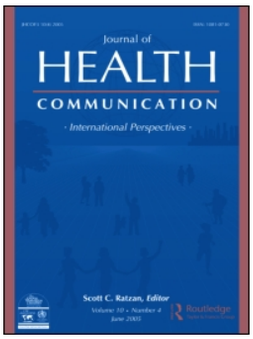

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Skepticism toward Emerging Infectious Diseases and Influenza Vaccination Intentions in Nurses

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Nurses generally show low compliance with vaccination recommendations. We assessed whether low vaccine acceptance is due to skeptical attitudes toward emerging infectious diseases (EIDs). Skepticism toward EIDs manifests as doubts about the real threat of emerging diseases and as distrust in the motives and the competence of institutions that fight these diseases. We performed a cross-sectional questionnaire study in 293 Swiss nurses using a newly developed scale to assess skepticism toward EIDs. Skepticism affected nurses' intentions to vaccinate themselves against seasonal influenza and against possible future pandemic influenza. The influence of skepticism persisted after controlling for other factors that are known to determine nurses' vaccination behavior, namely vaccination habits, feeling at risk of catching influenza, and perceiving vaccination as a professional duty. Skeptical attitudes toward EIDs seem to have a unique and hitherto ignored impact on vaccination intentions. Nurses' vaccine acceptance could be increased if vaccination campaigns specifically target skeptical attitudes toward EIDs. These campaigns should address nurses' doubts about the real threat of EIDs and should rebuild their trust in institutions which fight these diseases.

Nurses are at the front line of public health defense systems against infectious diseases, which also puts them at risk of contracting and spreading these diseases. Vaccination of health-care personnel like nurses is one of the most effective ways to contain infectious disease propagation within health-care settings. For example, in the case of seasonal influenza, vaccination of health-care personnel decreases patient mortality (Carman et al., 2000; Hayward et al., 2006). Paradoxically, however, health-care workers, and especially nurses, often show low compliance with vaccination recommendations (Friedl, Aegerter, Saner, Meier, & Beer, 2011; Hofmann, Ferracin, Marsh, & Dumas, 2006; Nelson, 2004).

Much research has been devoted to understanding the determinants of vaccination decision-making. Prominent models posit that risk perceptions, i.e., beliefs about the potential harm of a certain disease, are vital in determining health behavior (Brewer et al., 2007). Indeed, for the case of influenza again, feeling at risk to catch the disease, worrying about it, anticipating regret if becoming ill, and perceived effectiveness of vaccines all increase vaccination acceptance (Weinstein et al., 2007; Zhang, While, & Norman, 2012), as does knowledge about the disease (Zhang et al., 2012). In accordance with these approaches, influenza vaccination campaigns typically focus on providing relevant information about the targeted disease or facilitating access to vaccines (Corace & Garber, 2014; Lam, Chambers, MacDougall, & McCarthy, 2010).

But the effectiveness of health campaigns does not only hinge on transmission of correct facts. Individuals and groups also need to "make sense" of risk phenomena, notably by applying symbolic frameworks that propose explanations of the phenomenon (Gilles et al., 2013; Wagner, Kronberger, & Seifert, 2002) and enable appropriate individual and collective action (Eicher et al., 2014). Sensemaking can apply different kinds of frames, but a common pattern is to blame particular groups for transgressive conduct (Douglas, 1992). Typically, blame for disease outbreaks focuses on outgroups (Joffe, 1999). In recent years, however, the public has been repeatedly confronted with several emerging infectious disease (EID) outbreaks that were portrayed in the media as potentially severe risks but turned out to have little impact in developed countries. Media portrayals of those outbreaks often oscillated between sensationalism and reassurance (Dudo, Dahlstrom, & Brossard, 2007; Klemm, Das, & Hartmann, 2016; Washer, 2004), which may have generated risk fatigue (Adams, 2003; Liao & Fielding, 2014) or detachment in the public (Joffe & Haarhoff, 2002), or even fueled conspiracy theories that pandemics are manufactured (Mayor et al., 2013; Wagner-Egger et al., 2011).

