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ORIGINALARBEIT

Trends in Influenza Vaccination Coverage Rates in Germany over Six Seasons from 2001/02 to 2006/07

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ABSTRACT

Background and Purpose: Influenza is a considerable health problem all over the world. Vaccination is the most important measure for preventing influenza and reducing morbidity and mortality. The aims of this study were to assess influenza vaccination coverage from 2001 to 2007 in Germany, to understand motivations and barriers to vaccination, and to identify vaccination intentions for season 2007/08.

Methods: In representative household surveys, 12,039 telephone interviews with individuals aged ≥ 14 years were conducted between 2001 and 2007. Essentially the same questionnaire was used in all seasons.

Results: In season 2006/07, the overall influenza vaccination coverage rate dropped from 32.5% in the previous season to 27.4%. In the elderly (≥ 60 years), the rate decreased from 51.6% to 44.7% and the odds ratio of being vaccinated, compared to those not belonging to a high-risk group, remained < 5. Chronically ill elderly persons had an odds ratio of vaccination of 7, while younger chronically ill persons and health-care workers had odds ratios of about 2. Perceiving influenza as a serious illness was the most frequent reason for getting vaccinated. 14% of those vaccinated in 2006/07 indicated the threat of avian flu as a reason. The main reason for not getting vaccinated was thinking not to be likely to catch the flu. A recommendation by the family doctor/nurse was perceived as the major encouraging factor for vaccination. A total of 44.7% of the respondents intended to get vaccinated against influenza in 2007/08.

Conclusion: A trend of increasing vaccination rates was observed from 2001 to 2006 in Germany, but the rates dipped by almost a sixth after 2005/06. The loss of media interest in the threat of avian influenza after February 2006 and stalling reimbursement programs may have contributed to the recent drop in vaccination rates.

Key Words: Influenza · Vaccination · Avian influenza · Population · Germany · Trend curves

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ZUSAMMENFASSUNG

Entwicklung der Influenzaimpfraten in Deutschland von 2001/02 bis 2006/07

Hintergrund und Ziel: Influenza stellt weltweit ein beachtliches Gesundheitsproblem dar. Die wirksamste Präventionsmaßnahme zur Senkung der

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There is ample evidence in the medical literature that influenza is a serious disease and that vaccination is efficacious and safe. Vaccination not only provides substantial health benefits, it may also be associated with significant economic benefits, not only among the elderly but also among healthy working adults and children. The German Standing Commission on Immunization (STIKO) currently recommends influenza vaccination for persons aged ≥ 60 years, persons with a chronic disease, persons with an increased professional risk, and, only if a larger epidemic disease outbreak or a pandemic occurs, also for the general public [1]. Since mid 2007 the vaccination is reimbursed if recommended by the STIKO [2]. In spite of ongoing efforts by physicians, other health-care providers and policy makers, influenza vaccination coverage is barely sufficient to contain the enormous disease burden.

The World Health Organization (WHO) and experts elsewhere maintain that the world is now closer to another influenza pandemic than at any time since the pandemic of 1968, the last of three in the previous century [3]. This situation underlines the importance of high immunization coverage rates in the general population, and particularly in subpopulations at high risk of influenza complications.

Previous publications based on cross-sectional data have reported influenza vaccination coverage rates for Germany [4–9]. Having available a consistent dataset for six consecutive seasons allows us to extend the usual cross-sectional approach to analyze vaccination rates.

This paper analyzes influenza vaccination coverage and related trends in Germany over six consecutive vaccination seasons, giving special attention to high-risk group coverage. Additional objectives are to understand the causal

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Mortalität und Morbidität ist die Schutzimpfung. Die Ziele der gegenwärtigen Untersuchung waren, die Influenzaimpfraten in Deutschland von 2001 bis 2007 zu analysieren, eine Einsicht in Einflussfaktoren auf die Impfbereitschaft zu erhalten sowie die Impfabsicht für den folgenden Winter 2007/08 zu erfragen.

☐ **Methodik:** Zufallsgesteuerte Telefonumfragen wurden während der Jahre 2001–2007 in 12 039 Haushalten durchgeführt. Die Stichprobengröße war repräsentativ für die nicht institutionalisierte deutsche Bevölkerung im Alter von ≥ 14 Jahren. Der verwendete Fragebogen war grundsätzlich in allen Jahren identisch.

