Discussion

In general, the locum service and general practice ILI surveillance patterns were similar both retrospectively from 1998 to 2002 and prospectively during 2003 and 2004. When comparing the two systems, we had anticipated there would be a higher proportion of patients with an ILI from the locum service, having assumed that doctors from the locum service would see a higher proportion of acutely unwell patients. This was the case each year but may also have been due to the different case definition of ILI used in the two systems. While there has been no validation of the locum GPs' diagnosis of influenza, we have shown that, even when using the case definition for influenza, influenza infection is confirmed by laboratory testing in only 35%-50% of patients with ILI seen in sentinel general practices. However this increases with the GP's confidence in the diagnosis of influenza [12]. We believe it is unlikely that the diagnostic approach of the 65 locum service GPs would be substantially different to that of the 41 metropolitan sentinel GPs.

Coordination of sentinel influenza surveillance in Victoria is relatively costly and time consuming. In contrast, the marginal cost of the locum service surveillance is negligible, since routinely collected data is analysed and forwarded to VIDRL by the locum service. This process does not require any additional effort from the locum doctors, since they routinely record consultation information and a working diagnosis for each patient. Compared to sentinel surveillance, locum service surveillance can be managed in a more timely fashion, with data accessible at any time from a password protected website. For the successful inclusion of locum service data, however, the service needs a sophisticated information technology environment and a commitment to issues related to population health.

Virological confirmation of a selection of specimens from sentinel GPs is an important part of understanding the causes of ILI [10,12]. Logistic problems related to the collection of swabs from patients seen by doctors from the locum service include maintaining specimens at 4°C and transporting specimens to the laboratory. These problems have not yet been resolved. We have shown, however, that the locum service can supplement ILI surveillance data from sentinel general practices, albeit without virological testing. Nonetheless, because of its timeliness, flexibility, patient mix and geographic spread, locum service surveillance may have a role in the recognition of emerging disease patterns. This is likely to be true not only in Australia but also in countries of the European Union.

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ORIGINAL ARTICLES

Surveillance report

A STRATEGY TO INCREASE AND ASSESS VACCINE COVERAGE IN THE NORTH OF PORTUGAL

G Gonçalves [1], M Assunção Frutuoso [2], M Carmo Ferreira [2], M Graça Freitas [3]

In the Northern Health Region of Portugal, vaccine coverage is measured by checking and studying individual vaccination records in health centres. Each year from 2001-2004, birth cohorts who were over 2, 6 and 14 years of age were selected for assessment. Data collection occurred on January the following year and meetings with district immunisation coordinators took place every March. For all vaccines and birth cohorts considered, vaccine coverage values observed in the north of Portugal were excellent. In this paper, we make comparisons with published international data on vaccine coverage and discuss validity issues; we believe that no serious biases have affected the validity of our vaccine coverage data but comparisons with international data must be addressed with caution; the methods we used have been useful in increasing vaccination coverage.

1. Instituto Gulbenkian de Ciência, Oeiras, Portugal.
2. Centro Regional de Saúde Pública do Norte, Porto, Portugal.
3. Direcção-Geral da Saúde, Lisbon, Portugal.

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Introduction

In Portugal, vaccines are given free of charge in health centres of the National Health Service (NHS), following the schedule and technical guidelines of the Portuguese National Vaccination Programme (PNVP) [1]. Some NHS hospitals give BCG and vaccine against hepatitis B (HBV) to newborns. Vaccination outside the NHS is extremely rare. In some special circumstances covered by Portuguese law, immunisation against tetanus and diphtheria might be compulsory, but globally, the PNVP is recommended, but not mandatory. There are no financial or non-monetary incentives for health workers or PNVP coordinators.

Vaccine coverage was estimated using routine data on the number of doses given by age group, as numerators, and the numbers of newborns (discounting infant deaths) as denominators. Data on vaccine coverage has been published [2-5] and the strengths and weaknesses of the estimation method were discussed [6]. Meanwhile, in order to get more valid and precise data on vaccine coverage, an alternative method was used in some local surveys, checking individual vaccination records [7,8].