Recurring experience with EIDs could thus have fostered sensemaking processes leading to *skeptical attitudes* toward EIDs, manifested as doubts about their real threat and distrust of institutions that fight these diseases. Health-care professionals like nurses are not automatically immune to such attitudes. We therefore explored if skepticism toward EIDs (Rubin, Finn, Potts, & Michie, 2015) affects nurses' intentions to vaccinate themselves against seasonal influenza and possible future

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pandemic influenza, using a novel scale we developed through interviews with nurses and members of the public. We hypothesized that skepticism would reduce vaccination intentions even after controlling for risk perception (Weinstein et al., 2007), perception of vaccination as professional duty (Falomir-Pichastor, Toscani, & Despointes, 2009), and vaccination habits (Lin et al., 2010), i.e., past vaccination decisions regarding both seasonal influenza and the most recent threat, the 2009 H1N1 influenza pandemic. As a prelude to our study, in the next section we describe sensemaking about disease outbreaks in more detail, especially the contrast between classic patterns of outgroup blame and the rise of new patterns like skepticism and its effects on vaccination behavior.

Public Sensemaking about Disease Threat: Skepticism about EIDs and Vaccination

Disease outbreaks pose existential threats to human communities (Morens, Folkers, & Fauci, 2004). But they also pose interpretive challenges for the social mentalities those communities support (Joffe, 1999). The uncertainty surrounding sudden disease outbreaks threatens the social fabric and begs for an explanation (Eicher & Bangerter, 2015). As such, disease outbreaks are accompanied by phenomena of sensemaking, where social groups try to interpret the meaning of the outbreak, for example by explaining its origins and proposing appropriate actions (Eicher et al., 2014). EIDs are particularly relevant in this respect. The concept has a complex history. It was developed in the 1980s to characterize a range of microbial diseases that were either newly discovered or re-emerging after having been defeated by the progress of medical science in the 20th century (Washer, 2010). Since then, many EIDs have been documented (Morens et al., 2004). Beyond the medical challenges posed by EIDs, the aura of novelty, lethality, and uncertainty surrounding them has fueled the public imagination and popular culture, as evidenced by numerous novels and movies dramatizing catastrophic disease outbreaks.

Social science research has documented the sensemaking processes (Wallis & Nerlich, 2005) evident in laypersons' and media discourse during such outbreaks and their aftermaths. Laypersons tend to view disease outbreaks as caused or exacerbated by outgroups (Joffe, 1999), due to some kind of stereotypical cultural deficiency (e.g., a lack of hygiene or exotic culinary practices in afflicted countries). In Western countries, a common denominator of these attributed cultural deficiencies is a lack of self-control, which is symbolically cast as being in opposition to Western ideals for social behavior (Joffe & Staerklé, 2007), thus allowing the construction of outgroups as culturally inferior. This constitutes a means of symbolically coping with the anxiety generated by the disease threat by projecting the cause on the outgroup. This pattern has been evidenced for AIDS in Africa (Joffe & Bettega, 2003), SARS (Washer, 2004), avian flu (Gilles et al., 2013; Joffe & Lee, 2004) the 1990s Ebola outbreak (Joffe & Haarhoff, 2002), and the 2009 H1N1 pandemic (Wagner-Egger et al., 2011). The association of disease with outgroups is thus a recurrent and ancient cultural phenomenon (Eicher & Bangerter, 2015) with probable evolutionary roots (Schaller, Murray, & Bangerter, 2015; Schaller & Park, 2011).

