

Influenza vaccination coverage rates in Europe – covering five consecutive seasons (2001–2006) in five countries

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Objective To understand potential drivers and barriers to influenza vaccination in the general population.

Methods 47 982 household surveys were conducted in five European countries between 2001 and 2006.

Results Overall influenza vaccination coverage increased over the years and reached 26.2% in 2005/06. Among the elderly ≥ 65 years, the rate increased significantly to 67.8% (2005/06). The

most common reason for being vaccinated over the 5 years was the perception of influenza as a serious illness, which people want to avoid. The main reason for not getting vaccinated among those never previously vaccinated was feeling that they were unlikely to catch influenza. A recommendation by the family physician was the most encouraging factor for vaccination.

Key words Coverage, influenza, population, vaccination.

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Introduction

The severity of influenza and the efficacy of vaccination are well documented in the medical literature.^{1,2} Eradication of influenza is impossible but continuous immunization of the population can minimize the impact of the disease.³ In addition to providing substantial health benefits, vaccination may also be associated with significant economic benefits, not only among the elderly but also among healthy working adults and children. Despite this knowledge and ongoing efforts by policy-makers, physicians and other healthcare providers, influenza vaccination rates in the five European countries surveyed remain limited, with the additional effect that manufacturing capacity may be too low for producing a sufficient amount of an appropriate monovalent vaccine when a pandemic occurs.³

The WHO states that the risk of a new pandemic is at its highest level since the last pandemic in 1968.⁴ This situation might influence the immunization coverage rates in the population.

Published literature evaluating vaccination coverage rates in Europe shows that importance placed on influenza vaccination varies greatly between countries.³ Two recent studies covering several European countries have been published.^{5,6} This report is an update of the earlier work

by Szucs and Muller. We now have data available for five consecutive influenza seasons which allows us to go beyond the usual cross-sectional approach to analyzing vaccination rates. The main focus of this paper is on high-risk group coverage. A second objective is to understand the determinants for being or not being vaccinated, and to describe the populations' opinions regarding influenza and vaccination. In this context, we examine whether the threat of avian influenza had an impact on recent changes in vaccination coverage in the different countries.

Methods

This survey is an ongoing assessment of influenza coverage rates in France, Great Britain, Italy, Spain, and Germany. During five influenza seasons, 2001/02, 2002/03, 2003/04, 2004/05, and 2005/06, population-based telephone surveys were conducted in December and January (only December in Germany) among households representative of the populations. In Spain, no data were available for the season 2001/02. The data for France stem from an annual survey conducted by Groupe d'Expertise et d'Information sur la Grippe (GEIG), using a questionnaire mailed out in May. Approximately 2000 respondents were included in each country in each season (47 982 in total). Based

on international recommendations,^{7–11} four target groups were specified.

1. Individuals aged ≥ 65 years
2. Individuals who suffer from a chronic illness
3. Individuals who work in the medical field
4. Combined group of individuals aged ≥ 65 years or who suffer from a chronic illness or who work in the medical field.

For example, in Germany the group of chronic illness sufferers is defined according to the German Standing Commission on Immunization, as children, adolescents and adults suffering from chronic diseases of respiratory organs, chronic cardiovascular or liver diseases, as well as nephropathies and diabetes, or other metabolic disorders. In our study, people suffering from heart diseases, pulmonary diseases, diabetes, or other chronic illnesses were included in the chronic illness group.

The survey questions have been published previously.⁶ The questions covered reasons to get vaccinated this winter, reasons for not getting vaccinated against influenza, and options that would encourage persons to get vaccinated against influenza. For the 2005/06 survey, questions on influenza pandemics and avian influenza were added.

The survey populations were representative of the adult population from age 14 years (Germany, Italy, Spain); from age 15 (France), or from age 16 (Great Britain). In Spain, persons above age 75 were not covered. Sample weights were applied to correct for small deviations from the applicable age and gender quota and the annual datasets were pooled.

Statistical evaluation used SPSS[®] version 13 for Windows. Bivariate associations of categorical variables were assessed using the chi-squared test. A chi-squared test for trend was used to assess time trends. In the case of continuous variables, differences of means were tested using one-way anova. For all statistical tests, two-sided $P = 0.05$ was used as the level of statistical significance. Ninety-five percent confidence intervals (CI) were reported as appropriate. Due to the descriptive nature of these data, no correction

for multiple testing was made. Covariates identified as predictors of influenza vaccination in univariate analysis were considered as candidates for multivariable analysis. Logistic regression was used to identify independent correlates of the outcome of interest, i.e. vaccination coverage.

