SYSTEMATIC REVIEW

# Factors Influencing Health Care Workers' Willingness to Respond to Duty during Infectious Disease Outbreaks and Bioterrorist Events: An Integrative Review

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## Abstract

**Background:** Infectious disease emergencies are increasingly becoming part of the health care delivery landscape, having implications to not only individuals and the public, but also on those expected to respond to these emergencies. Health care workers (HCWs) are perhaps the most important asset in an infectious disease emergency, yet these individuals have their own barriers and facilitators to them being willing or able to respond.
**Aim:** The purpose of this review was to identify factors affecting HCW willingness to respond (WTR) to duty during infectious disease outbreaks and/or bioterrorist events.
**Methods:** An integrative literature review methodology was utilized to conduct a structured search of the literature including CINAHL, Medline, Embase, and PubMed databases using key terms and phrases. PRISMA guidelines were used to report the search outcomes and all eligible literature was screened with those included in the final review collated and appraised using a quality assessment tool.
**Results:** A total of 149 papers were identified from the database search. Forty papers were relevant following screening, which highlighted facilitators of WTR to include: availability of personal protective equipment (PPE)/vaccine, level of training, professional ethics, family and personal safety, and worker support systems. A number of barriers were reported to prevent WTR for HCWs, such as: concern and perceived risk, interpersonal factors, job-level factors, and outbreak characteristics.
**Conclusions:** By comprehensively identifying the facilitators and barriers to HCWs' WTR during infectious disease outbreaks and/or bioterrorist events, strategies can be identified and implemented to improve WTR and thus improve HCW and public safety.

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**Keywords:** bioterrorism; health care workers; infectious disease emergency; infectious disease outbreak; willingness to respond

**Abbreviations:**
COVID-19: coronavirus disease 2019
EMS: Emergency Medical Services
EMT: emergency medical technician
HCW: health care worker
MERS: Middle Eastern Respiratory Syndrome
MMAT: Mixed Methods Assessment Tool
NGO: nongovernment organization
PPE: personal protective equipment
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis
SARS: Severe Acute Respiratory Syndrome
WTR: willingness to respond

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## Introduction

During any emergency situation, health care workers (HCWs) are an important part of the response workforce. The role of HCWs, including those working in emergency response roles, is critical during emergencies such as infectious disease outbreaks or bioterrorist events, particularly for ensuring patient and public well-being. Yet, there are a number of studies that demonstrate a lack of willingness to respond (WTR) to emergencies by HCWs with a particular reluctance to respond during an infectious agent event compared to any other type of emergency, such as a natural disaster, nuclear, radiological, or chemical emergency event.[1-4] Although there is a growing literature on HCW WTR to infectious disease emergencies, to date, no review has focused on the barriers or facilitators to these specifically.

In order to better prepare for staffing crises due to non-illness-related absenteeism during infectious disease emergencies, it is important to understand who *will* come to work and why. Previous events such as Severe Acute Respiratory Syndrome (SARS), H1N1 influenza, Ebola, Middle Eastern Respiratory Syndrome (MERS), and the current coronavirus disease 2019 (COVID-19) outbreak highlighted the rapidity with which outbreaks of infectious disease emerge and the importance of understanding barriers and facilitators for WTR to duty among HCWs. Given the reduced WTR to infectious disease emergencies, a review of barriers and facilitators specific to these is vital to understanding and improving response during an outbreak or bioterrorist incident.

The primary objectives of this review are to: (1) describe the rates of willingness of HCWs world-wide to respond to an infectious disease outbreak; and (2) describe the barriers and facilitators for willingness at the individual and organizational levels. This information may help inform disaster preparedness planning and provide direction for interventions that have the potential to decrease non-illness absenteeism across all segments of the health care sector.

## Method

An integrative review methodology was used as it includes various perspectives on a subject or topic and is currently the broadest type of research review, which has been advocated as important to health science and research.[5] The framework developed by Whittemore and Knafl[5] guided this review and includes: problem identification, literature search, data evaluation, data analysis, and presentation of the data. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was also used to guide study identification and selection.[6]

### *Search Strategies*

An electronic database search of the peer-reviewed literature published from October 2000 through April 2020 was conducted to identify all English-language studies on WTR to infectious disease emergencies among HCWs. The search was conducted through CINAHL (EBSCO Information Services; Ipswich, Massachusetts USA); Medline (US National Library of Medicine, National Institutes of Health; Bethesda, Maryland USA); Embase (Elsevier; Amsterdam, Netherlands); and PubMed (National Center for Biotechnology Information, National Institutes of Health; Bethesda, Maryland USA) databases for all articles published during this period. All database queries included the phrase "willingness to respond," both alone and in combination using the Boolean search term AND with one of the following keywords: "bioterrorism," "smallpox," "pandemic," "influenza," "SARS," "Ebola," "MERS," "COVID-19," "terrorism," "disaster," and "outbreak." Tables of contents for all issues of the journals *Biosecurity and Bioterrorism*, *American Journal of Disaster Medicine*, and *Prehospital and Disaster Medicine* since 2000 were reviewed by hand for additional relevant articles.