Recently, however, sensemaking patterns about the causes of EIDs may have changed (Joffe, 2011). Various commentators have emphasized the increasing role of trust in how laypersons make sense of disease threat (Bangerter, 2014; Larson & Heymann, 2010; Siegrist & Zingg, 2014). The repeated occurrence of disease outbreaks that have turned out to be less dangerous than announced by public health authorities and in the media may have decreased public confidence in the reliability of expert sources of information (Liao & Fielding, 2014). For example, a longitudinal survey of members of the Swiss public with two measurement points located around the beginning (Spring 2009) and end (Spring 2010) of the H1N1 pandemic evidenced a significant decrease in trust in institutions responsible for fighting disease outbreaks (Bangerter et al., 2012). More generally, in recent years, perceptions of conflicts of interest and collusion between public organizations and private corporations (e.g., pharmaceutical companies) in the management of disease outbreaks (Godlee, 2010) or collective memories of historical cases of criminal misconduct (e.g., the infamous Tuskegee syphilis project; Brandon, Isaac, & LaVeist, 2005) may also have decreased trust on the part of the public and fostered the proliferation of alternative cultural narratives for explaining infectious disease outbreaks. Thus, sensemaking patterns may increasingly focus on explaining the discrepancy between the lack of apparent danger posed by a disease outbreak and official discourse emphasizing risk and prioritizing urgent and comprehensive societal responses. In the face of such a discrepancy, an increasingly frequent explanation is that risk is exaggerated or even fabricated by authorities for ulterior motives.

An extreme example of skeptical sensemaking patterns is constituted by conspiracy theories. Conspiracy theories are narratives proposing alternatives to official explanations of events of public significance. They invoke story lines involving covert actions of powerful individuals or groups seeking to subvert or take control of mainstream society (Byford, 2011). Conspiracy theories apply to many topics of collective interest, and their prominence in explaining disease outbreaks is no exception. For example, Kalichman (2009) has documented the conspiracy theories denying the role of HIV in AIDS. Conspiracy theories about disease outbreaks are often promoted by special interest groups that seek to influence public opinion. For example, many such groups oppose vaccination, claiming that vaccines are promoted as part of an "unholy alliance for profit" (Davies, Chapman, & Leask, 2002, p. 23)—a conspiracy between authorities, physicians, and pharmaceutical companies. Antivaccination websites are so prevalent on the Internet that people searching for advice about vaccination are highly likely to encounter them (Davies et al., 2002). A recent content analysis of selected antivaccine websites confirmed that the conspiracist explanation of the H1N1 pandemic as having been "manufactured" is prominently positioned (Bean, 2011).

These elements suggest that trust is a new important component of public sensemaking about disease threats. Trust (or the lack thereof, i.e., skepticism) may be especially crucial for questions related to vaccination. Trust in institutions was a key predictor of vaccination intention in the public in the recent H1N1 pandemic (Gilles et al., 2011). Belief in antivaccine conspiracy theories is associated with decreased vaccination intentions (Jolley & Douglas, 2014). Trust could also play a role as a predictor of behaviors related to vaccine hesitancy, or "delay in acceptance or

refusal of vaccination, despite availability in vaccine services" (Dubé, Gagnon, & MacDonald, 2015, p. 4161).

While the majority of the abovementioned research focuses on the general public, the question arises to what extent skepticism affects nurses' vaccination decisions. Nurses have a double identity. On the one hand, they are trained health-care professionals who are likely to be aware of the benefits of vaccination and the normative expectations regarding vaccination. Indeed, a study with Swiss nurses (Falomir-Pichastor et al., 2009) showed that nurses' identification with nursing as a professional group predicted their perception of vaccination as a professional duty and, in turn, their intentions to vaccinate as well as actual behavior. However, nurses may not automatically be immune to ambient skeptical attitudes regarding disease threat. Indeed, skepticism about disease threat may be one reason why vaccination compliance is low in nurses. We therefore explored if skepticism toward EIDs affects nurses' intentions to vaccinate themselves against seasonal influenza and possible future pandemic influenza, using a novel scale (Table 1) we developed through interviews with nurses and members of the public. Skepticism was defined as doubt about the real threat posed by EIDs and distrust of institutions responsible for combating EIDs (e.g., the government, the media, or the World Health Organization). We hypothesized that skepticism would reduce vaccination intentions even after controlling for well-documented factors such as risk perception (Weinstein et al., 2007), perception of vaccination as professional duty (Falomir-Pichastor et al., 2009), and vaccination habits (Lin et al., 2010), i.e., past vaccination decisions regarding both the seasonal influenza and the most recent pandemic threat, the 2009 H1N1 influenza (Kaboli et al., 2010). If skepticism does predict variance in vaccination over and above these factors, it would constitute a novel and potentially important factor in vaccination decision-making. Given the special nature of the H1N1 vaccine and the pandemic context in which it was developed, we were interested in testing potential differences in predictors of vaccination intentions for pandemic versus seasonal influenza. In other words, while classical factors such as risk perception may explain vaccination intentions for seasonal influenza, they may constitute less powerful predictors of vaccination intentions for pandemic disease outbreaks like H1N1 in 2009.

