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## Major article

## Health care workers—part of the system or part of the public? Ambivalent risk perception in health care workers

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**Background:** The emergence of the avian influenza A (H7N9) in China during 2013 illustrates the importance of health care professionals as a mediating channel between health agencies and the public. Our study examined health care professionals' risk perceptions considering their unique position as representing the health care system and yet also being part of the public, hence a risk group. Recent studies have examined the role of health professionals' personal risk perceptions and attitudes regarding compliance of the general public with vaccination. Our study examined how risk perception affects their risk analysis.

**Methods:** We employed an online survey of Israeli health care professionals and the general public in Israel (N = 240).

**Results:** When risk perception is relatively low, health care professionals tend to base their attitudes toward vaccines on analytical knowledge ( $R_c = 0.315$ ;  $P < .05$ ), whereas in situations with high risk perception, the results did not indicate any significant difference between Israeli health professionals and the Israeli general public, hence both groups base their attitudes more on emotions and personal experience than on analytical knowledge.

**Conclusions:** Public health organizations must consider the fact that health professionals are a group that cannot be automatically treated as an extension of the organization. When the risk is tangible and relevant, health care workers behave and act like everybody else. Our study contributes to understanding health care professionals' perceptions about vaccines and the thinking processes underlying such perceptions.

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Avian influenza A (H7N9) emerged in The People's Republic of China during 2013. The ongoing epizootic of H7N9 influenza in eastern China as of June 2013 was associated with 132 confirmed human infections and 39 related deaths.<sup>1</sup> To date, there is no evidence of ongoing human-to-human transmission. Because the H7N9 virus had not previously been detected in humans or animals, the situation raises many urgent questions and global public health concerns and comprises "yet another reminder that we must continue to prepare for the next influenza pandemic."<sup>2</sup>

Preparation during the crisis was not only epidemiologic<sup>†</sup> but also consisted of global and local health organizations' erecting

their media operations. The main focus was the process of risk communication with the public to obtain vaccination compliance, if needed. Risk communication literature tries to explain the mechanisms and elements that comprise human risk perception. Slovic et al<sup>3</sup> have explored the association between the analytical and emotional aspects of risk perception, specifically the association between analytical risk analysis and experience-based risk perception. The analytical system model was presented as a person's ability to analyze rules and norms and calculate risks and opportunities, whereas the experiential system model was presented as intuitive, quick, automatic, and partially subconscious.<sup>3</sup>

The studies in the literature assessing the public's risk perceptions deal alternately with analytical and experiential aspects. For example, Goodwin and Sun<sup>4</sup> investigated initial beliefs about the disease, knowledge, media use, anxiety, and behavioral responses to H7N9. Despite anxiety, participants largely trusted official messages, particularly from Chinese officials. Respondents correctly identified symptoms of H7N9. Worry was related to viewing some

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† [http://www.who.int/influenza/preparedness/pandemic/GIP\\_PandemicInfluenzaRiskManagementInterimGuidance\\_Jun2013.pdf](http://www.who.int/influenza/preparedness/pandemic/GIP_PandemicInfluenzaRiskManagementInterimGuidance_Jun2013.pdf).

groups at greater risk, including sexually active persons and migrants. Forty-one percent had already bought medicines due to the threat, although few (7%) were willing to self-quarantine if infected.

In the history of the study of seasonal and epidemic flu, pride of place is given to public opinion studies of the positions and risk perceptions of different populations as variables that influence their responsiveness to vaccination. For example, studies on H1N1 influenza have found that public opinion is divided regarding vaccinations and that there are many barriers that cause people not to vaccinate, including barriers related to mistrust of governments and authorities,<sup>5,6</sup> cognitive barriers related to the risk perception that a healthy person does not need to get vaccinated,<sup>7</sup> fear of vaccine side effects, concerns about vaccine safety and its manufacturing process, and perceiving the vaccine as only partially protective.<sup>8,9</sup>