The initial search identified a total of 149 potential articles from the database search; an additional 34 articles were identified from the scan of journals by hand. After excluding duplicates, 95 articles were initially screened based on title and abstracts for those that met the inclusion criteria, by the first and last author, resulting in 50 full-text articles being screened. For inclusion in the review, articles had to include an assessment of willingness of HCWs to respond to an infectious disease outbreak, but this could have been either a hypothetical outbreak scenario, including during training, or an actual disease incident. At the time of assessing the full-text articles, three were excluded due to not measuring WTR, five for not having a specific measure of WTR for infectious disease emergencies, and two for poor quality (described below). This resulted in 40 studies included in the integrative synthesis. A systematic flow diagram (Figure 1), based on PRISMA, was used to display the search strategy and provides a breakdown of the search results.[6]

### *Data Extraction and Synthesis*

Each article was assessed for quality, including study design and sample size. In addition, the occupation of participants, location, incident type, pathogen(s), and WTR among HCWs was extracted from each paper (Table 1). Incidents were classified as naturally occurring outbreaks or bioterrorist-related incidents based on the framing of questions used to determine willingness or the specific pathogen incidents or disease described to study participants. All articles discussing hypothetical smallpox outbreaks were assumed to address bioterrorist-related outbreaks. Factors that were either facilitators or barriers for WTR were collated and are presented in Table 2.

### *Quality Assessment*

In order to assess the quality of the articles included in the review, the Mixed Methods Appraisal Tool (MMAT) version 2018 was used as it, unlike other appraisal tools, allows for a variety of studies to be included in its assessment including quantitative, qualitative, and mixed methods research designs.[7] The MMAT has been reported to have reliability and efficiency with interrater reliability scores ranging from moderate to perfect agreement.[7] The MMAT utilizes a set of five categories, each with five associated specific criteria, including a qualitative set, a randomized set, a non-randomized set, an observational descriptive set, and a mixed method set. The MMAT version 2018 does not recommend scoring against the category criteria, rather a description of what was met or not met.[7] The included studies were appraised independently by the second and last authors based on the MMAT version 2018 criteria, with two studies excluded based on the quality assessment. Results of the critical appraisal of the papers using the MMAT version 2018 ranged from papers meeting between three and five (out of five) of the criteria.

## Results

Forty articles met the inclusion criteria for the final review, four (n = 4; 10.0%) qualitative and 36 (n = 36; 90.0%) quantitative studies, 24 (n = 24; 60.0%) reported on infectious disease outbreaks, eight (n = 8; 20.0%) reported bioterrorist incidents, and eight (n = 8; 20.0%) reported on both in the same study. All articles were published from 2003 through 2020, with 30 (n = 30; 75.0%) from 2003 through 2010, demonstrating an increase in literature on WTR post-SARS-outbreak of 2002-2003 and the H1N1

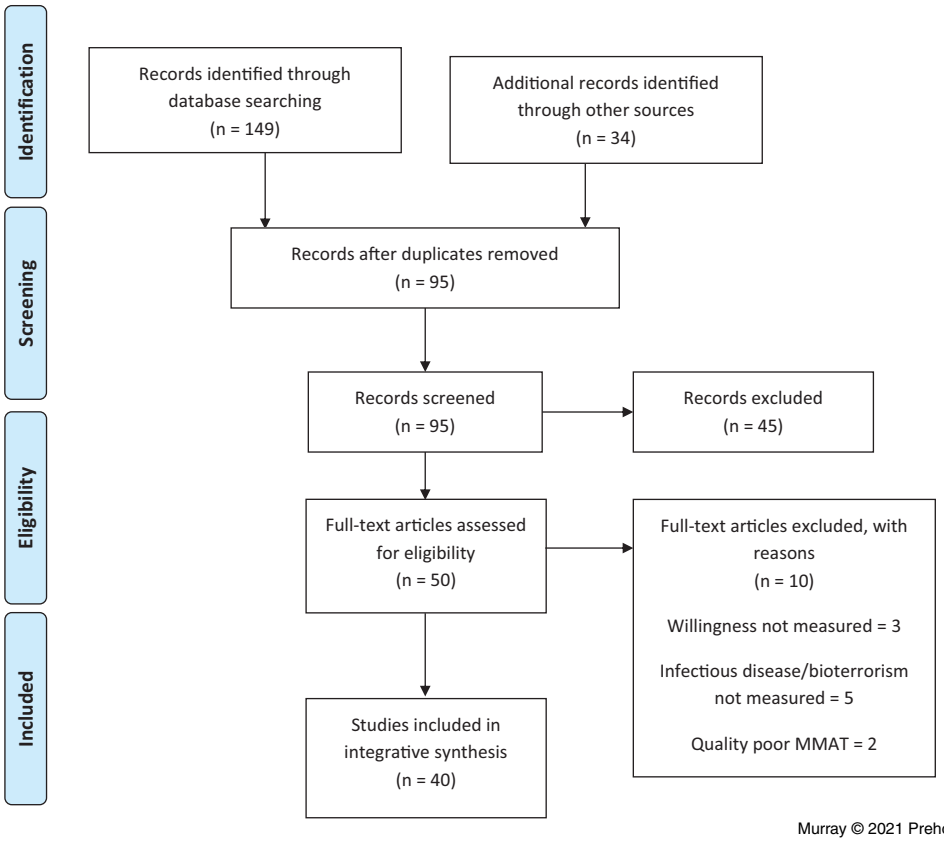


**Figure 1.** PRISMA Flow Diagram of Search.

outbreak of 2009. A large majority of studies were from the United States (n = 30; 75.0%), with other studies included from Singapore, Australia, Taiwan, the Netherlands, the United Kingdom, and an international nongovernment organization (NGO). The majority of the included papers focused on acute hospital HCWs (n = 17; 42.5%), with the remainder primarily focused on public health staff (n = 7; 17.5%), Emergency Medical Service (EMS)/paramedics (n = 6; 15.0%), primary health staff (n = 5; 12.5%), health students (n = 3; 7.5%), and dentists and international NGO HCWs (n = 1; 2.5% each).

