[1] Mirosław P Czarkowski, [2] Ewelina Hallmann-Szelińska, [1] Ewa Staszewska, [2] Karolina Bednarska, [2]Katarzyna Kondratiuk, [2] Lidia B Brydak

INFLUENZA IN POLAND IN 2011-2012 AND IN 2011/2012 AND 2012/2013 EPIDEMIC SEASONS

[1] Department of Epidemiology, National Institute of Public Health-
National Institute of Hygiene in Warsaw
[2] Department of Influenza Research, National Influenza Centre, National Institute of Public Health-
National Institute of Hygiene in Warsaw

ABSTRACT

This paper aimed at evaluating the epidemiological situation of influenza in Poland in 2011-2012 and in 2011/2012 and 2012/2013 epidemic seasons and comparing it with the situation observed in the previous years.

MATERIAL AND METHODS. An analysis was mainly based on three sources of data: (1) bulletins "Infectious diseases and poisonings in Poland in 2012" and "Vaccinations in Poland in 2012" (NIPH-NIH, CSI. Warsaw 2013) and analogically former bulletins, (2) "Reports on influenza cases and persons suspected of influenza", sent in 2013 and previous years to the Department of Epidemiology, NIPH-NIH by the Voivodeship Sanitary-Epidemiological Stations, (3) data of the Department of Influenza Research, National Influenza Centre, NIPH-NIH – results of virological testing performed in 2011/2012 and 2012/2013 epidemic seasons in the National Influenza Centre and/or laboratories of the Voivodeship Sanitary-Epidemiological Stations (VSES) within influenza surveillance – Sentinel as well as beyond this system. Data on influenza cases come from aggregated notifications which are sent obligatorily to the VSES by all health care units and physician practices. Influenza, influenza-like illness and acute respiratory infections, i.e. cases meeting the criteria recommended in influenza surveillance in the European Union are subject to mandatory notification.

RESULTS. In 2011-2012, there was an increase in the number of influenza and influenza-like illness cases in Poland compared to 2010, i.e. 2- and 2,5-fold, respectively. In 2011, a total of 1 156 357 cases were reported and incidence amounted to 3 001.5 per 100,000 population (11 014.5 in age group 0-4 years). As many as 0.51% of infected persons were referred to hospital. According to the CSO data, 95 fatal cases of influenza were notified. Influenza vaccination coverage was 2.8%. In 2012, 1 460 037 cases were registered and incidence was 3 789.0 (17 807,1 in age group 0-4 years). A total of 0.33% of influenza cases were referred to hospital. As many as 4 deaths due to influenza were reported. Percentage of population vaccinated against influenza amounted to 2.3%. In 2011/12 epidemic season, 1 085 471 cases were noted and incidence was 2 816.6 per 100,000 population (12 792.3 in age group 0-4 years) while in 2012/13 epidemic season its number was nearly 3-fold higher, i.e. 3 025 258 cases and incidence - 7 851.0 (30 591.7 in age group 0-4 years). In both epidemic seasons, type A influenza subtype H1N1 and human respiratory syncytial virus (RSV) predominated in infections with influenza virus and other viral respiratory infections, respectively. Antigenic analysis of influenza strains showed their affinity with vaccine strains of the vaccines recommended for these epidemic seasons.

SUMMARY. An increase in the number of notified cases of influenza and influenza-like illness, which is recently observed in Poland, is significantly affected by the improving quality (especially sensitivity) of surveillance system, commenced in the 2009 influenza pandemic. This surveillance system, however, is still not sufficiently uniform and stable.

Low percentage of population vaccinated against influenza suggests the ineffectiveness of influenza vaccine promotion campaigns conducted so far. An increase in the influenza vaccination coverage to the average observed in the EU countries should be one of the priorities for the sanitary-epidemiological stations.

Key words: *influenza, influenza-like illness, types of influenza viruses, infectious diseases, epidemiology, public health, SENTINEL, Poland, 2011, 2012, 2011/2012 epidemic season, 2012/2013 epidemic season*

INTRODUCTION

This paper's objective was to evaluate the epidemiological situation of influenza in Poland in 2011-2012 and in 2011/2012 and 2012/2013 epidemic seasons with comparison to the situation observed in the previous years.

MATERIAL AND METHODS

Analysis and evaluation of the epidemiological situation of influenza were mainly based on the data coming from three sources: (1) annual bulletins "Infectious diseases and poisonings in Poland in 2012" and "Vaccinations in Poland in 2012", which were published in 2013 by the National Institute of Public Health-NIH and Chief Sanitary Inspectorate and analogically former bulletins, (2) "Reports on influenza cases and persons suspected of influenza" sent in 2013 and previous years to the Department of Epidemiology, NIPH-NIH by the Voivodeship Sanitary-Epidemiological Stations, (3) data of the Department of Influenza Research, National Influenza Centre, NIPH-NIH – results of virological testing performed in 2011/2012 and 2012/2013 epidemic seasons in the National Influenza Centre and/or laboratories of the Voivodeship Sanitary-Epidemiological Stations (VSES) within influenza surveillance – SENTINEL as well as beyond this system.