Health care workers have been studied intensively because they are uniquely positioned as an extension of the health care system and yet also as part of the public, therefore comprising a risk group. According to official European Centre for Disease Prevention and Control documents, health professionals constitute “the message” and the voice of the organization.<sup>‡</sup>

Some studies of risk perception treat the difference between the public’s risk perception and that of experts.<sup>10-13</sup> The psychometric paradigm, for example, suggests that the public’s risk perception is influenced by dread, uncertainty, and lack of familiarity and controllability affiliated with the hazard, and that this is at variance with the risk perception of health experts.<sup>12</sup>

In the risk communication literature health care workers often appear as the “experts” who process information about the risk differently from the public. The mental models approach<sup>14</sup> indicates a differentiation between experts and the public, concluding that studies need to be conducted with the public to shape risk communication messages to address the gaps or inconsistencies in the audience’s knowledge. However, from studies on health care workers it has been found that there are many barriers that influence their lack of compliance with vaccination, although they are a “professional” public.<sup>15,16</sup>

Studies of health care workers have found that their barriers regarding vaccinations are similar to those of the rest of the public that is concerned about side effects, the novelty of the vaccination, and lack of faith in its efficacy and in the severity of the disease.<sup>17-19</sup>

Studies indicate that health care workers who choose to vaccinate<sup>20-22</sup> and those do not<sup>23,24</sup> encode the same epidemiologic data differently. A health care professional’s decision to vaccinate depends on his or her faith in the health system and its message. Health care professionals are often in a situation of cognitive dissonance,<sup>25</sup> wherein their professional obligation to recommend vaccination clashes with their personal values and perceptions. The literature rarely deals with the processes that underlie this ambivalence and the barriers and concerns that overturn or undermine their professional attitudes.

Our study tried to demonstrate how risk perception affects risk analysis. The mental model approach indicates that whereas health professionals analyze data concerning vaccines from a scientific-rational perspective, the general public’s choices are generated based on emotions and personal experience. Studies have not examined if the assessment type (analytic vs experimental) is affected by the perceived threat. We focused on Israeli health care professionals’ processing of the risk and compared health care professionals with the general public through a study

case of the H7N9 2013 influenza outbreak. Because that flu subtype virus did not spread beyond China, and is therefore at the pre-pandemic phase, it is worthwhile to check the risk perception of the general public and health care workers as a basis for a potential risk communication plan. We aimed to contribute to the public health literature devoted to understanding health care professionals’ risk perceptions and to enrich the body of literature on preparation for risk communication with the public.

We developed several distinct hypotheses. Hypothesis 1a: There is a correlation between professional occupation and the tendency to support a vaccine based solution in China, so that health care professionals tend to support vaccination more than the general public. Hypothesis 1b: There is a correlation between professional occupation and reasoning type, so that health care professionals tend to base their attitudes toward vaccination in China more on analytic reasoning than the general public. Hypothesis 1c: There is a correlation between the tendency to support a vaccine-based solution in China and reasoning type, so that respondents who support general vaccination in China, follow analytic reasoning more than those who do not. Hypothesis 2a: There is a correlation between professional occupation and the tendency to support a vaccine-based solution in Israel, so that health care professionals tend to support vaccination more than the general public. Hypothesis 2b: There is a correlation between professional occupation and reasoning type, so that health care professionals tend to base their attitudes toward vaccination in Israel more on analytic reasoning than does the general public. Hypothesis 2c: There is a correlation between the tendency to support a vaccine-based solution in Israel and reasoning type, so that respondents who support general vaccination in Israel follow analytic reasoning more than those who do not.

## METHODS

To examine the correlation between the professional occupation and support for a vaccine-based solution, a survey was conducted. We distributed our survey to 240 Israeli respondents (109 health care workers and 131 members of the public) via different social media outlets (Facebook, Twitter, and Google+). This research secured University of Haifa, Faculty of Social Welfare & Health Sciences Institutional Review Board committee approval under the TELL ME project.