Methods

We conducted a cross-sectional questionnaire study among registered nurses in 2013 in three medium-sized, non-teaching hospitals of French-speaking Switzerland (hospitals had 163, 119, and 164 beds at the time of the study). Hospitals 1 and 2 offer general and acute care, rehabilitation care, and geriatrics. Hospital 3 offers general and acute care. Hospitals were selected from a sample used in a previous interview study. Besides demographic information such as age, gender, and nationality, we assessed the following variables.

Skepticism Toward EIDs

Skeptical attitudes toward EIDs were assessed using a 12-item scale that we developed and validated in an unpublished study (Anonymized, 2015). Items consist of statements expressing doubts about the real threat and origin of EIDs and distrust in institutions which fight these diseases (for English translations of each item, see Table 1). Participants indicated their agreement with each statement on a 5-point Likert scale ranging from "not at all" to "very much". Exploratory factor analysis suggested a 1-factor solution accounting for 44.9% of variance. Cronbach's alpha of .89 indicated good internal consistency. We report data for the full 12-item scale. Results were almost identical if only the 5 items of a short version were analyzed.

Vaccination Habit and Intention

Participants indicated if they had been vaccinated against pandemic influenza H1N1 in 2009 and against seasonal influenza within the last 3 years. They further indicated their intentions to seek vaccination against seasonal influenza and possible future pandemic influenza on 5-point Likert scales ranging from "no, certainly not" to "yes, absolutely".

General Health

Participants rated their general health, from "very bad" to "very good" on a 5-point Likert scale. Due to high negative skewness, ratings were dichotomized into the categories "good or below" versus "very good".

Risk Perception of Seasonal Influenza

We used 8 items of a 12-item scale (Zhang et al., 2012) to measure nurses' risk perception of seasonal influenza. These items assess perceived personal vulnerability ("I get influenza easily") and perceived severity and negative consequences of seasonal influenza ("If I had seasonal influenza, I would pass it on to my patients."). Four items concerning H1N1 were discarded to prevent overlap with the scale on skepticism toward EIDs.

Perception of Vaccination as a Professional Duty

A 4-item scale (Falomir-Pichastor et al., 2009) assessed the extent to which nurses perceived vaccination against seasonal influenza as a professional duty ("Accepting vaccination is a proof of professional sense of responsibility"). We used 5-point Likert scales instead of the original 11-point scales to maintain a consistent response format.

Hospital authorities were first contacted for their permission to conduct the study. Questionnaires were web-based (administered via the Qualtrics online survey program) or paper-based if participating hospitals requested. We applied best practice recommendations for survey research (Baruch & Holtom, 2008), e.g., optimizing survey design and length, monitoring response, and using reminders to facilitate response. The study was conducted according to the Declaration of Helsinki principles. Questionnaires were accompanied by an informed consent form stating that participation was voluntary, anonymous, and confidential. Participants chose to receive an incentive of 20 Swiss Francs for participating or chose to donate the equivalent amount of money to charity.

Table 1. Items and descriptive statistics of the scale "Skepticism toward emerging infectious diseases."

