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SALMONELLOSIS IN POLAND IN 2011

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ABSTRACT

THE PURPOSE OF THE STUDY. To assess the epidemiological situation of salmonellosis in Poland in 2011 as compared with previous years.
MATERIALS AND METHODS. The assessment was based on the results of analysis of the data from the newsletter "Infectious diseases and poisonings in Poland 2011", information from laboratories of sanitary-epidemiological stations and reports of epidemiological investigations performed in outbreaks of salmonellosis, sent by the sanitary-epidemiological stations to the Department of Epidemiology and also on the data from the Department for Demographic Research, Central Statistical Office. For the purpose of surveillance disease were classified in accordance with the current case definition.
RESULTS. In 2011, the total number of cases of zoonotic salmonellosis registered in Poland was 8 813. Out of it 8 652 cases were of intestinal salmonellosis and 161 of parenteral. The overall incidence was 22.9/100 000. Over 95% of cases met criteria of confirmed case. The number of registered cases was the lowest ever recorded, indicating a continuing downward trend in incidence of salmonellosis in Poland. Maintains a high percentage of hospitalization, almost 70% of people infected with zoonotic *Salmonella* – but in outbreaks the figure is more than two and a half times lower and is less than 27%. The incidence was highest among children less then five years old. No deaths were registered with the salmonellosis indicated as the underlying cause. In 2011 there were reported 174 outbreaks caused by *Salmonella*, in which 1774 people fell ill. They were mostly small family outbreaks. Still the most common etiologic factor in Poland is S. Enteritidis. In 2011, fraction of *Salmonella* rods without confirmed species increased by 13% compared to 2010. In the province of Pomorskie it was the highest and reached 45%.
CONCLUSION. A very high percentage of hospitalized cases of salmonellosis that persists for many years at 70%, testifies to the recognition and reporting mostly the more severe cases. This means that reporting of salmonellosis in Poland is largely under-diagnosed and underreported. The fact that increasing the percentage of *Salmonella* that are not serotyped is another problem of concern.

Keywords*: salmonellosis infections, digestive, intestinal salmonellosis, salmonellosis parenteral, epidemiology, Poland, 2011*

Among the bacterial diseases presented with gastroenteritis salmonellosis is still most frequently reported infection in Poland. *Salmonella* infections can occur in the form of intestinal or parenteral one. Both forms of the disease are subject to mandatory reporting and recording in Poland. The purpose of the study is to assess the epidemiological situation of salmonellosis in Poland in 2010, as compared with the previous years.

MATERIALS AND METHODS

The analysis of the epidemiological situation of salmonellosis in Poland in 2011, was based on data from the annual newsletter "Infectious diseases and poisonings in Poland in 2011" (NIPH-NIH, GIS, Warsaw 2012). Additionally, another data sent to the NIPH-NIH by the regional sanitary-epidemiological stations: epi-

demiological investigations form foci and information from laboratories sanitary-epidemiological stations. The incidence of intestinal salmonellosis are classified based on the definition of the European Commission, and salmonellosis parenteral based on the definition developed in the country for the purpose of epidemiological surveillance. Definitions used in routine surveillance since 2009 are available on the http://www.pzh.gov.pl/oldpage/epimeld/inne/Def_PL2_Rob_1h.pdf.

RESULTS

In 2011, the total number of registered incident cases of zoonotic salmonellosis in Poland was 8 813 (incidence 22.9 /100 000) (Table I). It was the lowest annual number of cases so far recorded. This indicates a continuing downward trend in the number of registered cases of salmonellosis in the country. Compared to 2010, it was 919 fewer reported cases, but in relation to the median for the years 2005 - 2009 this number was reduced by 2 891 cases. The proportion of hospitalizations is still very high and stands at nearly 70%. This is especially apparent when compared to the percentage observed at the beginning of the 90s, which amounted

Table II. Salmonellosis in Poland in 2011. Number of cases and percentage by case definition and province

