood/blood components (Table 30). Most of them reported in 2009 — 144 872 in all (> 18% of the donor population in this age category). In the same year, the highest number of donors in this age-category was recorded at RBTC in Warsaw — 18 031 donors. The lowest number — 1404 was recorded in RBTC in Słupsk (Table 31).

In the period 2005–2010, 409 690 donors aged 46–65 reported at RBTCs to donate blood/blood components. The highest number — 71 013 in all

Table 18. Characteristics of the donor population aged 31–45 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_K+M	2005	6678	4867	140 242	1536	18 445	14.14%
daw_zgł_krew_3145_K+M	2006	6942	5104	145 776	1632	19 432	14.70%
daw_zgł_krew_3145_K+M	2007	7701	5800	161 712	2060	22 097	16.30%
daw_zgł_krew_3145_K+M	2008	8262	5751	173 509	2262	23 137	17.49%
daw_zgł_krew_3145_K+M	2009	8887	6126	186 637	2232	23 956	18.82%
daw_zgł_krew_3145_K+M	2010	8759	6513	183 937	2773	23 049	18.55%
Total				**991 813**			**100%**

daw_zgł_krew_3145_K+M — total number of donors (male +female) in the 31–45 age category

Table 19. Number of donors aged 31–45 who reported for blood/blood component donation in the years 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_K+M	Bialystok	6974	7163	41 846	4086	10 639	4.22%
daw_zgł_krew_3145_K+M	Bydgoszcz	9798	9938	58 786	8047	11 345	5.93%
daw_zgł_krew_3145_K+M	Gdansk	8739	8424	52 436	7345	10 368	5.29%
daw_zgł_krew_3145_K+M	Kalisz	5501	5590	33 007	4709	6094	3.33%
daw_zgł_krew_3145_K+M	Katowice	16 070	15 702	96 422	14 657	18 125	9.72%
daw_zgł_krew_3145_K+M	Kielce	4711	4718	28 263	4527	4867	2.85%
daw_zgł_krew_3145_K+M	Krakow	11 214	11 243	67 282	10 023	12 234	6.78%
daw_zgł_krew_3145_K+M	Lublin	7690	7698	46 137	6682	8617	4.65%
daw_zgł_krew_3145_K+M	Lodz	10 002	10 328	60 011	8304	11 181	6.05%
daw_zgł_krew_3145_K+M	Olsztyn	5052	5039	30 310	4268	6060	3.06%
daw_zgł_krew_3145_K+M	Opole	3891	3862	23 345	3062	4672	2.35%
daw_zgł_krew_3145_K+M	Poznan	14 468	14 612	86 805	10 883	17 508	8.75%
daw_zgł_krew_3145_K+M	Raciborz	5589	5258	33 535	4864	7036	3.38%
daw_zgł_krew_3145_K+M	Radom	2826	2833	16 955	2531	3063	1.71%
daw_zgł_krew_3145_K+M	Rzeszow	4990	4991	29 938	4162	5936	3.02%
daw_zgł_krew_3145_K+M	Slupsk	2083	2146	12 495	1536	2773	1.26%
daw_zgł_krew_3145_K+M	Szczecin	5792	5776	34 751	5390	6334	3.50%
daw_zgł_krew_3145_K+M	Walbrzych	4421	4522	26 528	3994	4688	2.67%
daw_zgł_krew_3145_K+M	Warsaw	21 686	22 573	130 116	18 445	23 956	13.12%
daw_zgł_krew_3145_K+M	Wroclaw	10 568	10 552	63 409	7946	12 866	6.39%
daw_zgł_krew_3145_K+M	Zielona Gora	3239	3171	19 436	2345	4157	1.96%
Total				**991 813**			**100%**

daw_zgł_krew_3145_K+M — total number of donors (male +female) in the 31–45 age category

— was recorded in 2007 (> 17% of the male donor population in this age category). In 2008, the highest value was recorded at RBTC in Warsaw (9322 donors) and the lowest (769) in Slupsk (Table 32 and Table 33).

Summary of data referring to specific age categories of men who reported in RBTCs in the period 2005–2010 with the intention of donating blood/blood components is presented in Figure 10. As for the general donor population (Figure 8) and

Table 20. Characteristics of the donor population aged 46–65 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_K+M	2005	3641	2710	76 465	808	11 090	15.46%
daw_zgł_krew_4665_K+M	2006	3853	2971	80 903	898	10 976	16.35%
daw_zgł_krew_4665_K+M	2007	4107	3281	86 237	1070	11 739	17.43%
daw_zgł_krew_4665_K+M	2008	4137	3263	86 885	1146	11 658	17.56%
daw_zgł_krew_4665_K+M	2009	3999	3030	83 978	1091	9964	16.97%
daw_zgł_krew_4665_K+M	2010	3822	3058	80 257	1199	9795	16.22%
Total				**494 725**			**100%**

daw_zgł_krew_4665_K+M — total number of donors (male +female) in the 46–65 age category

Table 21. Number of donors aged 46–65 who reported to donate blood/blood components in the years 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_K+M	Bialystok	2896	3081	17 376	1999	3536	3.51%
daw_zgł_krew_4665_K+M	Bydgoszcz	5433	5456	32 600	4834	5812	6.59%
daw_zgł_krew_4665_K+M	Gdansk	3822	3855	22 931	3543	3936	4.64%
daw_zgł_krew_4665_K+M	Kalisz	3131	3198	18 788	2710	3430	3.80%
daw_zgł_krew_4665_K+M	Katowice	8062	8072	48 370	7699	8386	9.78%
daw_zgł_krew_4665_K+M	Kielce	2832	2890	16 990	2305	3309	3.43%
daw_zgł_krew_4665_K+M	Krakow	5491	5577	32 943	4972	5806	6.66%
daw_zgł_krew_4665_K+M	Lublin	3464	3378	20 781	3030	3980	4.20%
daw_zgł_krew_4665_K+M	Lodz	5694	5582	34 164	5306	6222	6.91%
daw_zgł_krew_4665_K+M	Olsztyn	2327	2359	13 960	1987	2662	2.82%
daw_zgł_krew_4665_K+M	Opole	1893	1904	11 357	1557	2206	2.30%
daw_zgł_krew_4665_K+M	Poznan	6719	6832	40 316	5837	7250	8.15%
daw_zgł_krew_4665_K+M	Raciborz	2330	2293	13 979	1802	3058	2.83%
daw_zgł_krew_4665_K+M	Radom	1596	1593	9576	1403	1775	1.94%
daw_zgł_krew_4665_K+M	Rzeszow	2423	2373	14 539	2084	2938	2.94%
daw_zgł_krew_4665_K+M	Slupsk	1035	1081	6212	808	1199	1.26%
daw_zgł_krew_4665_K+M	Szczecin	2606	2566	15 633	2449	2828	3.16%
daw_zgł_krew_4665_K+M	Walbrzych	2646	2698	15 878	2202	2865	3.21%
daw_zgł_krew_4665_K+M	Warsaw	10 870	11 033	65 222	9795	11 739	13.18%
daw_zgł_krew_4665_K+M	Wroclaw	5541	5542	33 243	4850	6223	6.72%
daw_zgł_krew_4665_K+M	Zielona Gora	1645	1645	9867	1326	1869	1.99%
Total				**494 725**			**100%**

daw_zgł_krew_4665_K+M — total number of donors (male +female) in the 46–65 age category

the women population (Figure 9), the trend line for each variable indicates a clear upward trend for 18–30 and 31–45, and no distinctive trend for 46–65. It can therefore be assumed that if the structure of the collected data had remained unchanged, a further increase in the population of men in the first two age groups would have been observed and the population of the 46–65 group would have been relatively constant (app. 65–68 thousand donors per year).

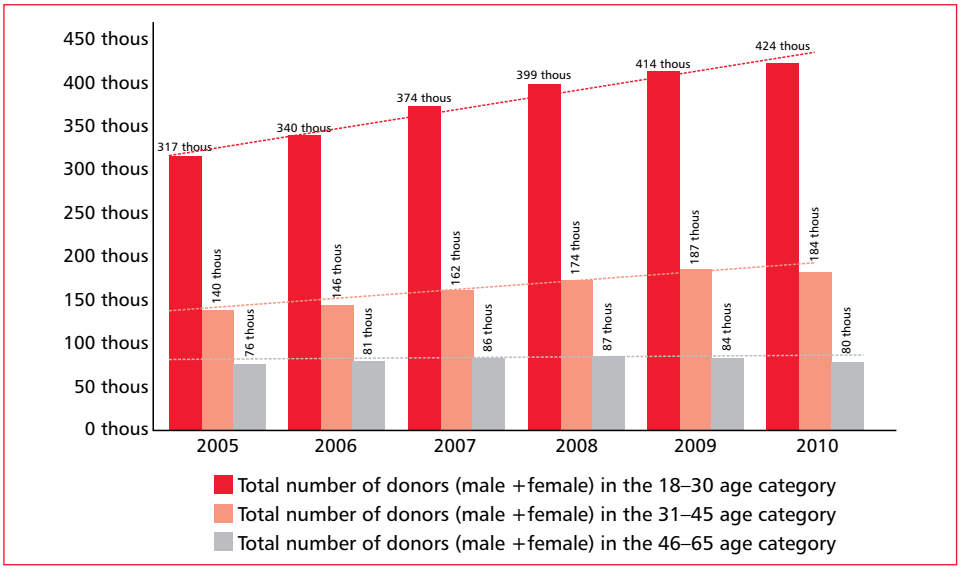

Figure 8. Number of donors who reported at RBTCs to donate blood/blood components in 2005—2010 broken down into age categories