☐ **Ergebnisse:** In der Grippesaison 2006/07 sank die Impfrate von 32,5% im vorherigen Jahr auf 27,4%. Bei den älteren Personen (≥ 60 Jahre) sank die Impfrate von 51,6% auf 44,7%. Personen ≥ 60 Jahre, welche chronisch krank waren, ließen sich weit häufiger impfen als jüngere chronisch Kranke oder die im Gesundheitswesen Tätigen. Der meistgenannte Beweggrund für eine Schutzimpfung war die Beurteilung, dass Influenza eine schwerwiegende Krankheit sei. 14% der geimpften Personen gaben als Grund die Furcht vor der Vogelgrippe an. Andererseits hielten es die meisten ungeimpften Personen für unwahrscheinlich, an Influenza zu erkranken. Eine Empfehlung vom Hausarzt oder durch Pflegepersonal war die stärkste Motivation für eine Impfung. Im Hinblick auf die Grippesaison 2007/08 beabsichtigten 44,7% der Befragten, sich impfen zu lassen.

☐ **Schlussfolgerung:** Die Studie zeigt, dass sich trotz der gegenüber 2005/06 um ein Sechstel gesunkenen Impfrate im Gesamtzeitraum von 2001 bis 2007 eine steigende Tendenz der Impfteilnahme in Deutschland abzeichnet. Das nachlassende Medieninteresse an der Bedrohung durch die Vogelgrippe nach Februar 2006 sowie Verzögerungen bei Programmen für die Rückerstattung der Impfkosten haben möglicherweise dazu beigetragen, dass sich die Impfraten in Deutschland kurzfristig verringert haben.

Schlüsselwörter: Influenza · Impfung · Vogelgrippe · Population · Deutschland · Trendkurven

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factors for being or not being vaccinated, to describe the motivations and barriers to vaccination, and to identify vaccination intentions for the season 2007/08.

Methods

This survey is part of an ongoing international assessment of influenza immunization uptake in Europe (France, Great Britain, Italy, Spain, Germany) [10]. During six influenza seasons, from 2001/02 to 2006/07, a population-based survey was conducted in December among German households, as part of an omnibus-type survey addressing different topics. Computer-assisted telephone interviews (CATI) were conducted by TNS healthcare (part of Taylor Nelson Sofres, London, UK) and the agreement of the interviewees was asked at the beginning of each call. There was no study intervention. Using quotas and weights based on data from official national sources assured that the reported sample of the survey (completed interviews) is representative of the noninstitutionalized German population aged ≥ 14 years in terms of gender, age, profession, region, and town size [8]. Four target groups based on national recommendations were specified [1, 11]:

(1) individuals aged ≥ 60 years;
(2) individuals who suffer from a chronic illness (e.g., chronic diseases of respiratory organs, chronic cardiovascular or liver diseases, nephropathies, diabetes or other metabolic disorders, some forms of multiple sclerosis, congenital or acquired immune deficiencies);
(3) individuals who work in the medical field;
(4) individuals belonging to one or more of the above groups 1, 2, and 3 (composite target group).

Accordingly, the non-target group comprised individuals belonging to neither of groups 1, 2, and 3. The survey questionnaire has been published earlier [8]. From season 2005/06 onward, questions on influenza pandemics and avian influenza were added to the questionnaire.

To correct for small deviations from the age and gender quotas requested, sample weights were applied, and the annual datasets were pooled. SPSS® version 14 for Windows was used for the statistical evaluation. The χ^2-test was used to assess bivariate associations of categorical variables, and the χ^2-test for trends was used to assess time trends of categorical variables. Two-sided $p \leq 0.05$ was set as the level of statistical significance for all statistical tests. 95% confidence intervals (CI) were reported where appropriate. Due to the descriptive nature of this data, no correction for multiple testing was made. Expected predictor variables were considered candidates for multivariable analysis, and logistic regression was used to identify independent correlates of the outcome of interest, i.e., vaccination coverage. Potential predictors of vaccination were gender, age, chronic illness, working as health-care professional, income, and level of education. The covariates were first included in the 2006/07 model and removed if not significant ($p > 0.05$). The regression models for all other seasons were based on the variables identified in season 2006/07.

