

# Factors Associated with the Willingness of Health Care Personnel to Work During an Influenza Public Health Emergency: An Integrative Review

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## Abbreviations:

HCP: health care personnel  
PPE: personal protective equipment  
SARS: severe acute respiratory syndrome  
GP: general practitioner

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## Abstract

**Introduction:** The first decade of the 21<sup>st</sup> century has witnessed three major influenza public health emergencies: (1) the severe acute respiratory syndrome of 2002-2003; (2) the avian flu of 2006; and (3) the 2009 H1N1 pandemic influenza. An effective public health response to an influenza public health emergency depends on the majority of uninfected health care personnel (HCP) continuing to report to work. The purposes of this study were to determine the state of the evidence concerning the willingness of HCP to work during an influenza public health emergency, to identify the gaps for future investigation, and to facilitate evidence-based influenza public health emergency planning.

**Methods:** A systemic literature review of relevant, peer-reviewed, quantitative, English language studies published from January 1, 2001 through June 30, 2010 was conducted. Search strategies included the Cochrane Library, PubMed, PubMed Central, EBSCO Psychological and Behavioral Sciences Collection, Google Scholar, ancestry searching of citations in relevant publications, and information from individuals with a known interest in the topic.

**Results:** Thirty-two studies met the inclusion criteria. Factors associated with a willingness to work during an influenza public health emergency include: being male, being a doctor or nurse, working in a clinical or emergency department, working full-time, prior influenza education and training, prior experience working during an influenza emergency, the perception of value in response, the belief in duty, the availability of personal protective equipment (PPE), and confidence in one's employer. Factors found to be associated with less willingness were: being female, being in a supportive staff position, working part-time, the peak phase of the influenza emergency, concern for family and loved ones, and personal obligations. Interventions that resulted in the greatest increase in the HCP's willingness to work were preferential access to Tamiflu for the HCP and his/her family, and the provision of a vaccine for the individual and his/her family.

**Conclusions:** Understanding the factors that contribute to the willingness of HCP to report to work during an influenza public health emergency is critical to emergency planning and preparedness. Information from this review can guide emergency policy makers, planners, and implementers in both understanding and influencing the willingness of HCP to work during an influenza public health emergency.

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## Introduction

Periodically, novel influenza viruses emerge and spread rapidly through susceptible populations, resulting in worldwide epidemics or pandemics.<sup>1</sup> The first decade of the 21<sup>st</sup> century has witnessed three major influenza emergencies: (1) the severe acute respiratory syndrome (SARS) of 2002-2003; (2) the avian flu of 2006; and (3) the 2009 H1N1 pandemic influenza.<sup>2</sup> During a public health emergency caused by influenza, competent health care personnel (HCP) are an essential component of the health system response. Pandemic plans often specify that in addition to patient care, HCP will be involved in health education, epidemiological surveillance, quarantine management, fever clinics, and other duties.<sup>3</sup> Thus, an effective public health response to an influenza public health emergency depends on the majority of uninfected HCP continuing to report to work, despite the risks they might face in doing so.<sup>4</sup>

Often it is assumed that those providing health care services have a clear duty to work, even in the face of personal risk. This duty is enshrined in the professional codes of conduct that guide HCP performance.<sup>5</sup> But an influenza emergency, as with any event involving contagion or contamination, has the potential to alter the willingness of HCP to report to work for a variety of reasons.<sup>6</sup> A review of the current literature regarding the willingness of HCP to work during an influenza public health emergency can provide critical information for policy makers, planners, and HCP, and can identify gaps for further research.

The purpose of this integrative review was to analyze the current evidence concerning the willingness of HCP to work during an influenza public health emergency in the 21<sup>st</sup> century, and to identify the factors associated with their intents.

## Methods

The methodology for integrative review as described by Whittemore et al<sup>7</sup> and Chaffee<sup>8</sup> was adopted.

### Identification of Existing Reviews

A search for existing literature reviews on this topic revealed no relevant study.

### Inclusion Criteria

1. *Research Design*—Only original, quantitative designs (not qualitative designs) were included, as current methods of evidence synthesis tend to favor quantitative data only, and reviews generally do not include qualitative data.<sup>9</sup>
2. *Primary Study Participants*—All health care personnel involved in the delivery of health care services were included; employment site was not a factor.
3. *Outcome Measure*—Willingness to work in an influenza emergency/pandemic/epidemic or SARS epidemic or flu epidemic was measured. Variations of wording were accepted including “willingness to report to work,” “willingness to care for patients,” “willingness to work,” “willingness to respond,” “willingness to report,” “willingness to report to duty,” and “willingness to provide care.
4. *Type of Research Reports*—Only peer-reviewed, published, quantitative studies were included.
5. *Language of Studies*—Only studies written in English were included.
6. *Time Period*—Studies published from January 1, 2001 through June 30, 2010, either electronically, ahead of print, or in print were included.

### Search Strategy

Potential reports for inclusion in this review were identified through: (1) a review of the Cochrane Library (John Wiley & Sons Ltd, <http://www.thecochranelibrary.com>); (2) an electronic database search of PubMed (US National Library of Medicine, Bethesda, Maryland USA, [www.ncbi.nlm.nih.gov/pubmed/](http://www.ncbi.nlm.nih.gov/pubmed/)); PubMed Central (US National Library of Medicine, Bethesda, Maryland USA, <http://www.ncbi.nlm.nih.gov/pmc/>); EBSCO Psychological and Behavioral Sciences Collection (EBSCO Publishing, Ipswich, Massachusetts USA, <http://www.ebsco-host.com/public/psychology-behavioral-sciences-collection>); and Google Scholar (Google Inc., Mountain View, California USA, <http://scholar.google.com/>); (3) an ancestry search in which the references of each publication selected for inclusion were examined for additional relevant publications; and (4) discussions

with individuals possessing a known interest in the topic. Search terms used for the electronic database searches were: “willingness,” “willingness to report,” “willingness to report, influenza,” “willingness to report, influenza pandemic” “willingness to work, influenza” “duty,” “duty to treat,” “influenza,” “flu,” “H1N1,” “influenza pandemic,” “willingness duty influenza,” “SARS,” “SARS duty,” “SARS willingness,” “influenza pandemic duty,” “influenza pandemic willingness,” and “willing.”

### Screening

Research reports were screened using a three-stage process described by Gifford et al<sup>10</sup> and Chaffee.<sup>8</sup> First, the titles of articles identified through the searches were reviewed for potential relevance and either retained for additional review or discarded. Next, the abstracts of relevant articles were reviewed using the inclusion criteria, and they were then retained for further evaluation or discarded. Finally, full articles were reviewed using the inclusion criteria. The studies included in this review were evaluated further using a checklist of specific aspects of quality, reliability, and validity developed by Chaffee.<sup>8</sup>

### Study Quality

Evaluating the quality of primary sources in the integrative review method, in which diverse primary sources are included, increases the complexity of the review.<sup>7</sup> In an integrative review with diverse sampling sources, it may be appropriate to evaluate quality in a manner similar to historical research in which the authenticity, methodological quality, informational value, and representativeness of available primary sources are considered and discussed in the final report.<sup>11</sup> The reasons to suspend trust in research include technical problems brought to the reader’s attention, conflicts of interest, carelessness, sampling inadequacy, lack of replication, poor scholarship, and lack of review by a refereed journal.<sup>12</sup> The studies included in this review did not appear to have any reasons to suspend trust in their findings, although a number did not report all of the study characteristics that are desirable.