Number	Item	*M*	*SD*	% agree[b]	Item-scale correlation
1[a]	The threat of emerging infectious diseases is exaggerated to increase sales of vaccines or medicaments.	3.17	1.11	43.7	.708**
2	I am wondering about the real threat of emerging diseases.	3.58	1.01	67.6	.562**
3[a]	I would need proof to believe that emerging diseases pose a real threat to the general public.	3.23	1.16	52.2	.737**
4[a]	We have to be cautious about the recommendations that are given to the general public to fight emerging diseases.	3.07	1.11	40.3	.750**
5	Certain emerging diseases were strategically created and spread by the government.	2.50	1.18	19.5	.636**
6[a]	I am not convinced by the explanations that are given about the origin of emerging diseases.	3.17	1.03	39.2	.756**
7	When facing an emerging disease, the World Health Organization acts as a mere puppet in the hands of pharmaceutical companies.	3.33	1.04	46.4	.717**
8	Media information about emerging diseases needs to be verified before taking it at face value.	4.19	0.76	87.7	.502**
9[a]	I doubt that emerging diseases pose a critical threat to the general public.	2.82	1.06	26.6	.699**
10	When facing an emerging disease, governments might not act in the sole interest of the general public.	3.37	1.00	50.9	.713**
11	The media have a habit of exaggerating the threat of emerging diseases to increase their audience.	3.86	0.96	70.6	.577**
12	We need to know about possible conflicts of interest of institutions that advise on how to fight emerging diseases.	3.83	0.81	71.2	.605**

Note. Item statistics were calculated using pairwise exclusion of missing data.
[a]Items belonging to the 5-item short version of the scale.
[b] % of participants who agreed (= 4) or strongly agreed (= 5) with statement.
**$p < .01$.

Results

Of 841 approached nurses, 293 (34.8%) returned questionnaires. There were 231 female and 62 male nurses between 24 and 63 years of age (M = 40.1, SD = 10.3; Table 2). Forty-one additional questionnaires had to be excluded from analysis because respondents provided invalid data for one or several of the scales (i.e., more than 25% missing item data for a scale) or single items (e.g., age, gender) of interest. Self-reported vaccination rates were 58.0% for seasonal influenza and 50.9% for pandemic H1N1. These rates exceed overall H1N1 vaccination rates reported by the recruiting hospitals (31.5%). Nurses with compliant vaccination habits are thus overrepresented in our sample. Despite these self-reported rates, only about one-third of participants intended to seek vaccination against seasonal (34.5%) or pandemic (30.0%) influenza in the future, with most nurses not seeking vaccination (seasonal: 56.0%, pandemic: 54.9%), and only a minority being undecided (9.6% and 15%). The mean skepticism score was 3.34 (SD = 0.68), indicating rather skeptical attitudes toward EIDs for health-care professionals. In fact, skepticism was not significantly different from skepticism scores obtained from a sample of the general Swiss population (Bangerter, Maridor, Ruch, & Emery, 2015; N = 881, M = 3.59, SD = 0.62, $t(1172) = 0.96$, $p = .34$). For descriptive statistics of all variables of the present sample see Table 2. Scale scores were created by computing the mean of all valid items for each participant.

An examination of correlations between predictor variables (Table 2) suggests low to moderate correlations between skepticism toward EIDs and other predictors of vaccination intention. Specifically, skepticism has a low positive correlation with general health, and low to moderate negative correlations with seasonal and pandemic influenza vaccination habits, risk perception, and perception of vaccination as a professional duty. These findings suggest in particular that skepticism is a construct that is related to, but conceptually distinct from, risk perception and perception of vaccination as a professional duty.

To examine the relationship between skepticism toward EIDs and vaccination intentions, we performed two hierarchical linear regressions with vaccination intention against seasonal and pandemic influenza as dependent variables (Table 3). In Step 1, we entered gender, age, general health, hospital of employment (dummy variables), and vaccination habit (seasonal and H1N1 influenza) as control variables. These variables accounted for 53.2% and 49.8%

Table 2. Descriptive statistics and correlations of variables in the study.