### Sample

Our sample was designed using Google Docs online software (Google Inc, Mountain View, Calif). It provided quick and efficient distribution of an interactive online questionnaire to our research population (ie, Israeli health care professionals and the Israeli general public). Namely, when dealing with real time health care crises that, by nature, have a tendency to develop unexpectedly, one must gather data quickly, because the constant evolution of information can affect people’s attitudes and beliefs. For this reason, we chose an online sampling method that enabled us to reach a relatively large sample in a short time. Specifically, we used a nonprobability stratified sampling to make sure that we had enough representation of health care professionals in our final sample.

### Measures

Participants completed a self-report questionnaire consisting of 3 discrete parts. In the first part, we introduced a real scenario where there is a H7N9 outbreak in China that could potentially turn

‡ <http://www.ecdc.europa.eu/en/publications/publications/ter-immunisation-and-trust.pdf>.

into a pandemic. We explained that, as far as official health care authorities know, all contagion cases were a result of direct contact with poultry. In other words, the first scenario characterizes a situation where there is no evidence of a human-to-human infection. This narrative enabled us to understand people's risk perceptions regarding a potential risk that is, presumably, far both geographically and culturally. After the short scenario, participants were asked to answer closed questions that measured the agreement with the assumption that the World Health Organization needs to develop a new vaccine and if the participant would agree to such a vaccine treatment. This agreement was assessed with 2 questions: "Do you agree that there is a need for a new vaccine?" and, "Do you agree that there is a need to vaccinate the whole Chinese population with the new vaccine?" Subjects were asked to rate their opinions on a 5-point scale ranging from 1 ("completely disagree") to 5 ("completely agree"). Then participants were asked to elaborate as to why they (and their families) would vaccinate or avoid vaccination. The equivalent open-ended question had a 2-fold purpose. First, to understand the specific reasons underlying perceptions regarding vaccines. Second, comparing 2 different indicators that assessed the same attitudes helped us validate our measurement of the closed-ended questions regarding vaccination compliance.

To assess the reasoning underlying attitudes toward vaccination in China and in Israel, 2 human coders were used. Both coders analyzed a subsample of 60 questionnaires to generate intercoder reliability scores. Each answer was coded as either analytic or experimental. We measured overall percent agreement, as well as Krippendorff's  $\alpha$ ,<sup>26</sup> for each answer (Krippendorff's  $\alpha$  represents the level of agreement between coders beyond mere chance). Overall, for both questions, the between-coders agreement was satisfactory (vaccination in China,  $\alpha = 0.79$  [92%]; vaccination in Israel,  $\alpha = 0.72$  [89%]).

The second part of the questionnaire presented a fictitious scenario where the H7N9 virus spread to Israel. The vaccine is presumed to be effective but there is no real estimation of its coverage or side effects. Afterward, participants were asked to answer the question; "Do you agree that there is a need to vaccinate the whole Israeli population with the new vaccine?" Subjects were asked to rate their opinions on a 5-point scale ranging from 1 ("completely disagree") to 5 ("completely agree"). Similar to the first scenario, an equivalent open-ended question assessed participants' attitudes toward vaccination in Israel.

The last part of the questionnaire was devoted to different demographic variables, such as gender, age, professional occupation, and education. This allowed us to ensure that we were successful in creating a representative sample.

### Sample

Our sample was diverse in terms of gender (33.8% men and 66.2% women) and professional occupation (45.5% health care professional and 54.5% general public). The mean age was  $37.8 \pm 10.44$  years. With the exception of gender (which probably stems from a higher percentage of women in the Israeli health care service), the sample was successful in representing our target population of adult Israeli health care workers and the Israeli adult public.