## Results

A total of 32 studies of health care personnel’s willingness to work during an influenza public health emergency were identified and met all inclusion criteria for review. Key findings of these studies are listed in Table 1. The purposes, methods, and sample characteristics of these studies are listed in Table 2. Twenty-eight of the 32 studies evaluated only influenza as the independent variable, whereas four studies<sup>14,16,20,30</sup> evaluated other variables as well.

Thirteen (41%) of the studies were from the US, four (12.5%) were from Singapore, three (9%) each were from Australia, China, and Taiwan, two (6%) were from the UK, and one (3%) each were from Belgium, Germany, Canada, and Georgia.

The HCP included in the studies were physicians, nurses, administrators, medical and nursing students, paramedical workers, ancillary staff, emergency health care workers, home health aides, home attendants, and personal care workers. Twenty-one of the studies included more than two categories of HCP. Five studies included only nurses, two studies included only physicians, and two studies included only nurses and physicians. One study each included medical and nursing students only. Twenty-two studies reported the ethical clearance of their study.<sup>3-6,13,15,20,22-27,29,31-33,35-37,39-40</sup>

Year	Study	Key Findings
2004	Tzeng <sup>13</sup>	Nurses in the "post-SARS" group were more willing to provide care for patients with SARS and agreed more with the general SARS control measures than those in the "during-SARS" group. The nurses' levels of agreement with general SARS infection control measures and the need for quarantine after providing care for infected patients were significant predictors of nurses' commitment to their professional obligation.
2004	Gullion <sup>14</sup>	20.2% of respondents were not at all willing to care for a patient infected with a communicable respiratory infection such as SARS. Nurses' willingness to care for patients in the event of an outbreak of an unknown but potentially deadly illness was positively correlated ( $r = 0.471, P < .001$ ) with their agreement with the statement that a nurse has an obligation to care for a patient, even if doing so may put the nurse's life at risk.
2005	Koh <sup>15</sup>	69.5% of workers accepted that the risk of falling ill with SARS came with their job. Doctors were more ready to "accept the risk of getting SARS as part of my job" than all other categories of HCWs, including nurses. 82% of participants were concerned about inadvertently spreading the disease to their families, friends, and colleagues.
2005	Qureshi <sup>16</sup>	53% of respondents had child care obligations; 27% had eldercare obligations; 30% had a spouse who would also be expected to work during a disaster. 48% of respondents were willing to report to work during a SARS event; 22% were not willing; and 30% were unsure. Respondents were more willing to report to work in a snowstorm, mass casualty, radiation, smallpox, chemical and environmental disaster than SARS. Fear and concern for the safety of families and themselves was the most frequently cited reason for unwillingness to report to duty.
2006	Balicer <sup>17</sup>	53.8% would report to work during a pandemic influenza. Clinical staff indicated a higher likelihood of reporting to work than technical/support staff. Increased likelihood of reporting to work during a pandemic was associated with perceived capacity to communicate effectively, perceived importance of one's role in the agency's overall response, and familiarity with one's role-specific response in an emergency.
2006	Ehrenstein <sup>18</sup>	28% of respondents agreed or strongly agreed that it is professionally acceptable for HCP to abandon their workplace during a pandemic in order to protect themselves and their families; 52% disagreed or strongly disagreed; 19% reported "no opinion." The number of administrators not willing to accept personal risk was approximately twice as high as the number of HCP.
2006	Tzeng <sup>19</sup>	57% of respondents indicated a willingness to care for patients infected with avian influenza. 59% believed that, if an outbreak of avian flu occurred, their hospitals would not have sufficient infection control measures/equipment to prevent a nosocomial infection.
2006	Hogg <sup>20</sup>	26% of respondents felt prepared for an outbreak of influenza not well-covered by vaccine. 77% were willing to be contacted on an urgent basis in case of a public health emergency.
2007	Shiao <sup>21</sup>	12.2% of respondents felt that they should not be caring for patients with SARS; 25.9% were looking for another job or considering resigning due to the risk. Shorter job tenure, increased workload and stress, the perceived possibility of fatality, affected social relationships due to infection risk, and inadequacy of protective equipment were found to be adversely associated with nurses' willingness to care for SARS patients.
2007	Chenong <sup>22</sup>	26.3% of tertiary hospital workers, and 16% of community hospital workers felt that they should not be caring for patients with avian influenza. 68.5% of tertiary hospital workers and 56.1% of community hospital workers were concerned that their job placed people close to them at high risk.
2007	Tam <sup>23</sup>	72.7% of respondents accepted a personal risk of avian influenza infection in the course of their work. 84% were prepared to take care of patients infected with the avian influenza virus. 69.4% were afraid of becoming ill with the infection. 81.6% would not consider a job change even if they were required to take care of patients with the infection. Nurses who experienced high exposures were less likely to avoid avian influenza patients and to change their job if they were required to care for them.
2007	Butsashvili <sup>24</sup>	Overall, a 23% work absenteeism rate. Females were more likely to discontinue work compared with males (RR = 2.95, 95% CI: 1.13-7.7)

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**Table 1.** Key Findings in Reviewed Studies on Willingness of Health Care Personnel to Work During an Influenza Public Health Emergency (*continued*)