Results

Demographic Data

For the 2006/07 coverage study, 60,870 telephone contacts were made (inclusive of busy signal or answering machine), resulting in 17,911 responses, of which 2,007 persons completed the interview (11.2% of responses, 3.3% of contacts) and 14,269 individuals refused.

Table 1. Overview of sample. CI: confidence interval.

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
Total respondents (n)	2,003	1,999	2,012	2,001	2,017	2,007
Mean age (years) (95% CI)	46.6 (45.8; 47.4)	46.9 (46.1; 47.7)	46.8 (46.0; 47.6)	47.3 (46.5; 48.1)	47.5 (46.7; 48.4)	47.5 (46.8; 48.4)
Male (%) (95% CI)	47.8 (47.3; 48.3)	47.8 (47.3; 48.3)	47.8 (47.3; 48.3)	47.9 (47.4; 48.4)	47.9 (47.4; 48.4)	48.1 (47.6; 48.6)
Age ≥ 60 years (%) (95% CI)	28.8 (28.5; 29.1)	29.6 (29.3; 29.9)	29.6 (29.3; 29.9)	24.3 (24.0; 24.7)	30.7 (30.4; 31.0)	31.0 (30.7; 31.3)
Work in the medical field (%) (95% CI)	6.7 (4.8; 8.7)	6.4 (4.5; 8.4)	6.4 (4.5; 8.5)	7.2 (5.3; 9.1)	7.3 (5.4; 9.2)	8.5 (6.6; 10.4)
Chronic illness (%) (95% CI)	–	–	23.3 (21.5; 25.1)	30.7 (22.6; 26.1)	22.7 (21.0; 24.5)	24.4 (22.3; 26.2)
Composite target group (%) (95% CI)	–	–	46.2 (45.8; 46.7)	47.4 (46.9; 47.9)	47.2 (46.7; 47.7)	48.8 (48.3; 49.3)

Since 2001 a total of 12,039 persons were interviewed. Table 1 gives an overview of the samples. The samples were composed similarly over the years and are representative of the population aged ≥ 14 years [8, 12].

Vaccination Coverage Rate

Influenza vaccination coverage dropped from 32.5% (95% CI 29.5%; 34.5%) in season 2005/06 to 27.4% (95% CI 25.4%; 29.4%) in season 2006/07 (Figure 1). This drop was borderline significant (p = 0.05). A drop similar in magnitude occurred from 26.8% (95% CI 24.8%; 28.8%) in season 2001/02 to 22.2% (95% CI 20.2%; 24.2%) in season 2002/03, the lowest vaccination coverage measured in this series of surveys. There was a steady increase thereafter to 26.4% (CI 24.4%; 28.4%) in season 2004/05, and a peak coverage rate of 32.5% (95% CI 29.5%; 34.5%) was reached in season 2005/06.

With respect to the coming winter of 2007/08, 44.7% of the interviewed intended to get vaccinated against influenza (Figure 1). Regarding season 2006/07, 47.5% had expressed such an intention.

The proportion of vaccinated persons who had also been vaccinated in the past decreased distinctly from 28.9% (95% CI 26.9%; 30.9%) of the total sample in season 2005/06 to 25.6% (95% CI 26.7%; 27.5%) in season 2006/07, but was still higher than in season 2004/05 (23.7%, 95 % CI 21.8%; 25.6%). By contrast, the proportion of persons who had been vaccinated in the past, but not in this season, increased markedly from 19.7% (95% CI 17.9%; 21.4%) of the total sample in season 2005/06 to 27.5% (95% CI 25.5%; 29.5%) in season 2006/07. The proportion of first-time immunizations (1.7%, 95% CI 1.2%; 2.2%) was only half that of the previous season, while the proportion of those who have never been vaccinated decreased from 47.5% (95% CI 45.3%; 49.7%) to 44.9% (95% CI 44.8%; 47.1%). The latter confirms a decreasing trend (p for trend across seasons < 0.001).