Data on influenza cases, which are published in bulletin "Infectious diseases and poisonings in Poland" and "Reports on influenza cases and persons suspected of influenza", come from notifications sent obligatorily to the VSES by all health care units and physician practices. These notifications (in an aggregated form) are sent four times in a month as "Reports on influenza cases and persons suspected of influenza" (MZ-55). Influenza (clinically and/or laboratory confirmed), clinically-confirmed influenza-like illness and acute respiratory infections, i.e. cases meeting the criteria recommended in influenza surveillance in the European Union are subject to mandatory notification. Virological testing within SENTINEL was performed on the samples collected by general practitioners from patients suspected of influenza. Testing aimed at detecting the genetic material of influenza virus or antigens of influenza virus, using the methods of molecular biology and immunofluorescence test (IF), respectively. Pursuant to the assumptions of SENTINEL, such tests were performed by the laboratories of VSES in the whole Poland dependent on the diagnostic equipment possessed, using one or both aforesaid methods. IF tests were also performed to detect antigens of other viruses causing respiratory infections.

To calculate incidence rates included in the present paper, data on the population size of Poland as of 30th June (incidence in a year) and 31st December (incidence in a season), which are published by the Central Statistical Office, were employed.

RESULTS AND THEIR INTERPRETATION

EPIDEMIOLOGICAL SITUATION IN 2011. In 2011, a total of 1 156 357 influenza cases and persons suspected of influenza (i.e. influenza and influenza-like illness) were reported in Poland. Incidence was 3 001.5 per 100,000 population. Compared to 2010 and median as of 2005-2009, incidence for influenza and influenza-like illness was 2- and more than 3-fold higher in 2011. However, it should be noted that the incidence was lower compared to the median of annual incidences noted in Poland after 1970 (Fig. 1).

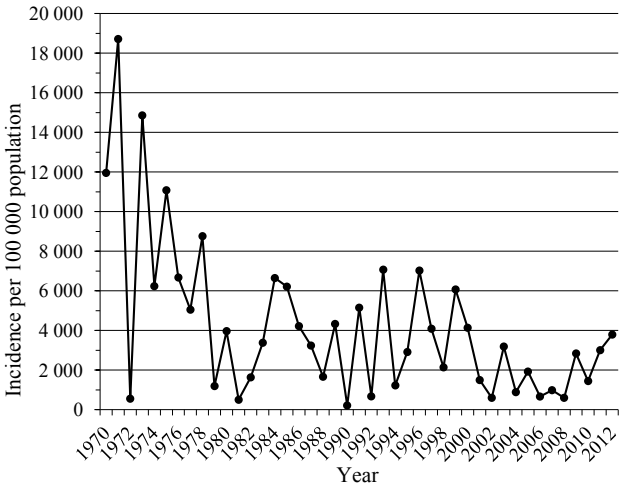

Fig. 1. Influenza and influenza-like illness in Poland 1970-2012. Incidence per 100 000 population

The majority of cases were reported in February (247 458 cases; 21.4% of all cases notified in the year), March (190 070; 16.4%) and January (183 229; 15.8%), i.e. in the months of the peak of 2010/11 epidemic season.

Compared to 2010, an increase in the number of cases was noted in the whole country, in all voivodeships. The lowest and the highest increase was reported in Opolskie voivodeship, where incidence increased by only ca 20% and Świętokrzyskie voivodeship, where there was a 11-fold increase, respectively (Tab. I).

In 2011, the highest incidence was reported in Wielkopolskie voivodeship, i.e. 5 928.2 per 100,000 population. Its value was nearly 2-fold higher compared to the incidence for the whole country. Relatively high incidence (compared to the country incidence) was also observed in Mazowieckie (4 899.7) and Małopolskie (4 270.2) voivodeships. The lowest incidence was

Table I. Influenza and influenza-like illness in Poland 2005-2011. Number of cases and incidence per 100 000 population by voivodeship

Voivodeship		Median 2005-2009		2010		2011	
		number of cases	incidence	number of cases	incidence	number of cases	incidence
	POLAND	374 042	981.3	551 054	1 443.0	1 156 357	3 001.5
1.	Dolnośląskie	19 289	669.8	57 424	1995.9	98 211	3 368.2
2.	Kujawsko-pomorskie	11 944	578.3	15 647	756.0	24 057	1 146.6
3.	Lubelskie	8 694	400.8	9 063	420.6	23 627	1 086.4
4.	Lubuskie	10 742	1 065.2	2 748	271.9	5 826	569.5
5.	Łódzkie	49 619	1 937.6	37 204	1 465.6	77 410	3 050.6
6.	Małopolskie	57 954	1 769.8	51 000	1 543.4	142 661	4 270.2
7.	Mazowieckie	96 956	1 872.3	141 498	2 704.2	258 422	4 899.7
8.	Opolskie	25 045	2 386.3	26 370	2 560.5	31 135	3 065.7
9.	Podkarpackie	9 236	440.4	15 936	757.9	46 991	2 208.4
10.	Podlaskie	6 995	582.4	18 171	1 528.0	32 813	2 727.9
11.	Pomorskie	5 309	239.7	22 972	1 027.6	50 244	2 204.4
12.	Śląskie	33 862	726.3	41 862	902.5	100 255	2 165.3
13.	Świętokrzyskie	4 683	364.0	485	38.2	5 281	412.5
14.	Warmińsko-mazurskie	12 499	876.1	14 408	1 009.3	32 893	2 263.7
15.	Wielkopolskie	13 294	392.0	83 865	2 456.4	204 540	5 928.2
16.	Zachodniopomorskie	10 727	633.7	12 401	732.3	21 991	1 276.3

Source: Infectious diseases and poisonings in Poland. NIPH-NIH, CSI. Warsaw. Annals 2005-2011

Table II. Influenza and influenza-like illness in Poland 2005-2011. Number of cases, incidence per 100 000 population and percentage by age