Year	Study	Key Findings
2007	Gershon <sup>25</sup>	11% of home health aides/personal care workers reported they would provide care for a client quarantined due to serious infectious disease exposure. 37% of home health nurses indicated they would provide care for an influenza patient if PPE were available.
2008	Wong <sup>26</sup>	71.9% of respondents accepted the risk; 25.5% felt that they should not be caring for patients with influenza; 15% were considering resignation.
2008	Wong <sup>27</sup>	82.5% of respondents were willing to provide medical care and accepted the risk as part of their profession. Public primary care physicians (PCP) were more confident than private PCPs that their employers would look after their medical needs.
2008	Irvin <sup>28</sup>	50% of respondents replied "yes"; 42% replied "maybe"; and 8% replied "no, even if I might lose my job" to the question of reporting to work during an avian influenza pandemic. Doctors were most likely to report to work (74% "yes"), and nurses were most likely not to report to work (15% "no"). The most important factor (83%) among those who answered "maybe" was, "How confident I am that the hospital can protect me."
2009	Martinese <sup>29</sup>	36% of respondents would not attend work; an additional 17% would work only if immunization and/or antiviral medications were immediately available; 53% of staff would not attend work. Significant predictors for absenteeism included: employment status; pregnancy in family; being required in the emergency department; and working with acute medical patients.
2009	Seale <sup>3</sup>	83.3% of respondents indicated they would report to work if a patient in their ward/department had influenza-like illness; 79.0% would report to work if a colleague had contracted pandemic influenza; and 60.6% would report to work if a family member had an influenza-like illness. 81.2% would not come to work if they had symptoms consistent with influenza including in the context of a severe staff shortage (53.4%). Factors significantly associated with work avoidance were: HCW category (nursing) and not knowing what a pandemic was.
2009	Kaiser <sup>30</sup>	87.8% of respondents would be willing to respond in the event of an influenza pandemic, regardless of severity. Increased likelihood of response was associated with a belief in the importance of one's role, a belief that one's role affects the success of response, and confidence about personal safety. Respondents were more likely to respond to other disasters than an influenza pandemic.
2009	Shabanowitz <sup>31</sup>	>60% disagreed that it was ethical to abandon the workplace during a pandemic. 65% of respondents wanted autonomy in deciding whether or not to work. 79% would volunteer to work, given some incentives and protective options, the most salient being protective equipment (with relative training for use) and infectious disease training.
2009	Damery <sup>4</sup>	Absenteeism may be as high as 85% at any point during a pandemic, with potential absence concentrated among nursing and ancillary workers. The mean likelihood of working score for all respondents was 59.3%; 14.4% indicated that they would be likely to work in all circumstances. Females were significantly less likely than males to work during a pandemic, as were part-time employees compared with full-time workers, and HCWs with caring responsibilities compared with those without children or elderly dependents. Across employment categories, nurses, ancillary workers and community HCWs had the lowest likelihood of reporting to work. The most influential interventions to increase work attendance were the provision of vaccination for oneself and one's family followed by the provision of PPE.
2009	Basta <sup>32</sup>	72.6% of respondents considered family health and safety to be their greatest concern during an influenza pandemic. 92.3% of respondents were willing to work in the lowest risk scenario as compared with 56.2% in the highest risk scenario. Nurses, employees who work in the clinical service department, and employees who had read either the state or country pandemic influenza response plan were significantly more likely to report a willingness to respond compared with other workers.
2009	Barnett <sup>33</sup>	92% willing to respond, if required; 86% willing to respond if asked, but not required. Employees who considered their roles to be important in response were 8.45 times more likely to report to duty during a pandemic. 91% of the clinical staff felt their job during an influenza pandemic would be important, as compared with 85% of non-clinical staff.

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**Table 1.** Key Findings in Reviewed Studies on Willingness of Health Care Personnel to Work During an Influenza Public Health Emergency (*continued*)

Year	Study	Key Findings
2009	Mortelmans <sup>34</sup>	82.3% of respondents were willing to care for patients with influenza in case of a pandemic, but only 41.2% would do so if those patients were children. Female students were significantly more reluctant to treat children than were their male counterparts ( $P = .01$ ).
2009	Garrett <sup>6</sup>	Concern for safety of family (25.0%), personal safety (18.03), dependent care responsibilities (16.2%) and transportation (10.75%) were the most cited barriers to reporting to work. Mean initial "willingness to work score" was 75.6 (SD = 1.1). Most of the proposed interventions resulted in a statistically significant increase in the willingness to work score; the greatest increase was related to provision of Tamiflu for the individual and his/her family (increase to approximately 90.0).
2009	Daugherty <sup>35</sup>	20% of ICU staff reported being unlikely or unsure about reporting to work during a pandemic. African American respondents (31%) were more unlikely to come to work than were whites (12%) and Asians (14%) ( $P = 0.004$ ).
2010	Damery <sup>5</sup>	76.8% of respondents agreed that doctors and nurses have a duty to work during a pandemic. A third of respondents agreed that HCWs should have the option to refuse to work with infected patients. Three-quarters of respondents stated that their primary responsibility was to themselves and their family. Those agreeing that family responsibilities were important had a lower mean likelihood of working than those who disagreed (54.4 versus 72.7, respectively).
2010	Wong <sup>36</sup>	76.9% of participants reported being "not willing" (33.3%) or "not sure" (43.6%) to care for patients during an H1N1 influenza pandemic. Reasons for being unwilling to report to duty were psychological stress (55.0%) and fear of being infected with H1N1 influenza (29.2%).
2010	Seale <sup>37</sup>	86% of respondents willing to work if a patient in their ward/department had an influenza-like illness; 81% willing to work if a colleague had contracted influenza; and 71% willing to work if a family member had an influenza-like illness. 40% would present to work if they had symptoms consistent with influenza; increased to 62% in the event of a severe staff shortage. Factors significantly associated with willingness to work during a pandemic included being a nurse and being $\leq 40$ years old.
2010	Gershon <sup>38</sup>	After a training program on pandemic preparedness, willingness of Emergency Medical Service personnel to report to duty during an influenza pandemic increased from 63% to 66% [ $\chi^2(1, n = 128) = 53.2, P < .001$ ].
2010	Tippett <sup>39</sup>	43% of 725 prehospital emergency medical care personnel would be unwilling to work during pandemic conditions; one-quarter indicated that they would not be prepared to work in PPE; and one-third would refuse to work with a colleague exposed to a known case of pandemic human influenza. Respondents based within metropolitan regions were significantly less willing than those employed outside of the metropolitan regions to work during a pandemic (OR = 0.64; 95% CI = 0.5-0.9). Respondents with a high overall concern (OR = 0.36; 95% CI = 0.2-0.5) and those who perceived that their relationship partners were concerned (OR = 0.60; 95% CI = 0.4-0.9) also were less willing to work during pandemic conditions. Increased willingness to work during a pandemic was associated with high confidence in their employer (OR = 2.83, 95% CI = 1.9-4.1), and perceived adequate education/training on infectious disease (OR = 1.41; 95% CI = 1.0-1.9; $P = 0.05$ ).
2010	Barnett <sup>40</sup>	The conditional willingness to report to work ranged from 92-97%. However, if there was a possibility for disease transmission to family members, the willingness to work rate declined to 48%. EMS personnel who knew their responsibilities in a pandemic influenza emergency were more likely to report to the emergency, if required [unadjusted OR (95% CI): 2.3 (1.03, 5.07)]. Being prepared to perform their responsibilities increased the unadjusted odds (95% CI) for willingness to report to work, if required, to 4.3 (1.71, 10.92). Perceiving that one's response role is important increased the unadjusted odds (95% CI) for willingness to report to work, if required, to 5.3 (2.34, 11.90).

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**Table 1 (continued).** Key Findings in Reviewed Studies on Willingness of Health Care Personnel to Work During an Influenza Public Health Emergency

Abbreviations: CI, confidence interval; HCP, health care personnel; HCW, health care worker; ICU, intensive care unit; OR, odds ratio; PPE, personal protective equipment; SARS, severe acute respiratory syndrome.

### Reliability

Two of the reports reviewed included evidence of reliability. Tzeng<sup>13</sup> reported a Cronbach's  $\alpha = 0.898$  for all items in the health status questionnaire, and  $\alpha = 0.657, 0.865, 0.922,$  and  $0.899$  for items of general health, physical health, psychological

health, and social health, respectively. Tzeng and Yin<sup>19</sup> reported a Cronbach's  $\alpha = 0.899$  for all items in the questionnaire, and  $\alpha = 0.900, 0.827, 0.897,$  and  $0.685$  for items of physical health, psychological health, social health, and general health, respectively.

