Risk perception and information-seeking behaviour during the 2009/10 influenza A(H1N1)pdm09 pandemic in Germany

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During the influenza A(H1N1)pdm09 pandemic in 2009/10, a total of 13 consecutive surveys were carried out of the general population in Germany to monitor knowledge, attitude and behaviour concerning the disease and vaccination against pandemic influenza in real time. In total, 13,010 persons aged 14 years or older were interviewed by computer-assisted telephone techniques between November 2009 and April 2010. During the peak of the pandemic, only 18% of participants stated that they perceived the risk of pandemic influenza as high; this proportion fell to 10% in January 2010. There was a significant difference in information-seeking behaviour among population subgroups concerning the disease and vaccine uptake. However, in all subgroups, conventional media sources such as television, radio and newspapers were more frequently used than the Internet. While the majority of participants (78%) felt sufficiently informed to make a decision for or against vaccination, overall vaccination coverage remained low. Among those who decided against vaccination, fear of adverse events and perception that the available vaccines were not sufficiently evaluated were the most frequently stated reasons. Such mistrust in the vaccines and the perceived low risk of the disease were the main barriers that contributed to the low vaccination coverage in Germany during the pandemic.

Introduction

After the first description of a novel influenza A(H1N1) virus in April 2009, the virus rapidly spread worldwide. While many countries experienced a first pandemic wave in the middle of 2009, Germany was initially affected by imported cases followed by an acceleration of cases mainly due to travellers and their contacts in the summer of 2009 [1]: at the end of September, there was an increase in the number of reported autochthonous influenza A(H1N1)pdm09 cases, followed by a sharp increase in the number of cases from October onwards, which peaked in the middle of November (week 46) [2].

In September 2009, the German Standing Committee on Vaccination (STIKO) recommended that people in target groups – people at occupational risk (including healthcare workers), persons with underlying chronic diseases and pregnant women – should be vaccinated against influenza A(H1N1)pdm09. The vaccination campaign officially started at the end of October 2009 (week 44), when pandemic vaccines became available. In Germany, an AS03-adjuvanted vaccine was almost exclusively used, with a one-dose recommendation for all age groups. With the availability of large numbers of vaccine doses, in mid-December 2009, the Committee expanded its recommendation to the general population, but still with prioritisation of the target groups mentioned above [3]. Although the vaccine was shown to be highly effective in protecting against pandemic influenza [4], vaccine uptake remained low among the general public and even among those in vaccination target groups [5].

Research into knowledge, attitude and behaviour in the context of a pandemic can not only guide communication and mitigation strategies during the event, but can also inform future pandemic preparedness planning. Data can be collected via online or telephone surveys, which – if analysed ad hoc – can provide insights into public perceptions related to the disease and implemented control measures in real time. In Germany, we conducted 13 consecutive cross-sectional knowledge, attitude and behaviour surveys to monitor the vaccination campaign against pandemic influenza in the general population in 2009/10. Our primary objective was to assess vaccine uptake in different target groups. Details of target group-specific vaccination coverage have been published previously [5]. Here we present data from the surveys related to public perception of the disease and relevant vaccination as

well as information seeking-behaviour during the pandemic. The analysis aimed to identify possible pivotal points and needs for future communication planning in situations with pandemic potential and immunisation campaigns.

Methods

Cross-sectional telephone surveys

A series of 13 computer-assisted telephone interview surveys took place from 16 November (week 47) 2009 to 14 April (week 14) 2010. The first nine were carried out every two weeks, until 10 March; the final four, from 22 March to 14 April (weeks 12–15) 2010, were weekly. The first survey took place about three weeks after the official start of the influenza A(H1N1)pdm09 vaccination campaign in Germany.

The survey methodology has been published previously [5]: in brief, each survey was conducted with a representative sample of approximately 1,000 households. The surveys included a core set of questions: other questions were changed, included or deleted in surveys over the study period to monitor new or upcoming topics of research or to adjust to changing situations. Because of that, each analysis refers to the particular surveys in which the questions of interest were included. The interviews were conducted by forsa (Gesellschaft für Sozialforschung und statistische Analysen mbH), a large market research company with extensive experience in health-related surveys, as part of forsa's daily omnibus survey in Germany, a continuing multi-topic survey primarily used for market research.