Age	Median 2005-2009			2010			2011		
	number of cases	incidence	%	number of cases	incidence	%	number of cases	incidence	%
0-4	40 447	2 240.7	10.9	120 075	6 060.0	21.8	227 624	11 014.5	19.7
5-14	84 613	2 036.4	23.9	122 439	3 229.1	22.2	272 176	7 223.9	23.5
0-14	125 060	2 098.3	34.7	242 514	4 200.7	44.0	499 800	8 566.6	43.2
15-64	208 495	771.2	55.7	266 754	979.2	48.4	569 081	2 074.0	49.2
65+	40 487	790.6	9.8	41 786	807.8	7.6	87 476	1 665.3	7.6
Total	374 042	981.3	100.0	551 054	1 443.0	100.0	1 156 357	3 001.5	100.0

Source: Influenza and influenza-like illness reports sent to the Department of Epidemiology NIPH-NIH by Voivodeship Sanitary-Epidemiological Stations

Table III. Influenza and influenza-like illness in Poland 2005-2011. Number of cases and incidence in children aged 0-14 per 100 000 population by voivodeship

Voivodeship		Median 2005-2009		2010		2011	
		number of cases	incidence	number of cases	incidence	number of cases	incidence
	POLAND	125 060	2 098.3	242 514	4 200.7	499 800	8 566.6
1.	Dolnośląskie	5 282	1 278.1	27 130	6 729.2	47 734	11 677.6
2.	Kujawsko-pomorskie	4 770	1 420.8	5 968	1 848.1	8 698	2 674.1
3.	Lubelskie	3 122	873.6	4 546	1 370.1	10 893	3 273.8
4.	Lubuskie	3 599	2 236.2	977	625.4	1 913	1 214.6
5.	Łódzkie	17 225	4 666.7	13 849	3 894.9	28 496	8 006.9
6.	Małopolskie	16 115	2 806.4	16 039	3 042.3	55 564	10 366.9
7.	Mazowieckie	33 497	4 222.9	64 792	8 171.0	111 782	13 787.8
8.	Opolskie	7 899	4 880.1	9 269	6 687.3	11 500	8 340.9
9.	Podkarpackie	2 938	818.0	7 491	2 225.5	22 276	6 507.1
10.	Podlaskie	3 210	1 555.6	10 112	5 686.0	15 542	8 629.7
11.	Pomorskie	2 409	655.8	9 605	2 608.7	20 707	5 536.7
12.	Śląskie	11 140	1 666.8	17 674	2 743.4	39 402	6 104.7
13.	Świętokrzyskie	1 682	797.6	146	79.3	1 688	914.7
14.	Warmińsko-mazurskie	5 071	2 095.4	7 247	3 136.8	16 078	6 936.1
15.	Wielkopolskie	5 547	1 005.0	42 157	7 667.2	99 333	17 851.6
16.	Zachodniopomorskie	4 604	1 778.6	5 512	2 180.0	8 194	3 214.4

Source: Infectious diseases and poisonings in Poland. NIPH-NIH, CSI. Warsaw. Annals 2005-2015

reported in Świętokrzyskie (irrespective of the highest increase of incidence, only 412.5; 86.3%; below the country incidence) and Lubuskie (569.5; 81.0%) voivodeships. Therefore, there were considerable disparities between voivodeships in 2011 – relation of the highest and the lowest incidence was 14:1 (Tab. I).

As in previous years, the highest incidence was observed in the youngest children, i.e. in age group 0-4 years (11 014.5 per 100,000 children in this age group). Incidence in older groups, especially in persons older than 14 years was significantly lower (Tab. II).

In 2011, the percentage of infections in children and adolescents aged up to 15 years amounted to 43.2% of all notified cases. Its value was comparable to the one noted in 2010 (44.0%). In particular voivodeships, the percentage of infections in this age group ranged from 32.0% (Świętokrzyskie voivodeship) to 48.9% (Warmińsko-mazurskie voivodeship). For the whole country, incidence in children and adolescents aged up to 15 years was 8 566.6. Its value was nearly 3-fold higher compared to the incidence for the whole country whereas it was at least 2-fold higher in all voivodeships. The highest incidence in age group 0–14 years was reported in Wielkopolskie (17 851.6) and Mazowieckie (13 787.8) voivodeships while the lowest incidence was noted in Świętokrzyskie (914.7) and Lubuskie (1 214.6) voivodeships (Tab. III).

In 2011, a total of 5 949 persons, i.e. 0.51% of all infected persons (from 0.21% in Dolnośląskie to 3.86% in Świętokrzyskie voivodeships) were referred to hospital due to influenza or influenza-like illness. The reasons were as follows: the symptoms of respiratory tract (88.6%), cardiovascular system (3.7%) and other (15.4%).*)

The youngest children and the elderly were most commonly referred to hospital. In both age groups: 0-4 years and 65 years and older, the percentage of persons referred to hospital amounted to 0.81% while in the remaining age groups (total) – 0.40%. The reasons were: in age group 0-4 years - the symptoms of respiratory tract (92.2% of all referrals), cardiovascular system (0.3%) and other (13.7%) while in the group of persons aged 65 years and older - symptoms of respiratory tract (90.1%), cardiovascular system (9.3%) and other (10.7%).*)

According to the data of the Central Statistical Office, a total of 95 persons died due to influenza (underlying cause of death) in 2011 in Poland, including 9 (9.5%), 71 (74.7%) and 15 persons (15.8%) in age groups 0-19, 20-64 and older than 64 years, respectively. Nearly 1/5 of all deaths (17 cases) were registered as caused by unspecified influenza virus.