Province	Cases of salmonellosis				Total	
	confirmed		probable			
	number	%	number	%	number	%
POLSKA	413	4,7	8 400	95,3	8 813	100,0
1. Dolnośląskie	17	5,5	293	94,5	310	100,0
2. Kujawsko-pomorskie	38	6,9	511	93,1	549	100,0
3. Lubelskie	32	5,5	551	94,5	583	100,0
4. Lubuskie	0	0,0	135	100,0	135	100,0
5. Łódzkie	26	4,9	505	95,1	531	100,0
6. Małopolskie	10	1,3	746	98,7	756	100,0
7. Mazowieckie	89	4,7	1 807	95,3	1 896	100,0
8. Opolskie	1	0,7	135	99,3	136	100,0
9. Podkarpackie	68	11,2	540	88,8	608	100,0
10. Podlaskie	0	0,0	248	100,0	248	100,0
11. Pomorskie	47	7,0	620	93,0	667	100,0
12. Śląskie	14	2,2	619	97,8	633	100,0
13. Świętokrzyskie	4	1,9	211	98,1	215	100,0
14. Warmińsko-mazurskie	7	1,2	574	98,8	581	100,0
15. Wielkopolskie	42	6,7	581	93,3	623	100,0
16. Zachodniopomorskie	18	5,3	324	94,7	342	100,0

Data sources: Annual reports on cases of infectious diseases and poisonings in Poland (MZ-56)

Table I. Salmonellosis in Poland in 1985-2011. Number of cases, incidence per 100 000 population, percentage of hospitalization and number of deaths

Year	Intestinal salmonellosis [1]			Extraintestinal salmonellosis [2]			Total			
	No. of cases	Incidence rate	% hosp.	No. of cases	Incidence rate	% hosp.	No. of cases	Incidence rate	% hosp.	No. of death
1985-1989[3]	26 622	70,7	37,9	22 726	67,5	48,7	49 242	130,7	42,9	17
1990	28 352	74,4	43,6	21 155	55,5	44,9	49 507	129,9	44,2	16
1991	31 144	81,4	46,4	20 983	54,9	47,1	52 127	136,3	46,7	12
1992	24 558	64,0	49,5	17 503	45,6	50,0	42 061	109,6	49,7	8
1993	19 220	50,0	47,4	11 934	31,0	48,8	31 154	81,0	47,9	6
1994	36 277	94,1	47,6	67	0,17	94,0	36 344	94,3	47,6	5
1995	30 029	77,8	49,7	64	0,17	85,9	30 093	78,0	49,8	3
1996	26 052	67,5	52,1	54	0,14	88,9	26 106	67,6	52,2	8
1997	23 157	59,9	53,7	49	0,13	93,9	23 206	60,0	53,8	3
1998	26 675	69,0	52,7	64	0,17	95,3	26 739	69,2	52,8	3
1999	23 381	60,5	62,7	55	0,14	83,6	23 436	60,6	62,8	7
2000	22 712	58,8	64,9	87	0,23	93,1	22 799	59,0	65,0	6
2001	19 788	51,2	66,7	93	0,24	88,2	19 881	51,5	66,8	5
2002	20 575	53,8	67,8	113	0,30	91,2	20 688	54,1	68,0	7
2003	16 496	43,2	72,5	121	0,32	90,1	16 617	43,5	72,7	6
2004	15 818	41,4	70,7	140	0,37	89,3	15 958	41,8	70,8	6
2005	15 815	41,4	70,1	191	0,50	91,1	16 006	41,9	70,3	8
2006	13 210	34,6	71,3	152	0,40	94,7	13 362	35,0	71,6	4
2007	11 568	30,3	70,4	136	0,36	93,4	11 704	30,7	70,6	1
2008	9 478	24,9	70,6	130	0,34	90,8	9 608	25,2	70,8	6
2009	8 855	23,2	69,3	117	0,31	93,2	8 972	23,5	69,6	6
2010	9 549	25,0	69,7	183	0,48	86,3	9 732	25,5	70,0	4
2011	8 652	22,5	69,4	161	0,42	93,2	8 813	22,9	69,9	3

1) change in registration: until 1993 only food poisoning, since 1994, food poisoning and other gastrointestinal infections
2) change in registration: up to 1993 other salmonellosis than food poisoning, since 1994, only extraintenstinal infections
3) medians
Data sources: Infectious diseases and poisonings in Poland. NIZP-PZH, MZiOS / GIS. Warsaw, Annual Reports:1985-2011

Table III. Salmonellosis in Poland in 2005-2011. Number of cases and incidence per 100 000 population by voivodeship

