

Factors in vaccination intention against the pandemic influenza A/H1N1

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Received 10 December 2009, accepted 9 April 2010

Background: Vaccination against pandemic influenza A/H1N1 is an effective strategy to mitigate the spread of the disease. While the vaccine is now available, social acceptance remains relatively uncertain in many societies. The purpose of this study was to examine the beliefs, attitudes and practices associated with the intention to get vaccinated against the A/H1N1 virus among the general population in France. **Methods:** A representative sample of 1001 individuals (stratified random recruitment procedure, ages 16–90 years) was interviewed by telephone. The questionnaire included a variety of items associated with socio-demographic characteristics, risk perceptions, illness perceptions, political attitudes and worldviews as well as intention to get vaccinated. **Results:** More than 6 out of 10 of the respondents indicated that they planned to get vaccinated when the vaccine becomes available. The same proportion of parents also reported the intention to vaccinate their children against the disease. In multiple regression analyses, socio-cognitive factors consistently predicting influenza A/H1N1 vaccination were: level of worry, risk perception and previous experience of vaccine against seasonal flu. **Conclusions:** The factors found to predict vaccination intention and their distribution are assumed to be a consequence of the fact that people perceive the risk of swine flu to be similar to that of seasonal flu. As a result, in the absence of an increase of the risk perception of pandemic influenza A/H1N1, a very low level of actual vaccination is forecasted. Behavioural change would require that the risks and consequences of pandemic influenza A/H1N1 be perceived as highly different from seasonal flu.

Keywords: pandemic influenza A/H1N1, vaccination intention, risk perception, worry, illness representation, vaccination experience

Introduction

Since the announcement of the emergence of the novel swine-origin influenza A/H1N1 virus (A/H1N1v) in April 2009, the risk of pandemic flu has become a reality. As a consequence of the spread of the virus and its novelty, the need for an operational vaccine quickly became a major issue and was put at the top of the political agenda. Coordinated by the World Health Organization (WHO), most Western governments planned strategies to face a severe viral agent, mainly through pharmaceutical tools and non-pharmaceutical recommendations.¹ In France, a vaccination campaign was announced to be launched as soon as the vaccine would be available. The French strategy was to propose the vaccine to everyone and progressively, according to individual's level of risk, to cover 85% of the population. Although pandemic influenza A/H1N1 represents an emerging risk, we do not know how people view the threat and if their perception has an influence on vaccination intention. Consequently, we do not know what proportion of the French population will actually choose to be vaccinated, or the reasons that will determine their decision.

Willingness to be vaccinated against a given infectious agent, recognized as a major issue affecting the success of vaccination programs, has been extensively investigated in the psychosociological literature dealing with risk perception and illness representations.^{2–6} The role of risk perception on vaccination has been largely tested and assessed through a meta-analysis of 34 studies.⁷ The authors clearly demonstrated that perceived

probability of exposure, susceptibility to and severity of a disease are significantly associated with vaccination behaviour. In the case of influenza pandemic A/H1N1, it was assumed that two main theoretical perspectives would be appropriate to explain willingness to be vaccinated. The first is based on mental representations of the illness demonstrated by the Self-Regulation Model (SRM),⁸ as an interactive set of factors predicting behaviour to counteract the disease. The second perspective assumes that the psycho-cognitive factors determining risk perception represent the best predictor of protective behaviour against a health threat. Among different models based on risk perception, the Health Belief Model (HBM)⁹ was largely empirically tested and improved upon by introducing feelings as a parallel, intuitive reaction to a threat.¹⁰ The level of risk perception is generally assessed through cognitive factors: the perceived probability of being harmed by the hazard (or the perceived vulnerability to the hazard) and the perceived severity related to the extent of harm caused by the hazard. These factors have been found to interact with what is called the 'experimental system'¹¹ driven by individual emotions. Among them, the level of worry associated with the threat is believed to influence the cognitive factors.^{12,13}

In this article, we tested these two models and investigated socio-cultural characteristics that may be associated with the intention to get vaccinated, such as individual values, worldviews and attitudes. Three main questions are addressed: (i) What factors predict the intentions of individuals to be vaccinated against the A/H1N1v? (ii) Does risk perception of

the pandemic influenza A/H1N1 determine vaccination intention? (iii) All things being equal, do people's experiences of seasonal flu play a role in their intention to get vaccinated against A/H1N1v by influencing illness representations?