## RESULTS

Hypothesis 1a predicted a correlation between professional occupation and the tendency to support a general immunization program in China, so that health care professionals tend to support vaccination more than the general public. To test this hypothesis, a *t* test for independent groups was conducted, with professional occupation as the main independent variable and support for a

general immunization program in China as the dependent variable. The variance between different occupations was significant ( $t_{[238]} = 3.59$ ;  $P < .05$ ), with the confidence interval 0.159-0.547 consistent with the expectation of Hypothesis 1a. As this hypothesis suggests, the mean difference between the groups revealed that there is a higher level of support for vaccine-based solution in China in the health care professionals group than in the general public group (mean  $\pm$  standard deviation,  $2.22 \pm 0.639$  and  $1.87 \pm 0.838$ , respectively). The level of support for vaccines reported in the health care professional group was 0.353 points higher (on a 1-5 scale) than that of the general public group.

To test Hypothesis 1b, data from the content analysis was correlated with the professional occupation of the respondents. Consistent with Hypothesis 1b, the pattern of results showcased that health care professionals tend to base their answers more on analytic reasoning than the general public in the case of China ( $\chi^2$ , 22.386; *Rc*, 0.315;  $P < .05$ ). In fact, in the health care professionals' group, only 12 (11.01%) answers had some reference to experimental explanations, whereas 47 (43.12%) answers referred directly to analytic knowledge (eg, "in the last avian flu, the vaccine proved to be extremely effective and safe so why not vaccinate?").<sup>§</sup> As expected, the majority of respondents in the general public group (64%) tended to support their opinions by experimental arguments (eg, "I don't know why, it just sounds unsafe").

To test Hypothesis 1c, a *t* test for independent groups was conducted with type of reasoning as the independent variable and support for a general immunization program in China as the dependent variable. The variance between different occupational groups was significant ( $t = 3.08$ ;  $P < .05$ ) with the confidence interval ranging from 0.077-0.503, consistent with the expectation of Hypothesis 1c. Following Hypothesis 1c, the pattern of results demonstrated that those who follow analytic reasoning tend to support vaccination in China more than those who follow experimental reasoning.

Hypothesis 2a predicted a correlation between professional occupation and the tendency to support a general immunization program in Israel so that health care professionals tend to support vaccination more than the general public. To test this hypothesis, a *t* test for independent groups was conducted, with professional occupation as the main independent variable and support for a general immunization program in Israel as the dependent variable. The variance between different occupational groups was insignificant ( $t_{[238]} = 1.23$ ;  $P =$  not significant), so that there was no evident mean difference between the health care professionals and the general public regarding support for vaccination in Israel. To test Hypothesis 2b, data from the content analysis was correlated with the professional occupation of the respondents. Inconsistent with Hypothesis 2b, the pattern of results showcased that there is no correlation between professional occupation and reasoning type ( $\chi^2 = 4.048$ ;  $P =$  not significant). Significantly, both health care professionals and the general public tended to base their answers more on experimental reasoning (eg, "First, we need to look into the side effects of this vaccine"). To test Hypothesis 2c, a *t* test for independent groups was conducted, with type of reasoning as the independent variable and support for a general immunization program in Israel as the dependent variable. The variance between different occupational groups was significant ( $t = 2.4$ ;  $P < .05$ ), with the confidence interval ranging from 0.056-0.567, consistent with the expectation of Hypothesis 2c; the pattern of results demonstrated that those who follow analytic reasoning tend to support vaccination in Israel more than those who follow experimental reasoning.

<sup>§</sup> The remaining 45.87% of the answers had either no reference to analytical or experimental explanations or they were equally analytical and experimental.

## DISCUSSION

The findings paint an interesting picture about health care workers' support for vaccination. When health care workers were asked hypothetically about what their attitude toward vaccination would be if they were citizens of China, the answer was more supportive vaccination than in the second scenario, had the flu spread to Israel where they live. These gaps between the health care workers' answers can be interpreted using the distance variable that influences their risk perception. In other words, when the health care workers were asked about China, which is far from them geographically and mentally, most said they were in favor of vaccination. But when the question was if they would get vaccinated in Israel, where they live, the risk became relevant to them and they expressed more reserved attitudes toward vaccination.