At health centres, vaccination files are organised by year of birth. Each person has an individual paper record, in which information on the vaccine manufacturer, batch and date of administration is recorded, for each vaccine dose given. Recently, some health centres have computerised their vaccination databases as part of a national computerised vaccine registration initiative. To be registered in a health centre vaccination file, a citizen must be born in the geographic area served by the health centre or have moved into it; citizens have the legal right to be vaccinated at the location that is most convenient for them (for example: in the area where the child's mother works). In this case, the health centre creates a new record and later informs the health centre in the person's area of residence. Records are removed from the active file whenever a patient dies, moves to another area or is vaccinated at another health centre; these records are not destroyed but do not count for statistical purposes. Immigrants, including illegal immigrants, have free access to vaccination inside the PNVP.

The Northern Health Region (NHR) of Portugal includes five districts and 3 021 511 residents; the proportion of those below 15 years of age is 22.8% (20.0% in Portugal as a whole – 2001 Census) [9]. In the NHR, vaccines included in the schedule of the PNVP are given in 425 health units belonging to the Portuguese NHS. The Northern Health Region authority is responsible for coordinating the vaccination programme in the area, and so we designed and implemented a strategy to measure and improve vaccine coverage. This paper briefly describes that approach.

Methods

For each year (2001-2004) coverage targets were set, specific to each vaccine and birth cohort. Vaccine coverage assessment was carried out in early January the following year, and a meeting took place every March with the 5 district coordinators to discuss performance in the previous year and to set the targets for the current year. As resources were limited, we decided to concentrate on some cohorts each year and moving on to the next cohorts in the following year [TABLE 1]. We decided to measure vaccine coverage by birth cohort at a certain moment in time, instead of coverage at x years of age, which would have meant studying more cohorts.

TABLE 1

Chronology of activities of vaccine coverage assessment by birth cohort, North of Portugal, 2001-2006

Birth Cohort	Evaluation in Month / Year					
	May 2001	January 2002	January 2003	January 2004	January 2005	January 2006
2004						• Preliminary
2003					• Preliminary	Final
2002				• Preliminary	Final	
2001			• Preliminary	Final		
2000		• Preliminary	Final			
1999	• Preliminary	Final				Final
1998					• Final	
1997				• Final		
1996		• Preliminary	Final			
1995	• Preliminary	Final				
1994 and 1993						
1992						• Preliminary
1991					• Preliminary	Final
1990				• Preliminary	Final	
1989			• Preliminary	Final		
1988		• Preliminary	Final			
1987	• Preliminary	Final				

Birth cohorts chosen were children who were 2, 6 and 14 years of age in the year of the target. In January that year each cohort was subjected to a preliminary assessment, and a final evaluation was performed the following January [TABLE 1]; we thought that this method of assessing vaccine coverage could induce local activities (catch-up) to improve the situation, since health professionals were motivated to meet targets. Due to local staff complaints, we had to negotiate skipping preliminary counts of some cohorts in the year they were 5 years old.

In order to measure vaccine coverage, each individual record of 12 birth cohorts was studied, in all health centres. Data collection was the responsibility of local staff at the health centre level. Each district was responsible for checking and aggregating local data. At the March meeting only district and regional aggregates were analysed.

We compared the total number of individual vaccination records checked and studied with the number of live newborns from resident mothers in NHR, discounting infant deaths.

Vaccines assessed were [1]:

- **BCG**: (Bacille Calmette-Guérin): recommended to newborns.
- **DTP**: diphtheria-tetanus-pertussis (whole cell) vaccine; 3 doses recommended at 2, 4, 6 months of age and booster doses at 18 months and 5-6 years; since 2002, a combined DTPwHib vaccine has been given

in the first year of life; previously, Hib had been given separately.

• **Td**: combined vaccine against tetanus and diphtheria, with reduced amount of diphtheria toxoid; recommended at 10-13 years of age and every 10 years for the rest of life.

• **OPV**: oral polio vaccine; 3 doses recommended at 2,4,6 months of age and a booster at 5-6 years.

• **MMR**: combined vaccine against measles, mumps and rubella, recommended at 15 months of age (introduced in 1987); since 1990, a second dose has been recommended at 10-13 years of age; in 2000 the second dose of MMR was given earlier, at the age of 5-6 years, but cohorts born before 1993 will continue to receive the 2nd dose at 10-13 y.

• **HBV**: hepatitis B vaccine; since 2000, recommended in the first year of life with the schedule 0, 2, 6 months; older cohorts will maintain the previously recommended schedule of 3 doses at age 10-13 (schedule 0, 1, 6 months).