Methods

A survey was carried out by computer-assisted telephone on a sample of 1001 residents of France between 10 June 2009 and 27 June 2009. The participants were selected using proportional random digit dialling so that the sample was geographically representative of the general population. Prior to the interview, participants were informed that the survey questions focused on subtype A/H1N1v in order to obtain verbal consent. However, as the term 'swine flu' was commonly used in the news media, respondents were specifically told that, 'we are primarily discussing the type of influenza caused by the A/H1N1v, also known as swine flu'. After a qualitative phase conducted through focus groups, a questionnaire was developed and pre-tested for length and comprehensibility. It consisted of about 100 defined category and open-ended questions, including a wide range of demographic and socio-economic items. The four main categories of questions figuring into our assumptions are described below.

Perceptions of risk

Participants were asked about their risk perceptions related to the A/H1N1 influenza according to the HBM extended to the feeling dimension.¹⁰ Four key dimensions of risk perceptions were investigated: worry ('How worried are you about the influenza pandemic?'), severity ('How serious do you think the influenza pandemic is?'), prevalence ('what proportion of the population of France could get the disease during the pandemic?') and vulnerability ('How high do you think is your personal risk of getting the disease during the pandemic?'). Measurements consisted of either a percentage scale or the 11-point Likert scale (for instance, from 0 = 'not worried at all' to 10 = 'extremely worried'). A multidimensional measurement of risk perception was also constructed by multiplying severity and vulnerability in order to take into account the potential interactive effects of these variables.

Perceptions of illness

According to the SRM,⁸ health information activates cognitive representations as images of the health threat which have five key attributes: identity, based on symptoms that are associated with the illness; a set of consequences; perceived coherence (understandability); the range of causes for the disease; and behavioural control (how to prevent the illness or minimize its consequences). Mental representations associated with A/H1N1 influenza were assessed with 12 items, deriving from an adapted version of the Revised Illness Perception Questionnaire (IPQ-R). Factor analysis using varimax rotation was performed to group the items into coherence, consequences, control and cure. All the scales demonstrated an acceptable internal consistency (Cronbach's $\alpha > 0.6$). The permitted response options for each question were the following: totally agree (scored as 5), somewhat agree (4), neither agree nor disagree (3), somewhat disagree (2), totally disagree (1). Responses were summed across items to produce scores on the four illness perception scales.

Attitudes and worldviews

Ten items covered possible attitudes toward A/H1N1v pandemic, derived from the existing literature about the 'socio-cultural' explanations of health behaviour. Factor analysis using varimax rotation was again performed to

group the items into fatalism, social trust and beliefs in conspiracy theories. All the scales demonstrated an acceptable internal consistency (Cronbach's $\alpha > 0.6$). Again, the permitted response options for each question were totally agree (scored as 5), somewhat agree (4), neither agree nor disagree (3), somewhat disagree (2), totally disagree (1). Responses were again summed across items to produce scores on the four attitude scales.

Vaccination intentions

Participants were asked about their intentions and practices associated with influenza vaccination. Notably, they were queried whether they had been previously vaccinated, at least one time, against seasonal influenza, and whether they would be vaccinated—as well as vaccinate their children—if a vaccine against the A/H1N1v were made available. They were also asked whether they had already caught seasonal influenza during the past 5 years.

Statistical analysis

To make the different response formats comparable as well as normalize the distribution of the variables, the results were converted either by dividing the risk perception scores by 2 (scale 0–10), 3 (scale 0–15), or square-rooting the scores then dividing them by 2 (scale 0–100). The remaining variables were basically divided by the number of items used to evaluate the construct. This resulted in 13 socio-cognitive measurements related to A/H1N1 influenza on a scale from 0 (low) to 5 (high).