Slovic et al<sup>3</sup> explored the association between an analytical risk analysis and experience-based risk perception. The analytical system model was presented as a person's ability to analyze rules and norms and calculate risks and opportunities, whereas the experiential system model was presented as intuitive, quick, automatic, and partially subconscious. There is a tendency to view affective responses to risk as irrational. According to Slovic et al<sup>3</sup> the rational and experiential systems operate separately and yet each seems to depend on the other for guidance. Both of these models demonstrated in the studies exist simultaneously and interdependently. A rational decision, according to Slovic et al,<sup>3</sup> relies on emotions and thoughts. Their conclusion can explain the findings of our study: when the risk gets close, a person cannot remain "analytical" without mixing in feelings, emotions, intuition, and prior experience.

When the health care workers in our study were asked in the first scenario about the flu in China, they could respond without considering effect. When they were asked in the second scenario about their attitude toward vaccination if the epidemic occurred in their close environment, their answers reflected feelings, fears, and their prior experience from past epidemics and integrated all of these, leading to less clear-cut and unequivocal answers.

Furthermore, we argue that the health care workers' attitude toward vaccination in China allowed them to maintain their professional perspective as the representatives of the health system, which universally supports and recommends vaccination (when there is a risk of contracting influenza). However, when the health care workers were asked about getting vaccinated in their close environment, they adopted the perspective of the public, including the barriers and difficulties that lead people to choose not to get vaccinated. This explanation is in line with findings from the literature that indicate barriers and obstacles that make health care workers fail to comply with vaccinations.<sup>15</sup>

We can also understand the gap between the health care workers' answers through the concept of "optimistic bias." It has been found that people tend to give a lower estimate of their own risk compared with others'.<sup>27,28</sup> Researchers claim that this phenomenon affects human behavior, so that reducing optimistic bias would encourage risk-reducing behavior and decrease rates of illness or hazards.<sup>27,29</sup>

In the context of our findings, health care workers attached greater risk to what was going on "over there" in China than to what was happening at home. In other words, when something happens to other people in another place, the risk is perceived as worse than when it is close by. When the risk hit home, they brought in alleviating and optimistic perceptions as to the severity of their condition. In this vein, a study of risk perception in the context of H1N1 revealed that people expressed lower risk perceptions toward H1N1 relative to their peers.<sup>30</sup> This suggests that people are not passive, unbiased, or unmotivated recipients of information about risks. Such findings indicate that the effect of risk

communication on self-protecting behavior is significantly moderated by people's predisposed risk perceptions.

Although our main hypothesis was confirmed, this study is not free of methodologic limitations. A possible critique could focus on our nonprobability sampling procedure and measuring. Although we cannot rule out this possible criticism, our data offer some evidence against it. The fact that all participants were requested to answer 2 open-ended questions asking them to elaborate on their vaccination decision gave us an opportunity to validate our measurement through an expectation based on previous studies. Specifically, the fact that the majority of health care professionals tended to base their opinions regarding the vaccine on analytical notions, whereas the general public based their choices on experience, suggests that there is a strong case for construct validity in our study. Second, because our study is based on a small subpopulation (ie, health care professionals), the choice of a snowball sampling technique seems more of a necessity than convenience. Although this choice could have threatened the validity of our survey, this claim can be contested by the descriptive statistics presented, suggesting that we were able to reach a diverse sample, as far as demographic variables.

## CONCLUSIONS

The conclusions of our study indicate that public health organizations must consider the fact that health professionals are a group that cannot be automatically treated as an extension of the organization. When the risk is tangible and relevant, health care workers behave and act like everybody else: they mix intuition and emotions with analytical analysis, creating a complex risk perception with an optimistic bias. The innovative aspect of this study was our attempt to quantify the gap between risk perceptions of health care workers and the general public by correlating it with distinct thinking patterns. From this point of view, the challenge is to deal with health care workers' barriers by including them in planning and building the risk communication plan while addressing their fears and concerns. Preliminary work with this group will help build simulations (different scenarios) to improve communication with the general public.

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