Table 22. Characteristics of the population of female donors aged 18–30

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_K	2005	4022	2963	84 462	787	9489	12.43%
daw_zgł_krew_1830_K	2006	4454	3305	93 530	1066	10 782	13.76%
daw_zgł_krew_1830_K	2007	5138	3931	107 894	1648	12 928	15.88%
daw_zgł_krew_1830_K	2008	5659	4274	118 843	1893	13 405	17.49%
daw_zgł_krew_1830_K	2009	6243	4605	131 112	2082	13 286	19.29%
daw_zgł_krew_1830_K	2010	6846	5012	143 771	2656	14 611	21.15%
Total				**679 612**			**100%**

daw_zgl_krew_1830_K — total number of female donors in the 18–30 age category

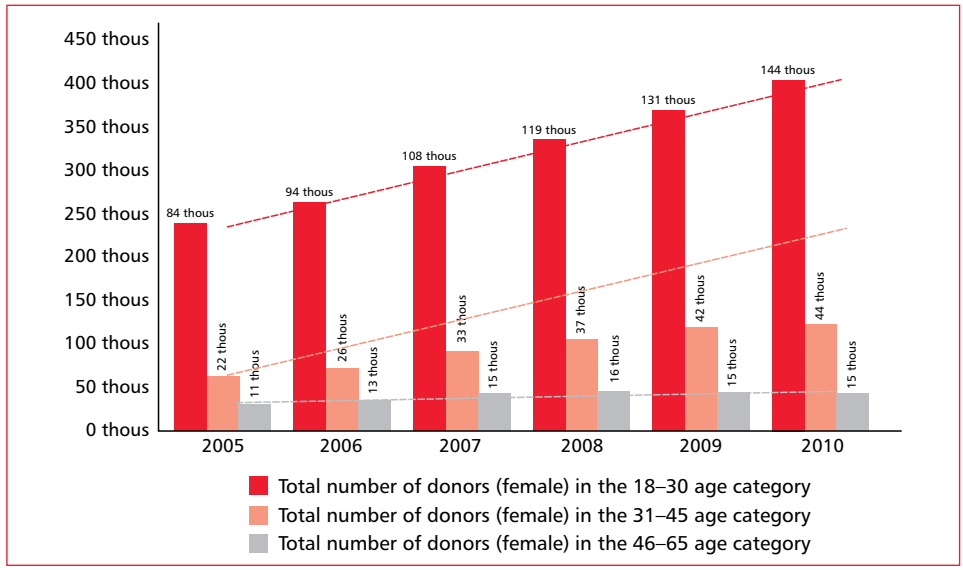

Figure 9. Number of women who reported to RBTCs for donation of blood/blood components in 2005–2010 broken down into age categories

Table 23. Number of women aged 18–30 who reported to donate blood/blood components in 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_K	Bialystok	4956	4588	29 737	3523	7334	4.38%
daw_zgł_krew_1830_K	Bydgoszcz	7098	6948	42 585	4909	9130	6.27%
daw_zgł_krew_1830_K	Gdansk	5523	5165	33 137	3759	7745	4.88%
daw_zgł_krew_1830_K	Kalisz	3629	3886	21 771	2676	4168	3.20%
daw_zgł_krew_1830_K	Katowice	8802	8591	52 814	7219	10 735	7.77%
daw_zgł_krew_1830_K	Kielce	3087	3116	18 520	2705	3497	2.73%
daw_zgł_krew_1830_K	Krakow	8295	8224	49 771	6471	10 491	7.32%
daw_zgł_krew_1830_K	Lublin	7302	7385	43 809	5850	8434	6.45%
daw_zgł_krew_1830_K	Lodz	7567	7137	45 401	5839	10 119	6.68%
daw_zgł_krew_1830_K	Olsztyn	3992	4469	23 952	2326	5014	3.52%
daw_zgł_krew_1830_K	Opole	3694	3780	22 161	2667	4605	3.26%
daw_zgł_krew_1830_K	Poznan	9334	9506	56 003	5847	12 093	8.24%
daw_zgł_krew_1830_K	Raciborz	2857	2822	17 143	2255	3671	2.52%
daw_zgł_krew_1830_K	Radom	2411	2318	14 468	1925	2897	2.13%
daw_zgł_krew_1830_K	Rzeszow	3707	3783	22 239	2963	4296	3.27%
daw_zgł_krew_1830_K	Slupsk	1689	1771	10 132	787	2656	1.49%
daw_zgł_krew_1830_K	Szczecin	3344	3114	20 066	2264	5012	2.95%
daw_zgł_krew_1830_K	Walbrzych	2649	2648	15 891	1901	3338	2.34%
daw_zgł_krew_1830_K	Warsaw	12 417	13 107	74 501	9489	14 611	10.96%
daw_zgł_krew_1830_K	Wroclaw	8595	8973	51 570	5658	10 687	7.59%
daw_zgł_krew_1830_K	Zielona Gora	2324	2248	13 941	1066	3443	2.05%
Total				**679 612**			**100%**

daw_zgł_krew_1830_K — total number of female donors in the 18–30 age category

Table 24. Characteristics of the population of women aged 31–45 who reported in RBTCs to donate blood/blood components in 2005–2010 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_K	2005	1064	744	22 354	132	3382	10.99%
daw_zgł_krew_3145_K	2006	1221	871	25 640	217	3934	12.61%
daw_zgł_krew_3145_K	2007	1557	1141	32 692	376	5184	16.07%
daw_zgł_krew_3145_K	2008	1782	1189	37 417	389	5342	18.40%
daw_zgł_krew_3145_K	2009	1989	1404	41 765	442	5925	20.53%
daw_zgł_krew_3145_K	2010	2073	1389	43 524	605	5714	21.40%
Total				**203 392**			**100%**

daw_zgl_krew_3145_K — total number of female donors in the 31–45 age category

Group 2

The data demonstrates that a total of 4 933 916 donors reported at RBTCs in the period 2011–2017 with the intention of donating blood/blood components and 4 931 676 of them were in the 18––65 age category (i.e. eligible for blood donation). A separate group were donors under 18 and above 65 who are eligible for donation only in exceptional situations. These donor groups were by far the least numerous — a total of 490 donors under 18 and 1750 donors over 65. Therefore, as in the case of the data for the period 2005–2010, further

Table 25. Number of women aged 31–45 who reported to donate blood/blood components in 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_K	Bialystok	1358	1509	8150	744	1780	4.01%
daw_zgł_krew_3145_K	Bydgoszcz	2200	2269	13 199	1269	2877	6.49%
daw_zgł_krew_3145_K	Gdansk	1878	1807	11 270	1129	2658	5.54%
daw_zgł_krew_3145_K	Kalisz	1122	1165	6732	729	1404	3.31%
daw_zgł_krew_3145_K	Katowice	3119	3017	18 712	2401	3879	9.20%
daw_zgł_krew_3145_K	Kielce	837	861	5024	667	969	2.47%
daw_zgł_krew_3145_K	Krakow	2222	2310	13 331	1599	2680	6.55%
daw_zgł_krew_3145_K	Lublin	1493	1595	8956	916	1856	4.40%
daw_zgł_krew_3145_K	Lodz	2279	2402	13 672	1516	2952	6.72%
daw_zgł_krew_3145_K	Olsztyn	905	916	5431	527	1234	2.67%
daw_zgł_krew_3145_K	Opole	974	1000	5846	511	1317	2.87%
daw_zgł_krew_3145_K	Poznan	3132	3208	18 791	1720	4264	9.24%
daw_zgł_krew_3145_K	Raciborz	806	702	4833	441	1386	2.38%
daw_zgł_krew_3145_K	Radom	496	512	2975	327	636	1.46%
daw_zgł_krew_3145_K	Rzeszow	682	727	4089	372	959	2.01%
daw_zgł_krew_3145_K	Slupsk	360	383	2161	132	605	1.06%
daw_zgł_krew_3145_K	Szczecin	911	945	5466	518	1302	2.69%
daw_zgł_krew_3145_K	Walbrzych	976	1025	5856	678	1258	2.88%
daw_zgł_krew_3145_K	Warsaw	4914	5263	29 481	3382	5925	14.49%
daw_zgł_krew_3145_K	Wroclaw	2554	2609	15 325	1529	3348	7.53%
daw_zgł_krew_3145_K	Zielona Gora	682	655	4092	287	1052	2.01%
Total				**203 392**			**100%**

daw_zgł_krew_3145_K — total number of female donors in the 31–45 age category

Table 26. Characteristics of the women population aged 46–65 who reported to donate blood/blood components in 2005–2010 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_K	2005	504	323	10 576	39	1911	12.44%
daw_zgł_krew_4665_K	2006	603	389	12 668	89	2034	14.90%
daw_zgł_krew_4665_K	2007	725	519	15 224	149	2457	17.90%
daw_zgł_krew_4665_K	2008	765	610	16 066	184	2336	18.89%
daw_zgł_krew_4665_K	2009	737	551	15 479	200	1845	18.20%
daw_zgł_krew_4665_K	2010	715	566	15 022	222	1868	17.67%
Total				**85 035**			**100%**

daw_zgł_krew_4665_K — total number of female donors in the 46–65 age category

analyses included only data referring to the 18–65 age group.

Among the multiple donors who reported at RBTCs to donate blood/blood components, the largest group (2 352 099) fell within the 25–44 age category (48% of the total donor population; 16 001 at average). The least numerous group were donors aged 45–65 (548 885 > 11%). Donors aged 18–24 were less numerous — 2 030 692 (> 41% of the total donor population) (Table 34).

Table 35, Table 36 and Table 37 present data which characterize the donor population in each age category.

