

Invasive bacterial diseases: national surveillance in Italy and vaccination coverage in the Local Health Agency 4 "Chiavarese", Liguria Region (Italy)

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Key words

Invasive bacterial diseases • Surveillance • Immunization policies • Vaccination coverage

Summary

Introduction. In 2007 in Italy, the National Institute of Health published a new protocol for the National Surveillance of Invasive Bacterial Diseases, in order to enhance the notification system of these diseases and to improve immunization strategies. Available vaccines to prevent these diseases were introduced for the first time into the 1999-2000 National Immunization Plan (NIP) (vaccination against *Haemophilus influenzae* type b) and the 2005-2007 NIP (vaccination against *Streptococcus pneumoniae* and *Neisseria meningitidis* serogroup C).

We evaluated the frequency of invasive diseases, on the basis of the number of notifications, the different immunization strategies in the Italian Regions and the vaccination coverage in Local Health Agency 4 "Chiavarese" (LHA) in the Liguria Region (Italy).

Materials and methods. We evaluated the number of notifications of invasive diseases collected by the national databank coordinated by the ISS (Informative System of Infectious Diseases, SIMI) from 1994 to 2011. We also examined regional regulations concerning immunization policies. Immunization coverage was calculated by means of the "OASIS" software (version 9.0.0) used in our LHA.

Results and discussion. Available data indicate that the large-scale vaccination policy begun in 1999 in Italy has led to a great reduction in *Haemophilus influenzae*-related diseases in the pediatric age. Meningococcal diseases have declined to a lesser degree; this is due to the more recent introduction of vaccination against serogroup C (in 2005), the variability of the immunization strategies adopted in the different Italian Regions and the availability of the vaccination against serogroup C only in the

pediatric age. The diseases caused by *Streptococcus pneumoniae* seem to have increased since 2007 because of the implementation of the Surveillance of Invasive Diseases Program and the subsequent notification of all invasive diseases (not only meningitis). Furthermore, the various Italian Regions have adopted different immunization strategies against this disease, too.

We evaluated vaccination coverage in LHA 4 from 2003 to 2008. VC levels against *Haemophilus influenzae* are excellent; the objective indicated in the 2005-2007 NIP ($\geq 95\%$) has therefore been reached. Vaccination coverage levels against *Streptococcus pneumoniae* and *Neisseria meningitidis* serogroup C at the 24th month of age are also good. However, we need to implement specific immunization strategies for adolescents, since the vaccination coverage levels are not completely satisfactory.

Conclusions. The improvement of the national invasive disease surveillance system has provided better knowledge of the size of the problem and the impact of immunization strategies on the incidence of invasive bacterial diseases.

Furthermore, immunization policies in Italy display territorial heterogeneity. Vaccination coverage levels against *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Neisseria meningitidis* at the 24th month in LHA 4 are very high. In adolescents (15 year-olds) the immunization coverage are good but needs to be improved through specific strategies, such as raising the awareness of healthcare workers, involving general practitioners and educating the target population.

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Introduction

Neisseria meningitidis, *Haemophilus influenzae* type b and *Streptococcus pneumoniae* are bacteria that cause serious invasive infections such as meningitis, sepsis and pneumonia with bacteremia [1]. These diseases are a major cause of morbidity and mortality, and carry high rates of complications [2]. According to their clinical presentation, a specific etiologic diagnosis is essential for both therapy and primary prevention. Today, there are many vaccines against these infections [3]. It is therefore important to estimate the number of vaccine-preventable illnesses and the impact of the vaccination policies implemented.

In 2007 in Italy, the National Institute of Health (Istituto Superiore di Sanità, ISS) published a new protocol for the National Surveillance of Invasive Diseases caused by *Neisseria meningitidis*, *Streptococcus pneumoniae* and *Haemophilus influenzae* [4]. The objective was to potentiate immunization strategies by improving the notification system of these diseases. Given the availability of vaccines to prevent these diseases, a recommendation for routine vaccination against *Haemophilus influenzae* type b was introduced into the 1999-2000 National Immunization Plan (NIP) [5]. In accordance with the 2005-2007 NIP [6], which recommends vaccination against *Neisseria meningitidis* serogroup C and *Streptococcus pneumoniae* at the national level only for at-risk groups,

the Regional Health Authorities have introduced these vaccinations into pediatric immunization schedules; furthermore, some Regional Authorities have adopted additional strategies, offering these vaccinations to other targets, too [7].

We conducted a survey to assess the frequency of invasive diseases, on the basis of the number of notifications, and the different immunization strategies in the Italian Regions. Furthermore we evaluated the vaccination coverage (VC) in the Local Health Agency 4 “Chiavarese” (LHA) in the Liguria Region.