EPIDEMIOLOGICAL SITUATION IN 2012. In 2012, a total of 1 460 037 influenza and influenza-like illness cases were reported in Poland and incidence was 3 789.0 per 100,000 population. Compared to the previous year, incidence for influenza and influenza-like illness was higher by 26.2% and nearly 4-fold in 2012 and median as of 2006-2010, respectively. However, its value was higher by only 17.1% than the median of annual incidences noted in Poland after 1970 (Fig. 1).

The highest number of cases was noted in December (267 634 cases; 18.3% of all infections notified in the year). Contrary to what could be expected, it did not occur in the peak of 2011/12 epidemic season (March, 151 234 cases; 10.4%) but in the period of increasing waves of infection in 2012/13 epidemic season.

Compared to 2011, an increase in the incidence was not reported in the whole country. In 2012, incidence increased only in eight voivodeships while in the remaining eight voivodeships it significantly decreased. The lowest increase was noted in Śląskie voivodeship, where incidence increased by only ca 5 % while the highest one was observed in Pomorskie voivodeship, where there was more than 5-fold increase observed. The highest decrease was reported in Lubuskie voivodeship, where incidence decreased by more than 60% (Tab. IV).

In 2012, the highest incidence was noted in Pomorskie voivodeship, i.e. 13 562.2 per 100,000 population. Its value was more than 2.5-fold higher compared to the country incidence. Relatively high incidence (more than a half higher compared to country incidence) was reported in Wielkopolskie (6 845.9) and Małopolskie (6 154.5) voivodeships. The lowest incidence was registered in Lubuskie voivodeship, where the incidence decrease was the highest in 2012 (225.7; 94.0%; below the country incidence) and Świętokrzyskie voivodeship (502.5; 86.7%). Therefore, there were considerable disparities between voivodeships in 2012 – relation of the highest and the lowest incidence was 60:1 (Tab. IV).

Pursuant to the long-term tendency, the highest incidence was noted in the youngest children, i.e. in age group 0-4 years (17 807.1 per 100,000 children at this age). Incidence in older age groups, especially in persons older than 14 years was significantly lower (Tab. V).

In 2012, the percentage of infections in children and adolescents aged up to 15 years amounted to 48.1% of all notified cases. Compared to 2011, their distribution in the total number of cases was higher by 4.9 percentage points. In particular voivodeships, their distribution ranged from 18.8% (Lubuskie voivodeship) to 55.5% (Warmińsko-mazurskie voivodeship). For the whole country, incidence in children and adolescents aged up to 15 years was 12 096.2. Its value was more than 3-fold higher compared to the incidence for the whole population. Comparable disparities were observed between all voivodeships, excluding Lubuskie voivodeship, where incidence in children and adolescents aged up to 15 years was higher by only 23.1% than the

Table IV. Influenza and influenza-like illness in Poland 2006-2012. Number of cases and incidence per 100 000 population by voivodeship

Voivodeship	Median 2006-2010		2011		2012	
	number of cases	incidence	number of cases	incidence	number of cases	incidence
POLAND	374 042	981.3	1 156 357	3 001.5	1 460 037	3 789.0
1. Dolnośląskie	19 289	669.8	98 211	3 368.2	65 863	2 259.3
2. Kujawsko-pomorskie	11 944	578.3	24 057	1 146.6	19 847	946.1
3. Lubelskie	8 694	400.8	23 627	1 086.4	19 679	907.4
4. Lubuskie	3 181	315.4	5 826	569.5	2 309	225.7
5. Łódzkie	38 741	1 506.5	77 410	3 050.6	80 923	3 200.3
6. Małopolskie	51 000	1 543.4	142 661	4 270.2	206 197	6 154.5
7. Mazowieckie	96 956	1 872.3	258 422	4 899.7	281 206	5 312.6
8. Opolskie	26 370	2 560.5	31 135	3 065.7	23 032	2 275.2
9. Podkarpackie	9 236	440.4	46 991	2 208.4	26 376	1 238.9
10. Podlaskie	8 242	688.2	32 813	2 729.9	36 316	3 027.0
11. Pomorskie	5 309	239.7	50 244	2 204.4	310 134	13 562.2
12. Śląskie	33 862	726.3	100 255	2 165.3	104 732	2 266.6
13. Świętokrzyskie	1 812	142.3	5 281	412.5	6 410	502.5
14. Warmińsko-mazurskie	12 499	876.1	32 893	2 263.7	20 018	1 378.7
15. Wielkopolskie	13 294	392.0	204 540	5 928.2	236 793	6 845.9
16. Zachodniopomorskie	10 727	633.7	21 991	1 276.3	20 202	1 173.1

Source: Infectious diseases and poisonings in Poland. NIPH-NIH, CSI. Warsaw. Annals 2006-2012

Table V. Influenza and influenza-like illness in Poland 2006-2012. Number of cases, incidence per 100 000 population and percentage by age

Age	Median 2006-2010			2011			2012		
	number of cases	incidence	%	number of cases	incidence	%	number of cases	incidence	%
0-4	40 447	2 240.7	10.9	227 624	11 014.5	19.7	367 706	17 807.1	25.2
5-14	84 613	2 036.4	23.9	272 176	7 223.9	23.5	334 878	8 945.9	22.9
0-14	125 060	2 098.3	34.7	499 800	8 566.6	43.2	702 584	12 096.2	48.1
15-64	208 495	771.2	55.7	569 081	2 074.0	49.2	647 630	2 370.4	44.4
65+	40 487	790.6	9.8	87 476	1 665.3	7.6	109 823	2 032.4	7.5
Total	374 042	981.3	100.0	1 156 357	3 001.5	100.0	1 460 037	3 789.0	100.0

Source: Influenza and influenza-like illness reports sent to the Department of Epidemiology NIPH-NIH by Voivodeship Sanitary-Epidemiological Stations