Interviews were performed according to the data protection standards used by forsa, which include obtaining oral informed consent before starting the interview. Trained interviewers surveyed randomly selected German-speaking individuals, aged 14 years and older, living in private households equipped with a telephone. In each household contacted, the last-birthday selection method was applied [6]. Interviews were usually conducted on workdays in the afternoon or evening, but appointments were also made if requested. The survey samples were weighted for region, age, sex and educational level on the basis of recent population projections of the Federal Statistical Office of Germany [7].

To monitor vaccine uptake as well as knowledge and attitude related to pandemic influenza, we used a core set of questions in all 13 surveys, e.g. questions on immunisation against pandemic or seasonal influenza, as well as questions designed to categorise interviewees into specific target groups for vaccination as defined by the German Standing Committee on Vaccination. Socio-demographic information (e.g. age, sex, educational level) was assessed as part of the omnibus survey. Furthermore, interviewees were asked to judge how high they perceived the threat imposed by pandemic influenza to their personal health, how well informed they felt about the disease and vaccination against pandemic influenza, the information sources they used during the pandemic and the perceived risk related to the vaccination.

Statistical analysis

Statistical analysis was performed using PASW version 18.0 for Windows (SPSS, United States). Univariable and multivariable analyses were performed using the complete set or subsets of survey data. A two-sided p value of less than 0.05 was considered to indicate a statically significant difference. Statistical independence was tested using logistic regression models. Multivariate analysis was performed using multiple logistic regression models with combined stepwise backward removal and forward selection. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Variables potentially associated with vaccine uptake (p<0.2 in univariable analysis) were entered into a multivariate logistic regression model in a first step, followed by stepwise backward removal of variables with a p value greater than or equal to 0.05 to produce a final model.

Variables were categorised as follows: age group (aged 14–24, 25–59, ≥60 years), sex (male/female), geographical region (west/east), level of education (low: nine years or less of school education; medium: at least 10 years of school education; high: university entrance diploma), community size (≤5,000; 5,001–20,000; 20,001–100,000; 100,001–500,000; >500,000 inhabitants), whether in a vaccination target group, as defined by German Standing Committee on Vaccination (persons with underlying chronic diseases, people at occupational risk and pregnant women).

For questions requiring agreement or disagreement, four categories were possible: full or partial agreement and full or partial disagreement. Data were weighted with respect to the inclusion probability depending on geographical region, age, sex and level of education of the participants. All statistical analyses were performed using the weighted data.

Results

A total of 13,010 telephone-interviews were conducted in the 13 cross-sectional surveys. The first nine surveys, conducted every two weeks, comprised 9,005 participants and the final four weekly surveys, which were identical, a total of 4,005. As the interviews were part of the omnibus survey, which has an ongoing inclusion of telephone numbers, a precise response rate cannot be determined. The average response rate in the omnibus survey was approximately 45% and the refusal rate 26%. The median age of all respondents was 48 years (range: 14–93) with 52.5% of the interviewed persons being female.

Risk perception related to pandemic influenza

During the first nine surveys, the 9,005 respondents answered questions about the perceived threat of pandemic influenza to their personal health. The first

survey took place at about the same time most influenza A(H1N1)pdm09 cases per week were notified to the national disease surveillance system in Germany (Figure). Risk perception (i.e. risk due to 'swine flu' perceived as great or partially great) fell in the general population from about 18% in November 2009 (week 47) to a plateau of approximately 10% in the surveys in December 2009 (weeks 51 and 53) and January 2010 (weeks 2 and 4). Over the same time period, there was an increase in the proportion of respondents who stated that their perception of risk was low, from about 34% in the initial survey (week 47) to approximately 65% in March 2010 (week 10). The risk perception over the first nine surveys among all interviewed persons, among those who were aged 60 years or older and among those belonging to the target vaccination groups is shown in the Figure.