Results

The proportion of individual vaccination records studied (compared with live births minus infant deaths) varied between 94.0% and 101.8% [TABLE 2] in the studied cohorts.

TABLE 2

Comparison between the number of vaccination records studied and live births, by year of birth, North of Portugal, 1987-2002

Year of birth	A No. of records checked	B No. of live births*	% (A/B) x 100
1987	40 856	43 442	94.0
1988	41 362	43 070	96.0
1989	40 594	41 473	97.9
1990	39 650	40 462	98.0
1995	35 387	36 698	96.4
1996	37 639	37 878	99.4
1997	39 207	38 650	101.4
1998	38 520	38 311	100.5
1999	36 969	38 392	96.3
2000	38 096	38 997	97.7
2001	37 035	36 382	101.8
2002	35 921	36 680	97.9

* Discounting infant deaths.

Vaccine coverage values in the final assessments did not show important differences between districts and thus data is presented for the whole Northern Health Region.. Coverage data by vaccine (and number of doses) and birth cohort can be observed in Tables 3, 4 and 5. Vaccine coverage was higher in younger cohorts (those born 1999 to 2002). There is a moderate tendency to the improved coverage over time with any vaccine considered [Table 1], [TABLES 3-5], except BCG [TABLE 3]. Intermediate evaluations detected coverage values below those observed in final assessments, in which coverage for specific vaccines/doses ranged from 91.6% [TABLE 5] to 99.5% [TABLE 3]. For the cohort born in 1989, a more detailed analysis was performed, concerning MMR vaccination independently of the age at vaccination: 94.2% had received two doses of MMR, 5.0% were vaccinated only once and 0.8% received no dose of MMR; this means that 99.2% had received at least one dose.

Tables 6 and 7 summarise some international comparisons on vaccine coverage. Vaccine coverage data from the Northern Health Region of Portugal, described in Tables 3 and 5 should be compared respectively with data from tables 6 and 7.

TABLE 3

Vaccine coverage (%) by vaccine and year of birth among children over 2 years of age, Northern Health Region of Portugal

Vaccine / Dose No.	Year of Birth			
	1999	2000	2001	2002
BCG	n.a.	99.0	99.5	98.2
DTP 3	98.4	98.7	99.2	98.9
OPV 3	98.3	98.7	99.2	99.1
HBV 3	93.3	98.7	99.1	99.1
MMR	97.6	97.4	97.7	98.4

n.a. = not assessed.

TABLE 4

Vaccine coverage (%) by vaccine and year of birth among children over 6 years of age, Northern Health Region of Portugal

Vaccine / Dose No.	Year of birth			
	1995	1996	1997	1998
DTP *	94.6	94.1	95.5	96.4
OPV *	94.7	94.1	95.9	98.2
MMR **	94.6	93.3	94.6	95.0

* Booster doses at 5-6 years of age; previous vaccination history was checked but not recorded.

** MMR given at 5-6 years of age; MMR given in the 2nd year of life was not checked.

TABLE 5

Vaccine coverage (%) by vaccine and year of birth among young adults over 14 years of age, Northern Health Region of Portugal

Vaccine / Dose No.	Year of birth			
	1987	1988	1989	1990
Td	95.5	96.4	96.7	96.7
HBV 3	92.5	91.6	92.6	95.6
MMR 2 *	93.4	94.5	94.2	96.0

* Second dose of MMR.

Discussion

Among cohorts born between 1999 and 2002, vaccine coverage for all the vaccines [TABLE 3] was higher in the North Health Region than in Portugal as a whole [5,10], the United States [11] and Canada [12]. Vaccine coverage with BCG [TABLE 3]. was similar to that estimated for Finland and higher than in several other European Union (EU) countries [5,10] [TABLE 6], but comparability is affected by different international policies on primary immunisation [13,14]; BCG coverage was higher than that estimated for any of the WHO regions [14]. Coverage with 3 doses of vaccine against diphtheria, tetanus, pertussis and poliomyelitis was similar with that observed in Finland and Sweden, and higher than in the remaining EU countries [5,10], while coverage with the first dose of MMR [TABLE 3] was very similar with that observed in Finland [5] and Canada [12] and higher than in the remaining EU countries [10]. Coverage values with three doses of HBV of cohorts born 1999-2002 in the Northern Health Region of Portugal were higher than those in cohorts born in 1991-1992, in the Lazio Region of Italy [15] and higher than in the remaining EU countries in 2000 [10] [TABLE 6]. HBV coverage in the Northern Health Region was also above values reported for most countries in the world where there is universal infant vaccination in 1999 [16].