Binary logistic regression analyses were performed to estimate associations between variables. These analyses were conducted in two steps for each outcome variable related to vaccine intention. First, simple binary regressions were used to assess the effects of each of the socio-cognitive and socio-demographic variables such as age group, gender, occupation or education. The explanatory variables found to be significant in their individual regressions were then entered into a multiple regression model. Next, the experiential variables were in turn submitted to logistic regression analyses. After testing each of the variables individually, those found to be significantly predictive of vaccination intentions were added to the model simultaneously. Finally, a backward stepwise selection of variables was used to exclude one by one from the model insignificant cognitive and social predictors of the two types of self-reported intentions of vaccination against A/H1N1v. Odds ratios for each the four models were calculated and potential interactions between the socio-cognitive factors and the personal experience of flu—in particular the effect of previous vaccination—were tested. SPSS for Windows Release 13.0 was used to analyse the data, and P -values < 0.05 were considered to be statistically significant.

Results

The final sample of 1001 respondents provides estimates of proportions with 95% confidence intervals to $\pm 3.1\%$. Since the main socio-demographic characteristics of the participants were not found to be significantly different from those of the population on the basis of the latest census data, no statistical weighting was performed.

Influenza-related perceptions, attitudes, intentions and experiences

Mean risk perceptions, illness perceptions, and worldviews or political attitudes scores (total and by gender and age group) are presented in table 1. At the time of the survey, a majority of French people (61%) still indicated that they planned to get

vaccinated and, more specifically, about two-thirds (65%) of those who have children aged 0–15 years planned to get them vaccinated against pandemic influenza A/H1N1. With regard to seasonal influenza, 37% of the participants reported that they had already been vaccinated at least one time against the disease. Moreover, 28% reported that they had caught seasonal influenza ‘one time’ or ‘several times’ (17 and 11%, respectively) during the past 5 years.

Predictors of intention of personal vaccination

Binary logistic regression analyses were first performed to examine the association between the socio-cognitive and socio-demographic variables with the personal intention to get vaccinated. In the final model, after removing non-significant variables, the significant predictors of vaccine intention were the co-variables ‘feeling of worry’ [odds ratio (OR) = 1.84, $P < 0.001$], ‘perceived risk of contracting the disease’ (OR = 1.40, $P < 0.01$), ‘belief in conspiracy theories’ (OR = 0.74, $P < 0.001$), and being 60 years of age and older (OR = 1.86, $P < 0.001$) (table 2). After controlling for the

significant effects of the experiential variables, i.e. ‘previous experience of influenza’ and ‘influenza vaccination’, there were significant relationships between the participants’ age, the illness perception dimension of coherence, and the vaccination intention. Notably, the perceived coherence was found to positively influence the outcome variable, and the significant effect of age was found to disappear, indicating interaction terms between participants’ age and the experience of vaccination. Overall, a previous experience of seasonal flu vaccine was strongly predictive of personal vaccination intention. Holding the other variables constant, a previous experience of seasonal flu vaccine corresponded to an increase of more than 300% in the intention to get vaccinated against A/H1N1v pandemic.

Predictors of intention of vaccination for children

Binary logistic regression analyses were next used to investigate the association between the socio-cognitive and socio-demographic variables with the parents’ intention to vaccinate their 0–15-year-old children (the dependent variable). After

Table 1 Comparison of mean risk perceptions, illness perceptions and political attitudes by gender and age group