Table VI. Influenza and influenza-like illness in Poland 2006-2012. Number of cases and incidence in children aged 0-14 per 100 000 population by voivodeship

Voivodeship	Median 2006-2010		2011		2012	
	number of cases	incidence	number of cases	incidence	number of cases	incidence
POLAND	125 060	2 098.3	499 800	8 566.6	702 584	12 096.2
1. Dolnośląskie	5 282	1 278.1	47 734	11 677.6	34 412	8 437.9
2. Kujawsko-pomorskie	4 770	1 420.8	8 698	2 674.1	8 527	2 644.8
3. Lubelskie	3 122	873.6	10 893	3 273.8	8 695	2 648.2
4. Lubuskie	1 067	672.5	1 913	1 214.6	435	277.8
5. Łódzkie	13 849	3 894.9	28 496	8 006.9	36 598	10 344.9
6. Małopolskie	16 039	3 042.3	55 564	10 366.9	94 963	17 775.1
7. Mazowieckie	33 497	4 222.9	111 782	13 787.8	132 179	16 187.0
8. Opolskie	8 798	5 908.3	11 500	8 340.9	9 356	6 889.0
9. Podkarpackie	2 938	818.0	22 276	6 507.1	14 053	4 162.1
10. Podlaskie	3 669	1 878.3	15 542	8 629.7	17 850	10 066.5
11. Pomorskie	2 409	655.8	20 707	5 536.7	158 244	42 303.9
12. Śląskie	11 140	1 666.8	39 402	6 104.7	47 008	7 298.2
13. Świętokrzyskie	655	342.9	1 688	914.7	2 901	1 596.7
14. Warmińsko-mazurskie	5 071	2 095.4	16 078	6 936.1	11 102	4 844.3
15. Wielkopolskie	5 547	1 005.0	99 333	17 851.6	116 415	20 926.5
16. Zachodniopomorskie	4 604	1 778.6	8 194	3 214.4	9 846	3 899.8

Source: Infectious diseases and poisonings in Poland. NIPH-NIH, CSI. Warsaw. Annals 2006-2012

country incidence. The highest incidence in age group 0-14 years was reported in Pomorskie (42 303.9) and Wielkopolskie (20 926.5) voivodeships while the lowest in Lubuskie (277.8) and Świętokrzyskie (1 596.7) voivodeships. Disparities between voivodeships were higher in case of incidence in children and adolescents aged up to 15 years than the overall incidence - relation of the highest and the lowest incidence was 152:1 (!) (Tab. VI).

In 2012, a total of 4 887 influenza and influenza-like illness cases, i.e. 0.33% of all infected persons (from 0.03% in Łódzkie to 0.93% in Warmińsko-mazurskie voivodeships) were referred to hospitals. The reasons were mainly the symptoms of respiratory tract (96.0%), cardiovascular system (2.0%) and other (9.3%).*)

In 2012, the elderly and the youngest children were most commonly referred to hospital. In persons aged 65 years and older, the percentage of those referred to hospitals (as in the previous year) was 0.81% while in age group 0-4 years – 0.68%. In the remaining groups (total) its value amounted to 0.15%. The reasons why the persons aged 65 years and older were referred to hospital were the symptoms of respiratory tract (96.5% of all referrals), cardiovascular system (4.5%) and other (5.3%) while in age group 0-4 years - symptoms of respiratory tract (96.5%), cardiovascular system (0.4%) and other (11.5%).*)

According to the data of CSO, a total of 4 persons died to influenza (underlying cause of death) in 2012. Of them, all were older than 64 years. Two fatal cases were registered as caused by unspecified influenza virus.

INFLUENZA VACCINATION COVERAGE IN 2011-2012. In Polish Immunization Programme (PIP) as of 2011 and 2012, vaccination against influenza – as in the previous years – is recommended for persons with chronic diseases and those who are immunosuppressed and older than 55 years (clinical indications) as well as persons exposed to contact with large number of population (e.g. persons working in healthcare, education, trade and transport sectors), children and adolescents aged 6 months through 18 years. Vaccine protects against influenza only for one year (epidemic season). Vaccination should be performed with vaccine whose composition for a given epidemic season is recommended by the World Health Organization.

According to the data collected by the VSES, a total of 1 061 111 and 903 178 persons were vaccinated against influenza in Poland in 2011 and 2012, respectively. Having considered the whole population, it was merely 2.8% and 2.3%. In particular voivodeships, the percentage of vaccinated persons ranged from 3.6% in Zachodniopomorskie to 1.8% in Pomorskie voivodeships in 2011 and from 3.0% in Mazowieckie to 1.6% in Pomorskie voivodeships in 2012. Irrespective of the widespread campaigns promoting vaccines as the most effective method of influenza prevention, a decreasing trend of the number of persons vaccinated against influenza annually, which is observed since 2009 pandemic season, has not been stopped. In 2010-2012, a total number of persons vaccinated against influenza decreased by 25.9%, 9.2% and 14.9%, respectively. Persons aged 65 years and older were most commonly vaccinated. In 2011, 8.7% of persons in this age group were vaccinated against influenza (from 13.1 in Zachodniopomorskie to 6.6% in Podkarpackie and Pomorskie voivodeships) while in 2012 – 7.8% (from 11.9% in Zachodniopomorskie to 5.7% in Podkarpackie voivodeships). Children aged 0-4 years were vaccinated against influenza very rarely while incidence in this group is the highest. In 2011, 0.9% of children aged 0-4 years were vaccinated while in 2012 – 0.6%. Undoubtedly, higher percentage of persons aged 65 years and older who are vaccinated against influenza is affected by the fact that this vaccination is financed by local governments and offered free of charge for persons in this age group.