Vaccination Coverage in Target Groups

Vaccination coverage among those aged ≥ 60 years increased in seasons 2004/05 and 2005/06 (51.6%), just to fall back to 44.7% in 2006/07. In all

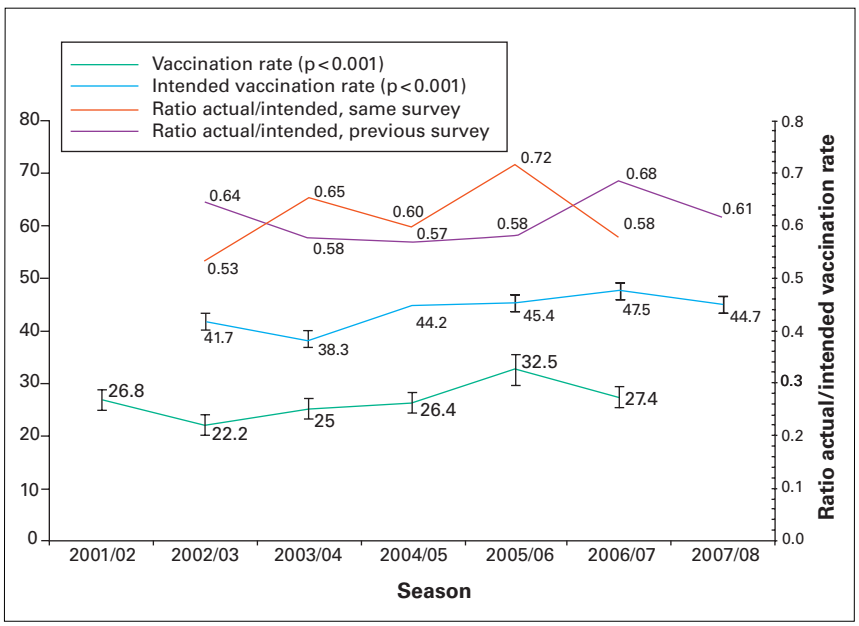

Figure 1. Vaccination rates and intended vaccination rates in Germany 2001–2007 (p-values for trend across seasons).

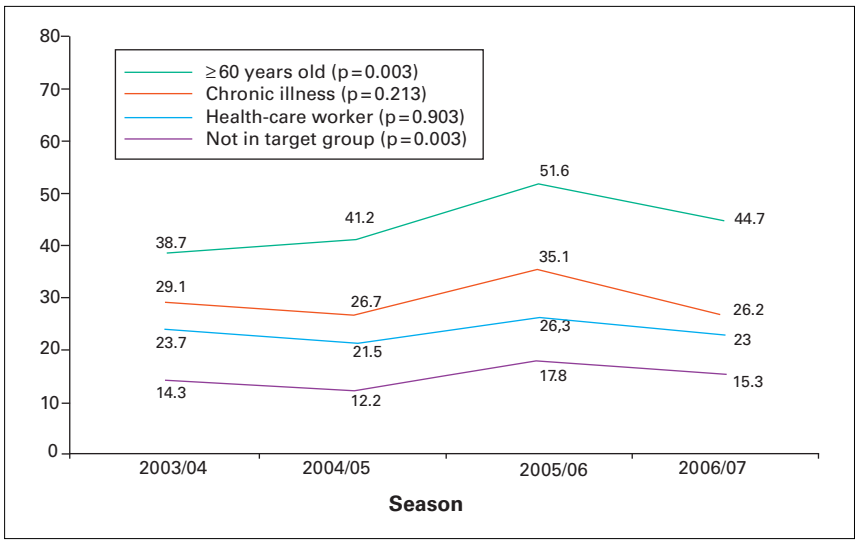

Figure 2. Trend curves of actual vaccination rates in German high-risk target groups and in the non-target group 2003–2007 (p-values for trend across seasons).

seasons, vaccination coverage was significantly higher than in the non-target group or in persons < 60 years of age ($p < 0.001$). A question exploring the prevalence of chronic illness was added to the questionnaire in 2003/04. Over the four observed seasons, significantly higher vaccination coverage was seen among the chronically ill compared to the non-target group. However, in season 2006/07, the vaccination coverage among those with a chronic disease (26.2%) dropped to the level of season 2004/05 after having peaked to 35.1% in the previous season. The vaccination coverage among health-care workers (23.0%) was only 1.5 times higher than in the non-target group (15.3%). The data indicate no trend in vaccination coverage among health-care workers or among the chronically ill over the last 4 years (Figure 2). In the composite target group, a significant increase in vaccination coverage was observed over the period from 2003/04 to 2005/06 (p for trend < 0.001). However, as in the individual target groups, there was a significant decrease in vaccination coverage between 2005/06 and 2006/07.