	Total	Male	Female	15–29	30–44	45–59	>60
<i>N</i>	1001	434	567	164	299	270	268
Worry	2.02 (±1.32)	1.87 (±1.32)	2.13 (±1.30)	2.11 (±1.32)	1.92 (±1.25)	2.13 (±1.40)	1.96 (±1.29)
Vulnerability	1.73 (±1.14)	1.73 (±1.16)	1.82 (±1.12)	1.61 (±1.01)	1.78 (±1.23)	1.85 (±1.15)	1.79 (±1.07)
Probability	1.49 (±1.03)	1.37 (±1.07)	1.58 (±0.98)	1.60 (±1.01)	1.42 (±1.08)	1.51 (±1.01)	1.49 (±0.99)
Severity	2.93 (±1.19)	2.84 (±1.22)	2.99 (±1.17)	2.96 (±1.09)	2.93 (±1.20)	3.63 (±1.23)	2.80 (±1.19)
Perceived risk	2.19 (±0.68)	2.15 (±0.71)	2.23 (±0.66)	2.16 (±0.66)	2.17 (±0.67)	2.27 (±0.75)	2.16 (±0.64)
Coherence	3.11 (±1.00)	3.04 (±1.07)	3.16 (±0.95)	3.10 (±0.95)	3.01 (±0.98)	3.05 (±1.02)	3.29 (±1.04)
Control	4.27 (±0.74)	4.25 (±0.76)	4.28 (±0.73)	4.07 (±0.76)	4.39 (±0.67)	4.28 (±0.70)	4.23 (±0.83)
Consequence	3.28 (±0.91)	3.23 (±0.93)	3.31 (±0.90)	3.34 (±0.88)	3.26 (±0.94)	3.30 (±0.87)	3.25 (±0.95)
Cure	3.83 (±0.87)	3.80 (±0.88)	3.85 (±0.83)	3.59 (±0.81)	3.82 (±0.91)	3.90 (±0.81)	3.92 (±0.89)
Fatalism	2.53 (±1.21)	2.53 (±1.21)	2.52 (±1.21)	2.59 (±1.17)	2.38 (±1.14)	2.46 (±1.22)	2.78 (±1.28)
Egalitarianism	4.23 (±0.81)	4.17 (±0.88)	4.25 (±0.75)	4.08 (±0.85)	4.15 (±0.84)	4.25 (±0.78)	4.35 (±0.77)
Trust	3.57 (±1.06)	3.55 (±1.12)	3.59 (±1.01)	3.39 (±0.96)	3.47 (±1.08)	3.60 (±1.14)	3.78 (±0.98)
Conspiracy	3.15 (±0.85)	3.11 (±0.92)	3.18 (±0.80)	3.05 (±0.78)	3.11 (±0.84)	3.14 (±0.91)	3.28 (±0.84)

Table 2 Modelling influenza A/H1N1 vaccination intentions (odds ratio, stepwise logistic regression)

	Pseudo R^2	χ^2	df	Odds ratio
Model 1				
Predictors of personal immunization intention	0.156	124***	4	
Worry				1.84***
Perceived risk				1.40**
Conspiracy				0.74***
Age: >60 years				1.86***
Predictors of Children immunization intention	0.197	39***	3	
Worry				2.17***
Perceived coherence				1.58**
Education: high				1.91*
Model 2				
Predictors of personal immunization intention	0.223	182***	5	
Worry				1.85***
Vulnerability				1.35**
Perceived coherence				1.23**
Conspiracy				0.72***
Previous influenza vaccination				3.33***
Predictors of Children immunization intention	0.223	44***	4	
Worry				2.09***
Perceived coherence				1.46*
Occupation: student				0.11*
Previous influenza vaccination				2.47**

Model 1 includes the risk perceptions, illness perceptions, attitudes and worldviews, socioeconomic characteristics as explanatory variables. Model 2 includes the risk perceptions, illness perceptions, attitudes and worldviews, socioeconomic characteristics, as well as influenza-related experiences as explanatory variables. Levels of statistical significance: *** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$

removing non-significant variables, significant predictors of intention to get children vaccinated were the co-variables 'feeling of worry' (OR=2.17, $P<0.001$), 'perceived coherence of the illness' (OR=1.58, $P<0.01$), and a level of education 'higher than high school' (OR=1.91, $P<0.001$) (table 2). After controlling for the significant effects of the experiential variables, the statistical influence of the participant's level of formal education was found to disappear, indicating possible interactions between the educational variable and the experience of seasonal flu vaccine. Again, the previous experience of flu vaccine was strongly predictive of vaccination intention. All other things being equal, the vaccination intention for children was more than two times higher (OR=2.47, $P<0.01$) among those who reported a previous experience of the seasonal flu vaccine.