Province	Salmonellosis - total						Extraintestinal salmonellosis					
	2005-2009 (median)		2010		2011		2005-2009 (mediany)		2010		2011	
	No. of cases	Incidence rate	No. of cases	Incidence rate	No. of cases	Incidence rate	No. of cases	Incidence rate	No. of cases	Incidence rate	No. of cases	Incidence rate
POLSKA	11 704	30,7	9 732	25,5	8 813	22,9	136	0,36	183	0,48	161	0,42
1. Dolnośląskie	548	19,0	360	12,5	310	10,6	6	0,21	5	0,17	2	0,07
2. Kujawsko-pomorskie	765	37,0	622	30,1	549	26,2	15	0,73	9	0,43	15	0,71
3. Lubelskie	950	43,7	508	23,6	583	26,8	3	0,14	0	0,00	6	0,28
4. Lubuskie	254	25,2	201	19,9	135	13,2	6	0,59	13	1,29	2	0,20
5. Łódzkie	774	30,2	652	25,7	531	20,9	5	0,20	14	0,55	6	0,24
6. Małopolskie	1 023	31,3	718	21,7	756	22,6	9	0,27	26	0,79	10	0,30
7. Mazowieckie	1 689	32,6	1 794	34,3	1 896	35,9	17	0,33	23	0,44	24	0,46
8. Opolskie	261	25,0	154	15,0	136	13,4	4	0,38	3	0,29	4	0,39
9. Podkarpackie	985	47,0	805	38,3	608	28,6	9	0,43	7	0,33	7	0,33
10. Podlaskie	482	40,4	464	39,0	248	20,6	5	0,42	6	0,50	5	0,42
11. Pomorskie	754	34,2	712	31,8	667	29,3	14	0,63	9	0,40	23	1,01
12. Śląskie	853	18,3	856	18,5	633	13,7	20	0,43	33	0,71	27	0,58
13. Świętokrzyskie	346	27,2	268	21,1	215	16,8	5	0,39	1	0,08	5	0,39
14. Warmińsko-mazurskie	536	37,6	537	37,6	581	40,0	3	0,21	7	0,49	6	0,41
15. Wielkopolskie	971	28,8	700	20,5	623	18,1	19	0,56	18	0,53	7	0,20
16. Zachodniopomorskie	421	24,9	381	22,5	342	19,8	7	0,41	9	0,53	12	0,70

Data sources: Infectious diseases and poisonings in Poland. NIZP-PZH, MZiOS / GIS. Warsaw, Annual Reports:2005 -2011

Table IV. Salmonellosis in Poland in 2005-2011. Number of cases, incidence per 100 000 population, and percentage of cases by age

Age group	Salmonellosis - total								Extraintestinal salmonellosis							
	2005-2009 (median)		2010			2011			2005-2009 (median)		2010			2011		
	No. of cases	Incidence rate	No. of cases	Incidence rate	%	No. of cases	Incidence rate	%	No. of cases	Incidence rate	No. of cases	Incidence rate	%	No. of cases	Incidence rate	%
Total	11 704	30,7	9 732	25,5	100,0	8 813	22,9	100,0	136	0,36	183	0,48	100,0	161	0,42	100,0
0	1 143	303,4	926	221,7	9,5	751	188,9	8,5	9	2,27	15	3,59	8,2	12	3,02	7,5
1	1 371	373,1	1 158	278,4	11,9	1 003	236,8	11,4	7	1,75	3	0,72	1,6	7	1,65	4,3
2	962	268,6	863	215,4	8,9	824	190,4	9,3	3	0,84	5	1,25	2,7	3	0,69	1,9
3	737	209,8	643	169,3	6,6	744	177,8	8,4	1	0,29	1	0,26	0,5	1	0,24	0,6
4	523	149,3	521	141,8	5,4	540	137,0	6,1	1	0,28	2	0,54	1,1	2	0,51	1,2
0 - 4	4 740	262,6	4 111	207,5	42,2	3 862	186,9	43,8	19	1,06	26	1,31	14,2	25	1,21	15,5
5 - 9	1 376	72,9	1 148	64,4	11,8	1 205	66,5	13,7	3	0,17	4	0,22	2,2	6	0,33	3,7
10-19	1 181	23,6	804	17,9	8,3	711	16,4	8,1	1	0,02	5	0,11	2,7	5	0,12	3,1
20-29	896	14,0	680	11,0	7,0	551	9,1	6,3	5	0,08	8	0,13	4,4	6	0,10	3,7
30-39	711	13,3	588	10,2	6,0	464	7,8	5,3	7	0,14	10	0,17	5,5	9	0,15	5,6
40-49	647	12,4	447	9,3	4,6	377	7,8	4,3	9	0,18	12	0,25	6,6	12	0,25	7,5
50-59	907	16,0	680	11,8	7,0	552	9,5	6,3	28	0,50	29	0,50	15,8	29	0,50	18,0
60 +	1 246	18,4	1 274	17,2	13,1	1 091	14,2	12,4	64	0,94	89	1,20	48,6	69	0,90	42,9