*Trends in Willingness*

Rates of HCW WTR to infectious disease outbreaks ranged widely among the 40 studies located, from 27.9% (n = 31/111) of school nurses asked to respond to a smallpox event when unvaccinated[8] to 86.0% (n = 2,736/3,181) of medical reserve corps for an inhalational anthrax event.[9] For natural infectious disease events, willingness varied from 8.3% (n = 5/60) to 100.0% (n = 60/60) among general practitioners asked to provide care for their own patients during an influenza pandemic without and with assurances of adequate personal protective equipment (PPE), respectively[10] (Table 1). Fourteen articles reported scenarios where willingness levels were less than 60.0%.[2,4,8,10-20] Willingness to respond varied by occupation, pathogen, disease source, level of perceived risk, degree of familiarity with patient population, and required job tasks.

In general, HCWs appeared to be most willing to respond to infectious disease outbreaks when: (1) the pathogen was non-transmissible; (2) they were provided adequate PPE; or (3) an effective prophylaxis, vaccine, or treatment was provided to both workers and their families (Table 1). The primary factors affecting WTR to naturally occurring outbreaks were individual-level characteristics, such as clinical or non-clinical work, occupation, and prior commitment to provide emergency care. Factors affecting WTR to bioterrorist incidents were typically structural or organizational in nature, such as availability of vaccine or PPE, safety of family members, and provision of information on the pathogen involved.

*Barriers to Willingness*

Of the 40 studies identified, 33 (n = 33; 82.5%) identified specific barriers to willingness (Table 2).[2,4,8-11,13-18,20-38] The barriers to willingness could be categorized into the following four groups: concern and perceived risk, interpersonal factors, job-level factors, and outbreak characteristics.

*Concern and Perceived Risk*—Concern for personal safety or the safety of family members was identified as a barrier to willingness in 12 (n = 12; 30.0%) studies with fear of being infected by a patient and/or fear of transmitting infection to their families primary concerns for HCWs.[3,4,8,16,17,26,37,38] Three studies (n = 3; 7.5%), all conducted in Singapore, found that HCWs were concerned that either they or their family members would be ostracized or face stigma from community members who might perceive the workers or their families as disease carriers.[26,37,38] In addition, lack of PPE was cited as a specific barrier in two studies (n = 2; 5.0%).[10,34] In two other studies (n = 2; 5.0%), the required performance of perceived high-risk tasks, such as patient resuscitation, was an important barrier.[13,25]

*Interpersonal Factors*—Interpersonal factors were common barriers to WTR among HCWs. Personal responsibilities, such as caring for family members who may fall ill, coupled with a lack of available resources to support these responsibilities, such as child care, elder care, and pet care services, were listed as barriers in seven studies (n = 7; 17.5%).[4,14,16,17] Another two studies (n = 2; 5.0%) found that staffing shortages were a potential barrier, primarily due to a perception that shortages would lead to conflict among coworkers or being overworked.[10,26] Similarly, concern about potential conflicts arising from working with untrained volunteers was a significant barrier to willingness among some HCWs.[14] In addition, HCWs whose spouse or partner also worked in health care, or whose spouse was also an emergency responder, reported different levels of willingness from other HCWs, although the evidence was conflicting: one study found workers were less willing to respond if their spouse was also a HCW,[3] while a second found that having a spouse who was a first responder increased willingness.[4]

*Job-Level Factors*—Requirements to work longer hours during an outbreak and part-time status among a general group of HCWs were associated with lower WTR, as was volunteer status among emergency medical technicians (EMTs).[2,3,14] A lack of inclusion of training and education in health curriculum for disaster medicine and public health preparedness was found to also be a barrier for students entering the workforce.[18,20,33] Health care workers were typically more willing to respond to an outbreak if they were likely to provide care to their own patients rather than to unfamiliar patients.[10,28]

*Outbreak Characteristics*—Although concern, perceived risk, and level of knowledge regarding the pathogen involved in the outbreak were clear barriers to willingness, only limited information was available on other outbreak characteristics. One study found that WTR may decrease as an outbreak continues due to a reduction in perceived duty to treat.[11] This may suggest that WTR will vary over the duration of outbreaks of long duration, with HCWs becoming less willing to respond as the outbreak progresses. In addition, outbreak location may be important: HCWs in one study were less willing to respond to outbreak situations outside their home town or state.[28] Willingness was also influenced by the availability of a vaccine[34] or the unknown nature of the pathogen,[36] creating a barrier to responding in some reported studies.