Variables		Descriptive statistics													
Dichotomous		%					*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Gender	78.8 (% women)					—								
2	General health	67.2 (% "very good")					–.006	—							
3	Vaccination habit: seasonal influenza	58.0 (% vaccinated)					–.034	–.196**	—						
4	Vaccination habit: H1N1	50.9 (% vaccinated)					.076	–.250**	.533**	—					
Continuous		Min	Max	*M*	*SD*	α									
5	Age	24	63	40.06	10.25		–.012	–.060	.032	.040	—				
6	Risk perception	1	4.25	2.64	0.46	.64	–.006	–.218**	.283**	.296**	–.021	—			
7	Professional duty	1	5	2.36	0.87	.74	–.002	–.163**	.392**	.380**	.140*	.272**	—		
8	Skepticism toward EIDs	1.42	5	3.34	0.68	.89	–.098	.146*	–.213**	–.299**	.097	–.278**	–.316**	—	
9	Vaccination intention: pandemic	1	5	2.56	1.51		.008	–.245**	.595**	.627**	.079	.381**	.580**	–.478**	—
10	Vaccination intention: seasonal influenza	1	5	2.57	1.65		–.076	–.242**	.693**	.538**	.052	.447**	.585**	–.350**	.774**

$N = 293$.
*$p < .05$, **$p < .01$.

Table 3. Summary of hierarchical regression analysis for variables predicting vaccination intention.

		Future pandemic influenza								Seasonal influenza							
Step	Variable	*B*	*SE*	*β*		R^2	Change in R^2:	*F*(*df*)		*B*	*SE*	*β*		R^2	Change in R^2:	*F*(*df*)	
1	Gender	–0.05	0.16	–.01		.498	40.42	(7,285)	***	–0.33	0.17	–.08		.532	46.31	(7,285)	***
	Age	0.01	0.01	.04						0.00	0.01	.00					
	General Health	–0.07	0.12	–.02						–0.10	0.13	–.03					
	Hospital 1	0.05	0.12	.01						0.06	0.13	.02					
	Hospital 2	0.14	0.21	.03						–0.04	0.22	–.01					
	Vaccination habit: influenza	0.80	0.13	.26	***					1.47	0.14	.44	***				
	Vaccination habit: H1N1	0.88	0.14	.29	***					0.37	0.14	.11	*				
2	Risk perception	0.25	0.13	.08		.596	34.45	(2,283)	***	0.64	0.14	.18	***	.653	49.12	(2,283)	***
	Professional duty	0.45	0.07	.26	***					0.54	0.08	.29	***				
3	Skepticism toward EIDs	–0.52	0.09	–.23	***	.640	34.47	(1,282)	***	–0.21	0.09	–.09	*	.659	4.91	(1,282)	*

Note. Coefficients (*B, SE, β*) for Step 4 of the hierarchical regression are listed. The step at which variables were entered, R^2 of each step, and a significance test for the change in R^2 to the previous step are indicated.
*$p < .05$, **$p < .01$, ***$p < .001$.

of the variance in vaccination intentions against pandemic and seasonal influenza. Only vaccination habit was significantly related to vaccination intention, suggesting that nurses who sought vaccination in the past intended to get vaccinated in the future. In Step 2, we added risk perception and perception of vaccination as a professional duty as predictors. Explained variance increased significantly for both types of influenza (Table 3). This replicates previous findings suggesting that perceiving influenza as a health risk (Weinstein et al., 2007; Zhang et al., 2012) and as a professional duty (Falomir-Pichastor et al., 2009) affects compliance with vaccination recommendations. Adding skepticism toward EIDs as predictor in Step 3 explained additional 4.4% of variance in vaccination intention against pandemic influenza ($F(1, 282) = 34.47$, $p < .001$), and 0.6% of variance in vaccination intention against seasonal influenza ($F(1, 282) = 4.91$, $p = .028$). Potential multicollinearity of predictors was not a problem, with VIF < 1.4 for all regression models. Skepticism was thus associated with reduced intentions to seek vaccination even after controlling for other factors such as previous vaccination decisions, perceived risk of influenza, and the feeling that vaccination is a professional duty.