Discussion

In the new context of the pandemic influenza A/H1N1 characterized by the will of health authorities to propose vaccination to the whole French population, the general objective of our survey was to identify the factors driving the intention to vaccinate against the pandemic influenza A/H1N1. With regards to the novelty of the virus and to the ignorance of its severity, it was assumed that pandemic influenza A/H1N1 would be perceived either as a new risk or as a well-known risk due to its similarity with the seasonal influenza.

The first factor found to be associated with vaccination intention in the bivariate logistic regression model 1 and in model 2 is worry, an emotional factor. In risk literature, the feeling of worry has been one of the most frequently investigated factors, aside from probability (or susceptibility) and 'badness' (or severity).^{12,13} Some authors stated that worry about risks was correlated with judgments of riskiness, and others found that it was correlated with personal action to reduce risk and with a desire to control risk.¹⁴ In other empirical studies, worry about risk was clearly demonstrated as a determinant of risk perception with a significant association with action to reduce the risk.¹⁵ The second factor, the perceived risk of being infected, as a product of perceived vulnerability multiplied by the severity of consequences, is clearly in line with the results of Brewer *et al.* meta-analysis.⁷ This significant association supports the perception/behaviour hypothesis and demonstrates a positive association with our second question 'Does risk perception of the current A/H1N1v pandemic determine vaccination intention?'

The third factor identified, belief in conspiracy theories, could be seen to be associated with intention to refuse to be vaccinated. Alternative explanations of the cause of a disease are frequently proposed in the case of emerging infectious diseases and often refer to malicious elements. This reflects still existing worldviews that viral emergence is man-made by organizations or individuals with hidden interests. Therefore, belief in conspiracy theories would be a marker of distrust, both in the health authorities and their recommendation to vaccinate. Conversely, because vaccination intention implies a belief in the viral cause of swine flu and trust in the health authorities, rejecting conspiracy theories could be interpreted as a consequence of the decision to vaccinate, rather than a determinant.

The final variable found in our model 1 of logistic regression, being >60 years of age, is the only socio-demographic co-variable, but disappears in model 2, when including the factors 'Previous seasonal influenza' and 'Previous influenza vaccination'. This shift is partly explained by the fact that people over the age of 65 years in France are targeted by an intensive annual seasonal flu vaccination program. Consequently, the variable 'experience of seasonal flu vaccine' appears as the strongest predictor of vaccination

intention against pandemic influenza A/H1N1, as it was found in a recent US study.¹⁶ The importance of previous seasonal flu vaccination equally justifies the disappearance of the perceived risk in model 2. But, surprisingly, experience of seasonal flu does not appear as a factor of vaccination intention, leading to what seems at first to be a paradoxical answer to the question, 'Do people's experiences of seasonal flu play a role in the intention to get vaccinated against the pandemic influenza A/H1N1?'. Generally, experience of a disease is likely to increase a feeling of worry and in some situations result in an increase in self-protective behaviour.¹⁷ The role of personal experience was assessed by several studies^{18,19} as an increasing factor for protection motivation,²⁰ with some authors assessing it as the strongest motivator of protective behaviour, probably because people seek parallels between their cognition and experiences.^{21,22}

Here we are confronted with two kinds of experiences: experience of the disease (seasonal flu) and experience of vaccination (against seasonal flu), where only the second is predictive of willingness to vaccinate. This paradoxical statement can be explained by assuming that pandemic influenza A/H1N1 is not perceived as a new disease but as similar to seasonal flu. For elderly people, the experience of seasonal flu vaccination was judged as an effective protection against the severe consequences of getting the flu and shapes their decision to immunize against A/H1N1v, because they perceive it as the same disease. For younger people, the analogy also works, but in the opposite direction: the experience of seasonal flu with no vaccination was, for the large majority, without any consequence. Thus, vaccination against A/H1N1v is perceived as pointless. That assumption is supported by the reported rates and distribution of seasonal flu vaccination in France.²³