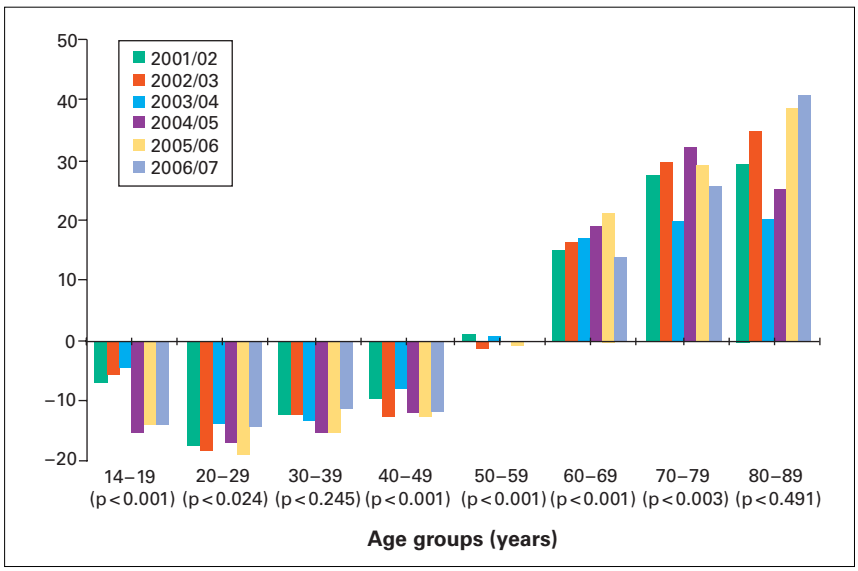

Figure 3. Vaccinated population by age groups in Germany 2001–2007 (p-values for trend across seasons).

Influences on Vaccination Coverage

Vaccination coverage differences across age were distinct. Older age (≥ 60 years) was associated with higher coverage (Figure 3). Of those < 60 years of age, the group aged 50–59 years had the highest coverage, followed by the youngest group (14–19 years). The group aged 20–29 years had the lowest coverage. In season 2006/07 compared to the previous season, the uptake was lower in all age groups (Figure 3). The decrease in the 60–79 years old was greater than the previous increase, but in all other age groups, the 2006/07 rates remained higher than in 2004/05. The relative decrease was least in the group aged ≥ 80 years.

A gender difference was only observed in season 2004/05, when women were moderately more likely than men to be vaccinated (unadjusted odds ratio [OR]: 1.3; CI 1.0; 1.5) Pooled data from the first five seasons showed a higher vaccination rate among households with few children, a low educational level, and low income [9]. Such differences were not present in season 2006/07 where the corresponding ORs fell to almost unity. A decrease in vaccination rates was observed among all income groups, most notably in the middle-class group (income range, 2,000–2,499 Euros) where the OR dropped to 0.7 (95% CI 0.5; 1.0), from 1.6 (95% CI 1.1; 2.4) in the previous season.

Multivariate analysis of vaccination coverage took membership in one or several target groups (covering age), gender, educational level, and income into account. As only target group membership (being chronically ill, elderly, or a health-care worker) had a statistically significant effect in season 2006/07, the other potential influences (some of which were affected by substantial numbers of missing values) were not included in the final logistic regression model (Table 2). Regression confirmed age ≥ 60 years to be a significant predictor of vaccination (ad-

Table 2. Adjusted odds ratios of vaccination coverage in target groups. CI: confidence interval.

	2003/04 (n = 2,004)[a]	2004/05 (n = 1,988)[a]	2005/06 (n = 2,008)[a]	2006/07 (n = 1,996)[a]
Age ≥ 60 years[b]	3.8	5.0	4.9	4.5
(95% CI)	(2.9; 5.0)	(3.8; 6.7)	(3.8; 6.4)	(3.4; 5.9)
p-value	< 0.001	< 0.001	< 0.001	< 0.001
n	335	323	326	329
Chronic illness[b]	2.5	2.6	2.5	2.0
(95% CI)	(1.8; 3.5)	(1.8; 3.7)	(1.8; 3.5)	(1.4; 2.8)
p-value	< 0.001	< 0.001	< 0.001	< 0.001
n	201	191	191	190
Chronic illness and age ≥ 60 years[b]	6.5	14.0	10.7	7.0
(95% CI)	(4.7; 8.9)	(10.1; 19.2)	(7.8; 14.7)	(5.2; 9.5)
p-value	< 0.001	< 0.001	< 0.001	< 0.001
n	194	207	194	208
Work in medical field[b]	1.9	2.0	1.6	1.7
(95% CI)	(1.1; 3.1)	(1.2; 3.3)	(1.0; 2.5)	(1.1; 2.6)
p-value	0.016	0.006	0.034	0.026
n	115	117	141	118