In the final four weekly surveys, during March and April 2010, 70% of the 4,005 interviewees agreed fully and 10% agreed partially to the statement that in retrospect at no point in time had they felt a special threat to their personal health due to 'swine flu'.

In two surveys in January 2010 (weeks 2 and 4), we asked participants about the potential influence of the media coverage on their risk perception related to pandemic influenza in Germany. Among the 1,000 respondents in the mid-January survey (week 2), 68.2% agreed fully and 16.1% agreed partially to the statement that media reporting about pandemic influenza had been exaggerated. Furthermore, 33.0% of the 1,004 respondents at the end of January (week 4) agreed fully and 12.0% agreed partially to the statement that media reporting about the vaccine had led to a feeling of uncertainty.

Informedness about pandemic influenza

In the first six surveys (those until the end of January 2010 (week 4)), we asked how well informed the participants felt about pandemic influenza. In the first survey, 17.7% of the 1003 respondents stated that they were 'not well' informed and 28.5% 'partially not well'. Over the time course of these six surveys, the proportion of 6005 respondents who did not feel well or partially not well informed fell to 10.2% and 21.5%, respectively. In the pooled data set of the first six surveys, the proportion of respondents who felt well or partially well informed increased by level of education (59.3% with a low level of education, 64.5% with a medium level and 69.7% with a high level; for comparisons at all educational levels, p <0.001) and decreased with age (age group 14–24 years: 72.7%; 25–59 years: 64.2%; ≥60 years: 61.0%; for comparisons in all age groups: p<0.001). Respondents who were not immunised against pandemic influenza stated more frequently

Proportion of respondents who perceived a great or partially great threat due to pandemic influenza in the first nine surveys, by population subgroup, 16 November (week 47) 2009–10 March (week 10) 2010 (n=9,005) and epidemic curve of pandemic influenza cases (case reports)
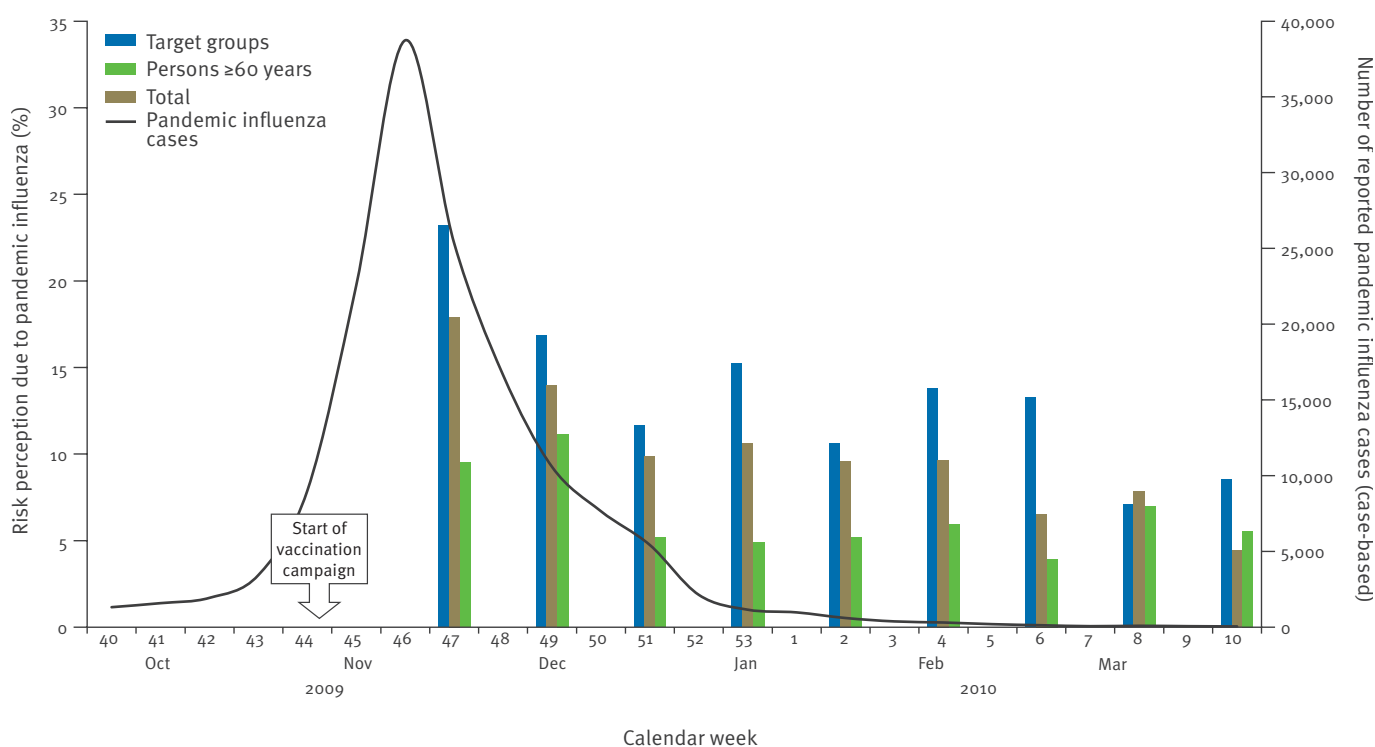
Source of number of reported pandemic influenza cases (case based): [2].