To assess whether the influence of skepticism on vaccination intentions differs for seasonal versus pandemic influenza, we performed a repeated-measures ANCOVA for vaccination intention with the within-subject factor *target disease* (seasonal vs. future pandemic influenza) and with all variables of regression Step 3 as covariates (Table 4). Vaccination habit for seasonal influenza was a stronger predictor of seasonal influenza vaccination intention, whereas vaccination habit for pandemic influenza was a stronger predictor of pandemic influenza vaccination intention. Skepticism was significantly more strongly related to

Table 4. Interactions between disease (seasonal vs. future pandemic influenza) and all included predictors of vaccination intention.

	Pandemic influenza			Seasonal influenza		Interaction	
Variable	*β*		Versus	*β*		*F*(1, 282)	
Gender	–0.01			–0.08		2.78	
Age	0.04			0.00		0.79	
General health	–0.02			–0.03		0.04	
Hospital 1	0.01			0.02		0.02	
Hospital 2	0.03			–0.01		0.63	
Vaccination habit: seas. influenza	0.26	***	<	0.44	***	21.54	***
Vaccination habit: H1N1	0.29	***	>	0.11	*	11.78	**
Risk perception	0.08		<	0.18	***	7.58	**
Professional duty	.26	***		0.29	***	1.31	
Skepticism toward EIDs	–0.23	***	>	–0.09	*	10.48	**

Note. $N = 293$. A significant interaction term (*F*-test) indicates that a predictor has different slopes (*β*) for pandemic vs. seasonal influenza.
*$p < .05$, **$p < .01$, ***$p < .001$.

vaccination intention against pandemic influenza, whereas risk perception was significantly more strongly related to vaccination intention against seasonal influenza. Perception of vaccination as a professional duty had a similar effect on vaccination intentions in both diseases.

Discussion and Conclusion

Vaccination is an efficient means to combat infectious diseases such as influenza. As such, vaccination of health-care personnel is recommended. However, actual vaccination rates are often low. Many theoretical approaches appeal to risk perceptions and health literacy to explain vaccination intentions and behavior. However, laypersons engage in sensemaking processes to interpret the meaning of disease outbreaks, and the outcomes of these processes may also affect vaccination behaviors. In recent years, repeated outbreaks of EIDs have been handled by the media and authorities as high risk but have had little impact. Making sense of this recurrent collective experience may have led to the emergence of skeptical attitudes toward EIDs, defined as doubt about the real threat posed by EIDs and distrust of institutions responsible for combating EIDs. Skeptical attitudes may constitute a predictor of vaccination intentions and behavior that is theoretically distinct from determinants like risk perception. Accordingly, the goal of this study was to assess the effect of skepticism about EIDs on vaccination intentions in nursing personnel.

Skepticism levels were found to be moderately high. Skepticism was found to be conceptually distinct from, but related to, risk perception and the perception of vaccination as a professional duty. Nurses who were skeptical about the real danger of EIDs reported reduced intentions to seek vaccination against seasonal and future pandemic influenza. The influence of skepticism persisted after controlling for previously identified determinants of vaccination behavior: vaccination habit (Lin et al., 2010), perceived risk of influenza (Weinstein et al., 2007), and the perception of vaccination as professional duty (Falomir-Pichastor et al., 2009). Skeptical attitudes thus have a unique impact on nurses' vaccination intentions. Importantly, skepticism was more strongly related to the intention to seek vaccination against future pandemic influenza than against seasonal influenza, which suggests that nurses make clear distinctions between seasonal and pandemic influenza and have different motives to accept or refuse vaccination for each disease.

Our study has some limitations. First, it is cross-sectional, so that claims of causation have to be taken with some circumspection. However, the fact that skepticism affects vaccination intention even when variance explained by other theoretical approaches is removed points to its potential importance and warrants further research. Second, the sample is small, which limits the generalizability of the results. Moreover, the response rate is moderate, which further limits generalizability. Finally, the sample may have been biased to overrepresent nurses who were more open to vaccination. More research using the skepticism scale on larger and more diverse samples (and possible samples from other countries) is necessary to generalize our findings. Such research might also try to measure the prevalence of skepticism in other health-care professions.