Results

Demographic data

The overall sample consisted of 47 982 persons. In Table 1 an overview of the sample is given for the year 2005/06 only. In an earlier publication, similar data can be found for the years 2002/03 and 2003/04.⁶ Spain was expected to show a lower number of people over 65 years of age, as the survey covered only persons ≤ 75 years old. The reason for the great deviation in the number of chronic ill persons in Germany compared to other countries remains unclear as there is no difference in the way the question was asked in the five countries.

Vaccination rates in the general population

The overall vaccination coverage across countries, based on an average of the country samples, decreased from 22.5% (95% CI: 21.6–23.4%) in season 2001/02 to 21.3% (95% CI: 20.5–22.1%) in season 2002/03. Thereafter, it increased to 23.4% (95% CI: 22.6–24.2%) in season 2003/04, to 23.6% (95% CI: 22.7–27.1%) in season 2004/05, and to 26.2% (95% CI: 25.3–27.1%) in season 2005/06 (Figure 2). The increase between season 2004/05 and season 2005/06 was statistically significant ($P < 0.001$). This was mainly due to significant increases in immunization uptake in Germany and Italy, where the coverage increased to 32.5% and 24.1%, respectively, in 2005/06. Adjusting the overall vaccination rate in Europe (weighting the population sizes) resulted in an average vaccination rate of 26.8% in season 2005/06.

Vaccination rates were highly age-dependent. Older age was associated with higher vaccination rates. In season 2005/06 the immunization uptake across all countries was

Table 1. Overview of samples in season 2005/06

	Great Britain	Germany	Italy	France	Spain	All
<i>n</i>	2024	2011	2010	1967	2002	10 015
Mean age (years)	44.8	47.5	44.8	45.6	41.9	44.9
Aged ≥ 65 years (%) ¹	19.0	22.9	17.4	19.5	12.3	18.2
Male (%)	48.9	47.8	48.7	48.0	49.6	48.6
Healthcare workers (%) ²	6.6	7.3	3.7	5.8	5.1	5.7
Chronic illness (%) ³	14.2	22.8	13.7	15.6	10.2	15.3
Target group: 1, 2 or 3 above (%)	33.2	42.7	29.1	33.9	24.2	32.6

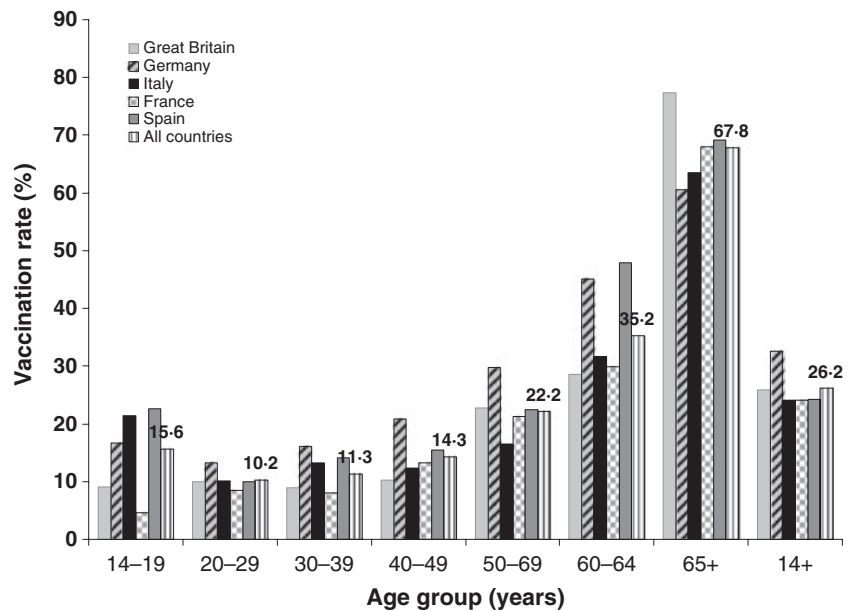


Figure 1. Profile of vaccinated population by age groups (2005/06).

higher for all age groups compared to the previous seasons (Figure 1). Across all five seasons, vaccination rates appeared to be associated with gender in Great Britain, Italy, and Spain. In Great Britain a higher vaccination rate was observed in women, whereas in Italy and Spain, the majority of the vaccinated were men (details not shown).