Study	Purpose	Method	N	Population	Sample Design and RR
Tzeng <sup>13</sup>	To compare nurses' willingness to provide care for SARS-afflicted patients during- and post-SARS	Self-administered survey	172	Nurses from six hospitals in Taiwan	Convenience sample; RR not reported
Gullion <sup>14</sup>	To assess the preparedness and willingness of school nurses to respond as a public health resource during an emergency	Nursing supervisor administered survey	111	School nurses in Denton County, Texas USA	Convenience sample; RR not reported
Koh <sup>15</sup>	To assess the personal risk perception, and impact of the SARS outbreak on the personal and work life of HCWs	Self-administered survey	10,511	All employees of nine major health care institutions in Singapore	Convenience sample; RR = 70%
Qureshi <sup>16</sup>	To determine the ability and willingness of health care workers to report to work during various catastrophic events	Self-administered survey	6,428	Health care workers (nurses, physicians, administrators and others) at 47 health care facilities in New York City, USA and surrounding metropolitan region	Convenience sample; RR not reported
Balicer <sup>17</sup>	To assess local public health workers' perceptions regarding pandemic influenza response	Self-administered survey	308	Employees at three health departments in Maryland, USA	Convenience sample; RR = 58%
Ehrenstein <sup>18</sup>	To assess HCP's opinion on professional ethical topics	Self-administered paper survey	644	Physicians, final year medical students, nurses, and hospital administrators at a university hospital in Germany	Convenience sample; RR = 34%
Tzeng <sup>19</sup>	To determine the factors that contribute to nurses' fears about a possible avian flu pandemic and their willingness to care for patients infected with "bird flu"	Self-administered paper survey	225	Nursing students attending a two-year bachelors degree in Taiwan	Convenience sample; RR 95%
Hogg <sup>20</sup>	To describe family physicians' perceptions of their preparedness to respond to outbreaks of infectious diseases or other public health emergencies, and to assess their capacity and willingness to assist in the event of such emergencies	Self-administered survey	274	Ottawa family physicians	Convenience sample; RR = 41%
Shiao <sup>21</sup>	To determine the proportion of nurses considering leaving their job because of the SARS outbreak and the factors related to this consideration	Self-administered survey	753	Nurses from one community hospital, one secondary hospital, and two tertiary referral hospitals in Taiwan	Convenience sample; RR = 83%
Chenong <sup>22</sup>	To study and compare the concerns and the preparedness for an avian influenza pandemic among HCWs	Self-administered survey	1,234	HCWs in two community hospitals and one tertiary hospital in Singapore	Convenience sample; RR = 81%
Tam <sup>23</sup>	To assess the attitude of Hong Kong nurses toward avian influenza, their risk perception, and their relationships with previous exposure to SARS-afflicted patients	Self-administered survey	999	Nurses affiliated with three nursing associations in Hong Kong	Convenience sample; RR = 30.0-35.3%

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Table 2. Purpose, Methods, and Sample Characteristics of Studies Reviewed (*continued*)

Study	Purpose	Method	N	Population	Sample Design and RR
Butsashvili <sup>24</sup>	To determine the factors associated with likely absenteeism of HCWs associated with a potential influenza pandemic	Self-administered or interviewer-administered based upon preference of respondent	288	Physicians and nurses at two urban hospitals in Georgia	Random sample; RR not stated
Gershon <sup>25</sup>	To assess the willingness of home health care workers to care for clients with a serious infectious disease	Not stated	1,242	Home health aides, home attendants, personal care workers and registered nurses in New York City, USA	Not stated
Wong <sup>26</sup>	To compare the concerns, perceived impact of, and preparedness for an influenza pandemic between health care workers (HCWs) in public primary care clinics and those in tertiary health care settings	Self-administered survey	2,459	HCWs in public primary care clinics and tertiary health care settings in Singapore	Random sample; RR (PC = 74.6%, TH = 76.7%)
Wong <sup>27</sup>	To assess the concerns, perceived impact of, and preparedness for an influenza outbreak among primary care physicians	Self-administered survey	285	Primary care physicians working in private practice and public clinics in Singapore	Random sample; RR = 70%
Irvin <sup>28</sup>	To survey hospital personnel regarding their attendance at work in the event of avian influenza pandemic, and what factors might influence this decision	Self-administered survey	169	Hospital workers of a medical center in Detroit, Michigan USA	Convenience sample; RR = 90%
Martinese <sup>29</sup>	To estimate the expected staff absentee rate and work attitude in a single-admission avian influenza and a multiple-admission influenza pandemic	Self-report paper survey	560	Medical, nursing, allied health and support staff of a hospital in Queensland, Australia	Convenience sample; RR = 98%
Seale <sup>3</sup>	To determine HCWs' knowledge of pandemic influenza and their intended behaviours during that period	Self-administered survey (paper and e-mail)	1,079	Clinical and non-clinical HCWs from two tertiary-referral, teaching hospitals in Sydney, Australia	Convenience sample; RR = 74.5%
Kaiser <sup>30</sup>	To assess perceptions and self-described likelihood to respond to disaster and public health scenarios	Web-based online survey	523	All individuals enrolled in an allopathic or osteopathic medical school in the United States	Convenience sample; RR = 60.6%
Shabanowitz <sup>31</sup>	To investigate the opinions of health care workers on their perceived duty to treat, and how they might respond to a severe avian flu pandemic	Web-based online survey and e-mail	908	All categories of health care workers of the Geisinger Health System, Pennsylvania, USA	Convenience sample; RR = 9.0%
Damery <sup>4</sup>	To identify the factors positively or negatively associated with willingness to work during an influenza pandemic, and to identify changes to working practice to promote the continued presence at work of those otherwise unwilling or unable to attend	Self-administered survey (both paper and online)	1,032	All categories of health care workers, health care managers, ancillary staff, general practitioners, and community health care workers in West Midlands, United Kingdom	Random sample; RR = 34.4%

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Table 2. Purpose, Methods, and Sample Characteristics of Studies Reviewed (*continued*)