These findings have major implications on the objectives, targets and design of the vaccination campaign against A/H1N1v influenza. Although 61% of respondents declared their willingness to be vaccinated at the beginning of the pandemic, this rate has substantially decreased in the past 3 months.²⁴ The generally low level of worry found in our sample does not support a high rate of actual vaccination. Therefore, in order to increase the rate of active vaccination needed to reduce the level of outbreak, public health communication efforts should emphasize the novelty of the risk and the severity of the consequences of contracting the disease. This is especially needed in the case of younger people, who seem to be not at all worried about pandemic influenza A/H1N1 even though they are more likely to be affected by it.²⁵ Moreover, the low levels of interest in flu vaccination (both seasonal and A/H1N1v) has to be linked to a general trend of disagreement about relevance of all the vaccinations in France as in many developed countries. If this trend needs to be reversed through massive public health campaigns, it appears difficult to achieve in such a short timeframe.

Two basic factors limit the findings and utility of our research. The first is methodological: a cross-sectional survey is not sufficient to assess the translation from intentions to actions. The second is related to the potential change in the image of losses from contracting A/H1N1v influenza, which could directly modify willingness to get vaccinated. Increasing severity of A/H1N1v influenza or new side effects of the vaccine would modify the proportion of the population who will get the vaccine. Nevertheless, the relationship between feeling of worry with vaccination intention will remain stable and will not be affected by such changes.

Conclusion

Conducted at the beginning of the French pandemic influenza A/H1N1, at a time when it was announced as a new infectious

disease risk, our survey identified the main factors predicting vaccination intention. They were feeling of worry, as the emotional expression of risk perception, and previous vaccination against seasonal flu, rooted in individual experience. The feeling of worry appears to be very low in the general population, while experience of seasonal flu vaccination involves mainly elderly people. These findings have major consequences on the success/failure of the vaccination programme and consequently on the control of the A/H1N1v epidemic. Without a drastic increase in the perceived risk through worry, the proportion of the French population actually vaccinated will be very low and mainly concentrated among older people. A successful vaccination campaign cannot be expected as long as pandemic influenza A/H1N1 will be perceived to be as benign as a seasonal flu, with no change in the perceived risk/benefit of vaccination.

Acknowledgements

We thank Professor Antoine Flahault, the dean of the French school of public health (EHESP), for his help while conducting this study as well as for his advice on the writing of the article.

Funding

This research was funded by a grant from the Service d'Information du Gouvernement (French Government Information Office) which is in charge of the risk communication on the pandemic swine flu.

Conflicts of interest: None declared.

Key points

- Level of worry and experience of seasonal flu vaccination are the strongest factors predicting vaccination intention against A/H1N1v influenza of French individuals.
- Experience of seasonal flu vaccination is more frequent among elderly people than it is among younger, while concerning experience of seasonal flu it is quite the reverse.
- The low level of the risk perception in the French population observed at the beginning of pandemic influenza A/H1N1 appears similar to the perceived risk of seasonal flu and is assumed as a factor of refusal to get vaccinated.
- An increase of the rate of vaccinations against A/H1N1v depends mostly on a change in perception of pandemic influenza A/H1N1 as a new and frightening risk, highly different from seasonal flu.