In the year 2005/06, 39.0% of the respondents expressed the intention to get vaccinated against influenza in the coming winter of 2006/07. Over the years, the proportion of those expressing such an intention was on average 36%, about 13% higher than the actual vaccination rate. The gap was highest in Germany (between 15% and 20% over the years) and almost non-existent in Italy in season 2005/06.

Vaccination coverage trends in target groups

The overall vaccination coverage rate in persons aged ≥ 65 increased over time (Figure 2). The increase between season 2004/05 and season 2005/06 was statistically significant ($P < 0.001$). Coverage in the elderly was highest in Great Britain (79%) and lowest in Germany and Italy (63.4%). It was significantly different from the population under 65 years of age. Since season 2003/04, data on health status in terms of chronic illness were collected. Persons with a chronic illness showed significantly higher vaccination coverage than those not suffering from a chronic disease (Figure 2). The highest coverage among the chronically ill persons was found in Great Britain (66.4%) and the lowest in France (51.8%). Working in the medical field did not seem to be a driving factor for vaccination as the vaccination coverage rate in this sub-population was not significantly different from the rest of the sample (Figure 2), at the unadjusted level. However, adjustment for age and

other covariates revealed the presence of an association (Table 2). For persons in the combined target group a significant difference in coverage was found compared to the non-target group population. The vaccination rate in this group increased over the years and the increase in season 2005/06 was significantly different from the previous season. The coverage rate in the combined target group was highest in Great Britain (60%) and lowest in Germany (49%). However, this result could be influenced by the observed difference in the proportion of chronically ill respondents in Germany (Table 1).

Table 2 shows unadjusted odds ratios for the target groups for the year 2005/06. Odds ratios across all seasons did not greatly differ from the 2005/06 results.

Adjusted odds ratios were investigated in logistic regression models. The adjustment took into account gender, age over 65 years, work in medical field, and chronic illness. For years where data on chronic illness were not available, data were only adjusted for the remaining covariates. The odds ratios for the combined target group were only adjusted for age. Multivariate adjustment showed significantly higher vaccination rates for healthcare workers in Great Britain (OR: 1.8, 95% CI: 1.5–2.2), France (OR: 1.7, 95% CI: 1.4–2.1), Italy (OR: 1.4, 95% CI: 1.1–1.9), and Spain (OR: 2.1, 95% CI: 1.6–3.6). The impact of chronic illness on the vaccination rate was significantly lower after multivariate adjustment, mainly due to taking into account the effect of age (Germany OR: 2.3, 95% CI: 2.0; 2.6, Italy OR: 5.0, 95% CI: 4.2; 6.0, France OR: 3.4, 95% CI: 2.7; 4.2 and Spain OR: 3.3, 95% CI: 2.8; 4.0). All other odds ratios were not substantially changed by multivariate adjustment (details not shown).

Table 2. Likelihood of vaccination coverage in target groups in season 2005/06 (unadjusted)

	Great Britain	Germany	Italy	France	Spain
Age ¹ (<65*/>65 years)					
OR (95% CI)	24.2 (18.2–32.1)	5.6 (4.5–7.0)	9.3 (7.2–11.9)	15.8 (12.1–20.6)	10.1 (7.8–14.2)
P-value	<0.001	<0.001	<0.001	<0.001	<0.001
Work in medical field ² (yes/no*)					
OR (95% CI)	0.8 (0.5–1.3)	0.7 (0.5–1.1)	0.7 (0.4–1.2)	0.9 (0.6–1.5)	1.6 (1.0–2.4)
P-value	0.383	0.127	0.183	0.750	0.032
Chronic illness ³ (yes/no*)					
OR (95% CI)	6.0 (4.6–7.8)	3.0 (2.4–3.7)	4.8 (3.7–6.3)	4.8 (3.7–6.2)	4.8 (3.5–6.4)
P-value	<0.001	<0.001	<0.001	<0.001	<0.001
Target group 1, 2 or 3 (yes/no*)					
OR (95% CI)	15.8 (12.4–20.1)	4.2 (3.4–5.1)	6.7 (5.3–8.3)	10.1 (7.9–12.8)	7.2 (5.7–9.0)
P-value	<0.001	<0.001	<0.001	<0.001	<0.001

OR, odds ratio; CI, confidence interval; P-value, Pearson chi-squared.