Study	Purpose	Method	N	Population	Sample Design and RR
Basta <sup>32</sup>	To assess how informed health department employees are about pandemic response and how willing they are to report to work during a pandemic	Web-based survey	2,414	County health department employees in Florida, USA	Random (stratified cluster) sample; RR = 51%
Barnett <sup>33</sup>	To examine the relative influences of perceived threat and efficacy on public health workers' response willingness to a pandemic influenza	Web-based survey	1,835	Local health department employees from three states in the midwestern and eastern United States	Cluster sample; RR = 83%
Mortelmans <sup>34</sup>	To evaluate the knowledge and preparedness of senior medical students	E-mail survey	243	Senior medical students enrolled in Flemish universities in Belgium	Convenience sample; RR = 30%
Garrett <sup>6</sup>	To assess the response to proposed interventions to mitigate absenteeism in hospital workers during a pandemic	Web-based online survey and email	2,864	All employees of five large, urban, health care facilities in the New York City area, USA	Convenience sample; RR = 17%
Daugherty <sup>35</sup>	To estimate the likelihood of reporting to work in the event of an influenza pandemic	Self-administered survey	256	Internal medicine house staff, pulmonary and critical care fellows and faculty members, nurses, and respiratory care professionals at two hospitals in Baltimore, Maryland, USA	Convenience sample; R = 88%
Damery <sup>5</sup>	To evaluate the association between health care workers' likelihood of working during a pandemic with their views about the duty to work	Self-administered survey (paper and online)	1,032	All categories of health care workers, general practitioners, and community health care workers of three NHS trusts in West Midlands, United Kingdom	Stratified random sample; RR = 34.4%
Wong <sup>36</sup>	To explore the willingness of community nurses to work during an H1N1 influenza pandemic	Self-administered survey	270	Community nurses in Hong Kong	Convenience sample; RR = 66.6%
Seale <sup>37</sup>	To assess the views and intended behavior of hospital health care workers regarding a pandemic influenza	Self-administered survey	1,909	Full-time health care workers of 24 hospitals in four districts of Beijing, China	Convenience sample; RR = 99%
Gershon <sup>38</sup>	To assess the effectiveness of a multi-method, pandemic preparedness training intervention	Pre-/post-test self-administered questionnaire	129	Emergency Medical Service personnel of New York, USA	Convenience sample; RR not stated
Tippett <sup>39</sup>	To investigate the association between knowledge and attitudes regarding avian influenza on likely behavioral responses of emergency prehospital medical care providers during pandemic conditions	Self-administered questionnaire	725	Prehospital emergency medical care providers in Australia	Stratified random sample; RR = 24.7%
Barnett <sup>40</sup>	To understand Emergency Medical Service workers' response willingness during an influenza pandemic	Self-administered questionnaire-based mail survey	773	Emergency Medical Service personnel in the United States	Stratified random sample; RR = 49%

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**Table 2** (continued). Purpose, Methods, and Sample Characteristics of Studies Reviewed

Abbreviations: HCP, health care personnel; HCW, health care worker; NHS, National Health System; RR, response rate; SARS, severe acute respiratory syndrome.



### Validity

Evidence of the construct validity (ie, the confidence that the instrument used measured what it was expected to measure<sup>8,41</sup>) reported in the studies reviewed is listed in Table 3. Reports of face validity,<sup>8,42</sup> content validity, construct validity, and/or criterion validity were sought specifically.

Tippett et al reported that a panel of experts, including epidemiologists, infectious disease experts, and psychologists, assessed the face and content validity of the instrument used.<sup>39</sup> Tzeng reported that content validity was determined by two physicians and two nurse educators.<sup>13</sup> Tzeng and Yin reported that content and expert validity evaluation was conducted by three scholars in sociology, psychology, and health care science.<sup>19</sup> Barnett et al stated that the Johns Hopkins Public Health Infrastructure Response Survey Tool used in their study has been validated extensively in multiple national, cultural, and health care contexts, but no details were provided.<sup>40</sup>

Garrett et al reported that the “Willingness to Work Score” tool used in their study has not been validated under real-world conditions.<sup>6</sup> Shiao et al ensured the construct validity of the questionnaire used in their study, but no details were provided.<sup>21</sup> Hogg et al reported pre-testing of their questionnaire by two focus groups.<sup>20</sup> Balicer et al reported that their findings fit well with their theoretical framework (indicating evidence of construct validity), but no details were provided.<sup>17</sup> Basta et al used the instrument developed by Balicer et al.<sup>17,32</sup>

No criterion-related validity was noted in any of the studies reviewed.

### Evaluation of Instrument Development

New instruments were developed for use in 23 of the 32 studies included in this review. Evidence of psychometric evaluation sought included evidence of reliability and validity, stakeholders’ or focus groups’ interviews, multi-method study, and expert panel evaluation of survey items. No study described instrument development in detail.

### Additional Factors Evaluated

**Pre-testing**—Eleven studies reported conducting a pre-test or pilot test. Four of these<sup>3,21,30,39</sup> reported that the results of the pre-test led to instrument revision. Seven of the studies<sup>13,14,19,20,23,24,28</sup> did not report the outcome of the pre-test or whether it was used to revise or refine the instrument or administration methods.

**Use of a Theoretical or Conceptual Framework**—Theories predict the presence of new phenomena and generate hypotheses that can be translated into questions that can be answered through scientific study.<sup>8,43</sup> Not using theory to guide research can leave a gap in the scientific process. Five studies described the use of a conceptual or theoretical framework<sup>13,17,19,33,40</sup> and Wong et al reported using a conceptual framework suggested by Patel et al.<sup>36,44</sup>

**Sampling Strategy**—Eight studies used random sampling (a sampling strategy that improves external validity)<sup>4,5,24,26,27,32,39,40</sup> and 23 used a convenience sampling strategy. The sampling method was not stated in one study.<sup>25</sup>

**Statistical Power**—Seale et al reported a power analysis.<sup>37</sup> Balicer et al noted that the sample size of their study limited

power, but no power analysis was discussed. No other studies included a discussion of statistical power.<sup>17</sup>

**Selection Associated with Non-response**—Four studies evaluated non-response bias and found no significant difference; the variables included were age, gender, and job classification.<sup>6,32,37,40</sup>

**Social Desirability Bias**—Martinase et al and Barnett et al discussed the potential for social desirability bias in their studies.<sup>29,33</sup>

**Missing Data Management**—No studies reviewed included discussions of analysis or management of missing data in the research reports.

### Data Synthesis

The following factors were found to be associated with the willingness of HCP to work during an influenza public health emergency:

**Age**—Seale et al reported that age  $\leq 40$  years was statistically associated with reporting to work during an influenza public health emergency,<sup>37</sup> whereas Shabanowitz and Reardon reported that the age group 20–34 years was more likely to abandon work during an influenza pandemic as compared with the other age groups.<sup>31</sup>

**Gender**—All studies that evaluated gender as a correlate to willingness to report to work during an influenza public health emergency reported that being female lowers the likelihood of a respondent’s willingness. Damery et al found that females were significantly less likely to work during a pandemic than males,<sup>4</sup> while Butsashvili et al reported that women were more likely to discontinue work during a pandemic compared with men.<sup>24</sup> Qureshi et al found that, compared with males, females had a significantly lower likelihood of willingness to report to duty during a catastrophic disaster for most types of events including influenza pandemic.<sup>16</sup>

**Race**—Daugherty et al analyzed the self-reported likelihood of reporting to work during an influenza public health emergency based on race, and found that a significantly larger proportion of African-American respondents (31%) were unlikely to come to work than were whites (12%), and Asians (14%).<sup>35</sup>

**Marital Status**—Irvin et al found no statistically significant difference between married and single respondents’ willingness to report to work during an influenza public health emergency.<sup>28</sup>

**Type and Location of Health Facility**—Emergency prehospital medical care providers based within metropolitan regions were less willing to work during an influenza public health emergency than were those employed outside of the metropolitan regions.<sup>39</sup> Cheong et al reported that health care workers in tertiary level hospitals were less willing to care for influenza-affected patients as compared to health care workers in community hospitals.<sup>22</sup>

**Category of Worker**—Twelve studies evaluated the association between category of health care worker and willingness to respond during an influenza public health emergency; 11 studies found statistically significant differences in willingness among different categories of staff, whereas Martinese et al did not find