Materials and methods

We obtained data on the frequency of some invasive diseases caused by *Haemophilus influenzae*, *Neisseria meningitidis* and *Streptococcus pneumoniae* in Italy from the report published by the Ministry of Health based on the national notifications of infectious diseases databank coordinated by the ISS (SIMI) [4]. Furthermore, we examined regional regulations concerning immunization policies [8-13]. Immunization coverage was calculated by means of the “OASIS” software (version 9.0.0) used in our LHA.

Tab. I. *Haemophilus influenzae*-related diseases (broken down by year and age-class) [4].

Year	Age-class								TOTAL
	0	1 - 4	5 - 9	10 - 14	15 - 24	25 - 64	> 64	n.a.	
1994	32	41	3	2	1	1	4	2	86
1995	44	59	6	0	1	4	1	1	116
1996	46	66	2	4	0	9	1	2	130
1997	42	43	2	0	2	5	3	2	99
1998	43	38	3	4	1	4	3	0	96
1999	26	37	4	0	1	11	5	0	84
2000	21	17	0	1	2	9	6	1	57
2001	10	19	2	1	0	10	12	0	54
2002	9	6	5	2	0	12	4	0	38
2003	8	8	1	0	0	14	4	0	35
2004	3	2	2	0	2	6	4	0	19
2005	2	4	1	1	2	12	8	0	30
2006	3	2	0	1	0	11	3	0	20
2007	1	3	0	0	1	13	20	0	38
2008	2	4	1	2	0	18	22	0	49
2009	6	3	0	0	1	18	26	0	54
2010	7	3	1	0	3	28	28	0	70
2011*	2	1	0	1	2	8	10	0	24

*partial data

Tab. II. Meningococcal-related diseases (broken down by year and age-class) [4].

Year	Age-class								TOTAL
	0	1-4	5-9	10-14	15-24	25-64	>64	n.a.	
1994	17	42	17	12	28	31	11	6	164
1995	27	39	18	6	60	40	9	1	200
1996	27	29	14	13	35	42	8	1	169
1997	24	39	18	14	39	34	12	2	182
1998	17	31	24	11	30	33	9	0	155
1999	34	41	29	17	51	78	25	0	275
2000	28	41	30	16	58	68	8	1	250
2001	16	40	23	16	42	50	16	0	203
2002	22	50	16	11	53	55	9	1	217
2003	28	56	22	19	59	77	12	4	277
2004	34	83	27	33	63	90	10	3	343
2005	31	56	38	18	69	84	27	1	324
2006	19	35	13	13	28	57	10	4	179
2007	17	39	15	11	41	46	10	4	183
2008	22	24	16	18	38	51	11	0	180
2009	16	36	19	21	37	49	9	0	187
2010	26	27	18	9	20	40	10	0	150
2011*	7	12	11	8	21	24	6	0	89

*partial data

Tab. III. Pneumococcal-related diseases (broken down by year and age-class) [4].

Year	Age-class							n.a.	TOTAL
	0	1 - 4	5 - 9	10 - 14	15 - 24	25 - 64	> 64		
1994	9	10	3	7	2	42	34	1	108
1995	14	15	11	3	9	87	37	2	178
1996	10	15	5	6	6	90	48	2	182
1997	20	18	9	2	14	97	68	2	230
1998	19	25	4	7	14	105	82	2	258
1999	13	22	5	2	13	153	95	3	306
2000	17	20	6	6	7	124	62	1	243
2001	16	30	4	4	6	104	65	3	232
2002	22	24	9	2	6	98	63	4	228
2003	22	31	7	7	11	120	108	2	308
2004	19	19	6	3	5	131	112	5	300
2005	17	25	3	5	7	124	105	4	290
2006	11	24	8	3	7	111	103	3	270
2007	22	49	11	6	4	225	202	5	524
2008	35	63	24	12	8	222	327	0	691
2009	34	51	18	8	10	276	339	2	738
2010	29	57	17	11	7	314	413	3	851
2011*	5	21	6	0	6	97	173	0	308

*partial data

Results

Tables I-III show the numbers of notifications of invasive diseases received by the Ministry of Health from 1994 to 2010. The available data indicated a great reduction in *Haemophilus influenzae*-related diseases in the pediatric age. The reduction in Meningococcal diseases caused by all the circulating serogroups in Italy proved to be less marked. Diseases caused by *Streptococcus pneumoniae* seem to have increased since 2007. Figure 1 shows variability in the vaccination policies against *Streptococcus pneumoniae* and *Neisseria meningitidis* serogroup C on the basis of regional regulations concerning the immunization strategies adopted in the various Italian Regions.

Figures 2-4 show vaccination coverage against *Haemophilus influenzae* type b, *Pneumococcus*, and *Meningococcus* serogroup C at the 24th month of age in LHA 4 from 2003 to 2008. *Haemophilus influenzae* VC was 95% during the period considered. From 2006 Meningococcal VC was 90% or more. Finally, immunization coverage against *Streptococcus pneumoniae* was 90% or more in the last 4 years of the period. Figure 5 shows Meningococcal C VC in adolescents (cohorts 1990-1994): in the cohorts 1992, 1993 and 1994, Meningococcal VC was consistently above 70%.