*Reference category.

Drivers and barriers to vaccination

For those who reported to have been vaccinated in season 2005/06, the most frequently stated reasons were that influenza is a serious illness that people want to avoid and that they have received a recommendation from their family physician or nurse (Table 3). In France the most commonly stated reason for vaccination was that the vaccine is provided free. Over the 5-year period, the ranking of the cause for getting vaccinated did not change substantially.

The proportion of respondents whose decision to get vaccinated was influenced by the recent attention given to avian influenza or a possible influenza pandemic varied from 13% in Germany to 1.3% in Spain. It was 8.6% in Great Britain, 4.1% in Italy, and 2.0% in France. Across all countries, the persons who gave the threat of avian influenza as a reason for vaccination were not found to be statistically different from other vaccinated persons (Table 3). Only the proportion of those vaccinated for first time was statistically higher among the group influenced by the attention given to avian influenza ($P < 0.001$).

For those of the total survey population who had never been vaccinated, the reasons for not being vaccinated varied across countries over the 5 years of observation. Overall, the most frequently stated reasons were no expectation of catching influenza, not having considered vaccination, and absence of a family physician's recommendation (Table 3).

The level of knowledge about influenza and the vaccine among the general population was similar across countries. Seventy-nine percent of the respondents agreed with the statement that *you can catch influenza even if you are vaccinated against it*. Sixty-eight percent agreed with the statement that *if you catch influenza after having had the*

vaccine, the infection is less severe. Fifty-eight percent said that *It is important to get the influenza vaccine each year and 52% agreed that the side effects associated with the vaccine (fever, headache...) are acceptable*. Most of the participants did not agree with the following statements: *the vaccine is not useful if you are in good health and if you have the vaccine, you will not catch influenza*.

A recommendation by the family physician or nurse, and receiving more information regarding the vaccine being efficacious and well tolerated were regarded as the most important factors that might encourage vaccination (Table 3). Data on this question were not available for France.

Discussion

The vaccination coverage rate in the total sample is currently 26.2% (season 2005/06). A statistically significant increment of 2.5% was observed between season 2004/05 and season 2005/06. This was mainly due to significant increases in immunization uptake in Germany and Italy. In Germany reimbursement of vaccination for all age groups has been implemented in several federal states to encourage vaccination rates.¹² This may explain the high coverage rates in Germany. A sub-analysis of the data obtained in Great Britain showed that Wales reached a vaccination rate of 33.3% in season 2005/06, higher than the German coverage rate (32.5%). The immunization rates in the defined high-risk target groups were also increased in season 2005/06. In particular, higher age and suffering from chronic illness were important predictors of vaccination. In the elderly ≥ 65 years, the lowest coverage was observed in Germany and Italy and the highest in Great Britain. In Great Britain