*Facilitators of Willingness*

Only four of the 40 (n = 4; 10.0%) studies did not identify at least one facilitator of willingness among HCWs (Table 2).[25,26,37,38] The facilitators of willingness could be categorized into the following five groups: availability of PPE and/or vaccine, level of training, professional ethics, family and personal health and safety, and worker support systems.

*Availability of PPE and/or Vaccine*—Overall, nine (n = 9; 22.5%) studies mentioned infection control, vaccination, or PPE as an important facilitator of HCW WTR.[4,14-16,19,28,30,39] Lack of adequate provisions to prevent infection among HCWs significantly impacted WTR: the lowest level of WTR noted was the 8.3% (n = 5/60) of general practitioners in Tasmania, Australia willing to provide care to patients during an influenza pandemic if they were not provided with PPE; however, when assured that they would be provided with appropriate PPE, 100.0% (n = 60/60) were willing to provide care to their own patients.[10] Comparisons between studies further support the importance of providing adequate PPE and vaccination, as HCWs were generally willing to respond to smallpox outbreaks with vaccine (65.0% [535/823] of EMTs[3] and 61.1% [n = 3,447/5,645] of clinical and non-clinical HCWs[4]); however, only approximately thirty percent of both physicians (n = 174/526; 33.1%) and school nurses (n = 31/111; 27.9%) were willing to respond to a smallpox outbreak when informed that they would not have access to vaccine (Table 1).[8,11]

*Level of Training*—Nine of the 40 (n = 9; 22.5%) studies included in this review specifically identified the amount of training received as a facilitator of willingness.[3,4,8,11,14,16,17,28,30] Health care workers who felt adequately *prepared* to respond in an infectious disease emergency were also *willing* to respond.[11] Training on bioterrorism, weapons of mass destruction, or other terrorism scenarios,[3] especially following the events of 9/11, were particularly important for increasing WTR.[8,11] In addition, the HCWs' existing level of knowledge about emergency response for infectious diseases, coupled with a belief in the importance of bioterrorism or preparedness training, were associated with WTR.[28] Finally, confidence in one's ability to diagnose and treat bioterrorism-related diseases was also important;[40] and training opportunities in preparedness, response, and use of PPE were identified in several studies as a factor that could improve willingness.[30,41,42]

*Professional Ethics*—Eleven (n = 11; 27.5%) studies identified HCWs' feelings of moral or ethical responsibility to provide care during an infectious disease outbreak as an important factor in willingness.[3,8,10,11,15,17] Health care workers who believed they had a duty to treat patients with serious communicable diseases, such as HIV/AIDS, or a duty to treat patients during an epidemic were more willing to respond during infectious disease emergencies than HCWs who did not perceive these duties.[11] Overall, a sense of duty,[3,17] a perceived moral obligation[10] to treat patients regardless of personal risk,[8] a belief that coworkers would respond[3] and need help,[10] or that their patients really needed help[15] were all important facilitators. A perception of one's importance to the organization further facilitated willingness.[12]

*Family and Personal Health and Safety*—Four (n = 4; 10.0%) studies identified availability of vaccines and prophylaxis for HCWs' families as a critical facilitator of willingness.[4,14,15,19] In addition, having a personal preparedness plan[4] or an institutional preparedness plan[4,14] which included provisions for child care, elder care, and pet care were identified as important facilitators.[2,14]

*Worker Support Systems*—Six (n = 6; 15.0%) studies identified worker support systems to help facilitate willingness.[2,14,16,28,35,39] Valued supports included telephone and email access,[2] transportation support,[2,14,39] provision of food[2] and accommodation,[2,14] and guaranteed financial supports, such as life and/or disability insurance or hazard pay.[14,39] A study of WTR among nursing students further supported the value of providing food, opportunities for rest and personal hygiene (eg, showers), and organizational programs to support mental and spiritual health, such as available chaplains.[20] Another aspect that facilitated WTR was having clear roles within the response and/or their respective organizations and associated expectations of input towards control of the infectious disease emergency.[11,12,21-23]

*Beyond Acute HCW*

Although available evidence suggested many HCWs may not be willing to respond during an infectious disease emergency, there was some indication that staffing shortfalls or surge capacity could be provided for using workers or volunteers from other occupational groups. Identification of surge capacity workforces was not a focus of the current review; nevertheless, the search strategy returned a number of papers on WTR among non-hospital HCWs, which appeared valuable.

Groups which may be highly willing to respond to infectious disease emergencies included veterinarians, pharmacists, health department employees, and medical or health science students or faculty. For example, 90.1% (n = 471/523) of US medical students in one study reported WTR to pandemic influenza,[33] and 79.0% (n = 384/486) of pharmacists in Florida (USA) reported WTR to a bioterrorist incident.[28] In another study of medical students in the Netherlands, only 65.9% (n = 659/999) were willing to respond to a bioterrorist event and 43.0% (n = 430/999) to an Ebola type outbreak.[18] However, the ability for planners to rely on students as surge capacity may be highly dependent on outbreak characteristics and perceived risk, and students' concerns appeared to be similar to those of HCWs. In one study for instance, only 56.9% (n = 128/225) of nursing students in Taiwan were willing to respond to an avian influenza outbreak.[20]

Finally, seven (n = 7, 17.5%) studies suggested that health department employees were willing to respond to biological emergencies.[12,13,22,24,35,36,43] A series of studies conducted by a research group at Johns Hopkins University (Baltimore, Maryland USA) found that fifty-four percent to ninety-four percent of local health department employees in the US were willing to respond to pandemic influenza.[12,22,24] A study of county health department employees in Florida found that 92.3% (n = 2,228/2,414) were willing to respond to pandemic influenza, although when asked about performing high-risk tasks, willingness dropped to 56.2% (n = 1,357/2,414).[13]

It should be noted that the prospect of working with untrained volunteers had been demonstrated to reduce WTR among HCWs.[14] Therefore, care should be taken to ensure that adequate training is provided to all volunteers and surge capacity workers.