to be not well or partially not well informed about the disease compared with those respondents who were immunised (35.9% v. 28.2%; p<0.05).

Information sources used to find out about pandemic influenza

Between mid-November and the end of December 2009 (weeks 47–53) – a period with substantial spread of pandemic influenza in the population – we asked 4,003 participants about the sources used to gather information about the disease. The main sources of information were the mass media, such as television and radio (71.2%; 95% CI: 69.3–73.0), as well as print media, such as magazines or newspapers (58.6%; 95% CI: 56.6–60.7). The Internet was used by 27.6% (95% CI: 26.0–29.4) as a source of information, but – when stratifying by age group – only by 10.2% (95% CI: 8.3–12.4) of persons 60 years and older. Friends and relatives were mentioned as an important source of information by 56.1% (95% CI: 54.1–58.1) and physicians by 31.0% (95% CI: 29.1–32.8). Some 3.1% (95% CI: 2.4–4.0) stated not to have used any kind of information source.

Respondents belonging to the vaccination target groups used physicians more frequently (38.0% v. 28.1%; p<0.001) and peers less frequently (51.4% v. 58.0%; p<0.01) as a source of information related to the disease when compared with the respondents who were not in a target group. Physicians were used as a source of information about the disease by 62.1% of respondents who had been vaccinated against pandemic influenza, in contrast to 28.8% of respondents who had not received the vaccine (p<0.001). There was, however, no statistically significant association between any source used to gather information on the disease in general and the uptake of influenza A(H1N1) vaccine.

Informedness and attitude related to pandemic influenza vaccination

In the final four surveys (n=4,005), we asked how well informed the respondents felt about issues related to pandemic influenza vaccination. In total, 78.4% (95% CI: 75.1–81.6) agreed fully or partially to the statement that they felt sufficiently informed during the pandemic to make a decision for or against vaccination. Only 23.8% (95% CI: 22.1–25.6) agreed fully and 11.3% (95% CI: 10.1–12.6) agreed partially that they lacked neutral and factual information. However, 55.3% (95% CI: 51.8–59.0) fully and partially had the feeling that official authorities had not informed the public openly and honestly about issues related to the vaccination.

Stratified analysis showed that 91.8% (95% CI: 87.6–94.6) of respondents who had been vaccinated agreed fully or partially that they were sufficiently informed to make a balanced vaccination decision, while only 78.1% (95% CI: 76.2–79.9) of those who had not been vaccinated felt well informed (p<0.001). There was also a significant difference in the number of respondents who agreed that official authorities had informed the public openly and honestly about pandemic influenza vaccination when comparing vaccinated with unvaccinated respondents (63.0% v. 41.1%; p<0.001).