Table 27. Number of women aged 46–65 who reported for blood/blood component donation in 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_K	Bialystok	519	579	3116	323	636	3.66%
daw_zgł_krew_4665_K	Bydgoszcz	939	1024	5635	627	1110	6.63%
daw_zgł_krew_4665_K	Gdansk	659	672	3951	467	782	4.65%
daw_zgł_krew_4665_K	Kalisz	465	511	2791	306	551	3.28%
daw_zgł_krew_4665_K	Katowice	1341	1350	8047	1090	1501	9.46%
daw_zgł_krew_4665_K	Kielce	359	358	2152	299	407	2.53%
daw_zgł_krew_4665_K	Krakow	937	936	5623	791	1051	6.61%
daw_zgł_krew_4665_K	Lublin	590	581	3540	431	711	4.16%
daw_zgł_krew_4665_K	Lodz	1138	1183	6829	919	1323	8.03%
daw_zgł_krew_4665_K	Olsztyn	344	384	2064	207	437	2.43%
daw_zgł_krew_4665_K	Opole	353	375	2119	251	409	2.49%
daw_zgł_krew_4665_K	Poznan	1201	1278	7204	842	1451	8.47%
daw_zgł_krew_4665_K	Raciborz	375	363	2249	167	610	2.64%
daw_zgł_krew_4665_K	Radom	224	220	1345	181	271	1.58%
daw_zgł_krew_4665_K	Rzeszow	241	242	1445	148	363	1.70%
daw_zgł_krew_4665_K	Slupsk	147	167	883	39	222	1.04%
daw_zgł_krew_4665_K	Szczecin	316	346	1895	171	385	2.23%
daw_zgł_krew_4665_K	Walbrzych	489	502	2936	263	752	3.45%
daw_zgł_krew_4665_K	Warsaw	2075	1973	12 451	1845	2457	14.64%
daw_zgł_krew_4665_K	Wroclaw	1226	1289	7355	902	1465	8.65%
daw_zgł_krew_4665_K	Zielona Gora	234	248	1405	103	315	1.65%
Total				**85 035**			**100%**

daw_zgł_krew_4665_K — total number of female donors in the 46–65 age category

Table 28. Characteristics of the population of men aged 18–30 who reported to donate blood/blood components in 2005–2010, broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1830_M	2005	11 079	11 214	232 653	3295	24 884	14.65%
daw_zgł_krew_1830_M	2006	11 759	11 903	246 929	5343	25 645	15.54%
daw_zgł_krew_1830_M	2007	12 663	12 782	265 930	5514	27 652	16.74%
daw_zgł_krew_1830_M	2008	13 350	12 139	280 359	6158	27 637	17.65%
daw_zgł_krew_1830_M	2009	13 466	12 536	282 794	5508	26 573	17.80%
daw_zgł_krew_1830_M	2010	13 329	12 130	279 916	5610	26 679	17.62%
Total				**1 588 581**			**100%**

daw_zgł_krew_1830_M — total number of male donors in the 18–30 age category

The data presented in Table 35 shows that the highest number in this age category (339 945) was reported in 2011 (16% of the total donor population in this age category). The lowest recorded number was 3626 (in 2017) and the highest was 34 930 (in 2011).

The largest group of donors are donors aged 25––44. According to the data presented in Table 36, the highest number of donors in this age group (368 198, i.e. > 15% of the general donor population in this age category) reported for donation in 2017. The lowest number was 2733 (in 2011); the highest — 41 240 (in 2017).

The least numerous group were donors in the 45–65 age category (548 885). The highest num-

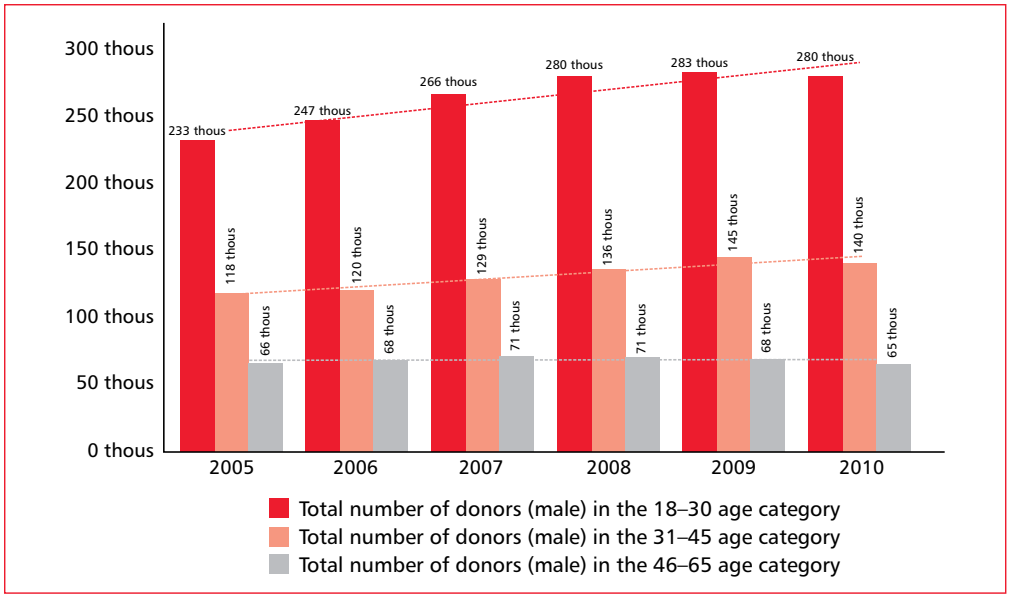

Figure 10. Number of men who reported at RBTCs to donate blood/blood components in 2005–2010 broken down into age categories

Table 29. Number of men aged 18–30 who reported in 2005–2010 to donate blood and blood components broken down into RBTCs

Variable	RBTC	Average	Median	Total	Minimum	Maximum	% total
daw_zgł_krew_1830_M	Bialystok	12 679	12 933	76 072	10 733	13 959	4.79%
daw_zgł_krew_1830_M	Bydgoszcz	15 142	15 463	90 849	13 540	15 876	5.72%
daw_zgł_krew_1830_M	Gdansk	13 078	13 081	78 469	11 218	14 561	4.94%
daw_zgł_krew_1830_M	Kalisz	7778	7988	46 667	6904	8154	2.94%
daw_zgł_krew_1830_M	Katowice	19 951	19 548	119 708	17 201	23 567	7.54%
daw_zgł_krew_1830_M	Kielce	7675	7558	46 051	7077	8268	2.90%
daw_zgł_krew_1830_M	Krakow	18 088	17 699	108 530	15 498	20 762	6.83%
daw_zgł_krew_1830_M	Lublin	17 021	16 842	102 123	16 557	18 178	6.43%
daw_zgł_krew_1830_M	Lodz	15 364	15 062	92 182	13 516	17 367	5.80%
daw_zgł_krew_1830_M	Olsztyn	12 512	12 039	75 070	11 126	14 346	4.73%
daw_zgł_krew_1830_M	Opole	6756	7217	40 538	3295	8852	2.55%
daw_zgł_krew_1830_M	Poznan	19 685	20 425	118 110	16 248	22 231	7.43%
daw_zgł_krew_1830_M	Raciborz	6748	6615	40 488	5037	8616	2.55%
daw_zgł_krew_1830_M	Radom	5574	5562	33 442	4829	6158	2.11%
daw_zgł_krew_1830_M	Rzeszow	11 094	10 955	66 562	10 108	12 536	4.19%
daw_zgł_krew_1830_M	Slupsk	6328	6014	37 968	5232	7860	2.39%
daw_zgł_krew_1830_M	Szczecin	11 940	11 948	71 641	11 409	12 303	4.51%
daw_zgł_krew_1830_M	Walbrzych	6085	5966	36 508	5699	7049	2.30%
daw_zgł_krew_1830_M	Warsaw	26 512	26 626	159 070	24 884	27 652	10.01%
daw_zgł_krew_1830_M	Wroclaw	15 800	16 192	94 798	12 471	18 191	5.97%
daw_zgł_krew_1830_M	Zielona Gora	8956	8593	53 735	7800	11 655	3.38%
Total				**1 588 581**			**100%**

daw_zgł_krew_1830_M — total number of male donors in the 18–30 age category

Table 30. Characteristics of the male population aged 31–45 who reported for blood/blood component donation in 2005–2010 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_M	2005	5614	4423	117 888	1404	15 063	14.95%
daw_zgł_krew_3145_M	2006	5721	4418	120 136	1415	15 498	15.24%
daw_zgł_krew_3145_M	2007	6144	4909	129 020	1684	16 913	16.36%
daw_zgł_krew_3145_M	2008	6481	4753	136 092	1873	17 795	17.26%
daw_zgł_krew_3145_M	2009	6899	5116	144 872	1790	18 031	18.37%
daw_zgł_krew_3145_M	2010	6686	5032	140 413	2168	17 335	17.81%
Total				**788 421**			**100%**