*Methodological Limitations*

Although there is a growing body of literature on HCW WTR during infectious disease emergencies, few of the located studies presented participants with a range of outbreak scenarios, limiting the comparability of willingness levels between outbreak types, locations, or scenarios. In addition, few studies asked participants to provide feedback on the relative importance of specific barriers or facilitators of willingness in determining their decisions to report to work. Finally, no studies compared WTR with data on actual response levels during previous disease outbreaks.

## Discussion

Low levels of WTR to infectious disease emergencies among HCWs may have catastrophic implications during large-scale bioterrorist events, outbreaks, or pandemics. However, HCW non-illness-related absenteeism is often overlooked. This review identified only 40 studies published over 20 years. Many of these studies focused primarily on *ability* to respond during outbreaks rather than *willingness*. However, these studies suggest that HCW WTR to large-scale biological incidents may be less than fifty percent and is unlikely to be higher than eighty percent, highlighting the importance of considering willingness of HCW to respond in preparing for biological emergencies. Preparedness planners who exclusively focus on factors affecting ability to respond, such illness-related absenteeism, may significantly over-estimate the availability of HCWs during an infectious disease outbreak. However, planners have the opportunity to enhance willingness significantly by including provisions that ensure the risk to HCWs and their families is minimized[44] and that help ease the child, elder, or pet care responsibilities that HCW face.

*Vaccination*

The importance of vaccination availability during an outbreak is evident from the literature. In particular, a lack of available smallpox vaccine greatly reduced HCW WTR to a hypothetical outbreak of smallpox, from around sixty percent to seventy percent down to only thirty percent of HCWs.[3,4,8,11] Although it is unlikely that HCWs would be denied vaccine during a smallpox outbreak, or during any outbreak for which a vaccine was available, it is unclear how apprehension and lack of acceptance of a vaccine might affect HCW WTR. In the case of smallpox, refusal to be vaccinated may be high. A study of private physicians found that only twenty-two percent of physicians surveyed were willing to be vaccinated in advance of a smallpox outbreak.[45]

Vaccine availability and attitudes towards vaccinations became highly controversial issues during the H1N1 pandemic. Importantly, a study conducted from June through September of 2009 in Mexico found that HCWs were generally willing to receive the H1N1 vaccine and to recommend the vaccine to their patients.[46] However, nineteen percent of HCWs answered that they would refuse the vaccine and twenty-two percent would not recommend the vaccine to their patients, largely due to a belief that the vaccine would not work, that it would be harmful, or that it would weaken the recipient's immune system.[46] Unfortunately, this study was conducted before a vaccine against H1N1 influenza became available, so no comparison of perceived acceptance and actual uptake was available.

Whether refusal to accept vaccine would influence the decision of HCWs to respond to an influenza pandemic, smallpox outbreak, or other type of biological emergency is at present unknown and should be explored.

*Ethical Concerns*

Several studies highlighted the importance of codes of ethics in determining whether HCWs respond during infectious disease emergencies and noted the current lack of universal ethical guidance. Such guidelines may help workers balance responsibilities to patients and their own family members, and the development of such guidelines should be considered.

## Recommendations

Professional ethical guidelines that address personal risks and concerns are needed to guide HCWs during an infectious disease outbreak. The findings of this review may help to inform these guidelines. In addition, employers should work with HCWs to ensure that they are familiar with their organization's preparedness plans, including what is expected of workers, what services (such as child care, pet care, overtime pay, sick leave, and transportation aid) the employer will provide, and what provisions exist for providing prophylaxis or medical care to family members of HCWs. Employers should also work with employees to ensure that every HCW has a personal preparedness plan.

Preparedness planners should consider reaching out to groups such as veterinarians; nursing, medical, veterinary, or public health students and faculty; and health department employees when developing surge capacity strategies. However, planners should remember that students may not be willing to respond during more severe emergencies, such as avian influenza or bioterrorism events.[18,20,33]

Finally, training programs should be developed to provide guidance to HCWs on managing patient load during outbreaks and on the delivery of patient care, including altered standards of care, during outbreaks. Training programs should also ensure that HCWs have a good understanding of the use of PPE and of vaccines, and other prophylaxis measures that may be used during a biological disaster, to ensure maximum uptake of these measures during an outbreak. In addition, training programs for volunteers are crucial to ensuring safety of volunteers, HCWs, and patients, as well as supporting WTR among HCWs.