Study	Independent Variable(s)	Dependent variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Tzeng <sup>13</sup>	SARS epidemic	Nurses' willingness to provide care for SARS-afflicted patients during-SARS and post-SARS	Cronbach's $\alpha = 0.898$ for all items in health status questionnaire; $\alpha = 0.657, 0.865, 0.922,$ and $0.899$ for general health, physical health, psychological health, and social health, respectively	Tests of content validity conducted by two physicians and two nurse educators	Research question, hypothesis, definitions of measurement items, and data analysis clearly explained
Gullion <sup>14</sup>	Outbreak of an unknown potentially deadly illness, communicable respiratory illness (SARS)	Preparedness and willingness to respond in an emergency response	Utilized survey instrument based on Alexander and Wynia <sup>45</sup>	Pre-testing conducted	Small sample size and lack of random sampling prevent generalizations of findings
Koh <sup>15</sup>	SARS outbreak	Perception of exposure to SARS, perceived risk of infection, and impact of the SARS outbreak on personal and work life	Not stated	Not stated	Approved by institutional review board; Large sample size High response rate
Qureshi <sup>16</sup>	Seven hypothetical disaster scenarios including SARS	Ability to report to duty during a disaster, willingness to report to duty during a disaster	Not stated	Researchers considered convenience sample to be representative and compared it to the demographic profile of the population	Outcome variables well defined; results cannot be generalized
Balicer <sup>17</sup>	Influenza pandemic	Ability and willingness to report to duty in pandemic influenza and the factors that may influence both	Not stated	Non-response bias assessed-no significant difference; findings support risk perception theory; findings were internally consistent among three departments	Sample size limited power but no power analysis discussed; three data collection sites not randomly selected
Ehrenstein <sup>18</sup>	Influenza pandemic	Acceptance to abandon work place during a pandemic in order to protect him/herself and family	Not stated	Non-response bias assessed- no significant difference	Actual behaviors during a pandemic cannot solely be predicted by answers to hypothetical questions
Tzeng <sup>19</sup>	Avian flu pandemic	Willingness to care for patients	Cronbach's $\alpha = 0.899$ for all items; $0.900, 0.827, 0.897$ and $0.685$ for items of physical health, psychological health, social health, and general health, respectively	Content and expert validity evaluated by three scholars in sociology, psychology, and health care science	Research questions and definition of variables explained; High response rate
Hogg <sup>20</sup>	Public health emergencies including influenza pandemic and SARS	Willingness to be contacted in the event of public health emergencies	Not stated	Pre-tested by two focus groups; approved by hospital research ethics board	Survey questionnaire was developed in consultation with survey experts; low response rate

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Table 3. Variables, Evidence of Reliability and Validity, and Quality Considerations of Reviewed Studies (continued)

Study	Independent Variable(s)	Dependent variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Shiao <sup>21</sup>	SARS outbreak	Looking after patients with SARS, looking for another job or considering resignation	Not stated	"Ensured" construct validity; Pilot tested followed by revision of instrument	Research questions clearly stated; factor loading of all questions described; approved by institutional review board
Chenong <sup>22</sup>	Influenza pandemic	Not caring for avian influenza-afflicted patients	Developed survey instrument based on Koh <sup>15</sup>	Not reported	Good response rate; rating bias and lack of qualitative design in questionnaire
Tam <sup>23</sup>	Avian influenza pandemic	Nurse's willingness to take care of patients infected with avian influenza	Not stated	Questionnaire developed after interviewing stakeholders, field tested	Approved by institutional review board; selection bias
Butsashvili <sup>24</sup>	Influenza pandemic	Potential absenteeism	Not stated	Pilot-tested	Approved by institutional review board
Wong <sup>26</sup>	Avian influenza pandemic	Willing to provide medical care	Used survey instrument based on Koh <sup>15</sup>	Random survey	Recall bias and lack of qualitative design
Wong <sup>27</sup>	Influenza pandemic	Willing to provide medical care	Used survey instrument based on Koh <sup>15</sup> and tested <sup>22</sup> by Cheong	Random survey	Recall bias and lack of qualitative design
Irvin <sup>28</sup>	Influenza pandemic	Willingness to report to work and issues important in making this decision	Not stated	Pilot-tested	Outcome variables well defined; review board approved survey instrument; survey handed out in person provided less anonymity
Martinese <sup>29</sup>	Influenza pandemic	Staff absentee rates in two hypothetical scenarios: (1) single admission of influenza; (2) multiple admissions of pandemic influenza	Not stated	Survey instrument designed in collaboration with the hospital administration, infectious diseases and emergency departments	Approved by institutional review board; Informed consent obtained; high response rate
Seale <sup>3</sup>	Influenza pandemic	Willing to work during pandemic influenza	Not stated	Pilot-testing followed by revision	Approved by institutional review board; broad spectrum of HCWs represented; good response rate
Kaiser <sup>30</sup>	Influenza pandemic	Willingness to respond in the event of influenza pandemic	Not stated	Survey instrument designed by working group; pilot-testing followed by revision	Potential selection bias

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Table 3. Variables, Evidence of Reliability and Validity, and Quality Considerations of Reviewed Studies (*continued*)

Study	Independent Variable(s)	Dependent variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Shabanowitz <sup>31</sup>	Avian flu pandemic	Perception of duty to work	Not stated	Not reported	Approved by institutional review board; low response rate; possible selection bias
Damery <sup>4</sup>	Influenza pandemic	Factors associated with willingness to work, and acceptability of potential interventions to promote continued presence at work	Not stated	Phase Two of a multi-method study; random sample; non-response bias assessed	Research questions clearly stated; scale scoring clearly described
Basta <sup>32</sup>	Influenza pandemic	Willingness to report to work in four scenarios of combination of pandemic stage (early vs. peak) and job duties required (no face-to-face contact vs. face-to-face contact)	Not stated; survey instrument was based on Balicer <sup>17</sup>	Random sample	Ensured a representative sample across health departments of different sizes; approved by institutional review board
Barnett <sup>33</sup>	Influenza pandemic	Perceived likelihood of being asked to report to duty and self-reported willingness to respond	Johns Hopkins Public Health Infrastructure Response Survey Tool was used	Not stated	Approved by institutional review board; extended Parallel Process Model (EPPM); Social desirability bias
Mortelmans <sup>34</sup>	Influenza pandemic	Willingness to participate	Not stated	Not stated	
Garrett <sup>6</sup>	Influenza pandemic	Willingness to work	Survey content developed from the findings of focus group sessions	Researchers accepted that willingness to work score (WTWS) approach has not been validated under real world conditions	Approved by institutional review board; WTWS not validated under real world conditions; interventions offered depending on the barriers; selection bias, reporting bias, and language bias
Daugherty <sup>35</sup>	Influenza pandemic	Likelihood to report to work	Not stated	Not stated	Analysed racial factor; high response rate
Damery <sup>5</sup>	Influenza pandemic	Perception of duty to work	Survey content was developed from the findings of qualitative research of Draper et al <sup>48</sup>	Part of two-phase multi-method study; random sample; non-response bias assessed—no significant difference	Research questions clearly stated; approved by Nottingham Research Ethics Committee and participating trusts; limitations acknowledge that HCW might behave differently during a pandemic
Wong <sup>36</sup>	H1N1 influenza pandemic	Willingness to work	Questionnaire based on conceptual framework suggested by Patel <sup>44</sup>	Not reported	Approved by University ethics committee