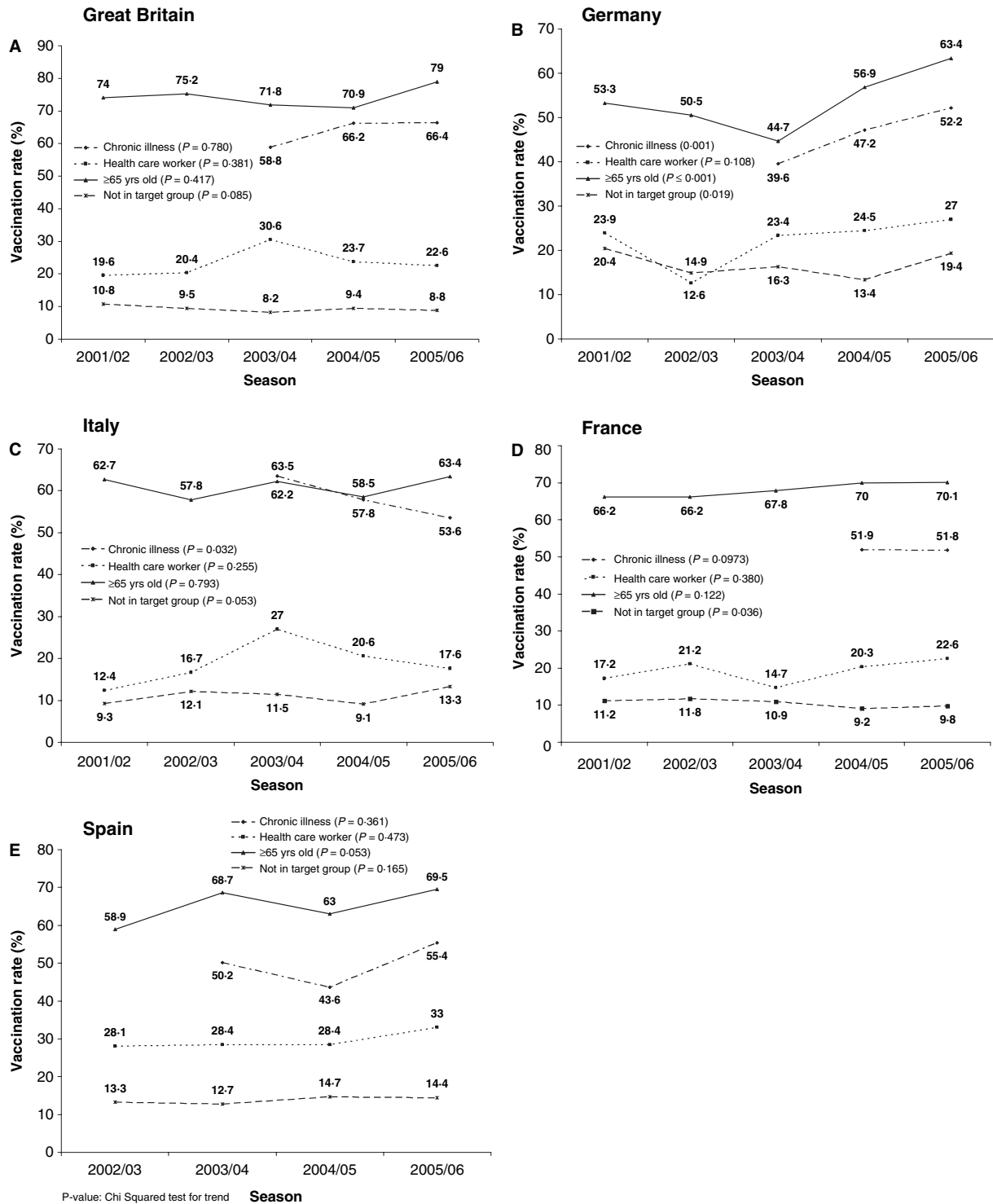


Figure 2. Trend curves for high-risk groups (unadjusted) in all five countries. (A) Great Britain. (B) Germany. (C) Italy. (D) France. (E) Spain.

general practitioners are encouraged to recommend vaccination to eligible high-risk patients, which may have contributed to the high vaccination rates in the target groups.⁹ In

Spain, vaccination coverage increased in those aged ≥ 60 after the age threshold of vaccination recommendations was reduced to age 60 in some communities.

Table 3. Ranking of opinions regarding flu vaccination among the total surveyed population (season 2005/06) – rank (%)

	All	Great Britain	Germany	Italy	France	Spain
Ranking of reasons influencing the decision for influenza vaccination						
Because influenza is a serious illness and I did not want to get it	2 (42)	2 (40)	1 (89)	2 (20)	3 (37)	2 (25)
My family physician/nurse advised me to do it	1 (46)	1 (52)	3 (66)	1 (41)	4 (35)	1 (48)
Because of my age	3 (33)	3 (37)	4 (36)	3 (19)	2 (40)	3 (24)
So that I do not pass influenza bug to my family and friends	5 (27)	4 (27)	2 (67)	5 (14)	5 (17)	5 (15)
Because it is free: the Social Security pays for it	4 (31)	5 (22)	5 (34)	8 (4)	1 (48)	4 (16)
Ranking of reasons influencing the decision for <i>not</i> getting vaccinated						
I do not think I am very likely to catch influenza	1 (34)	3 (30)	2 (44)	2 (21)	4 (15)	1 (63)
I have never considered it before	2 (33)	1 (37)	5 (31)	1 (35)	2 (22)	2 (42)
My family physician has never recommended it to me	3 (23)	2 (37)	4 (33)	4 (12)	3 (17)	3 (23)
I am too young to be vaccinated	4 (21)	4 (29)	12 (11)	5 (12)	1 (33)	4 (17)
Encouragements to receive an influenza vaccination						
If my family physician/nurse recommended it to me	67	1 (74)	1 (67)	2 (59)		1 (75)
If I had more information on the vaccine regarding efficacy and tolerance	67	2 (55)	2 (56)	1 (70)		2 (64)
If I knew more about the disease	33	3 (37)	3 (51)	3 (22)		5 (25)