[a] n < total sample size for this season due to missing covariate values
[b] reference category: non-target group (persons who do not belong to any target group)
Note: some persons worked in the medical field and were at the same time ≥ 60 years old and/or chronically ill. These persons were taken into account when the logistic regression model was estimated but group sizes were too small for reliable parameter estimates. Therefore, parameter estimates for these groups are not shown

justed OR in 2006/07, compared to the non-target group: 4.5; ORs ranging from 3.8 in season 2003/04 to 5.0 in seasons 2004/05 and 2005/06). The respondents in the chronically ill target group, in season 2006/07, had an OR of 2.0, which was less than in the three previous seasons (OR range: 2.5–2.6). Being aged ≥ 60 years and chronically ill raised the OR considerably in all seasons, with maxima in seasons 2004/05 and 2005/06 (14.0 and 10.7, respectively) and a decrease to 7.0 in season 2006/07 (comparable to season 2003/04). Health-care workers' ORs ranged between 1.6 and 2.0.

The composite target group (at least one of age ≥ 60 years, chronic illness, health-care worker) had an OR of vaccination of 3.6 (95% CI 2.9; 4.5), compared to the non-target group in season 2006/07. Previous results for the composite target group ranged from 3.6 (CI 2.9; 4.5) in season 2001/02 to 5.2 (CI 4.2; 6.5) in season 2004/05.

Motivations and Barriers for Vaccination

Reasons for getting or not getting vaccinated are shown in Table 3. Those who indicated to have been vaccinated in the current season most frequently stated "because the flu is a serious illness and I did not want to get it" as a reason (season 2006/07: 90%, Table 3). In all seasons, this was the most frequent reason for getting vaccinated, and set off distinctly from the lower-ranking reasons. Second were the following two reasons: "my family doctor/nurse advised me to do it" (71%) and "so that I do not pass the flu bug to my family and friends" (69%). These rankings were consistent over all seasons. The attention on avian influenza and on influenza pandemics had influenced the decision of 14% of the vaccinated. This subgroup was not statistically different from the other vaccinated in terms of age, gender, and target group membership. The proportion of first-time vaccinated among those who indicated avian influenza as a reason for vaccination was 5.3%, considerably less than in the previous season (19.3%).

In season 2006/07, the most common response from those never vaccinated before was, "I do not think I am very likely to catch the flu" (48%, Table 3). Second in rank, with similar frequency, was, "I thought about it but I did not end up getting vaccinated" (47%). These reasons were ranking first or second in all seasons. Responses "it is not a serious enough illness" (40%) and "my family doctor did not recommend it to me" (39%) were ranking third and fourth in season 2006/07 and similarly in the previous seasons. Persons previously vaccinated but not in season 2006/07, said that they did not feel concerned (39%; previous season 46%), or that they did not think about getting vaccinated, respectively forgot (36%).

Table 3. Ranking of reasons for and against vaccination.

Motivations for getting vaccinated (among those vaccinated)	**2001/02 (n = 537) Rank (%)**	**2002/03 (n = 443) Rank (%)**	**2003/04 (n = 503) Rank (%)**	**2004/05 (n = 528) Rank (%)**	**2005/06 (n = 656) Rank (%)**	**2006/07 (n = 549) Rank (%)**
Because the flu is a serious illness and I did not want to get it	1 (83)	1 (90)	1 (90)	1 (89)	1 (88)	1 (90)
My family doctor/nurse advised me to do it	2 (66)	2 (72)	3 (70)	2 (73)	2 (68)	2 (71)
So that I do not pass the flu bug to my family and friends	3 (62)	3 (70)	2 (71)	3 (71)	3 (67)	3 (69)
Because of my age	4 (47)	4 (40)	4 (40)	4 (45)	4 (38)	4 (39)
Because it's free: the Social Security system pays for it	6 (21)	5 (36)	5 (34)	6 (26)	5 (37)	5 (46)
Reasons for not getting vaccinated (among those never vaccinated)	**2001/02 (n = 1,017) Rank (%)**	**2002/03 (n = 1,041) Rank (%)**	**2003/04 (n = 1,036) Rank (%)**	**2004/05 (n = 962) Rank (%)**	**2005/06 (n = 959) Rank (%)**	**2006/07 (n = 900) Rank (%)**
I do not think I am very likely to catch the flu	1 (38)	1 (47)	2 (41)	2 (41)	2 (44)	1 (48)
I thought about it but I did not end up getting vaccinated	–	2 (44)	1 (52)	1 (52)	1 (50)	2 (47)
It is not a serious enough illness	2 (33)	4 (37)	4 (35)	5 (32)	3 (34)	3 (40)
My family doctor did not recommend it to me	4 (30)	5 (37)	3 (36)	3 (36)	4 (33)	4 (39)
My pharmacist did not recommend it to me	–	3 (38)	5 (32)	6 (32)	5 (31)	5 (33)
I have never considered it before	3 (30)	6 (31)	6 (31)	7 (32)	5 (31)	6 (31)