References

- 1 World Health Organization. WHO Global Pandemic Preparedness Plan. Available at: http://www.who.int/entity/csr/resources/publications/influenza/GIP_2005_5Eweb.pdf, (23 April 2010, date last accessed).
- 2 Chapman GB, Coups EJ. Predictors of influenza vaccine acceptance among healthy adults. *Prev Med* 1999;29:249–62.
- 3 Cummings KM, Jette AM, Brock BM, Haefner DP. Psychosocial determinants of immunization behavior in a swine influenza campaign. *Med Care* 1979;17:639.
- 4 Honkanen PO, Keistinen T, Kivela S. Factors associated with influenza vaccination coverage among the elderly: role of health care personnel. *Public Health* 1996;110:163–8.
- 5 Chapman GB, Coups EJ. Worry, risk and influenza vaccination. *Health Psychol* 2006;25:82–90.
- 6 Beguin C, Boland B, Niname J. Health care workers: vectors of influenza virus? Low vaccination rate among hospital health care workers. *Am J Prev Med* 1998;20:21–5.
- 7 Brewer NT, Chapman GB, Gibbons FX, et al. Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. *Health Psychol* 2007;26:136–45.
- 8 Leventhal H, Brissette I, Leventhal E. The common-sense model of self-regulation of health and illness. In: Cameron LD, Leventhal H, editors. *The self-regulation of health and illness behavior*. London: Routledge, 2003: 42–65.
- 9 Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the Health Belief Model. *Health Educ Q* 1988;15:175–83.
- 10 Loewenstein GF, Weber EU, Hsee CK, Welsh E. Risk as feelings. *Psychol Bull* 2001;127:267–86.
- 11 Slovic P, Finucane ML, Peters E, MacGregor DG. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Anal* 2004;24:311–22.
- 12 Sjöberg L. Worry and risk perception. *Risk Anal* 1998;18:85–93.
- 13 Baron J, Hershey JC, Kunreuther H. Determinants of priority for risk reduction: the role of worry. *Risk Anal* 2000;20:413–28.
- 14 Myers JR, Henderson-King DH, Henderson-King EL. Facing technological risks: the importance of individual differences. *J Res Personality* 1997;31:1–20.
- 15 Setbon M, Raude J, Fischler C, Flahault A. Risk perception of the “mad cow disease” in France. Determinants and consequences. *Risk Anal* 2005;25:813–26.
- 16 Maurer J, Harris KM, Parker A, Lurie N. Does receipt of seasonal influenza vaccine predict intention to receive novel H1N1 vaccine: evidence from a nationally representative survey of U.S. adults. *Vaccine* 2009;27:5732–4.
- 17 Weinstein ND. Effects of personal experience on self-protective behavior. *Psychol Bull* 1989;105:31–50.
- 18 Fazio RH, Zanna MP. Direct experience and attitude behavior consistency. In: Berkowitz L, editor. *Advances in experimental social psychology*. San Diego, CA: Academic Press, 1981: 161–202.
- 19 Lindell MK, Perry RV. Communicating environmental risk in multiethnic communities. Thousand Oaks, CA: Sage Publications, Inc, 2004.
- 20 Terpstra T, Lindell MK, Gutteling JM. Does communicating (flood) risk affect (flood) risk perceptions? Results of a quasi-experimental study. *Risk Anal* 2009;29:1141–55.
- 21 Baumann LJ, Cameron LD, Zimmerman RS, Leventhal H. Illness representations and matching labels with symptoms. *Health Psychol* 1989;8:449–69.
- 22 Anderson DB, Pennebaker JW. Pain and pleasure: alternative interpretations of identical stimulation. *Eur J Soc Psychol* 1980;10:207–12.
- 23 GIEG. Seasonal flu immunization in France. Available at: http://grippe-geig.com/fr/vaccination/couverture_vaccin.php, (23 April 2010, date last accessed).
- 24 Associated Press. Grippe A/vaccin: un Français sur cinq, published in *Le Figaro* (November 14, 2009). Available at: <http://www.lefigaro.fr/flash-actu/2009/11/14/01011-20091114FILWWW00664-grippe-avaccin-un-francais-sur-5.php>, (23 April 2010, date last accessed).
- 25 Louie JK and the California Pandemic (H1N1) Working Group. Factors associated with death or hospitalization due to pandemic 2009 influenza A(H1N1) infection in California. *JAMA* 2009;302:1896–902.