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| Study Citation, Year (Location)/MMAT | Study Design and Methods | Study Sample: Sample Size (N), Response Rate | Infectious Disease Type | Willingness for Natural Outbreaks[a] N (%) | Willingness for Bioterrorist Incidents[a] N (%) |
|---|---|---|---|---|---|
| Alexander & Wynia, 2003[11] (United States)/Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey of a random sample of licensed patient care physicians, nation-wide | Patient care physicians<br>N = 526<br>Response rate = 56% | Unknown, potentially deadly<br><br>Smallpox-Unvaccinated | | 421 (80)<br><br>174 (33) |
| Balicer et al, 2006[12] (United States)/ Criteria 4.4 for quantitative descriptive studies not met | Cross-sectional survey of public health staff, three county health departments, Maryland | Public health staff<br>Total N = 308<br>Response rate = 58% | Pandemic influenza | 163/303 (54) | |
| Balicer et al, 2010[21] (United States)/ Criteria 4.4 for quantitative descriptive studies not met | Survey of all hospital workers based on Witte's Extended Parallel Process Model (EPPM), Johns Hopkins Hospital | Hospital workers<br>Total N = 3,426<br>Response rate = 18% | Pandemic influenza | 2,467 (72) | |
| Barnett et al, 2009[22] (United States)/ Criteria 4.4 for quantitative descriptive studies not met | Survey of public health staff based on Witte's EPPM, three US states | Public health staff<br>Total N = 1,835<br>Response rate = 83% | Pandemic influenza | 1,578 (86) | |
| Barnett et al, 2010[23] (United States)/ Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Survey EMS workers, nation-wide | EMS workers<br>Total N = 586<br>Response rate = 49% | Pandemic influenza | 516 (88) | |
| Barnett et al, 2012[24] (United States)/ Criteria 4.4 for quantitative descriptive studies not met | Scenario-based survey of local health department workers, nation-wide | Local health department workers<br>Total N = 2,993<br>Response rate = 66% | Pandemic influenza<br>Bioterrorism – inhalational anthrax | 2,335 (78) | <br><br>2,005 (67) |
| Basta et al, 2009[13] (United States)/ Criteria 4.4 for quantitative descriptive studies not met | Scenario-based survey of county health department staff, Florida | County health department staff<br>Total N = 2,414<br>Response rate = 51% | Pandemic influenza | | |
| | | | Early pandemic, low -risk duties | 2,228 (92) | |
| | | | Early pandemic, high-risk duties | 1,603 (66) | |
| | | | Peak pandemic, low-risk duties | 1,996 (83) | |
| | | | Peak pandemic, high-risk duties | 1,357 (56) | |
| Butsashvili et al, 2007[25] (Georgia)/Criteria 4.2 and 4.4 of quantitative descriptive studies not met | Cross-sectional survey of hospital-based physicians and nurses in two urban hospitals | Hospital-based physicians and nurses<br>N = 288<br>Response rate = n/a | Pandemic influenza | 219 (76) | |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| Study Citation, Year (Location)/MMAT | Study Design and Methods | Study Sample: Sample Size (N), Response Rate | Infectious Disease Type | Willingness for Natural Outbreaks[a] N (%) | Willingness for Bioterrorist Incidents[a] N (%) |
|---|---|---|---|---|---|
| Cheong et al, 2007[26]<br>(Singapore)/Criteria 4.4 and 4.5 for quantitative descriptive studies not met | Survey of HCWs at two community hospitals and one tertiary hospital | HCWs Total N = 1,234<br>Response rate = n/a<br>Tertiary care hospital<br>N = 908<br>Response rate = 80%<br>Community hospitals<br>N = 326<br>Response rate = 84% | Pandemic avian influenza | 669 (74)[e]<br>274 (84)[e] | |
| Cone et al, 2006[2]<br>(United States)/Criteria 4.4 and 4.5 for quantitative descriptive studies not met | Survey of employees at nine hospitals in five states: convenience or consecutive sampling of all staff or emergency department only | Hospital employees<br>N = 1,711<br>Response rate = 85% | Epidemic influenza<br>Man-made biological event (eg, anthrax) | 1,232 (72) | 992 (58) |
| Considine & Mitchell, 2009[27]<br>(Australia)/Criteria 4.4 and 4.5 for quantitative descriptive studies not met | Exploratory descriptive survey | Emergency department nurses<br>N = 64<br>Response rate = 71% | Biological incident | 54 (84) | |
| Crane et al, 2010[28]<br>(United States)/All criteria for quantitative descriptive studies met | Cross-sectional survey of all licensed physicians, pharmacists, and nurses, state-wide | Licensed physicians, pharmacists, and nurses<br>Total N = 2,242<br>Response rate = 85%<br>Physicians N = 604<br>Response rate = n/a<br>Nurses N = 1,152<br>Response rate = n/a<br>Pharmacists N = 486<br>Response rate = n/a | Local response only; bioterrorism agent, treatment unknown | | 1,961 overall<br>513 (85)<br>945 (82)<br>384 (79) |
| Damery et al, 2009[14]<br>(United Kingdom)/All criteria for quantitative descriptive studies met | Survey of HCWs at three National Health Service facilities, including an acute teaching facility, a rural district general facility and a Primary Care Trust | Clinical and non-clinical HCWs<br>Total N = 1,032<br>Response rate = 34% | Pandemic influenza | 609 (59) | |