Knowledge about influenza vaccination in season 2006/07 (Table 4) was similar to previous seasons (data not shown), despite increased awareness of pandemic risks in the population [13]. Three quarters of the surveyed knew that it is possible to catch influenza even if vaccinated, and about two thirds knew that the infection is then less severe. One quarter of the respondents agreed with the statement that the influenza vaccine would protect them against avian influenza, although the majority disagreed with this statement (68%, Table 4).

The survey also revealed (Table 5) that

- a recommendation by the family doctor/nurse (rank 1 in all seasons, 64–69%),
- knowing more about the efficacy and tolerability of the vaccine (rank 2 in all seasons, 54–56%),
- knowing more about the disease (rank 3 in all but the season 2001/02, 47–54%),
- none or lower cost (rank 4 in all seasons, 32–44%),
- vaccination offered at work (rank 5 in four out of six seasons, 33–42%),

would encourage most people to get vaccinated.

DISCUSSION

Telephone interviews have been used on several occasions to study vaccination coverage in Germany [4, 5, 7–9, 14]. 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 drawing of telephone numbers has been shown to be of high quality [15]. The major potential reason for selection bias despite correct sampling is nonresponse. Comparisons of face-to-face, mailed and telephone surveys addressing health-related issues, however, revealed only small differences between modes of administration and little nonresponse effects with respect to prevalence estimates [12, 16]. Compared to mailed surveys, nonresponse in telephone surveys was found to be less content-oriented [17]. Moreover, bias due to different sociodemographic characteristics of persons not reachable by telephone only slightly affected reports of illness and related use of medical services, provided the general population was addressed and telephone coverage was at least 90% [17, 18]. These published findings support the validity of our approach, although we had no means of independently confirming self-reported vaccination status. The limitations of the present data collection were also described in greater detail in an earlier publication [8]. An increasing problem is the use of wireless telephones. It was shown in the USA that persons with landlines had a higher odds (1.27) of being vaccinated than those with only access to wireless telephones [19]. If the same holds true for Germany, where mobile phones are even more common than in the USA [20, 21], we may have slightly overestimated the vaccination rates.

In Germany, overall vaccination coverage decreased significantly in season 2006/07 compared to season

Table 4. Knowledge about influenza and vaccination (winter 2006/07, n = 2,007).

	Agree (%)	Disagree (%)	Don't know (%)
You can catch influenza even if you are vaccinated against it	75.7	20.4	3.9
If you catch influenza after having had the vaccine, the infection is less severe	66.1	26.2	7.7
The side effects associated with the vaccine (fever, headache, etc.) are acceptable	58.8	29.0	12.2
It is important to get the influenza vaccine each year	57.3	41.3	1.4
The influenza vaccine is not useful if you are in good health	42.5	54.4	3.1
If you have the vaccine you will not catch the flu	32.4	63.6	4.0
The influenza vaccine will protect me in case of avian influenza/influenza pandemic	27.5	67.8	4.7

Table 5. Encouragements for vaccination.