daw_zgł_krew_3145_M — total number of male donors in the 31–45 age category

Table 31. Number of men aged 31–45 who reported for blood/blood component donation in 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_3145_M	Białystok	5616	5563	33 696	3342	8902	4.27%
daw_zgł_krew_3145_M	Bydgoszcz	7598	7669	45 587	6778	8511	5.78%
daw_zgł_krew_3145_M	Gdansk	6861	6617	41 166	6216	7710	5.22%
daw_zgł_krew_3145_M	Kalisz	4379	4425	26 275	3980	4705	3.33%
daw_zgł_krew_3145_M	Katowice	12 952	12 737	77 710	12 064	14 246	9.86%
daw_zgł_krew_3145_M	Kielce	3873	3827	23 239	3703	4200	2.95%
daw_zgł_krew_3145_M	Krakow	8992	8934	53 951	8424	9554	6.84%
daw_zgł_krew_3145_M	Lublin	6197	6201	37 181	5629	6761	4.72%
daw_zgł_krew_3145_M	Lodz	7723	7926	46 339	6788	8376	5.88%
daw_zgł_krew_3145_M	Olsztyn	4147	4123	24 879	3724	4826	3.16%
daw_zgł_krew_3145_M	Opole	2917	2848	17 499	2551	3533	2.22%
daw_zgł_krew_3145_M	Poznan	11 336	11 404	68 014	9163	13 365	8.63%
daw_zgł_krew_3145_M	Raciborz	4784	4583	28 702	4371	5650	3.64%
daw_zgł_krew_3145_M	Radom	2330	2323	13 980	2204	2477	1.77%
daw_zgł_krew_3145_M	Rzeszow	4308	4237	25 849	3738	5116	3.28%
daw_zgł_krew_3145_M	Slupsk	1722	1737	10 334	1404	2168	1.31%
daw_zgł_krew_3145_M	Szczecin	4881	4891	29 285	4753	5032	3.71%
daw_zgł_krew_3145_M	Walbrzych	3445	3399	20 672	3282	3782	2.62%
daw_zgł_krew_3145_M	Warsaw	16 773	17 124	100 635	15 063	18 031	12.76%
daw_zgł_krew_3145_M	Wroclaw	8014	7943	48 084	6417	9531	6.10%
daw_zgł_krew_3145_M	Zielona Gora	2557	2516	15 344	2058	3105	1.95%
Total				**788 421**			**100%**

daw_zgł_krew_3145_M — total number of male donors in the 31–45 age category

ber of these donors reported for donation in 2017 (82 024, i.e. almost 15% of the overall donation population in this age category); the lowest in 2014 (76 045, i.e. < 14%). The minimum and maximum numbers were recorded in 2011 (Table 37).

Summary of data referring to specific age categories of men who reported in RBTCs in the period 2011–2017 with the intention of donating blood/blood components is presented in Figure 11. The trend lines for each variable indicate a clear upward trend for the most numerous 25–44 age category and a distinctive lower trend for 18–24. There is no distinctive trend for 46–65 age category which may lead to an assumption that this age group will remain relatively stable (app. 80 thousand donors per year).

Table 32. Characteristics of the male donor population aged 46–65 who reported at RBTCs to donate blood/blood components in 2005–2010 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_M	2005	3138	2404	65 889	769	9179	16.08%
daw_zgł_krew_4665_M	2006	3249	2578	68 235	809	8942	16.66%
daw_zgł_krew_4665_M	2007	3382	2762	71 013	921	9282	17.33%
daw_zgł_krew_4665_M	2008	3372	2718	70 819	962	9322	17.29%
daw_zgł_krew_4665_M	2009	3262	2454	68 499	891	8119	16.72%
daw_zgł_krew_4665_M	2010	3106	2448	65 235	977	7927	15.92%
Total				**409 690**			**100%**

daw_zgł_krew_4665_M — total number of male donors in the 46–65 age category

Table 33. Number of men aged 46–65 who reported in to donate blood/blood components in 2005–2010 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4665_M	Bialystok	2377	2502	14 260	1676	2900	3.48%
daw_zgł_krew_4665_M	Bydgoszcz	4494	4535	26 965	4207	4732	6.58%
daw_zgł_krew_4665_M	Gdansk	3163	3162	18 980	3076	3254	4.63%
daw_zgł_krew_4665_M	Kalisz	2666	2687	15 997	2404	2879	3.90%
daw_zgł_krew_4665_M	Katowice	6721	6665	40 323	6314	7136	9.84%
daw_zgł_krew_4665_M	Kielce	2473	2494	14 838	2006	2944	3.62%
daw_zgł_krew_4665_M	Krakow	4553	4673	27 320	4106	4818	6.67%
daw_zgł_krew_4665_M	Lublin	2874	2835	17 241	2454	3269	4.21%
daw_zgł_krew_4665_M	Lodz	4556	4471	27 335	4192	4915	6.67%
daw_zgł_krew_4665_M	Olsztyn	1983	1975	11 896	1780	2225	2.90%
daw_zgł_krew_4665_M	Opole	1540	1530	9238	1252	1801	2.25%
daw_zgł_krew_4665_M	Poznan	5519	5568	33 112	4995	5859	8.08%
daw_zgł_krew_4665_M	Raciborz	1955	1924	11 730	1635	2448	2.86%
daw_zgł_krew_4665_M	Radom	1372	1406	8231	1177	1504	2.01%
daw_zgł_krew_4665_M	Rzeszow	2182	2120	13 094	1936	2575	3.20%
daw_zgł_krew_4665_M	Slupsk	888	906	5329	769	977	1.30%
daw_zgł_krew_4665_M	Szczecin	2290	2288	13 738	2073	2475	3.35%
daw_zgł_krew_4665_M	Walbrzych	2157	2303	12 942	1450	2382	3.16%
daw_zgł_krew_4665_M	Warsaw	8795	9061	52 771	7927	9322	12.88%
daw_zgł_krew_4665_M	Wroclaw	4315	4270	25 888	3948	4758	6.32%
daw_zgł_krew_4665_M	Zielona Gora	1410	1426	8462	1223	1572	2.07%
Total				**409 690**			**100%**

daw_zgł_krew_4665_M — total number of male donors in the 46–65 age category

Female donors

The most numerous group were women aged 18–24, and the least numerous, aged 45–65 (Figure 12).

In 2011, the highest number of women aged 18–24 was recorded — a total of 127 783 (> 15% of the female donor population in this age category). The lowest value was recorded in 2017 at RBTC in Walbrzych (1433); the highest in 2011 (12 845) at RBTC in Poznan (Table 38, Table 39).

Women aged 25–44 were the middle group (629 236). Most women in this age category reported for donation in 2016 (99 617, 15.83%). The minimum number recorded was 640 women in 2011 who reported for donation in RBTC in Slupsk; the

Table 34. Total number of donors who reported at RBTCs for donation of blood/blood components in the period 2011–2017 broken down into age categories

Variable	Average	Median	Total	Minimum	Maximum	% total
daw_zgł_krew_1824_K+M	13 814	13 254	2 030 692	3626	34 930	41.16%
daw_zgł_krew_2544_K+M	16 001	13 633	2 352 099	2733	41 240	47.67%
daw_zgł_krew_4565_K+M	3734	3185	548 885	1082	9365	11.12%
daw_zgł_krew_m18_K+M	3	0	490	0	57	0.01%
daw_zgł_krew_w65_K+M	12	7	1750	0	55	0.04%
Total			**4 933 916**			**100%**

daw_zgl_krew_1824_K+M — total number of donors (male +female) in the 18–24 age category
daw_zgl_krew_2544 K+M — total number of donors (male +female) in the 25–44 age category
daw_zgl_krew_4565_K+M — total number of donors (male +female) in the 45–65 age category
daw_zgl_krew_m18-K+M — total number of donors (male + female) below 18
daw_zgl_krew_w65_K+M – total number of donors (male +female) above 65

Table 35. Characteristics of the donor population aged 18–24 who reported for blood donation in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1824_K+M	2011	16 188	16 070	339 945	6045	34 930	16.74%
daw_zgł_krew_1824_K+M	2012	14 802	13 000	310 847	5418	28 252	15.31%
daw_zgł_krew_1824_K+M	2014	13 615	13 427	285 910	4789	27 660	14.08%
daw_zgł_krew_1824_K+M	2013	14 378	12 512	301 929	4945	27 285	14.87%
daw_zgł_krew_1824_K+M	2015	13 555	13 304	284 650	4512	26 614	14.02%
daw_zgł_krew_1824_K+M	2016	12 658	13 639	265 818	4140	23 882	13.09%
daw_zgł_krew_1824_K+M	2017	11 504	11 773	241 593	3626	22 315	11.90%
Total				**2 030 692**			**100%**

daw_zgł_krew_1824_K+M — total number of male and female donors in the 18–24 age category

maximum number (12 620) was recorded in 2015 in Warsaw (Table 40, Table 41).

In the 45–65 age category a total of 121 530 female donors was reported. The highest number reported for donation in 2017 (20 149, i.e > 16% of the overall female general population in this age category). The highest value was recorded in 2017 (2204) and the lowest in 2011 (209) in the RBTCs in Warsaw and Slupsk respectively (Table 42, Table 43).

Summary of data referring to specific age categories of women who reported in RBTCs in the period 2011–2017 with the intention of donating blood/blood components is presented in Figure 12. As in the case of the general donor population (Figure 11), the trend lines for each variable indicate a clear upward trend for the most numerous 25–44 age category and a distinctive lower trend for 18–24 category. There is no distinctive trend for 45–65 age category, which may lead to an assumption that this age group will remain relatively stable (app. 20 thousand donors per year).

Male donors

Unlike in the case of women, the most numerous group of men donors were in the 25–44 age category; while the least numerous was the 45–65 age category as was the case with women donors (Figure 13).

In the period 2011–2017 a total of 1 208 805 donors in the 18–24 age group were recorded. The highest number of donors in this age-category was recorded in 2011 (212 162, i.e. > 17% of the total donor population in this age-category). The lowest value was recorded in 2017 (2193) at the RBTC in Walbrzych, and the highest in 2011 (22 085) at the RBTC in Poznan (Table 44, Table 45).

Men aged 25–44 were a group of donors — estimated at a total of 1 722 863. The highest number (269 971) reported for donation in 2017 (> 15% of the donor population in this age category). In the same year, the highest value (29 326) was recorded at RBTC in Warsaw. The lowest value (2093) was recorded in the RBTC in Slupsk (Table 46, Table 47).