Use of information sources related to pandemic influenza vaccination

Data on sources used to gather information on vaccination against pandemic influenza was available from the 4,005 persons interviewed in the final four surveys. There was a significant difference in information-seeking behaviour among population subgroups (Table 1). When compared with younger age groups, respondents aged 60 years or older obtained information significantly more frequently from conventional media sources such as radio, television, newspapers, and magazines. The Internet as well as information materials of official health authorities were less frequently used by all age groups compared with conventional media sources. Internet use for this purpose increased significantly with higher educational level. Physicians as a source of information related to vaccination were mentioned more frequently by older age groups and almost twice as frequently by vaccinated compared with unvaccinated respondents (Table 1). Persons who belonged to a vaccination target group used the Internet less frequently (21.6% v. 26.9%; p<0.01) and their physician more frequently (42.1% v. 29.8%; p<0.001) as source of information compared with respondents not in the target groups.

We used univariable and multivariable logistic regression models to explore potential associations between the source of information about vaccination and vaccine uptake by using data from the final four surveys (Table 2). After adjusting for possible confounders (i.e. age, sex, whether in a vaccination target group, education level, community size and region), we found that use of radio or television (OR: 0.62; 95% CI: 0.48–0.81) as well as family and friends (OR: 0.72; 95% CI: 0.55–0.94) as a main source of information were independently associated with lower vaccine uptake. In contrast, an association with vaccine uptake and the search for information about vaccination was found when physicians (OR: 2.77; 95% CI: 2.16–3.57) or official materials (OR: 2.07; 95% CI: 1.55–2.77) were used as a main source of information. Use of the Internet as a main information source for vaccination was not associated with pandemic influenza vaccination in our study population (Table 2).

Reasons for not being immunised against pandemic influenza

In all 13 surveys over the whole study period, we asked persons who were not vaccinated against pandemic influenza and did not intend to be the reason why they objected to vaccination. Fear of adverse events of the vaccine was given as a reason for not being vaccinated in approximately 20%; the perception that the vaccines were insufficiently tested was stated in 15%. An additional 14% stated that their decision against

the vaccination was triggered by 'public panicking and overhyping' and approximately 10% stated that they felt vaccination was just not necessary. Lack of information about the vaccine or information about possible side effects was mentioned in 2%. The proportion of respondents who stated they had a fear of adverse events decreased by age (chi-square test for trend, p<0.001) and was lowest in those aged 60 years or older (13.5%). In mid-January 2010, we asked the survey participants (n=1,000) if they believed that the adjuvant in the pandemic vaccine was safe. Of those, 8% agreed fully and 10% partially.

Discussion

Our survey results provide important insights into public opinion and information-seeking behaviour related to the influenza pandemic and vaccination campaign in Germany in 2009/10. The findings of the survey are generally in line with those conducted in other countries during the pandemic [8,9]. In Germany, vaccine uptake was particularly low, even in vaccination target groups, and communication practices might have contributed to this fact [5]. Our findings suggest that a perceived low risk related to the disease and concerns about the safety of available vaccines were the main barriers to pandemic influenza vaccination.

The first of the 13 consecutive surveys was carried out during the peak of the pandemic wave and at the early phase of the vaccination campaign. Therefore, we were not able to monitor trends in risk perception from the beginning of the pandemic in spring 2009. However, even during the peak of pandemic influenza in Germany, we observed that the level of perceived risk was low. Similar findings were reported from Australia in 2009, where risk perception was low even during times of high likelihood of acquiring the virus [10]. Risk perception in our survey fell further at the beginning of 2010 and was particularly low in persons aged 60 years and older.

According to the health belief model, risk perception (which is usually defined by the expected probability of an event and its severity) and believing that preventive measures are safe and effective are the main factors influencing a vaccination decision [11]. A literature review assessing factors that influence preventive behaviour during pandemic situations highlighted that perceived susceptibility to and severity of the disease as well as believing in the effectiveness of protective measures increased its implementation [12]. A low-to-moderate risk perception related to pandemic influenza and lack of concern was observed in surveys in various industrialised countries during 2009/10, for example in Italy [13], the Netherlands [14], Australia [15] and the United States [16].