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Table 3. Variables, Evidence of Reliability and Validity, and Quality Considerations of Reviewed Studies (*continued*)

Study	Independent Variable(s)	Dependent variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Seale <sup>37</sup>	Influenza pandemic	Intentions towards work	Partly adapted from Tam et al <sup>23</sup>	Not stated	Approved by institutional review board; high response rate; sample size determined to obtain 80% power at a 2-sided 5% significant level for detecting a significant difference
Gershon <sup>38</sup>	Influenza pandemic	Willingness to report to work	Not stated	Not stated	Post-test conducted immediately following the training, and therefore, measured only short-term retention of information
Tippett <sup>39</sup>	Avian influenza pandemic	Willingness to work and likely refusal to work with colleagues who were exposed to unknown/ suspected influenza	Not stated	A panel of experts (epidemiologists, infectious disease experts, and psychologists) assessed the face and content validity; pilot-tested	Sample representative of Australian emergency prehospital medical care work force in relation to the three stratification factors (ambulance service, age, gender); low response rate
Barnett <sup>40</sup>	Influenza pandemic	Willingness to report to work in different conditional scenarios	Based on Johns Hopkins – Public Health Infrastructure Response survey Tool (JH-PHIRST)	Researchers state that JH-PHIRST has been validated extensively in multiple national, cultural and health care contexts	Possibility of non-response bias

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**Table 3** (continued). Variables, Evidence of Reliability and Validity, and Quality Considerations of Reviewed Studies.

Abbreviation: SARS, severe acute respiratory syndrome.

any differences.<sup>29</sup> The majority of the 11 studies reported a higher willingness to report to work during an influenza epidemic among physicians and nurses than other health care personnel. Damery et al reported that doctors and general physicians (GPs) were most likely to continue working during an epidemic, despite the risk.<sup>4</sup> Irvin et al reported that doctors were more likely to respond to work during an avian influenza pandemic than were nurses.<sup>28</sup> Qureshi et al found that physicians and emergency medical technicians were significantly more likely to be willing to report to work during various catastrophic events as compared with nurses, administrators, and support staff.<sup>16</sup>

*Area of Work*—Four studies found that HCP who were working or had worked in the clinical services department, emergency department, and/or with acute medical patients were more willing to report to work during influenza emergency as

compared with HCP working in technical and/or non-clinical areas.<sup>17,29,32,33</sup>

*Type of Employment*—Staff who worked part-time were less likely to work during an influenza pandemic compared with full-time workers.<sup>4,29</sup>

*Duration of Employment*—Shiao et al<sup>21</sup> reported that nurses with longer work tenure were the least likely to consider leaving their jobs during a SARS outbreak, whereas Martinese et al<sup>29</sup> did not find any association between job duration and willingness to report to work.

*Education and Training*—Five of the six studies that evaluated the association between education and training on the topic of

influenza with willingness to work during an influenza public health emergency found a positive association,<sup>14,31,36,38,39</sup> whereas Basta et al reported that having attended pandemic influenza training in the past year was not significantly associated with willingness to report to work.<sup>32</sup>

*Past Experience with an Influenza Emergency*—Tam et al reported that nurses who had previously worked during an influenza public health emergency were less likely to avoid influenza patients and to change their jobs.<sup>23</sup> Tzeng also found that nurses in the post-SARS group were more willing to provide care for patients with SARS than were those in the during-SARS group.<sup>13</sup>

*Phase of Pandemic*—Basta et al reported a decline in willingness to report to work with the progression of a pandemic from early phase to peak phase, and when face-to-face contact was required.<sup>32</sup>

*Value in Response*—The perception of value of one's role in the overall response of an agency/department was positively associated with the HCP's willingness to work during an influenza emergency in five of the studies.<sup>17,29,30,33,40</sup>

*Belief in Duty*—Health care personnel who believed that they had a duty to treat were more likely to respond during an influenza public health emergency. Gullion reported that nurses' willingness to respond was positively correlated with their agreement with the statement that "a nurse has an obligation to care for a patient."<sup>14</sup> The perception of a duty to work emerged as a strong predictor of potential work attendance in the study by Damery et al. Those agreeing with the statement that "all HCWs have a duty to work" were more likely to report to work than were those who disagreed.<sup>5</sup> Similarly, those who agreed that "doctors and nurses have a duty to the sick" were over four times more likely to work than those who disagreed with that statement.

*Infection Risk Perception*—Fear of becoming infected with influenza was one of the major reasons for an unwillingness to report to duty during an epidemic, although the majority of HCP accepted a personal risk of influenza infection in the course of their work.<sup>23,36</sup>

*Concern for Family and Loved Ones*—Fourteen of the 32 reviewed studies evaluated this aspect, which emerged as a barrier to willingness to work in an influenza emergency. Basta et al reported that 72.6% of the respondents selected family health and safety as their greatest concern during peak of an influenza pandemic.<sup>32</sup> Martinese et al reported that the existence of a pregnancy in the family was a predictor for absenteeism during a pandemic.<sup>29</sup> Damery et al found that HCP with family-caring responsibilities were less likely to report to work during an influenza pandemic compared with HCP without children or elderly dependents.<sup>4</sup> Barnett et al noted a decline in willingness to work from 92–97% to 48% if there was a possibility for disease transmission to family members.<sup>40</sup> Garrett et al reported that concern for the safety of their family was the most significant barrier to hospital workers reporting to duty during an influenza pandemic; this concern for family safety was even more important than were personal safety concerns.<sup>6</sup> Qureshi et al also noted that

fear and concern for family were greater barriers to a willingness to report to duty than concern of self.<sup>16</sup>

*Personal Obligations*—Five studies reported that child care, elderly care, and pet care were significantly associated with willingness to report to work during an epidemic. Qureshi et al found child care (29.1%), personal health concerns (14.9%), elder care responsibilities (10.7%), pet care (7.8%), and second job obligations (2.5%) to be barriers to HCP's willingness to work during a disaster.<sup>16</sup> Daugherty et al reported that being a primary caregiver for children or adults was a significant factor influencing the likelihood of reporting to work during a pandemic.<sup>35</sup> Damery et al found that workers who agreed that family responsibilities were important had a lower likelihood of working than those who disagreed with that concept.<sup>5</sup> However, Irvin et al reported no statistically significant difference in the proportion of respondents with children <18 years old that would report to work as usual, compared with those without children who would report to work as usual.<sup>28</sup>

*Availability of Personal Protective Equipment*—When comparing groups who were likely to report to work with those who were not likely to report to work during an influenza epidemic, Daugherty found no significant differences in the proportion of respondents who thought protective measures would impact their likelihood of coming to work.<sup>35</sup> But findings from other studies indicate that personal protective equipment (PPE) was considered to be important by workers and the availability of PPE was associated with a willingness to work during an influenza emergency.<sup>13,21,28–30</sup>

*Confidence in Employer*—Tippett et al reported that an increased willingness of HCP to work during an influenza emergency was associated with high confidence in their employer.<sup>39</sup>