Table 36. Characteristics of the donor population aged 25–44 who reported for blood/blood component donation in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_2544_K+M	2011	13 463	11 278	282 729	2733	37 120	12.02%
daw_zgł_krew_2544_K+M	2012	15 202	12 248	319 249	4937	37 869	13.57%
daw_zgł_krew_2544_K+M	2013	15 534	12 176	326 209	5396	38 825	13.87%
daw_zgł_krew_2544_K+M	2014	16 114	13 527	338 401	5630	39 572	14.39%
daw_zgł_krew_2544_K+M	2015	16 945	15 250	355 844	5813	41 113	15.13%
daw_zgł_krew_2544_K+M	2016	17 213	14 728	361 469	5400	40 387	15.37%
daw_zgł_krew_2544_K+M	2017	17 533	15 788	368 198	6185	41 240	15.65%
Total				**2 352 099**			**100%**

daw_zgł_krew_2544_K+M — total number of male and female donors in the 25–44 age category

Table 37. Characteristics of the donor population aged 45–65 who reported for blood/blood component donation in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4565_K+M	2011	3754	3251	78 825	1082	9365	14.36%
daw_zgł_krew_4565_K+M	2012	3675	2700	77 171	1139	9024	14.06%
daw_zgł_krew_4565_K+M	2013	3706	2904	77 826	1216	8886	14.18%
daw_zgł_krew_4565_K+M	2014	3621	3012	76 045	1217	8523	13.85%
daw_zgł_krew_4565_K+M	2015	3721	3259	78 133	1254	8442	14.23%
daw_zgł_krew_4565_K+M	2016	3755	3318	78 861	1329	8613	14.37%
daw_zgł_krew_4565_K+M	2017	3906	3423	82 024	1371	8829	14.94%
Total				**548 885**			**100%**

daw_zgł_krew_4565_K+M — total number of male and female donors in the 45–65 age category

In the years 2011–2017 a total of 427 355 donors aged 45–65 reported at RBTCs to donate blood/blood components. The highest number (63 431) reported in 2011 (15% of the donor population in this age category). In the same year, the highest value (7473) was recorded in RBTC in Warsaw and the lowest (873) in RBTC in Slupsk (Table 48 and Table 49).

Summary of data referring to specific age categories of men who reported in RBTCs in the period 2011–2017 with the intention of donating blood/blood components is presented in Figure 13. As in the case of the general donor population (Figure 11) and the population of female donors (Figure 12), the trend lines for each variable indicate a clear upward trend for the most numerous 25–44 age category and a distinctive lower trend for 18–24 category. There is no distinctive trend for 45–65 age category, which may lead to an assumption that this age group will remain relatively stable (app. 60 thousand donors per year).

Figure 14 is a summing up of data on donor age-categories which were described in Group 1 and Group 2. As already mentioned, the data demonstrates that in group 1 the most numerous donor population was in the 18–30 age category, while in group 2, the trend changed and the most numerous group were donors in the 25–44 age category.

Figure 15 presents combined data with regard to donor age within the 18–45 age category. Despite differences in individual age categories, this donor population has remained relatively stable in the last several years (at a level of app. 600 thousand).

Discussion

The study is a presentation of the donor population who reported at the RBTCs in the period 2005–2017 with the intention of donating blood/blood components.

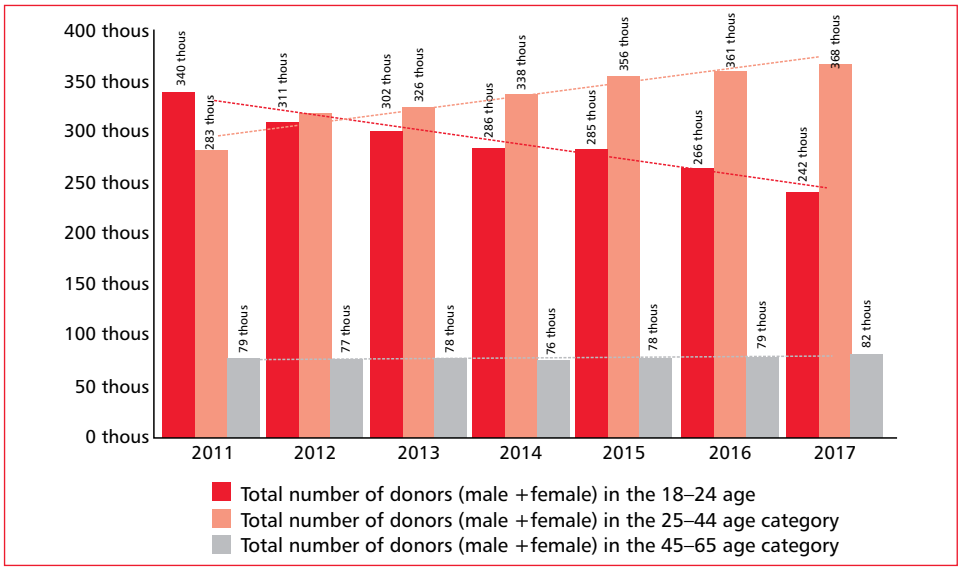

Figure 11. Number of donors (women and men) who reported at RBTCs to donate blood/blood components in 2011–2017 broken down into age categories

Table 38. Characteristics of the population of women aged 18–24 who reported for donation of blood/blood components in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1824_K	2011	6085	5577	127 783	2582	12 845	15.55%
daw_zgł_krew_1824_K	2012	5692	4602	119 533	2222	11 665	14.54%
daw_zgł_krew_1824_K	2013	5705	4455	119 800	2146	11 245	14.58%
daw_zgł_krew_1824_K	2014	5637	4973	118 378	1919	11 817	14.40%
daw_zgł_krew_1824_K	2015	5687	5366	119 425	1896	11 707	14.53%
daw_zgł_krew_1824_K	2016	5414	5633	113 698	1780	10 451	13.83%
daw_zgł_krew_1824_K	2017	4918	4949	103 270	1433	9755	12.56%
Total				**821 887**			**100%**

daw_zgł_krew_1824_K — total number of female donors in the 18–24 age category

Analysis of demographic data indicates that the demand for blood/blood components will increase in the nearest future. As result of the rapidly ageing population, the overall number of people who may require blood therapy will be growing steadily. On the other hand, the same process will bring about decline in the population of 18–65 aged donors eligible for blood donation. Decline in the population of potential blood donors is also affected by other factors such as falling birth rate and growing number of young people emigrating for permanent residence. Central Statistical Office (GUS) forecasts that by 2050 the population of Poland will decrease by over 4 million. The working age population, i.e. the source of potential blood donors, will decline by about 5 million [2, 3]. This is likely to cause serious shortage of blood/blood components.

The number of blood donations in Poland has recently reached the limit of approximately 1 200 000 donations per year and to exceed this limit will be no easy task. All efforts must therefore be focused on promotion of voluntary blood donation and on motivating people to donate.

Reduction of population is a significant problem worldwide and the consequences of these changes will have to be faced sooner or later. In numerous publications the demographic situation in individual countries with regard to prognoses/forecasts for size of donor population,

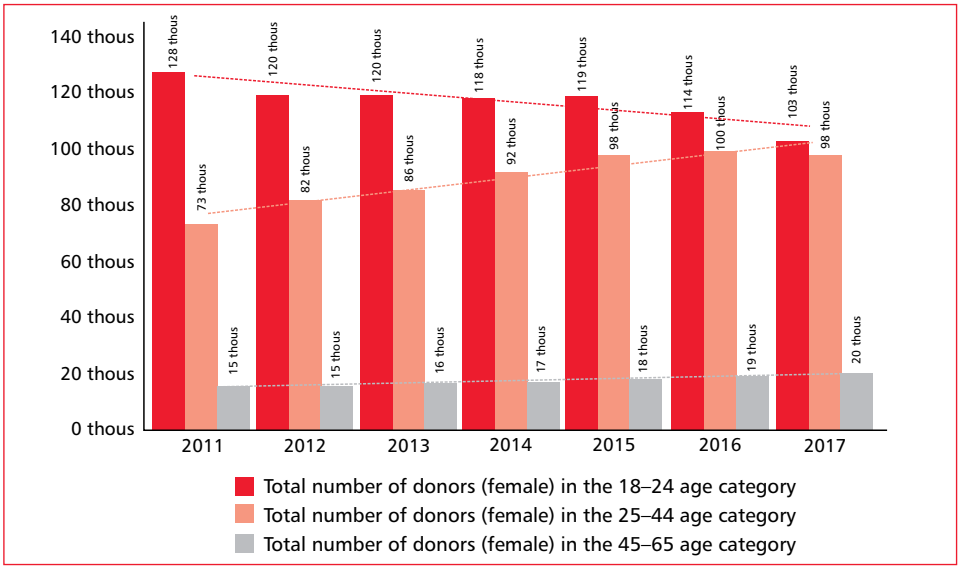

Figure 12. Number of women who reported at RBTCs to donate blood/blood components in 2011–2017 broken down into age groups