TABLE 6

Vaccine coverage (%) by vaccine at 2 years of age. International comparisons

Country/Year [ref]	Vaccine/doses				
	BCG	DTP 3	OPV/ IPV 3	HBV 3	MMR
Portugal 1995 [5]	94	93	95	n.a.	94
Portugal 2000 [10]	82	96	96	58	96
Portugal 2003 *	83.0	96.8	97.0	96.6	95.6
Finland 1995 [5]	100	100	100	n.a.	98
Finland 2000 [10]	99	98	95	n.a.	96
Sweden 1995 [5]	n.a.	99	99	n.a.	96
Sweden 2000 [10]	n.a.	99	99	n.a.	94
USA 2002 ** [11]	n.a.	94.9	90.2	89.9	91.6
Canada 1994 [12]	n.a.	92.8	89.0	0.9	97.2

* Unpublished data provided by the General Directorate of Health [Direcção-Geral da Saúde].

**Children aged 19-35 months, born between February 1999 – June 2001

n.a. = not available.

The proportion of children receiving DTP, OPV and MMR by 6 years [TABLE 4] was very high; previous vaccination history (before the age of seven) was checked but not recorded, making comparisons with other studies difficult. Nevertheless some international comparisons are possible in the case of vaccination against measles: coverage in the Northern Health Region [TABLE 5] was higher than that observed in a study among Greek schoolchildren (82.7%) [17] and in a French study at 6 years of age (90%) [18]. Routine statistics from the Portuguese Ministry of Health had shown high vaccine coverage values (90-95%) with the first dose of MMR, in the first two years of life [6], among these cohorts; since it is very likely that most of the 93.3-94.6% of children vaccinated at 5-6 years (in the north of Portugal) have then received the second dose of MMR, it is likely that the 5-9 age group in the Northern Health Region is below the seronegativity threshold (10%) proposed by the WHO to reach the objective of measles elimination [18]; we are expecting the results of the National Seroepidemiological Survey (NSS) to test this hypothesis.

Among teenagers, vaccine uptake was very high for all three vaccines and cohorts studied [TABLE 5]. For these cohorts as well, such a high proportion of individuals had received two doses of MMR (and at least one), that this is likely to have a very positive impact on the levels of immunity needed to measles elimination [18]. Coverage with two doses of MMR is above that observed in European [18] and American studies [19] [TABLE 7]. In our study, the proportion of teenagers (cohorts born in 1987-1989) receiving three doses of HBV [TABLE 5] was above that observed in most studies, all over the world [15,16,17,19] and similar to the coverage observed in a small rural community in Spain [20] [TABLE 7].

TABLE 7

Vaccine coverage (%) by vaccine among teenagers. International comparisons

Country/Year [ref]	Vaccine/doses	
	MMR 2	HBV 3
Italy 1996 [15]	n.a.	50.2
Greece 1998 [17]	58.7	19.6
France 2002 [18]	50 *	n.a.
USA 1998 [19]	70.0	15.8
USA 1999 [19]	92.6	68.5
Picassent (Valencia, Spain) 2002 [20]	89.6-96.3	90-98

* At 7 years of age. Above 7 years it has been impossible to distinguish between 1st and 2nd doses.

n.a. = not available.

Vaccine coverage values observed in northern Portugal are excellent. For several reasons, we believe that no serious biases have affected the validity of vaccine coverage data in Tables 3-5:

- The number of individual records studied is very close to the number of newborns (less infant deaths) in all cohorts assessed [TABLE 2]. The gap between the number of records studied and the number expected by vital statistics, though always small, increases in older cohorts; as time elapses, it is more likely that potential errors occur, especially those depending on people's mobility.
- Vaccination by the private sector and/or financial (or other) incentives have been pointed out as potential factors affecting validity of vaccine coverage data [20]; this is not the case in Portugal.
- We had previously conducted a small survey, studying individual vaccination records from a non-representative sample of health centres [8] to assess vaccine coverage in the 1999 birth cohort: the results were not significantly different from those reported in Table 3.
- We believe that checking directly all available vaccination records leads to more reliable vaccine coverage estimates than using statistics based on the number of doses given per year [22] and demographic statistics.
- We do not know how much the use of computerised data recently implemented has affected the validity of our estimates, but it has been argued that, as new vaccines are added to the immunisation programmes, the use of the traditional written records becomes obsolete and that computerised databases will minimise errors and produce more reliable data [20].