Public risk perceptions may be directly modulated by media coverage, and media-triggered public concern was shown to be an important factor for health-related personal measures during the influenza pandemic as shown in studies in, for example, the United States [17] or France [18]. While there are studies showing that media coverage can have a positive influence on disease perception and willingness to be vaccinated against seasonal influenza [19,20], the reception of media output during an influenza pandemic needs to be analysed carefully [21]. In Europe, the initial media attention, related to the occurrence of a new pandemic influenza strain in 2009, was found to be high [22].

TABLE 1

Sources used to gather information on vaccination against pandemic influenza, by population subgroup, Germany, final four surveys, 22 March–14 April (weeks 11–15) 2010 (n=4,005)

Source of information[a]	Total n=4,005	Percentage of respondents									
		Vaccinated against pandemic influenza		Sex		Age group (in years)			Educational level[b]		
		Yes[c] n=324	No n=3,676	Male[c] n=1,948	Female n=2,057	14–24 n=555	25–59 n=2,261	≥60[c] n=1,170	Low[c] n=1,706	Medium n=1,094	High n=965
Radio or television	64.6	53.0	65.6***	63.7	65.3	51.9***	64.5***	70.9	68.3	65.8	59.5***
Newspapers or magazines	50.0	47.4	50.3	49.4	50.5	35.2***	49.6***	58.2	50.1	49.9	53.6
Family and friends	42.8	39.5	43.1	39.4	45.9***	47.0***	46.9***	33.1	38.6	46.6***	45.6***
Physician	34.0	66.9	31.1***	30.0	37.7***	26.0***	33.8**	38.3	36.6	35.2	31.6*
Internet	25.1	21.9	25.4	26.0	24.3	31.5***	31.1***	10.9	17.2	27.2***	37.2***
Information materials from official authorities	13.4	22.9	12.6***	11.5	15.2**	12.6**	16.4***	8.2	8.6	16.7***	19.1***
Other sources of information	2.8	3.5	2.7	2.2	3.3*	3.2*	3.5***	1.3	1.9	3.2*	3.2*
No active information-seeking	5.7	0.0	6.2	7.2	4.2***	12.1***	4.7	4.3	6.2	5.2	4.2*

* p<0.05, ** p<0.01, *** p<0.001.
[a] Multiple answers were possible.
[b] Low: nine years or less of school education; medium: at least 10 years of school education; high: university entrance diploma.
[c] Reference group.

Systematic content analysis, for example, of television reports in Australia [23] or print media in the United Kingdom [24] and in the German city of Bremen [25], did not show that reports on pandemic influenza were scaremongering. Our data, however, suggest a public sentiment of media exaggerating the situation in Germany. Use of television and radio as a main source of information was associated with lower vaccine uptake compared with use of other sources. This finding is consistent with studies showing that uncertainty about the pandemic situation and perceived exaggeration of the situation is associated with a reduced likeliness to implement the recommended behaviour [26].

In general, the Internet is regarded as an important source of information for the general public on health-related topics: therefore, relevant and high-quality information should be made available online [27]. Nonetheless, in our survey, use of the Internet was found to be low compared with other information sources. The Internet does not seem to be effective in reaching certain population groups such as elderly people or those with a low educational level.

Source of information	Used or not	Univariable analysis OR (95% CI)	Multivariable analysis[a] OR (95% CI)
Radio or television	No	1[b]	–
	Yes	0.56 (0.46–0.72)	0.62 (0.48–0.81)
Newspaper or magazines	No	1[b]	–
	Yes	0.84 (0.67–1.05)	NS
Family and friends	No	1[b]	–
	Yes	0.75 (0.59–0.95)	0.72 (0.55–0.94)
Physician	No	1[b]	–
	Yes	3.37 (2.67–4.26)	2.77 (2.16–3.57)
Internet	No	1[b]	–
	Yes	0.93 (0.72–1.20)	NS
Information materials from official authorities	No	1[b]	–
	Yes	2.1 (1.66–2.78)	2.07 (1.55–2.77)
Other sources of information	No	1[b]	–
	Yes	2.08 (1.25–3.49)	2.26 (1.29–3.95)

CI: confidence interval; OR: odds ratio; NS = not significant.