Table 39. Number of women aged 18–24 who reported for donation of blood/blood components in the years 2011–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1824_K	Bialystok	6231	6385	43 620	4752	7214	5.31%
daw_zgł_krew_1824_K	Bydgoszcz	7573	7748	53 009	6667	8207	6.45%
daw_zgł_krew_1824_K	Gdansk	6402	6077	44 817	5805	8185	5.45%
daw_zgł_krew_1824_K	Kalisz	3556	3502	24 890	3335	3968	3.03%
daw_zgł_krew_1824_K	Katowice	7380	7500	51 663	5619	8178	6.29%
daw_zgł_krew_1824_K	Kielce	3608	3508	25 258	3192	4244	3.07%
daw_zgł_krew_1824_K	Krakow	10 651	10 830	74 559	9162	11 665	9.07%
daw_zgł_krew_1824_K	Lublin	5835	5724	40 846	4949	6505	4.97%
daw_zgł_krew_1824_K	Lodz	8271	8413	57 900	7447	8575	7.04%
daw_zgł_krew_1824_K	Olsztyn	4429	4343	31 000	3692	5577	3.77%
daw_zgł_krew_1824_K	Opole	2828	2623	19 796	2278	3642	2.41%
daw_zgł_krew_1824_K	Poznan	10 034	9641	70 235	8975	12 845	8.55%
daw_zgł_krew_1824_K	Raciborz	2252	1964	15 762	1740	3647	1.92%
daw_zgł_krew_1824_K	Radom	2814	2894	19 696	2510	3048	2.40%
daw_zgł_krew_1824_K	Rzeszow	5303	5404	37 122	4455	6171	4.52%
daw_zgł_krew_1824_K	Slupsk	2210	2222	15 470	1867	2712	1.88%
daw_zgł_krew_1824_K	Szczecin	4185	4171	29 295	3707	4467	3.56%
daw_zgł_krew_1824_K	Walbrzych	2046	2110	14 319	1433	2582	1.74%
daw_zgł_krew_1824_K	Warsaw	11 063	11 162	77 442	9755	11 817	9.42%
daw_zgł_krew_1824_K	Wroclaw	7642	7869	53 497	6661	8169	6.51%
daw_zgł_krew_1824_K	Zielona Gora	3099	3001	21 691	2500	4125	2.64%
Total				**821 887**			**100%**

daw_zgł_krew_1824_K — total number of female donors in the 18–24 age category

Table 40. Characteristics of the female population aged 25–44 who reported for donation of blood/blood components in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_2544_K	2011	3499	2417	73 476	640	10 054	11.68%
daw_zgł_krew_2544_K	2012	3910	2837	82 108	1023	10 581	13.05%
daw_zgł_krew_2544_K	2013	4081	2777	85 711	1284	11 267	13.62%
daw_zgł_krew_2544_K	2014	4377	3487	91 927	1431	11 713	14.61%
daw_zgł_krew_2544_K	2015	4675	3738	98 170	1614	12 620	15.60%
daw_zgł_krew_2544_K	2016	4744	3734	99 617	1470	12 305	15.83%
daw_zgł_krew_2544_K	2017	4677	3674	98 227	1522	11 914	15.61%
Total				**629 236**			**100%**

daw_zgł_krew_2544_K — total number of female donors in the 25–44 age category

Table 41. Number of women aged 25–44 who reported for donation of blood/blood components in 2011–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_2544_K	Bialystok	5131	5477	35 918	3991	5747	5.71%
daw_zgł_krew_2544_K	Bydgoszcz	5358	5464	37 504	4711	6011	5.96%
daw_zgł_krew_2544_K	Gdansk	4482	4602	31 376	2714	5188	4.99%
daw_zgł_krew_2544_K	Kalisz	2766	2838	19 360	2318	3107	3.08%
daw_zgł_krew_2544_K	Katowice	7891	7943	55 239	6841	8786	8.78%
daw_zgł_krew_2544_K	Kielce	2413	2334	16 893	1855	2935	2.68%
daw_zgł_krew_2544_K	Krakow	6997	6920	48 976	6093	7736	7.78%
daw_zgł_krew_2544_K	Lublin	3392	3402	23 743	2838	3738	3.77%
daw_zgł_krew_2544_K	Lodz	6039	6126	42 275	5108	6910	6.72%
daw_zgł_krew_2544_K	Olsztyn	2964	3357	20 746	1409	3734	3.30%
daw_zgł_krew_2544_K	Opole	1920	1920	13 439	1752	2110	2.14%
daw_zgł_krew_2544_K	Poznan	7693	8310	53 851	4199	8663	8.56%
daw_zgł_krew_2544_K	Raciborz	1597	1656	11 177	1245	1779	1.78%
daw_zgł_krew_2544_K	Radom	1477	1470	10 342	1220	1743	1.64%
daw_zgł_krew_2544_K	Rzeszow	2662	2537	18 631	1042	3698	2.96%
daw_zgł_krew_2544_K	Slupsk	1331	1431	9314	640	1636	1.48%
daw_zgł_krew_2544_K	Szczecin	3433	3487	24 030	2417	4053	3.82%
daw_zgł_krew_2544_K	Walbrzych	2363	2326	16 543	2172	2550	2.63%
daw_zgł_krew_2544_K	Warsaw	11 493	11 713	80 454	10 054	12 620	12.79%
daw_zgł_krew_2544_K	Wroclaw	6428	6616	44 997	5455	7165	7.15%
daw_zgł_krew_2544_K	Zielona Gora	2061	2261	14 428	1023	2678	2.29%
Total				**629 236**			**100%**

daw_zgł_krew_2544_K — total number of female donors in the 25–44 age category

blood supply and recipients' safety is widely discussed [4–7].

The analyses for Poland presented in this study demonstrate a reversal of trends predicting the increase or decrease in the number of donors in individual age categories. In group 1, which covered the period 2005–2010, a clear upward trend was observed for the 18–30 and 31–45 age categories

Table 42. Characteristics of the female population aged 45–65 who reported for donation of blood/blood components in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4565_K	2011	733	608	15 394	209	1892	12.67%
daw_zgł_krew_4565_K	2012	738	596	15 495	227	1912	12.75%
daw_zgł_krew_4565_K	2013	782	551	16 428	246	1963	13.52%
daw_zgł_krew_4565_K	2014	806	632	16 919	275	1946	13.92%
daw_zgł_krew_4565_K	2015	868	667	18 220	266	1972	14.99%
daw_zgł_krew_4565_K	2016	901	767	18 925	326	2070	15.57%
daw_zgł_krew_4565_K	2017	959	785	20 149	324	2204	16.58%
Total				**121 530**			**100%**

daw_zgł_krew_4565_K — total number of female donors in the 45–65 age category

Table 43. Number of women aged 45–65 who reported for donation of blood/blood components in the years 2011–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4565_K	Bialystok	977	866	6841	596	1392	5.63%
daw_zgł_krew_4565_K	Bydgoszcz	1147	1116	8028	1007	1387	6.61%
daw_zgł_krew_4565_K	Gdansk	716	725	5012	632	785	4.12%
daw_zgł_krew_4565_K	Kalisz	698	702	4887	599	815	4.02%
daw_zgł_krew_4565_K	Katowice	1739	1781	12 173	1379	1962	10.02%
daw_zgł_krew_4565_K	Kielce	496	480	3471	414	583	2.86%
daw_zgł_krew_4565_K	Krakow	1223	1171	8563	1150	1347	7.05%
daw_zgł_krew_4565_K	Lublin	613	608	4288	476	785	3.53%
daw_zgł_krew_4565_K	Lodz	1274	1239	8916	1117	1454	7.34%
daw_zgł_krew_4565_K	Olsztyn	598	616	4184	416	764	3.44%
daw_zgł_krew_4565_K	Opole	400	404	2801	356	440	2.30%
daw_zgł_krew_4565_K	Poznan	1223	1175	8561	1081	1446	7.04%
daw_zgł_krew_4565_K	Raciborz	461	461	3226	432	492	2.65%
daw_zgł_krew_4565_K	Radom	311	307	2178	257	364	1.79%
daw_zgł_krew_4565_K	Rzeszow	433	365	3034	248	608	2.50%
daw_zgł_krew_4565_K	Slupsk	268	266	1873	209	326	1.54%
daw_zgł_krew_4565_K	Szczecin	603	618	4220	396	767	3.47%
daw_zgł_krew_4565_K	Walbrzych	595	607	4163	545	631	3.43%
daw_zgł_krew_4565_K	Warsaw	1989	1963	13 920	1892	2204	11.45%
daw_zgł_krew_4565_K	Wroclaw	1165	1177	8157	1030	1302	6.71%
daw_zgł_krew_4565_K	Zielona Gora	433	419	3034	361	547	2.50%
Total				**121 530**			**100%**

daw_zgł_krew_4565_K — total number of female donors in the 45–65 age category

with no distinctive trend observed for 46–65 age category. It may therefore be assumed that the latter group will remain relatively stable (app. 80 thousand donors per year). The predictions were confirmed by results for group 2 which covered the period 2011–2017. In the consecutive years, the 46–65 group was indeed estimated at 80 000 donors per year. A disturbing trend was however observed

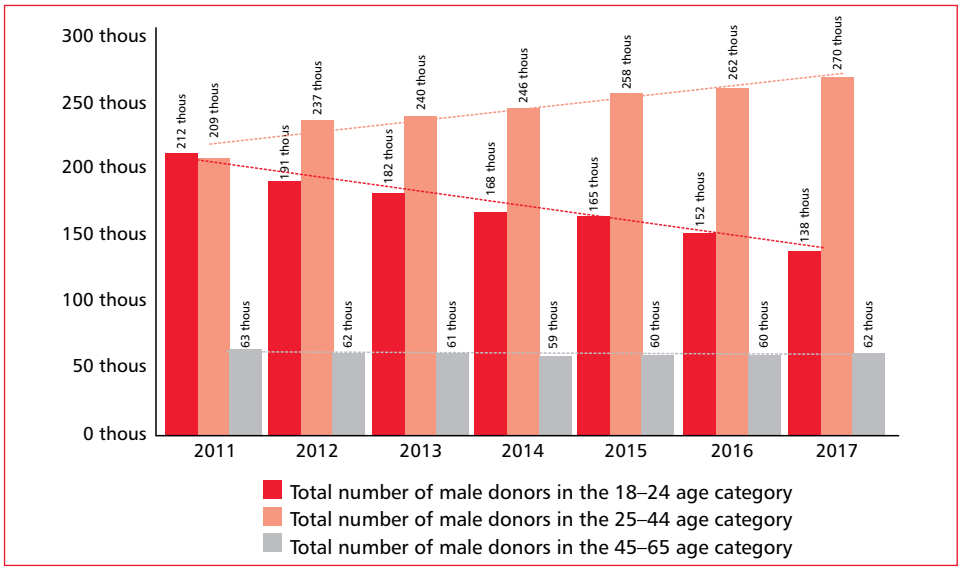

Figure 13. Number of men who reported at RBTCs to donate blood/blood components (2011–2017) broken down into age categories