In any case, an important check of validity of our vaccine coverage data is likely to come from the pending results of the NSS.

The precise age at vaccination was not recorded in our study, so we could not estimate the proportion of vaccinations performed later than the recommended age, probably induced by the assessment method itself. Nevertheless, taking into account the age group considered and the epidemiological situation in Portugal, this should not be critical for control issues and possible elimination of target diseases.

Coverage levels in the intermediate assessment have always been some points lower than in the final percentages; that can be explained by the age at consultation of the files, in the case of MMR, but the most likely explanation for the other vaccines is that catch-up activities were undertaken to improve coverage values. In one of the annual meetings we presented a method to tackle the issue of detecting delays in the vaccination schedule: first, people should be contacted by post and if this was not successful, by telephone; as a final resort, the family should be visited at home (vaccines are not given at home). This was based in the experience of an urban health centre, but district and local coordinators were given freedom to choose the best strategy for each community. On the other hand, the discussion among professionals, comparing coverage data between health centres and/or districts might also have been relevant as a motivational strategy. The approach we used is still underway [TABLE 1], and after some years, birth cohorts will begin to be assessed a second time, increasing the probability that good coverage values will be reached, supported by more reliable data. This strategy leads to an additional workload for the professionals at local level and we wondered about the sustainability of the approach. Nevertheless, the process of building computerised vaccination databases may play a positive role [20] in the future, making work easier, more reliable and efficient.

Given that our vaccine coverage data is valid, we should ask ourselves if it is comparable with data from other countries. The issue of validity and comparability of vaccine coverage data, depending on the diversity of methodologies used, has been assessed in the context of developed [21,22] and developing[21] countries. This is very important, but we have no answer but to recommend caution when making comparisons. Meanwhile, there seems to be an agreement on some issues: careful assessments of validity of data derived from various sources should be done [21], methods to produce valid

vaccination coverage data on birth cohorts should be developed [22] and robust surveillance of vaccine coverage is indispensable [23].

To quote Szilagyi [24]: 'coupled with exciting data about declining rates of vaccine-preventable diseases, the rising national vaccination rates represent one of the great healthcare achievements of our time'. This fits the situation in Portugal very well.

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ORIGINAL ARTICLES

Euroroundup

QUALITY ASSURANCE FOR THE DIAGNOSTICS OF VIRAL DISEASES TO ENHANCE THE EMERGENCY PREPAREDNESS IN EUROPE

O Donoso Mantke [1], H Schmitz [2*], H Zeller [3*], P Heyman [4*], A Papa [5*], M Niedrig [1*]

The threat posed by emerging and re-emerging communicable diseases and, more recently, by the intentional release of infectious agents in a susceptible population, has been receiving considerable attention at the national and international levels. Public health efforts to strengthen disease detection, surveillance and control have been intensified. However, clinicians and clinical microbiology laboratories play an important role in the early detection of disease, the identification of the putative agent, and notification of the appropriate authorities. To be effective in this role, laboratories must be specially prepared to handle viral agents safely, and need, among other things, the appropriate rapid and sensitive diagnostic tests. In 1998 the European Network for Diagnostics of "Imported" Viral Diseases (ENIVD) was established. ENIVD presently comprises, as permanent members, 44 expert laboratories in 21 European Union (EU) member states and 4 non-EU countries and is one of the networks on infectious diseases funded by the European Commission. ENIVD fulfils many of the important tasks required for the surveillance and control of imported, rare and emerging viral infections such as the exchange of expertise and the organisation of external quality assurance (EQA) programmes, both of which are needed to improve

1. Centre for Biological Safety (ZBS-1), Robert Koch-Institut, Berlin, Germany.
2. Department of Virology, Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany.
3. Unit Biologie des Infections Virales Emergentes, Institut Pasteur, Lyon, France.
4. Research Laboratory for Vector-Borne Diseases, Queen Astrid Military Hospital, Brussels, Belgium.
5. A' Dept. of Microbiology, School of Medicine, Aristotelian University of Thessaloniki, Greece.
* Representing the members of the European Network for Diagnostics of 'Imported' Viral Diseases.