[a] Adjusted for age, sex, whether in a vaccination target group, educational level, community size, region.

[b] Reference category.

Although Internet use was found to be lower than expected in our study, the impact of specific online communication, such as the use of social media, was not assessed. Nevertheless, the spread of information through informal online networks and peer-to-peer communication might have had considerable impact on vaccination decisions during the pandemic. This has been shown in Japan, where informal networks of communication were influential in sharing safety information on pandemic influenza vaccine [28]. A survey of Hong Kong adults supports the finding that trust in informal information sources may be linked to the perceived health risk related to pandemic influenza and avoidance behaviour [29]. Using family and friends as a main source of information was shown to be negatively associated with vaccine uptake in our study. This finding corroborates the hypothesis that peer-to-peer communication is of high importance in a pandemic [30].

Concern about the safety of the pandemic vaccines was identified as a major barrier to vaccination in our study population. This was consistently observed in many studies assessing factors influencing vaccination decision [11]. In Greece, for example, fear about vaccine safety was the most frequently mentioned reason against vaccination [31]. Although we found that the majority of respondents felt sufficiently informed to make a balanced vaccination decision, information about the safety and benefits of the pandemic vaccine was obviously not convincing enough to reach satisfactory immunisation rates in the population. In a situation of high uncertainty about risks, trust in public bodies may be a crucial factor for the success of public health measures. Building and maintaining trust should therefore be a long-term task, involving all stakeholders [30]. The observed mistrust in the safety and usefulness of the pandemic vaccines stresses that information campaigns primarily focusing on the safety of pandemic vaccines may not be sufficient in a situation of low risk perception related to the disease [32].

Physicians were considered an important source of information, in particular regarding vaccination decisions, among respondents who were in vaccination target groups. Therefore informing healthcare professionals about the risks and benefits of the vaccine can be regarded crucial to increasing vaccination coverage. Public trust in medical organisations was shown to be an important factor for pandemic influenza vaccination decisions in Switzerland [33]. In our study, being informed by physicians and use of information material of official authorities were independently associated with vaccination against pandemic influenza. Surveys in the United States showed that persons who reported use of information from healthcare providers and official sources were more frequently convinced about the seriousness of pandemic influenza and the usefulness of the immunisation [34]. In an Italian survey, not only concerns and risk perception, but also trust in the media and official bodies were associated with compliance to the recommended behaviour [35]. In our study,

however, a considerable proportion of participants had the feeling that official authorities had not informed the public openly and honestly about issues related to the vaccines.

A limitation of our study is that bias due to the telephone sample procedures cannot be excluded. Household-based telephone surveys may have limited access to certain groups such as people who use exclusively mobile phones or persons living in nursing homes. Furthermore, the survey represents only German-speaking persons: individuals without German-language skills might use different patterns of information sources. On the other hand, however, using a standard omnibus survey, which contained topics not related to the study, may have reduced potential bias due to rejection or higher interest in the study topic. Results of our surveys were furthermore weighted to control for possible selection biases.

In conclusion, on the basis of the results of our surveys – which began shortly after start of the vaccination campaign – we were able to demonstrate that the pandemic influenza vaccination campaign in Germany took place when public risk perception related to the disease was low, while scepticism and misconceptions about the pandemic influenza vaccine and implemented measures were frequent. These findings are in line with surveys of other countries conducted during the pandemic [8,9] but add the first insights into the situation in Germany, where vaccine uptake was particularly low. Rebuilding trust in recommendations of public health authorities and addressing common misinformation about immunisation against pandemic influenza will be a communication challenge when preparing for future pandemic situations and for vaccination policies in general [30]. The pre-pandemic development of tailor-made information strategies accompanied by surveys to monitor public perception implemented early in the pandemic should be considered for future pandemic preparedness planning and the mitigation of health threats on a population level.

Acknowledgments

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