Despite these limitations, our findings have important theoretical and practical implications. Because skepticism about EIDs is conceptually distinct from risk perception and the perception of vaccination as a professional duty, and predicts variance in vaccination intention over and above these factors, trust-related factors should be incorporated in theoretical models of vaccination determinants (Gilles et al., 2011; Siegrist & Zingg, 2014). Skepticism about emerging infectious diseases may also be related to behaviors like vaccine hesitancy (Dubé et al., 2015) or other health-related outcomes. It is also important to explore individual-difference correlates of skepticism about EIDs, in order to determine which individuals are more prone to skeptical attitudes. For example, skepticism about EIDs may correlate with other variables indicative of a generalized lack of trust, including belief in conspiracy theories (Jolley & Douglas, 2014) or denial of climate change (McCright & Dunlap, 2011). Finally, skepticism about EIDs may differentially predict vaccination intentions depending on the ambient uncertainty surrounding an EID. Some models of trust and risk perception (Earle, Siegrist, & Gutscher, 2007) suggest that trust plays a greater role in situations characterized by higher uncertainty (e.g., a pandemic situation vs. seasonal influenza).

In terms of practical implications, more attention should be paid to sensemaking processes in uncertain situations. Vaccine acceptance among health-care workers could be increased with vaccination campaigns that address issues of trust (Larson, Cooper, Eskola, Katz, and Ratzan (2011) and that specifically target skeptical individuals. Many campaigns focus on providing general information about a disease (Corace & Garber, 2014). These campaigns address the general population or broad occupational groups and are not sensitive to specific attitudes of subgroups. Recent approaches suggest that vaccine acceptance can be increased by targeting specific misconceptions about a disease or vaccine using commercial and social marketing principles (Nowak, Gellin, MacDonald, & Butler, 2015). More specifically, we suggest targeting three main aspects: (1) misconceptions, (2) professional identity, and (3) trust. Vaccination campaigns should of course focus on reducing misconceptions (e.g., that disease outbreaks are less severe or threatening than portrayed in media reports). An important discussion to promote is the usefulness of vaccination relative to other protection measures (e.g., face masks, hand hygiene, and the like). In a qualitative interview study, many Swiss nurses felt that vaccination was unnecessary because good hygiene measures were sufficient (Maridor, 2016). Thus, vaccination needs to be be promoted as an important component of prevention campaigns (Carlson, Budd, & Perl, 2010). But a good part of prevention should take place upstream, before a disease outbreak or before a campaign is designed. This entails strengthening the positive identity of nurses as a professional group: Falomir-Pichastor and colleagues (2009) showed that identification with nursing as a profession favorably impacts vaccination. Finally, based on the current research, we also suggest fostering trust in institutions (Bangerter, 2014), e.g., addressing skeptical nurses' misperceptions that institutions which fight EIDs are not trustworthy. A nursing profession with a strong professional identity and a high level of trust in related health-care organizations creates a strong foundation for effective vaccination campaigns when disease outbreaks occur.

Because health-related conspiracy theories are widespread on social media (e.g., Briones, Nan, Madden, & Waks, 2012; Davies et al., 2002), skepticism and misperceptions in nursing

personnel may partly arise from exposure to alternative media as a member of the general public (indeed, skepticism levels in our sample were comparable to levels in the Swiss general public). The prevalence of contact with conspiracy theories is currently high: A study found that 49% of the U.S. public believes in at least one medical conspiracy theory (Oliver & Wood, 2014). It is therefore likely that future generations of nurses and other health-care workers will enter professional training having extensive exposure to skeptical attitudes, conspiracy theories, and related pseudo-scientific views. It is therefore important to address skepticism and misperceptions early on, during nursing education and training.

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