Data sources: Infectious diseases and poisonings in Poland. NIZP-PZH, MZiOS / GIS. Warsaw, Annual Reports:2005 -2011

to just over 40%. It indicates that the laboratory tests are done mainly for people who require hospitalization and rare ordering of laboratory tests by primary care physicians in a patient with gastroenteritis.

As in previous years, the disease occurred primarily in the summer. The increase in the number of cases was observed in May, the peak was reached in August, a marked decrease in the number of cases occurred in November (Fig. 1).

Over 95% of all registered cases of salmonellosis met the criteria for a confirmed ones (Table II). The largest proportion of probable cases reported in the Podkarpackie (11.2%) and Dolnośląskie (11.1%). No probable cases were reported of in the Lubuskie and Podlaskie.

Table V. Salmonellosis in Poland in 2011. Outbreaks of foodborne infections caused by *Salmonella* involving 30 cases and more

Number of cases	Number of hospitalization	Etiological agent (*Salmonella* serotype)	Setting of outbreak occurance	Place of outbreak occurance		Month
(children age 0-14)				province	district	
143 (0)	0 (0)	Enteritidis	Prison	dolnośląskie	Wrocław	July
101 (76)	3 (2)	Enteritidis	Resort	zachodniopomorskie	kamieński	July
99 (96)	3 (3)	Enteritidis	Kindergarten	zachodniopomorskie	Koszalin	October
52 (2)	5 (1)	Enteritidis	Resort	pomorskie	pucki	October
51 (21)	11 (6)	Enteritidis	School	podkarpackie	dębicki	October
40 (9)	4 (2)	Enteritidis	Weeding House	podkarpackie	dębicki	October
37 (9)	4 (1)	Enteritidis	House	mazowieckie	otwocki	September
36 (6)	13 (4)	Enteritidis	Weeding House	łódzkie	zduńskowolski	August
31 (30)	0 (0)	Enteritidis	Kindergarten	mazowieckie	Warszawa	April
31 (31)	1 (1)	Enteritidis	Kindergarten	mazowieckie	Warszawa	May
31 (4)	5 (0)	Enteritidis	Restaurant	śląskie	Rybnik	August
30 (10)	10 (3)	Enteritidis	House	lubelskie	radzyński	June

Table VI. Salmonellosis in Poland in 2010-2011. Number of cases by serotype and province

Serotype of *Salmonella*	Poland		Province															
	2010*	2011	Dolnośląskie	Kujawsko-pomorskie	Lubelskie	Lubuskie	Łódzkie	Małopolskie	Mazowieckie	Opolskie	Podkarpackie	Podlaskie	Pomorskie	Śląskie	Świętokrzyskie	Warmińsko-mazurskie	Wielkopolskie	Zachodniopomorskie
Total	9 733	8 814	310	549	583	135	532	756	1 896	136	608	248	667	633	215	581	623	342
Enteritidis	7 163	6 783	266	439	488	113	360	658	1 411	101	548	175	344	413	150	471	544	302
Typhimurium	561	484	19	27	33	9	25	29	114	13	31	30	10	36	25	25	39	19
Infantis	235	99	5	12	4	2	6	15	11	6	10	2	2	14	1	3	3	3
Mbandaka	343	89	-	-	-	-	4	22	4	2	1	-	-	55	-	-	-	1
Virchow	175	73	1	3	6	4	6	2	19	2	-	10	2	4	-	4	9	1
Agona	35	15	-	-	-	1	5	2	3	-	2	-	-	-	1	-	-	1
Derby	14	15	1	1	-	1	-	1	3	-	-	4	-	2	-	-	1	1
Hadar	28	15	-	1	-	-	-	-	9	-	1	-	2	1	-	-	1	-
Newport	16	15	1	-	1	2	-	2	2	-	-	1	-	-	-	3	3	-
Saintpaul	28	12	-	-	3	-	1	1	1	1	-	1	1	2	-	1	-	-
Kentucky	14	9	-	1	2	-	-	-	-	-	1	-	-	2	-	1	2	-
Schleissheim	9	8	-	-	-	-	-	3	-	1	3	-	-	-	1	-	-	-
Abony	4	7	-	-	-	-	1	-	1	-	5	-	-	-	-	-	-	-
Indiana	4	7	-	-	1	-	-	-	2	3	-	-	-	1	-	-	-	-
Chester	5	6	-	-	1	-	1	1	-	-	-	-	-	-	-	2	1	-
Other	110	62	-	5	6	3	-	1	9	5	3	7	5	7	3	1	4	3
not determined	989	1 115	17	60	38	-	123	19	307	2	3	18	301	96	34	70	16	11