| DiMaggio et al, 2005[3]<br>(United States)/Criteria 4.4 for quantitative descriptive studies not met | Survey of nationally representative random sample of basic and paramedic EMS providers | EMTs N = 823<br>Response rate = 43% | Smallpox | | 535 (65) |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| Errett et al, 2013[9] (United States)/ Criteria 4.2 for quantitative descriptive studies not met | Survey of medical reserve corps volunteers, Witte's EPPM, national survey | Medical reserve corps volunteers<br>N = 3,181<br>Response rate = n/a | Pandemic influenza<br>Bioterrorism – inhalational anthrax | 2,895 (91)[a] | 2,736 (86)[a] |
| Gee & Skovdal, 2017[29] (International)/All criteria met for qualitative studies | Interviews of international aid workers, thematic analysis | International NGO health professionals<br>N = 11<br>Response rate = n/a | Ebola | 11 (100) | |
| Gershon et al, 2009[30]<br>(United States)/Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Pre-/post-training survey of EMS workers, including EMTs and paramedics, participating in department-sponsored pandemic preparedness education program | EMS workers<br>N = 129<br>Response rate = n/a | Pandemic influenza<br>Pre-training test<br>Post-training test | 81 (63)<br>85 (66) | |
| Gershon et al, 2010[15] (United States)/All criteria for quantitative descriptive studies met | Cross-sectional survey of home HCWs | Home HCWs<br>N = 384<br>Response rate = 91% | Pandemic influenza<br>Treating current patients<br>Treating new patients | 165 (43)<br>104 (27) | |
| Gullion, 2004[8]<br>(United States)/Criteria 4.4 for quantitative descriptive studies not met | Cross-sectional survey of school nurses | School nurses<br>N = 111<br>Response rate = n/a[b] | SARS or pneumonic plague<br>Unknown, potentially deadly<br>Smallpox - Unvaccinated | 44 (40)[c] | 64 (58)[c]<br>31 (28)[c] |
| Hayanga et al, 2017[31] (United States)/Criteria 4.4 for quantitative descriptive studies not met | Cross-sectional survey of anesthesiologists | Residents N = 95<br>Response rate = 51%<br>Attendings N = 175<br>Response rate = 47% | Pandemic influenza | 67 (70)<br>142 (81) | |
| Hogg et al, 2006[32] (United States)/ Criteria 4.2 and 4.4 for descriptive studies not met | Cross-sectional survey of family physicians | Family physicians<br>N = 246<br>Response rate = 41% | Influenza and/or respiratory epidemic | 189 (77) | |
| Irvin et al, 2008[16]<br>(United States)/All criteria for quantitative descriptive studies met | Survey of hospital employees: convenience sample | Hospital employees<br>Total N = 169*<br>Response rate = 90%<br>*one was unidentified<br>Doctors N = 57<br>Response rate = n/a<br>Nurses N = 55<br>Response rate = n/a<br>Environmental, clerical, or other paramedical employees<br>N = 56<br>Response rate = n/a | Pandemic influenza | 42 (74)<br>24 (44)<br>19 (34) | |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| Study Citation, Year (Location)/MMAT | Study Design and Methods | Study Sample: Sample Size (N), Response Rate | Infectious Disease Type | Willingness for Natural Outbreaks[a] N (%) | Willingness for Bioterrorist Incidents[a] N (%) |
|---|---|---|---|---|---|
| Kaiser et al, 2009[33] (United States)/ Criteria 4.4 for descriptive studies not met | Cross-sectional survey of medical students | Medical students<br>N = 523<br>Response rate = 61% | Pandemic influenza | 471 (90) | |
| Katz et al, 2006a[41]<br>(United States)/Criteria 4.2 for descriptive studies not met | Cross-sectional survey of a random sample of licensed dentists | Dentists<br>N = 133<br>Response rate = 57% | Unspecific bioterrorism | | 96 (74) |
| Katz et al, 2006b[42]<br>(United States)/Criteria 4.4 for descriptive studies not met | Cross-sectional survey of a random sample of licensed physicians and nurses | Physicians and Nurses<br>Total N = 261<br>Response rate = n/a<br>Physicians N = 115<br>Response rate = 45%<br>Nurses N = 146<br>Response rate = 53% | Unspecific bioterrorism | | 79 (74)<br>103 (74) |
| Mas et al, 2006[40]<br>(United States)/Criteria 4.4 for descriptive quantitative studies not met | Cross-sectional survey of licensed physician's assistants in 37 counties without public health offices | Physicians Assistants<br>N = 29<br>Response rate = 36% | Unspecific bioterrorism | | 19 (66) |
| Masterson et al, 2008[17]<br>(United States)/Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey of ED staff, and participants at regional organizational and educational meetings for ED personnel | ED employees<br>Total N = 204<br>Response rate = 82%<br>ED physicians, nurses, and support staff<br>N = 100<br>Response rate = n/a<br>ED clinical staff<br>N = 70<br>Response rate = n/a<br>ED non-clinical staff<br>N = 30<br>Response rate = n/a | Unspecific bioterrorism | | 54 (54)<br>40 (57)<br>14 (47) |