Table 44. Characteristics of the male population aged 18–24 who reported for blood/blood component donation in 2011–2017 broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1824_M	2011	10 103	9690	212 162	3463	22 085	17.55%
daw_zgł_krew_1824_M	2012	9110	9325	191 314	3064	16 775	15.83%
daw_zgł_krew_1824_M	2013	8673	8057	182 129	2781	16 134	15.07%
daw_zgł_krew_1824_M	2014	7978	8253	167 532	2679	15 843	13.86%
daw_zgł_krew_1824_M	2015	7868	7938	165 225	2616	14 907	13.67%
daw_zgł_krew_1824_M	2016	7244	7741	152 120	2360	13 431	12.58%
daw_zgł_krew_1824_M	2017	6587	6824	138 323	2193	12 560	11.44%
Total				**1 208 805**			**100%**

daw_zgł_krew_1824_M — total number of male donors in the 18–24 age category

with regard to the youngest donor category (aged 18–24) from group 2. The analyses demonstrate a clear downward trend and that must raise serious concern for the future. Although the middle aged population, i.e. 25–44 still demonstrates an upward trend, nevertheless the projected decline for the youngest age category should motivate to implementation of decisive measures/actions in order to recruit more donors, particularly in the youngest age group.

Undoubtedly, more and more importance will be attributed to mechanisms of motivating people of all age categories to donate blood and become multiple donors, but attention should mostly be focused on the youngest generation, as this is the potential population to donate blood/blood components for many years to come.

Promotion of voluntary non-remunerated blood donation is of utmost importance with regard to the youngest citizens who may become blood donors in several years' time. In Poland, such promotion activities have been ongoing for several years, e.g. as part of the Health Policy Program "Ensuring the self-sufficiency of the Republic of Poland in the field of blood, blood components and blood products for the years 2015–2020". One of the program-objectives was promotion of voluntary non-remunerated blood donation as well as training and education. The action is targeted at adult citizens as well as elementary school children and high school youth [8].

Table 45. Number of men aged 18–24 who reported for donation of blood/blood components in the years 2011–2017 broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_1824_M	Bialystok	8554	8804	59 877	7311	10 125	4.95%
daw_zgł_krew_1824_M	Bydgoszcz	9543	9709	66 804	7946	10 887	5.53%
daw_zgł_krew_1824_M	Gdansk	9393	8253	65 751	7741	14 489	5.44%
daw_zgł_krew_1824_M	Kalisz	5073	4926	35 509	4842	5421	2.94%
daw_zgł_krew_1824_M	Katowice	12 044	12 137	84 309	8324	14 903	6.97%
daw_zgł_krew_1824_M	Kielce	5497	5424	38 479	4827	5889	3.18%
daw_zgł_krew_1824_M	Krakow	14 560	14 805	101 920	11 385	17 206	8.43%
daw_zgł_krew_1824_M	Lublin	9079	8995	63 552	6824	10 837	5.26%
daw_zgł_krew_1824_M	Lodz	11 038	11 206	77 267	9538	12 106	6.39%
daw_zgł_krew_1824_M	Olsztyn	6893	6419	48 254	4552	11 090	3.99%
daw_zgł_krew_1824_M	Opole	4674	4382	32 716	3529	6080	2.71%
daw_zgł_krew_1824_M	Poznan	13 894	12 671	97 255	11 466	22 085	8.05%
daw_zgł_krew_1824_M	Raciborz	4687	4095	32 811	2990	8868	2.71%
daw_zgł_krew_1824_M	Radom	4051	4134	28 360	3387	4551	2.35%
daw_zgł_krew_1824_M	Rzeszow	9057	8454	63 400	7762	12 659	5.24%
daw_zgł_krew_1824_M	Slupsk	3941	3888	27 585	3138	5609	2.28%
daw_zgł_krew_1824_M	Szczecin	6723	6931	47 063	5397	7620	3.89%
daw_zgł_krew_1824_M	Walbrzych	2737	2679	19 156	2193	3463	1.58%
daw_zgł_krew_1824_M	Warsaw	15 238	15 843	106 669	12 560	17 019	8.82%
daw_zgł_krew_1824_M	Wroclaw	10 135	10 142	70 942	8561	11 451	5.87%
daw_zgł_krew_1824_M	Zielona Gora	5875	5147	41 126	4050	9325	3.40%
Total				**1 208 805**			**100%**

daw_zgł_krew_1824_M — total number of male donors in the 18–24 age category

Table 46. Characteristics of the male population aged 25–44 who reported for donation of blood/blood components in 2011–2017, broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_2544_M	2011	9964	8861	209 253	2093	27 066	12.15%
daw_zgł_krew_2544_M	2012	11 292	9411	237 141	3830	27 288	13.76%
daw_zgł_krew_2544_M	2013	11 452	9642	240 498	3996	27 558	13.96%
daw_zgł_krew_2544_M	2014	11 737	10 287	246 474	4128	27 859	14.31%
daw_zgł_krew_2544_M	2015	12 270	11 512	257 674	4199	28 493	14.96%
daw_zgł_krew_2544_M	2016	12 469	11 326	261 852	3930	28 082	15.20%
daw_zgł_krew_2544_M	2017	12 856	12 114	269 971	4466	29 326	15.67%
Total				**1 722 863**			**100%**

daw_zgł_krew_2544_M — total number of male donors in the 25–44 age category

The potential of the youngest group of citizens as future donors is also recognized in other countries. Finck et al. performed an analysis of factors motivating and potentially demotivating North American schoolchildren to donate blood. He found recruitment in this group of particular importance due to age and likelihood of becoming multiple donors and donating blood for many years to come. Moreover, this young population of potential donors is less likely to be deferred from donation due to disease or high-risk sexual behavior [9]. On the other hand, in their study of donors aged 16–17 (16 is the lower

Table 47. Number of men aged 25–44 who reported for donation of blood/blood components in the years 2011––2017, broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_2544_M	Bialystok	11 516	11 571	80 614	9642	13 021	4.68%
daw_zgł_krew_2544_M	Bydgoszcz	13 046	13 035	91 320	12 341	14 021	5.30%
daw_zgł_krew_2544_M	Gdansk	12 114	12 382	84 795	7814	13 572	4.92%
daw_zgł_krew_2544_M	Kalisz	7941	7976	55 587	7226	8632	3.23%
daw_zgł_krew_2544_M	Katowice	26 283	26 984	183 978	23 564	27 465	10.68%
daw_zgł_krew_2544_M	Kielce	6592	6477	46 144	6081	7167	2.68%
daw_zgł_krew_2544_M	Krakow	18 144	17 703	127 011	16 957	19 700	7.37%
daw_zgł_krew_2544_M	Lublin	11 065	11 326	77 455	9875	12 114	4.50%
daw_zgł_krew_2544_M	Lodz	14 291	14 429	100 034	13 155	15 253	5.81%
daw_zgł_krew_2544_M	Olsztyn	8045	8698	56 313	4373	9437	3.27%
daw_zgł_krew_2544_M	Opole	5690	5652	39 827	5336	6046	2.31%
daw_zgł_krew_2544_M	Poznan	20 110	21 096	140 772	12 361	22 619	8.17%
daw_zgł_krew_2544_M	Raciborz	7912	8314	55 386	5297	8582	3.21%
daw_zgł_krew_2544_M	Radom	4033	3996	28 233	3629	4466	1.64%
daw_zgł_krew_2544_M	Rzeszow	10 428	10 287	72 994	4621	13 391	4.24%
daw_zgł_krew_2544_M	Slupsk	4033	4199	28 230	2093	4876	1.64%
daw_zgł_krew_2544_M	Szczecin	10 127	10 040	70 888	8 861	11 215	4.11%
daw_zgł_krew_2544_M	Walbrzych	5419	5245	37 935	5148	5837	2.20%
daw_zgł_krew_2544_M	Warsaw	27 953	27 859	195 672	27 066	29 326	11.36%
daw_zgł_krew_2544_M	Wroclaw	15 894	15 624	111 261	14 247	17 542	6.46%
daw_zgł_krew_2544_M	Zielona Gora	5488	6012	38 414	3112	6765	2.23%
Total				**1 722 863**			**100%**

daw_zgł_krew_2544_M — total number of male donors in the 25–44 age category

Table 48. Characteristics of the male population aged 45–65 who reported in RBTCs to donate blood/blood components in 2011–2017, broken down into years

Variable	Year	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4565_M	2011	3021	2643	63 431	873	7473	14.84%
daw_zgł_krew_4565_M	2012	2937	2197	61 676	912	7112	14.43%
daw_zgł_krew_4565_M	2013	2924	2399	61 398	970	6923	14.37%
daw_zgł_krew_4565_M	2014	2816	2380	59 126	942	6577	13.84%
daw_zgł_krew_4565_M	2015	2853	2548	59 913	988	6470	14.02%
daw_zgł_krew_4565_M	2016	2854	2538	59 936	1003	6543	14.02%
daw_zgł_krew_4565_M	2017	2946	2645	61 875	1047	6625	14.48%
Total				**427 355**			**100%**

daw_zgł_krew_4565_M — total number of male donors in the 45–65 age category

age limit for donors in the United States), Eder et al. report the highest likelihood of adverse reactions in this group as compared with other age groups of donors. According to their observations, donation-related vasovagal reactions for those donors are 2.5 fold higher than in donors aged 18–19 and 14.5 fold higher than for donors aged 20 or more. The youngest group of donors may therefore require additional care and attention during donation as well as after the procedure [10].