* The difference of one in relation to the number of registered cases (in Śląskie province two serotypes: S. typhimurium i S. infantis were isolated from 2-year-old child)

Data sources: Annual reports on salmonellosis cases by an etiological agent and age sent to the Department of Epidemiology, NIPH-NIH by the provincional sanitary-epidemiological station

In 2011, a significant decrease in the incidence of zoonotic salmonellosis (at least 5% compared to the previous year) was observed in 12 provinces - the largest in the Podlaskie (almost 40%) (Table III). However, in the provinces of Lubelskie and Warmińsko-Mazurskie there was a significant increase in the incidence of which in Lubelskie by almost 14%.

In 2011 there were registered 161 cases of parenteral salmonellosis (incidence 0.42/100 000), with 22 cases less than in 2010 and 25 more than the median for the years 2005-2009.

As in previous years, most of the cases of unspecified salmonellosis were children under the age of five, with the highest incidence (236.8/100 000) occurred in children under the age of 2 (Table IV). But, parenteral salmonellosis was usually diagnosed in children under one year of age, and the incidence was 3.02 /100 000, which was lower than in 2010 and higher than the median for the period 2005-2009 (Table IV).

Table VII. Salmonellosis in Poland in 2011. Number of cases by serotype and age

Typ serologiczny *Salmonella*	Total		Age group												
	liczba	%	0	1	2	3	4	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60 +
Total	8 814	100,0	751	1 003	824	744	540	3 862	1 206	711	551	464	377	552	1 091
Enteritidis	6 783	77,0	526	721	632	595	440	2914	991	561	441	389	304	423	760
Typhimurium	484	5,5	55	69	51	29	17	221	54	38	28	17	13	34	79
Infantis	99	1,1	17	10	4	6	1	38	4	6	5	4	4	12	26
Mbandaka	89	1,0	17	16	7	7	3	50	1	5	5	2	3	3	20
Virchow	73	0,8	16	3	1	1	2	23	3	7	4	6	5	6	19
Agona	15	0,2	-	-	2	2	1	5	1	-	1	1	1	2	4
Derby	15	0,2	1	1	-	-	-	2	1	1	2	-	1	3	5
Hadar	15	0,2	1	1	1	-	-	3	-	-	3	2	-	2	5
Newport	15	0,2	4	4	1	-	1	10	-	-	-	-	-	1	4
Saintpaul	12	0,1	1	3	1	-	-	5	-	3	2	-	-	-	2
Kentucky	9	0,1	-	-	2	-	-	2	-	-	1	-	1	1	4
Schleissheim	8	0,1	4	1	-	-	-	5	-	1	-	-	-	1	1
Abony	7	0,1	3	1	-	-	-	4	-	1	1	-	-	-	1
Indiana	7	0,1	2	1	1	-	-	4	-	-	-	-	1	1	1
Chester	6	0,1	-	-	2	1	-	3	-	-	1	-	-	1	1
other	62	0,7	14	5	-	2	-	21	1	8	4	3	7	4	14
not determined	1 115	12,7	90	167	119	101	75	552	150	80	53	40	37	58	145

Data sources: Annual reports on salmonellosis cases by an etiological agent and age sent to the Department of Epidemiology, NIPH-NIH by the provincional sanitary-epidemiological station

Table VIII. Salmonellosis in Poland in 2011. Results of bacteriological examinations of different groups of persons: cases, convalescents, carriers, contacts, food staff and others