EPIDEMIOLOGICAL SITUATION IN 2011/12 EPIDEMIC SEASON. In 2011/12 influenza epidemic season, i.e. from 1st September 2011 to 31st August 2012, a total of 1 085 471 influenza and influenza-like illness case were reported in Poland and incidence was 2 816.6 per 100,000 population. These values were comparable to the ones noted in 2010/11 epidemic season (difference did not exceed 1%). However, it was 3-fold higher compared to the median of five previous epidemic seasons.

Seasonal peak of infections was reported in March of 2012, when a total of 151 234 cases were noted, i.e. 13.9% of all cases notified in the whole epidemic season (Fig. 2).

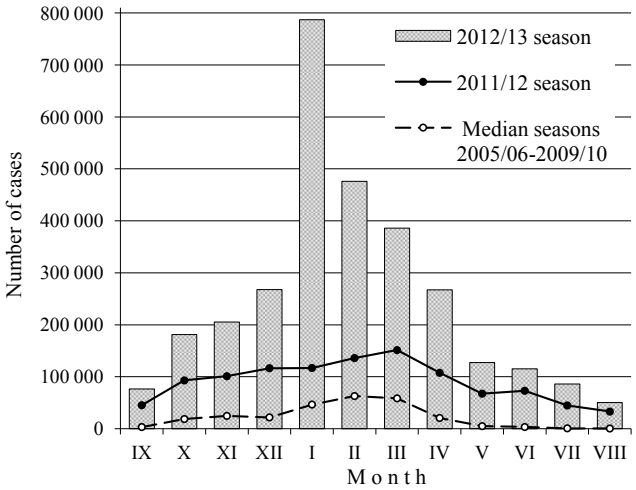

Fig. 2. Influenza and influenza-like illness in Poland in the epidemic seasons 2005/06-2012/13. Number of reported cases by month

In epidemic season analyzed, the highest incidence was noted in Wielkopolskie voivodeship. Its value amounted to 6 274.2 per 100,000 population and was

Table VII. Influenza and influenza-like illness in Poland in seasons 2005/06-2011/12. Number of cases and incidence per 100 000 population by voivodeship

Voivodeship	Median 2005/06-2009/10		2010/11 season		2011/12 season	
	number of cases	incidence	number of cases	incidence	number of cases	incidence
POLAND	355 617	932.8	1 066 246	2 791.2	1 085 471	2 816.6
1. Dolnośląskie	17 242	598.2	94 029	3 267.3	66 511	2 280.4
2. Kujawsko-pomorskie	12 287	594.6	25 055	1 210.7	16 958	808.2
3. Lubelskie	8 392	386.2	21 137	982.3	18 026	830.0
4. Lubuskie	10 518	1 042.9	6 386	631.6	611	59.7
5. Łódzkie	48 907	1 905.8	71 230	2 810.6	61 252	2 417.5
6. Małopolskie	56 293	1 720.9	122 678	3 706.2	157 390	4 702.7
7. Mazowieckie	96 146	1 864.1	246 524	4 702.0	244 927	4 633.9
8. Opolskie	26 805	2 594.8	30 967	3 010.6	22 557	2 224.7
9. Podkarpackie	8 872	423.0	51 604	2 453.2	24 752	1 162.8
10. Podlaskie	8 933	744.6	32 560	2 740.0	28 019	2 333.0
11. Pomorskie	4 703	213.9	53 955	2 408.4	98 776	4 325.6
12. Śląskie	34 333	737.7	89 778	1 936.6	92 975	2 009.7
13. Świętokrzyskie	4 073	320.0	5 541	437.7	172	13.5
14. Warmińsko-mazurskie	11 956	837.9	31 727	2 223.0	18 922	1 302.6
15. Wielkopolskie	13 340	393.9	162 673	4 757.3	216 802	6 274.2
16. Zachodniopomorskie	9 554	564.6	20 402	1 205.0	16 821	976.4

Source: Influenza and influenza-like illness reports sent to the Department of Epidemiology NIPH-NIH by Voivodeship Sanitary-Epidemiological Stations

Table VIII. Influenza and influenza-like illness in Poland in seasons 2006/07-2012/13. Number of cases and incidence per 100 000 population by voivodeship

Voivodeship	Median 2006/07-2010/11		2011/12 season		2012/13 season	
	number of cases	incidence	number of cases	incidence	number of cases	incidence
POLAND	563 860	1 478.6	1 085 471	2 816.6	3 025 258	7 851.0
1. Dolnośląskie	59 585	2 071.0	66 511	2 280.4	158 560	5 440.6
2. Kujawsko-pomorskie	18 405	890.0	16 958	808.2	78 862	3 761.8
3. Lubelskie	13 864	641.3	18 026	830.0	73 399	3 389.2
4. Lubuskie	10 518	1 042.9	611	59.7	24 882	2 431.5
5. Łódzkie	48 907	1 905.8	61 252	2 417.5	199 677	7 909.1
6. Małopolskie	65 145	1 981.8	157 390	4 702.7	353 858	10 550.1
7. Mazowieckie	106 184	2 040.2	244 927	4 633.9	451 916	8 523.9
8. Opolskie	27 286	2 618.8	22 557	2 224.7	52 737	5 220.4
9. Podkarpackie	20 372	970.3	24 752	1 162.8	74 328	3 489/7
10. Podlaskie	9 275	778.5	28 019	2 333.0	94 464	7 880.6
11. Pomorskie	12 301	554.2	98 776	4 325.6	736 018	32 139.5
12. Śląskie	47 142	1 014.8	92 975	2 009.7	205 959	4 462.0
13. Świętokrzyskie	5 328	416.3	172	13.5	42 726	3 353.7
14. Warmińsko-mazurskie	31 727	2 223.0	18 922	1 302.6	50 076	3 451.9
15. Wielkopolskie	53 518	1 575.2	216 802	6 274.2	371 903	10 741.8
16. Zachodniopomorskie	20 402	1 205.0	16 821	976.4	55 893	3 246.9