As healthcare workers are in contact with patients, it is critical for this group to be vaccinated in order to reduce transmission of the disease. Additionally, they play an important role in the communication and motivation of the public to get vaccinated. However, the vaccination rate among healthcare workers remained low compared to the other high-risk groups. A recent published literature review identified low coverage rates in this professional group to be especially a problem in Europe,¹³ with vaccination rates between 12% and 25%.⁵ Our observation of coverage rates increasing from 19% to 25% over the years is consistent with earlier findings.

Considering the entire population, 39% of the 2005/06 respondents expressed the intention to get vaccinated in season 2006/07. The gap between those who intended to get vaccinated and those who actually received vaccination was stable over the years, at 13% on average. There was, however, substantial variation between countries. The persistence of this gap indicates the potential to increase vaccination coverage rates in Europe. However, realizing this potential, activating the correct drivers, and dealing with the barriers to vaccination remains a challenge. Only Italy seems to have been able to diminish the gap. In season 2003/04 the Italian vaccination campaign was intensified by the Ministry of Health due to the increased focus on severe acute respiratory syndrome.¹⁴ A realistic vaccination coverage rate target in Europe could be set at the level of vaccination intentions (39%).

In the general population, the characteristics of those who gave the attention to avian influenza – a possible influenza pandemic as a reason for vaccination – were not found to be statistically different from the rest of the vacci-

nated group. Nonsignificant trends hinted at a larger proportion of women and a slightly lower mean age of this relatively small subgroup. The majority of persons influenced by the attention given to avian influenza were those who were vaccinated for the first time.

In the general population, a recommendation from the family physician is the most important encouragement for vaccination. This confirms findings from several previous studies.^{5,15,16} It was also stated that more information on the vaccines regarding tolerability and efficacy would motivate persons to get vaccinated.

We did not cover the vaccination rates of schoolchildren in our article. However, high vaccination coverage in children and subsequent positive external effects will be difficult to achieve at least in some countries. This reason makes high vaccination rates in the risk populations even more important.

Telephone surveys are an appropriate method to investigate influenza vaccination uptake at the population level. Telephone interviews have been used on several occasions to study vaccination rates in Europe.^{6,17,18} The main advantage of telephone interviews is a potentially high response rate obtained in an affordable and fast manner. The selection process based on random dialing of telephone numbers has been shown to be of high quality.¹⁹ In France, the questionnaire was a self-administered mail survey. In mailed questionnaires, there is a high risk of respondents omitting questions and of a low return rate. On the other hand, mailed questionnaires are an even more affordable option for large-scale surveys.¹⁹

The limitations of the present data collection are described in greater detail in an earlier publication.⁶ An

increasing problem is the use of wireless telephones. In the USA people with landlines had a higher odds (1:27) of being vaccinated than those with only access to wireless telephones.²⁰ If this is believed to be similar in Europe, we might have slightly overestimated the vaccination rate. The different methodological approach used in France may have affected the reliability of the comparison across countries. This is supported by the fact that the French gave different reasons for and against vaccination compared to the other countries.

The WHO considers the current influenza pandemic risk to be at its highest level since the last pandemic.⁴ Hence, efforts should be made at all national and international levels to increase vaccination coverage according to the WHO objectives (i.e. 50% vaccination coverage to be reached in the elderly in 2006 and 75% in 2010).²¹ Among elderly ≥ 65 years, a vaccination rate of 50% or higher was reached in all the countries studied. So far, only Great Britain has reached the 2010 target of 75% with an immunization rate of 79% in season 2005/06. The existence of national targets may provide a partial explanation for this success.²²

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