	2001/02 (n = 2,003) Rank (%)	2002/03 (n = 1,999) Rank (%)	2003/04 (n = 2,012) Rank (%)	2004/05 (n = 2,001) Rank (%)	2005/06 (n = 2,017) Rank (%)	2006/07 (n = 2,007) Rank (%)
If my family doctor/nurse recommended it to me	1 (64)	1 (66)	1 (67)	1 (69)	1 (67)	1 (68)
If I had more information on the vaccine regarding efficacy and/or tolerance	–	2 (54)	2 (55)	2 (55)	2 (56)	2 (55)
If I knew more about the disease	2 (47)	3 (51)	3 (54)	3 (53)	3 (52)	3 (52)
If it were cheaper or reimbursed/free	4 (32)	4 (41)	4 (43)	4 (43)	4 (42)	4 (44)
If I could be vaccinated at work	3 (33)	5 (40)	5 (39)	6 (38)	5 (41)	5 (42)

2005/06, but was still higher than in the years before. This was true for all age groups with the exception of the 60–79 old whose coverage fell to pre-2005/06 levels. It appears that a partial extension of reimbursement of influenza vaccination (introduction of full reimbursement of vaccination in all enrolees, by some insurance companies), in effect since 2005 [22], was not successful in modulating longer-term vaccination coverage to a relevant degree [9]. Vaccination target groups will be covered by the Statutory Health Insurance from 2007/08 on [2] and it remains to be seen whether this factor can reverse the observed decrease in coverage in the next season.

The German media have been particularly active in reporting on avian influenza and a possible shortage of antiviral agents in the years before season 2006/07. This apparently has increased the population's awareness of pandemic risks and, by consequence, positively influenced vaccination coverage. The attention on pandemics and avian influenza may also have encouraged more doctors to recommend vaccination. After February 2006, however, media coverage, and thus public awareness, of avian influenza has dwindled [13]. This is a possible cause of the coincident falling back of vaccination rates to pre-season-2005/06 levels.

Low frequency and severity of influenza during 2005 and 2006 could be another explanation for the lower frequency of vaccine usage [23]. Nevertheless, the lower coverage cannot be attributed to the fact of a shortness of vaccine, as there was no significant change in doses distributed between seasons 2006/07 and the previous year (2005/06).

The overall vaccination rate in eleven European countries was 20.2% in season 2006/07 (unpublished data). Thus, the vaccination rate in Germany (27.4%) was above the European average, as in previous seasons [8, 24]. Our observations on immunization uptake in the German population are consistent with findings from similar studies performed in Germany [5, 14, 25, 26].

The elderly and those with a chronic disease showed coverage rates above the average and are among the influenza vaccination target groups defined by the STIKO [11], which is putatively the main reason for high coverage. However, working in the medical field in Germany did not markedly encourage vaccination, with the odds in this group never even doubling those in the non-target group. Earlier publications on influenza coverage rates [4, 9, 26–29] already noted a low coverage in health-care workers in Germany, ranging from 8% [27] to 26% [26]. By comparison, we found a vaccination coverage range between 22% and 26% in the surveys from 2001/02 to 2006/07, while the non-target group remained < 18%.

With respect to individual drivers of vaccination, our data confirm that the major encouraging factor is a recommendation from the family doctor or nurse. This finding was confirmed in other publications [4, 7–9, 14, 30]. A better understanding of the disease and the vaccine would have encour-

aged more than half of the surveyed, whereas a free or cheaper vaccine was mentioned by only two fifths. Of those responding in 2006/07, 45% intend to get vaccinated in the season 2007/08. The ratio of actual and intended vaccination rates remained in the range of 0.6 over the years. Hence, there is a potential to increase vaccination coverage in Germany in the future. In order to achieve a vaccine uptake approaching vaccination intention (44.7% in 2007/08), activation of positive motivations and dealing with barriers to vaccination remains an important task. This challenge should be taken up by the primary-care professionals, as they are the patients' key motivators, and also by independent media, insurers, governments and health professionals' organizations, which could all help bridging the knowledge gap.

CONCLUSION

The WHO considers the influenza pandemic risk to remain on a high level [3]. Efforts should be made at all national and international levels to increase coverage according to the WHO objectives (i.e., 50% vaccination coverage to be reached in the elderly in 2006 and 75% in 2010 [31]). Unlike in the year before, Germany fell short of meeting the goal as the 2006/07 vaccination rate reached only 45% in those aged ≥ 60 years, and 40% on average in all high-risk persons. Strong efforts need to be undertaken to reach the WHO objectives for 2010, a challenge to primary health-care providers, governments, insurers, health organizations, and media.

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