Source: Influenza and influenza-like illness reports sent to the Department of Epidemiology NIPH-NIH by Voivodeship Sanitary-Epidemiological Stations

more than 2-fold higher compared to the country incidence. Relatively high incidence (compared to the country incidence) was noted in Małopolskie (4 702.7), Mazowieckie (4 633.9) and Pomorskie (4 325.6) voivodeships. The lowest two incidence rates noted in voivodeships (13.5 in Świętokrzyskie and 59.7 in Lubuskie voivodeships) differed considerably from the remaining voivodeships. Therefore, it suggests that the quality of influenza surveillance is not sufficient enough there and incidence rates of the epidemiological situation of influenza and influenza-like illness should not be considered as real (Tab. VII).

Nearly a half (47.7%) of all cases reported in 2011/12 epidemic season were infections in children and adolescents aged up to 15 years. Incidence in this age group was 8 893.8 per 100,000 children aged 0-15 years. It value was 3-fold higher than the incidence for the whole population. One in four infections noted in this epidemic season occurred in children aged 0-4 years. Incidence in this age group was the highest and

amounted to 12 792.3. Incidence in age group 5-14 years was nearly 2-fold lower (6 736.8) while in older age groups its value was even lower (15-64 years – 1 763.9; 64 years and older – 1 591.0).

A total of 3 431 persons, i.e. 0.32% of all infected persons were referred to hospital due to influenza and influenza-like illness in 2011/12 epidemic season. The percentage of those hospitalized was the highest in the elderly and the youngest children. In case of persons aged 65 years and older, 0.76% were referred to hospital while in age group 0-4 years – 0.68%. The percentage of hospitalized persons in the remaining groups amounted to 0.13%. The reasons were: the symptoms of respiratory tract (95.8%), cardiovascular system (1.9%) (5.0% in persons aged 65 years and older) and other (7.8%).*)

During the whole epidemic season, i.e. from September 2011 to August 2012, the Central Statistical Office registered 5 fatal cases due to influenza - 3 in 2011 and 2 in 2012.

Etiological agent. In 2011/12 epidemic season, i.e. from week 36 of 2011 to week 35 of 2012, a total of 476 samples collected from patients suspected of influenza in 14 voivodeships (excluding Dolnośląskie and Śląskie voivodeships) were tested within Sentinel. As many as 26 samples were positive for the presence of influenza virus (5.5%). In case of 19 (73.1% of all influenza cases) and 7 (26.9%) samples, infections with types A and B influenza virus were detected, respectively. In case of 18 samples, type A influenza virus was not subtyped and subtype A/H3N2/ was identified in 1 sample.

Having considered test results of samples collected in the whole country beyond Sentinel (1 590 samples, including those collected in hospitals), a total of 66 samples were positive (3.1%). Infection with type A influenza virus was identified in 55 samples (83.3% of all influenza infections) while infection with type B influenza virus – in 11 samples (16.7%). Type A influenza virus was not subtyped in 51 samples. Subtype A/H3N2/ was identified in 4 cases.

Test results for the presence of other viruses causing respiratory infections were positive in 335 samples (83.8%). In case of 293 (87.5% of all positive results), 38 (11.3%), 3 (0.9%), 1 (0.3%) samples, infections with RSV, parainfluenza virus type 3, parainfluenza virus type 1 and adenovirus were identified, respectively.

Therefore, in 2011/12 epidemic season, infections with type A influenza virus and RSV predominated in influenza infections and other viral respiratory infections, respectively.

Antigenic analysis of influenza strains isolated in 2011/12 epidemic season in the National Influenza Centre in the NIPH-NIH showed their affinity with vaccine strains of the vaccines recommended for these epidemic seasons.

EPIDEMIOLOGICAL SITUATION IN 2012/13 EPIDEMIC SEASON. In 2012/13 influenza epidemic season, i.e. from 1st September 2012 to 31st August 2013, a total of 3 025 258 influenza and influenza-like illness cases were reported in Poland. Incidence was 7 851.0 per 100,000 population. Compared to 2011/12 epidemic season and the median of five previous epidemic seasons, these values were nearly 3-fold and more than 5-fold higher, respectively. At least ¾ increase in the number of cases in the whole country and all voivodeships was reported compared to 2011/12 epidemic season.

Seasonal peak of infections was noted relatively early, i.e. in January of 2013. Only in this month, a total of 787 134 cases were reported in Poland, i.e. 26.0% of all infections notified in the whole epidemic season (Fig. 2).

The highest incidence was observed in Pomorskie voivodeship, i.e. 32 139.5 per 100,000 population. Its value was more than 4-fold higher compared to the country incidence for the whole country. It also exceeded the incidence noted in other voivodeships by at leat 3 times. The lowest incidence (2 431.5; 69.0%; below the country incidence) was reported in Lubuskie voivodeship. Compared to the previous epidemic season, there was a significant reduction of disparities between voivodeships. Relation of the highest and the lowest incidence was 13:1 (Tab. VIII).