*Knowledge of the Pandemic Plan*—Health care personnel who had read one of the pandemic influenza plans were more likely to be willing to respond during an emergency.<sup>32</sup> The self-described likelihood of reporting to work during an influenza emergency was associated with the HCP's familiarity with one's role-specific response requirements.<sup>17,40</sup> Incomplete knowledge of the pandemic plan was associated with work avoidance.<sup>3,40</sup>

*Influenza and Other Types of Disasters*—Qureshi et al compared the willingness to respond in different disaster settings and found that HCP were least willing to report to work during a SARS event as compared with disasters from other events such as a snow storm, environmental event, radiation, smallpox, or chemical event.<sup>16</sup> Kaiser et al also reported that medical students were more likely to respond to a disaster from a natural cause than to an influenza pandemic.<sup>30</sup>

*Persuasability and Interventions*—Damery et al examined the "persuasability" of those HCP who indicated a <100% likelihood of working during a pandemic by assessing their response to 12 proposed interventions or changes in work conditions.<sup>4</sup> The findings indicate that that nearly 70% of the proposed interventions would persuade HCP to continue to work during a pandemic. The demographics of the groups that were most persuaded by the interventions included those in the

16–30 years age group; community HCP; HCP living in households without children; and HCP living with parents or relatives. Groups that were least persuaded by the proposed interventions were nurses and HCP living with friends. The most influential interventions were the provision of vaccination for oneself and one's family, followed by the provision of personal protective equipment, and having employers share emergency plans with their HCP.

Interventions that would provide incentives or employee safeguards also were recognized as being potentially beneficial. These interventions included having employers accept liability for any mistakes made; being able to work flexible hours; receiving a financial bonus commensurate with the level of extra duties an individual may be asked to perform; and the provision of life/disability insurance. Garrett found that the intervention with the greatest increase in the HCP's willingness to work was preferential access to Tamiflu for the HCP and his/her family.<sup>6</sup> Daugherty et al reported that 76% of respondents felt that the provision of a vaccine for themselves and their families would influence their decision to come to work during an influenza emergency.<sup>35</sup> In the same study, 70% of the respondents reported that antiviral prophylaxis would be important, while only 50% indicated that the availability of protective masks for use at home would influence their decision.

## Discussion

The majority of the studies on the willingness of HCP to work during an influenza public health emergency have been conducted in the United States. This is followed by studies from Singapore, Taiwan, and China, countries that were affected severely during the avian flu and SARS epidemics. Surprisingly, no study was found to be from Mexico, the epicenter of the 2009 influenza pandemic. Similarly, no studies from Latin America and Africa have been reported. The willingness of HCP to work during an influenza public health emergency has been scrutinized by multiple disciplines (medicine, public health, nursing, intensivists, anesthesiologists, emergency management). The inclusion of multinational and multidisciplinary health care team participants in future studies may help to establish global evidence.

The seminal work by Tzeng in 2004 was important, as it included the development of a conceptual framework for study, and provided evidence of both reliability and validity.<sup>13</sup> These factors contributed to the soundness of the study and its findings. Only three subsequent studies described the use of a conceptual framework. Tzeng found that nurses in the "post-SARS group" (ie, having had experience caring for SARS patients) indicated a greater willingness to provide care for patients with SARS than did those who were in the "during-SARS group."<sup>13</sup> Tam et al concurred with these findings and reported that nurses who had previously worked during an influenza public health emergency were less likely to avoid caring for patients with influenza.<sup>23</sup> Understanding the factors that might influence the HCP's willingness to report to work during an influenza epidemic is essential for preparedness planning. This review reveals various factors associated with a willingness to work during influenza emergency: being male, being a doctor or nurse, working in a clinical or emergency department, working full-time, prior influenza education and training, prior experience of working during an influenza emergency, the perception of value in response, the belief in duty, the availability of PPE, and confidence in one's employer. Factors found to be associated with less willingness were: being female, holding a supportive

staff position, working part-time, the peak phase of the influenza emergency, concern for family and loved ones, and personal obligations. Being African-American was reported to be associated with a reduced willingness in one study,<sup>35</sup> but the association between race and willingness to work requires further research. Neither the marital status nor the seniority of the HCP was associated with willingness to work.<sup>28,29</sup> Any association between age and HCP's willingness to work was not clear as study results were conflicting. Although age  $\leq 40$  years was associated with reporting to work during an influenza emergency in one study,<sup>37</sup> findings from another study indicated that HCP in the age group of 20–34 years were more likely to abandon work during an influenza pandemic as compared with the other age groups.<sup>31</sup>

With regard to professional discipline, two studies<sup>16,28</sup> found that doctors were more likely to report to work than were nurses. However, this difference was not evident in the study by Martinese et al.<sup>29</sup> Nurses also were found to be the least persuaded by various work-related changes or interventions.<sup>4</sup>

The concern for family and loved ones emerged as a barrier to the willingness to work, and even exceeded personal safety concerns according to two studies.<sup>6,16</sup> This was corroborated by the findings that the provision of vaccination for family,<sup>4,35</sup> and preferential access to Tamiflu for family members were the most influential interventions to improve work willingness.<sup>6</sup> Other interventions associated with improvement in willingness to work were: the provision of PPE, bonus salary, insurance, and flexible hours. This provides valuable information about beneficial interventions to be targeted towards those HCP who initially are less willing to work during an influenza emergency, and who may constitute a substantial portion of the workforce. Sharing the emergency plans and protective programs with employees before an event occurs also improves the confidence of workers in their employer.

In comparing the willingness of HCP to report to work in different disaster settings, it emerged that HCP were less willing to work during an influenza emergency than during a disaster from other natural events and other causes such as radiation, chickenpox, and chemical events. The reasons for this were not elucidated from these studies and require further investigation. However, this finding emphasizes the need for health care authorities to be more concerned about the absenteeism of HCP during influenza public health emergencies than during a disaster from any other event.

It is hoped that the results of this integrative review will strengthen the methods used in future studies of the willingness of HCP to work in influenza emergencies. Such studies could be strengthened by: (1) the inclusion of a clear sampling strategy; (2) evidence of reliability and validity; (3) the use of conceptual frameworks; and (4) descriptions of pre-testing procedures and results. Details of the data collection instrument development also are helpful for researchers considering replication of a study.

The actual behavior of HCP in real situations may or may not be the same as that reported in the studies reviewed, and thus, the findings require cautious interpretation. The rate of HCP absenteeism during an influenza epidemic could be much higher, or possibly lower. Nonetheless, this integrative review provides valuable information regarding the barriers to HCP willingness to work during an influenza public health emergency and the appropriate actions required to improve their response.

## Limitations

Despite an extensive search, it is possible that one or more studies may have been missed as the topic pertains to multiple disciplines

and studies could appear in a wide variety of publications. Studies in languages other than English also may exist.

## Conclusions

Influenza public health emergencies have increased in frequency in the 21<sup>st</sup> century and will continue to be a challenge to health care systems.

This integrative review has revealed valuable information on the issue of the willingness of HCP to work during influenza public health emergencies, a crucial factor in providing an efficient and effective health care response. The findings documented in this review help us to understand and address the issue of willingness of HCP to report to work during influenza public health emergencies.

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