Discussion

This study presents the number of notifications of invasive diseases collected by the national databank coordinated by the ISS and the current immunization policies for anti-Hib, anti-pneumococcal and anti-meningococcal C vaccinations adopted in Italian Regions [7].

The great reduction in *Haemophilus influenzae*-related diseases in the pediatric age is due to the large-scale vac-

cination policy begun in 1999 in Italy. Prior to the recommendation for routine vaccination, Hib was the most common cause of bacterial meningitis and a major cause of other invasive bacterial diseases in Italian children (Tab. II). The less marked reduction in Meningococcal diseases is due to the fact that vaccination against serogroup C was introduced more recently (in 2006); furthermore the immunization strategies adopted in the various Italian Regions vary (Fig. 1), and vaccination against serogroup C is only available in the pediatric age. The diseases caused by *Streptococcus pneumoniae* seem to have increased since 2007. This can be ascribed to the implementation of the Surveillance of Invasive Diseases Program and the subsequent notification of all invasive diseases (not only meningitis). Furthermore, the various Italian Regions have adopted different immunization strategies against this disease, too.

Levels of VC against *Haemophilus influenzae* are excellent; the objective indicated in the 2005-2007 NIP has therefore been reached. VC against *Streptococcus pneumoniae* and *Neisseria meningitidis* serogroup C at the 24th month of age are also good. However, we need to implement specific immunization strategies for adolescents, as VC among these subjects is not completely satisfactory.

Conclusions

The national invasive diseases surveillance system has clearly been improved by the introduction of the Specific Surveillance Program. This has provided better information on the size of the problem and the impact of immunization strategies on the incidence of invasive bacterial diseases.

Furthermore, immunization policies in Italy display territorial heterogeneity, sometimes with differences even

Fig. 1. Immunization policies for pneumococcal and meningococcal disease, 2011.

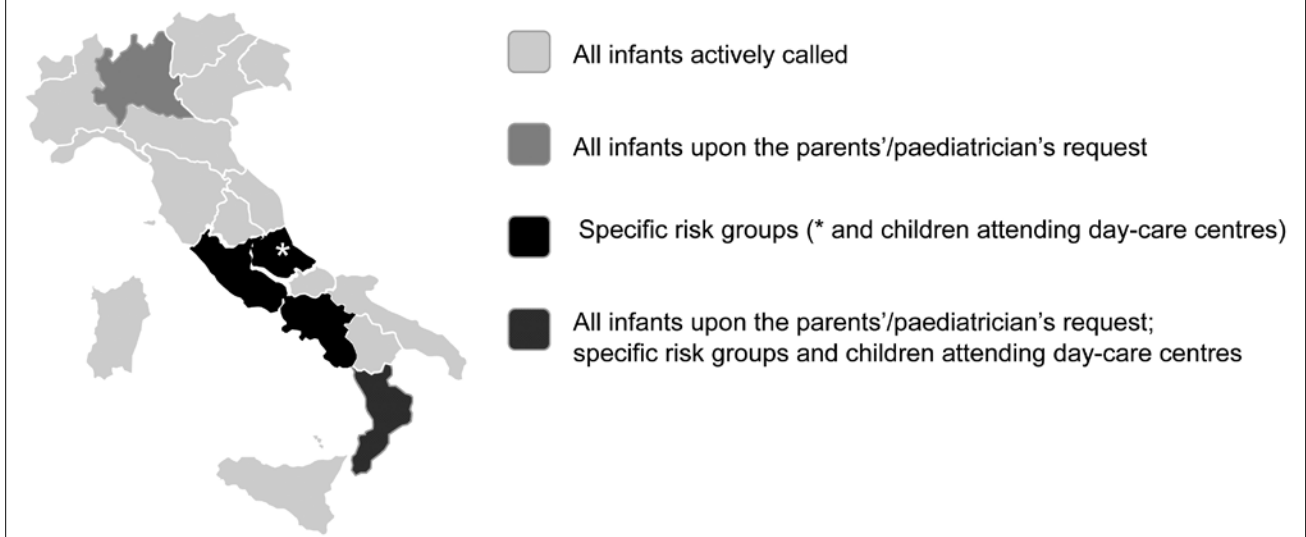


Fig. 2. Vaccination coverage against *Haemophilus Influenzae* type b at 24th month in the LHA 4 "Chiavarese".