As in 2011/12 epidemic season, nearly a half (43.5%) of all infections in 2012/13 epidemic season occurred in children and adolescents aged up to 15 years. Compared to the previous epidemic season, however, their distribution was slightly lower, i.e. by 4.2 percentage points. Incidence in this age group was 22 708.0. Its value was nearly 3-fold higher than the incidence for the whole population. As in the previous years, the highest incidence was noted in children aged 0-4 years (30 591.7). Incidence in age group 5-14 years was nearly 2-fold lower (18 374.0). Incidence in older groups was even lower (15-64 years – 5 320.3; older than 64 years – 4 724.0).

A total of 14 053 persons (0.46% of all cases) were referred to hospital due to influenza or influenza-like illness in 2012/13 epidemic season, i.e. more than 4-fold higher compared to the previous epidemic season. Having considered the total number of cases, it suggests that the patients were referred 1.5-fold more often to hospital in 2012/13 than in the previous epidemic season. The elderly and the youngest children were most commonly referred to hospital. Of persons aged 65 years and older, 1.18% of those infected were referred to hospital. In case of children aged 0-4 years and remaining age groups, 0.79% and 0.28% were hospitalized, respectively. The reasons of referral to hospital were: the symptoms of respiratory tract (93.3%), cardiovascular system (4.8%) (9.7% in persons aged 65 years and older) and other (9.9%).*)

During the whole epidemic season, i.e. from September 2012 to August 2013, the Central Statistical Office (initial data) registered 105 fatal cases due to influenza - 2 in 2012 and 103 in 2013.

Etiological agent. In 2012/13 epidemic season, i.e. from week 36 of 2012 to week 35 of 2013, a total of 1 519 samples collected in 15 voivodeships (excluding Śląskie voivodeship) were tested within Sentinel. As many as 461 samples were positive for the presence of influenza virus (30.3%). In case of 365 (79.2% of all influenza cases) and 96 (20.8%) samples, infections with types A and B influenza virus were detected, respectively. In case of 129 samples (35.3% of all infections with type A virus), type A influenza virus was not subtyped. Subtypes A/H1N1/pdm09 and A/H3N2/ were identified in 217 (59.5%) and 19 (5.2%) samples, respectively.

Having considered test results of samples collected in the whole country beyond Sentinel (5 430 samples, including those collected in hospitals), a total of 1 824 samples were positive (26.8%). Infection with type A influenza virus was identified in 1 589 samples (87.1% of all influenza infections) while infection with type B influenza virus – in 243 samples (13.3%).[**)] Type A influenza virus was not subtyped in 346 (21.8%) samples. Subtypes A/H1N1/pdm09 and A/H3N2/ were identified in 1 066 (85.8% of all subtyped viruses) and 187 (15.0%) samples, respectively.[**)] A total of 18 co-infections were identified -10 co-infections with subtypes A/H3N2/ and A/H1N1/pdm09 and 8 co-infections with subtype A/H3N2/ and type B.

Test results for the presence of other viruses causing respiratory infections were positive in 577 samples (24.0%). In case of 501 (86.8% of all positive results), 45 (7.8%), 12 (2.1%), 7 (1.2%), 5 (0.9%) and 4 (0.7%) samples, infections with RSV, parainfluenza virus type 3, parainfluenza virus type 2, adenovirus, parainfluenza virus type 1 and coronavirus were identified, respectively.

Therefore, in 2012/13 epidemic season, infections with subtype A/H1N1/pdm09 and RSV predominated in influenza infections and other viral respiratory infections, respectively.

Antigenic analysis of influenza strains isolated in 2012/13 epidemic season in the National Influenza Centre in the NIPH-NIH showed their affinity with vaccine strains of the vaccines recommended for these epidemic seasons.

SUMMARY AND CONCLUSIONS

From the comparison of the number of cases reported in the period prior and after 2009 influenza epidemic transpires that the incidence for influenza and influenza-like illness considerably increased in the last two years in Poland. Actual scope of this increase, however, is difficult to assess due to indirect consequences of pandemic i.a. increased frequency of infection reporting, implementation of case definition expending the scope of registration, not to mention about the increased interest among physicians and units notifying the infections. It resulted in increased sensitivity of the system and consequently leads to an increase in the number of reported cases. It may be concluded that the process of system modification is still continued.

Data on cases collected within the routine surveillance suggest that influenza and influenza-like illness surveillance in Poland is still not sufficiently uniform and stable. Such assumption may only explain the differences observed between incidence in particular voivodeships and the age of infected persons. Improvement of these elements of surveillance should be a priority for the VSES employees.

Alarmingly low (decreasing tendency) percentage of persons vaccinated against influenza does not ensure significant reduction of influenza virus circulation in population. Simultaneously, it suggests the ineffectiveness of influenza vaccine promotion campaigns conducted so far. Thus, there is a necessity to search for new methods to convince the population to the idea of vaccination. Increased acceptance of vaccination in healthcare settings and constant opposition to anti-vaccination movements should be the priorities in this respect.

Received: 29.07.2014.
Accepted for publication: 13.08.2014

Addresses for correspondence:
Mirosław P Czarkowski
Department of Epidemiology, National Institute of Public Health-NIH
Chocimska 24, 00-791 Warsaw
e-mail: mpc@pzh.gov.pl

Ewelina Hallmann-Szelińska
Department of Influenza Research
National Influenza Centre
National Institute of Public Health-NIH
Chocimska 24, 00-791 Warsaw
tel. 22 54 21 274
e-mail: ehallmann@pzh.gov.pl

[*)] Data do not sum up to 100% as a person could be referred to hospital due to several reasons.

[**)] Data do not sum up to 100% due to co-infections.