Table 49. Number of men aged 45–65 who reported to donate blood/blood components in 2011–2017, broken down into RBTCs

Variable	RBTC	Average	Median	Total	Min	Max	% total
daw_zgł_krew_4565_M	Bialystok	2818	2852	19 724	2197	3751	4.62%
daw_zgł_krew_4565_M	Bydgoszcz	3753	3686	26 273	3607	4035	6.15%
daw_zgł_krew_4565_M	Gdansk	2627	2620	18 391	2380	2912	4.30%
daw_zgł_krew_4565_M	Kalisz	2632	2645	18 425	2538	2719	4.31%
daw_zgł_krew_4565_M	Katowice	6240	6108	43 680	5831	6806	10.22%
daw_zgł_krew_4565_M	Kielce	2002	2040	14 014	1883	2120	3.28%
daw_zgł_krew_4565_M	Krakow	4409	4421	30 862	4238	4579	7.22%
daw_zgł_krew_4565_M	Lublin	2470	2533	17 290	2193	2674	4.05%
daw_zgł_krew_4565_M	Lodz	3863	3863	27 042	3619	4152	6.33%
daw_zgł_krew_4565_M	Olsztyn	1987	1930	13 910	1710	2169	3.25%
daw_zgł_krew_4565_M	Opole	1499	1522	10 490	1397	1606	2.45%
daw_zgł_krew_4565_M	Poznan	4242	4320	29 693	3813	4734	6.95%
daw_zgł_krew_4565_M	Raciborz	1859	1796	13 013	1675	2100	3.05%
daw_zgł_krew_4565_M	Radom	1232	1254	8624	1144	1281	2.02%
daw_zgł_krew_4565_M	Rzeszow	2519	2399	17 636	2067	2922	4.13%
daw_zgł_krew_4565_M	Slupsk	962	970	6735	873	1047	1.58%
daw_zgł_krew_4565_M	Szczecin	2271	2281	15 898	2032	2421	3.72%
daw_zgł_krew_4565_M	Walbrzych	1943	1926	13 598	1791	2148	3.18%
daw_zgł_krew_4565_M	Warsaw	6807	6625	47 646	6470	7473	11.15%
daw_zgł_krew_4565_M	Wroclaw	3397	3429	23 777	3211	3475	5.56%
daw_zgł_krew_4565_M	Zielona Gora	1519	1443	10 634	1406	1732	2.49%
Total				**427 355**			**100%**

daw_zgł_krew_4565_M — total number of male donors in the 45–65 age category

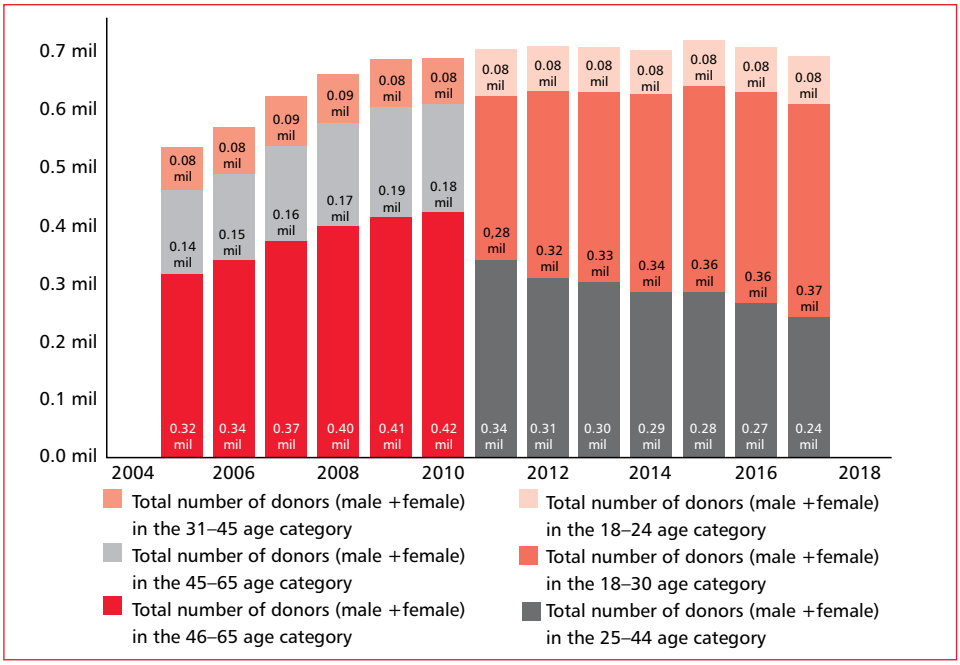

Figure 14. Comparison of data for donors who reported in RBTCs to donate blood/blood components in the periods 2005–2010 and 2011–2017, broken down into age categories

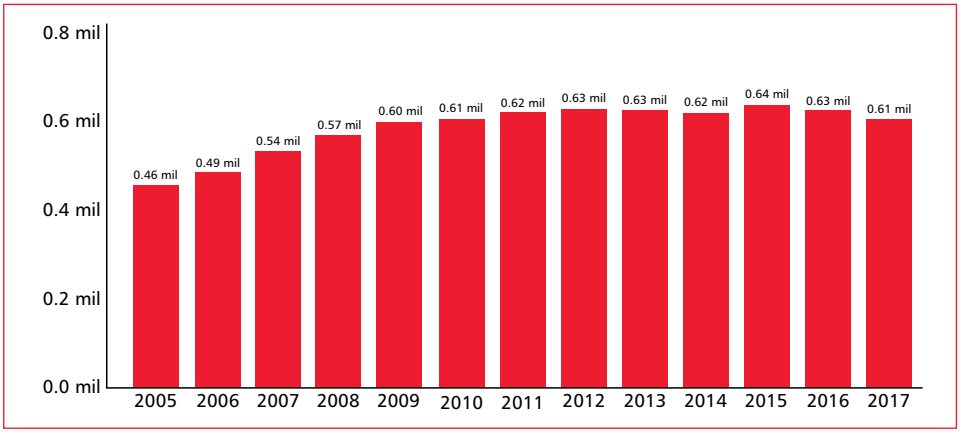

Figure 15. Number of donors in the 18–45 age category who reported at RBTCs to donate blood/blood components in the period 2005–2017

It is also advisable to take on measures to increase the number of women willing to donate blood. As presented in this study, for many years now the population of women in Poland has constituted 30–32% of the general donor population who report at RBTCs to donate blood/blood components. As indicated by WHO reports [11] the same trend is observed for other countries worldwide, nevertheless, it would be advisable to analyze the factors that demotivate women from donating blood. Currently in Poland less than 10% of women are multiple/regular blood donors.

Another challenge for Polish blood transfusion medicine is the recently growing number of foreigners with blood phenotypes unusual for the Polish population. According to the Central Statistical Office, in 2018 the number of immigrants for permanent residence amounted to 15 461, i.e. > 16% more than in 2017 (13 324) [12, 13]. Foreigners permanently living in Poland are on the one hand a source of potential donors, on the other — of potential recipients. As recipients, they may require transfusions of safe blood of atypical phenotypes for the Polish population and this is additional challenge. All the above considered, an in depth analysis of the phenomenon is required for estimation of the scale of the problem, and for taking appropriate actions, such as promotion to provide blood and blood components also for this group of Polish residents. Other countries are facing similar problems. In his study, Finck et al. found the donor population of young Americans to be interesting not only in terms of young age and potential for donation for years to come but because of ethnic diversity which reflects the diversity of the population of patients [9].

Activities of this kind require systematic analyses and targeted evidence-based intervention. This seems to be an ideal area for development of common approach of experts from various fields, including transfusion medicine, epidemiology and social sciences.

Alongside the growing significance of data processing which is being observed in the recent years, there is also a growing demand for effective analytical tools. Blood transfusion medicine seems to be the natural beneficiary of modern and effective analytical solutions [14, 15].

As result of computerization of the health care sector (blood transfusion service included), a huge amount of data is being generated and traditional tools have become insufficient for their analysis. Significance of multidimensional data analysis in the healthcare sector and the benefits which it brings about have already been recognized in other countries. Works are being published worldwide to demonstrate the potential use of advanced IT tools in the healthcare sector as well as tools for analysis of large and diverse data sets (Big Data and Data Mining) [16–19]. Sooner or later Poland will be following the same path and proceeding in the same direction.

Analysis of the huge amounts of data collected for the purpose of this study required the use of advanced analytical tools. For this purpose, Microsoft Power Business Intelligence (Power BI) software was introduced. Power BI is a set of tools for data analysis which, among others, allows to combine various data sources and prepare data for analysis (e.g. removal of unnecessary rows and columns, adjustment of data types or removal of repetitive/ /duplicate data). Furthermore, Power BI enables data transformation, e.g. column division, prepara-

tion of aggregation, transposition and arithmetic calculations. Advanced visualization of large data sets is made possible.

This study may be considered as a starting point for other analyses of great significance for transfusion service, epidemiological analyses included. Detection of epidemiological threats/ /risks and strengthening of epidemiological control through performance of detailed statistical and spatial analysis of blood donor deferrals for HBV, HCV and HIV as well as *Treponema pallidum* will expand the knowledge on the epidemiological situation in Poland. The information will have direct impact on the health safety of the Polish population.

Another important approach relevant for prevention of deficiencies in blood and blood components, is effective management and optimal use of donated blood.

As already mentioned above, the study is a starting point for a series of publications based on retrospective data analysis and devoted to description of selected aspects of public blood transfusion service in Poland. The next publication will be a sequel with characteristics of donors who were found eligible to donate blood/blood components and indeed donated blood for clinical use. Publications to follow will present the structure and organization of the public blood transfusion service, description of donations collected over the study period and management of blood and blood components, with particular emphasis on red blood cell inventories.

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