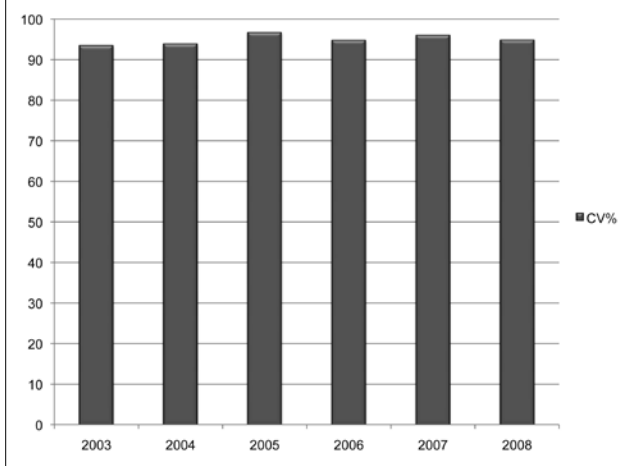


Fig. 3. Vaccination coverage against *Streptococcus Pneumoniae* at 24th month in the LHA 4 "Chiavarese".

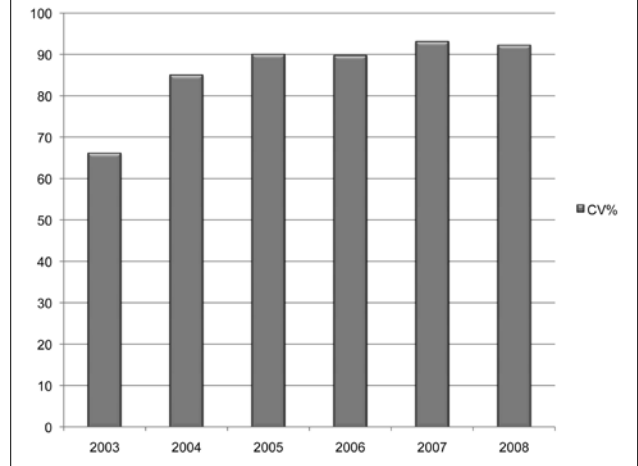


Fig. 4. Vaccination coverage against *Neisseria Meningitidis* at 24th month in the LHA 4 "Chiavarese".

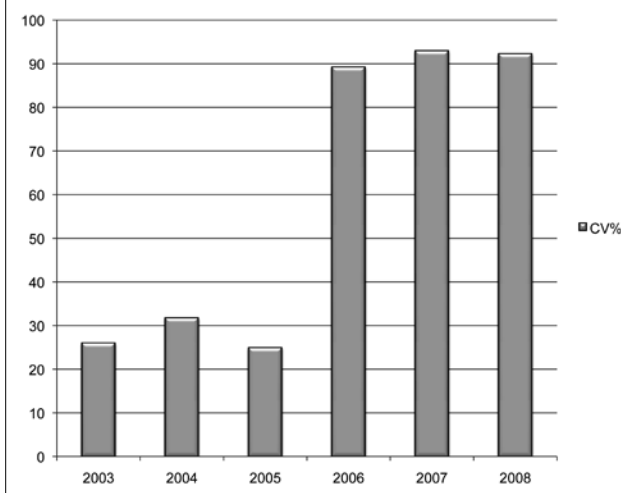
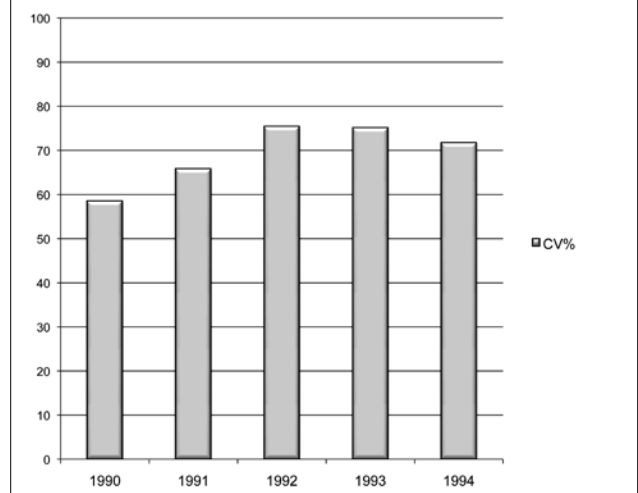


Fig. 5. Vaccination coverage against *Neisseria Meningitidis* at 15th year of age in the LHA 4 "Chiavarese".



within the same Region. Just two months ago, on March, the Italian Ministry of Health published the new NIP 2012-2014, where the vaccinations against Pneumococcus and Meningococcus C are recommended not only for risk groups but also for all newborn; the vaccination against Meningococcus C is also recommended to adolescents [14].

The levels of VC against *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Neisseria meningitidis* at the 24th month of age in LHA 4 are very high. VC in adolescents (15 year-olds), though good, needs to be improved through specific strategies, such as raising the awareness of healthcare workers, involving general practitioners and educating the target population.

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