Tested groups	Number of tested people	Number of people positive for *Salmonella*					
		Total	(%)	*S.* Typhi	*S.* Paratyphi	other *Salm.*	*Shigella*
Cases	26 147	1 851	7,1	-	-	1 851	-
Convalescents	7 795	3 177	40,8	-	-	3 177	-
Carriers	5 204	2 853	54,8	2	3	2 848	-
Contacts	12 801	1 157	9,0	-	-	1 157	-
Professionals	420 910	1 130	0,3	1	1	1 128	-
other	27 480	19	0,1	-	-	19	-

Data sources: Annual reports on results of laboratory tests for Salmonella and Shigella sent to the Department of Bacteriology NIPH-NIH by provincional sanitary-epidemiological station

According to data of CSO (Central Statistics Office), in 2011 there were three deaths in Poland in which the primary cause of death was salmonellosis.

In 2011 under the surveillance of food-borne infections it were reported 174 outbreaks caused by *Salmonella*. In total, in these outbreaks 1 774 people became ill, which as in previous years, amounted to about of 20% of all registered cases of intestinal salmonellosis. They were mostly small family outbreaks. There were reported 12 larger outbreaks, defined as 30 or more cases.

In the five more than 50 patients were ill, including two over 100 (Table V). In the 160 outbreaks (almost 92% of all reported) etiological agent was *S.* Enteritidis, *S.* Typhimurim was found in four, in two *S.* Infantis and in one *S.* Stanley. In addition, two outbreaks were caused simultaneously by two *Salmonella* serotypes – in one outbreak it was *S.* Enteritidis and *S.* Typhimurim and in the another one *S.* Typhimurimi and *S.* Derby. In four outbreaks *Salmonella* serotype was not identified. As compared to over 70% of all hospitalized persons infected with zoonotic *Salmonella* in 2011, the proportion of hospitalized cases in outbreaks was significantly lower and amounted to less than 27%.

In the 12 largest outbreaks of salmonellosis, occurred a total of 651 cases, of which 54 were hospitalized. In all these outbreaks an etiologic agent was *S.* Enteritidis. More information about outbreaks of food infection caused by *Salmonella* will be found in the article "Food poisoning and infection" (pp.1-10).

In 2011, among the five most common serotypes causing disease in all regions of Poland the most frequent etiological factor both in outbreaks and sporadic diseases, remains *S.* Enteritidis (Table V, VI). This serotype has caused nearly 77% of the total number of cases of salmonellosis (Table V, VI), an increase of almost 4% compared with the reports in 2010. *S.* Typhimurium, which still ranks second among serotypes, in 2011, caused 77 cases less than in 2010. In 2011, also number of reported cases caused by *S.* Infantis and *S.* Mbandaka was significantly smaller. Also, it was reported more than two times less cases caused by *S.* Virchow.

In 2011, again the percentage of isolates that do not specify *Salmonella* serotype – increased by almost 13% as compared to 2010. Just as in 2010, more than 45% of the isolates of serotype was not identified in the Pomorskie province, while in Łódzkie in 23%, in Świętokrzyskie in 16% and 15% Śląskie (Table V).

In 2011, the number of people working with food tested for *Salmonella,* was unchanged since 2010, while the difference between 2009 and 2011 is approximately 11% (Table VIII). In 2011, the proportion of people with a positive test result was 0.3% and was lower than in 2010 when it was 0.5%.

SUMMARY AND CONCLUSIONS

1. In 2011, the number of cases of zoonotic salmonellosis registered in Poland was 8 813 (incidence 22.9/ 100 000). This number indicates, the downward trend in the number of registered cases of salmonellosis maintains in the country.
2. Throughout the country the most common etiological factor in both outbreaks and sporadic cases is *S*. Enteritidis, and the share of infections caused by this type amounted to nearly 77% of the total number of *Salmonella* cases.
3. The number of tests performed for carrier detection among persons working with food remains at a similar level as in 2010 and it is much lower than in the previous years (about 11%). However, the percentage of respondents with a positive result was lower than in 2010 (0.5%) and it was only 0.3%.
4. Sustained since 2003 high proportion of hospitalization, at around 70% indicated that in Poland are diagnosed and reported mainly more severe cases of salmonellosis, which require hospital treatment. This fact suggests that of salmonellosis in Poland are largely under-diagnosed and under registered.

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