| Mortelmans et al, 2015[18] (Netherlands)/Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Cross-sectional survey of senior medical students over six universities | Senior medical students<br>N = 999<br>Response rate = 23% | Unspecific biological<br>H5N1 type pandemic<br>Ebola type outbreak | 749 (75)<br>430 (43) | 659 (66) |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| Qureshi et al, 2005[4] (United States)/Criteria 4.4 for quantitative descriptive studies not met | Cross-sectional survey of HCWs from each of 47 health care facilities in New York City and the surrounding metropolitan area: convenience sampling | Clinical and non-clinical HCWs<br>Total N = 6,428<br>Response rate = n/a<br>Smallpox N = 5,645<br>Response rate = n/a<br>SARS N = 4,017<br>Response rate = n/a | Smallpox<br>SARS | 1,946 (48) | 3,447 (61) |
| Rebmann et al, 2020[34] (United States)/Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey – purposive sampling | EMS personnel<br>N = 433<br>Response rate = 83% | Pandemic influenza<br>Required<br>Requested | 381 (88)<br>333 (77) | |
| Rutkow et al, 2014[44] (United States)/Criteria 4.4 for quantitative descriptive studies not met | Cross-sectional survey EMS – purposive sampling | EMS personnel<br>N = 421<br>Response rate = 72% | Pandemic influenza<br>Required<br>Requested | 400 (95)<br>392 (93) | |
| Rutkow et al, 2015[43] (United States)/Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey (Johns Hopkins-Public Health Infrastructure Response Survey Tool) – local health department workers – purposive sampling | Local health department workers<br>Total N = 2,993<br>Response rate = 66% | Pandemic influenza<br>Required:<br>with law<br>without law<br>Requested:<br>with law<br>without law<br>Regardless of severity:<br>with law<br>without law<br>Inhalational anthrax<br>Required:<br>with law<br>without law<br>Requested:<br>with law<br>without law<br>Regardless of severity:<br>with law<br>without law | 1,066 (92)<br>1,404 (91)<br>1,066 (86)<br>1,404 (78)<br>1,066 (82)<br>1,404 (77) | 927 (83)<br>1,187 (80)<br>927 (75)<br>1,187 (68)<br>927 (69)<br>1,187 (64) |
| Rutkow et al, 2017[35] (United States)/Criteria 1.2 for qualitative studies not met | Semi-structured interviews – local health department workers – purposive sampling | Local health department workers<br>Total N = 28<br>Directors = 8<br>Preparedness staff = 10<br>Non-preparedness staff = 10 | Non-specific infectious disease outbreak | n/a | |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| Study Citation, Year (Location)/MMAT | Study Design and Methods | Study Sample: Sample Size (N), Response Rate | Infectious Disease Type | Willingness for Natural Outbreaks[a] N (%) | Willingness for Bioterrorist Incidents[a] N (%) |
|---|---|---|---|---|---|
| Shabanowitz & Reardon, 2009[39]<br>(United States)/Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Cross-sectional survey of HCWs at a rural tertiary/quaternary health system – purposive sampling | All health system employees<br>N = 908<br>Response rate = 9% | Avian influenza pandemic | 554 (61)[d] | |
| Shaw et al, 2006[10]<br>(Australia)/All criteria for qualitative studies met | Semi-structured interviews with general practitioners purposively chosen to diversify the sample | General Practitioners<br>N = 60<br>Response rate = n/a | Pandemic influenza<br>Pandemic influenza, no PPE available | 60 (100)<br>5 (8) | |
| Syrett et al, 2007[19]<br>(United States)/Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey of emergency personnel: convenience sample | ED health care personnel, EMS providers, and ancillary staff<br>N = 186<br>Response rate = 100% | Unexplained increase in patient numbers<br>(grouped by marital status and children)<br>Identified, non-transmissible agent; effective treatment<br>Identified, transmissible agent; experimental treatment | | (75–78)<br>(71–81)<br>(36–37) |
| Taylor et al, 2018[36] (United States)/ All criteria for qualitative studies met | Focus group – purposive sampling | Local health department staff<br>N = 46 (4 focus groups) | Non-specific infectious disease outbreak | n/a | |
| Tzeng & Yin, 2006[20] (Taiwan)/ Criteria 4.2 for quantitative descriptive studies not met | Cross-sectional survey – convenience sampling | Nursing students<br>N = 225<br>Response rate = 95% | Avian influenza | 128 (57) | |
| Wong et al, 2008a[37]<br>(Singapore)/Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Cross sectional survey of primary care physicians in private and public clinics | Physicians<br>Total N = 285<br>Response rate = n/a<br>Public primary care physicians<br>N = 149<br>Response rate = 73%<br>Private primary care physicians<br>N = 136<br>Response rate = 67% | Avian Influenza | 120 (80)[e]<br>89 (64)[e] | |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| Wong et al, 2008b[38]<br>(Singapore)/Criteria 4.2 and 4.4 for quantitative descriptive studies not met | Survey of HCWs at 18 public clinics and one tertiary hospital – purposive sampling | HCWs Total N = 1,859<br>Response rate = n/a<br>Clinics N = 986<br>Response rate = 75%<br>Tertiary hospital<br>N = 873<br>Response rate = 77% | Avian Influenza | 769 (76)[e]<br>651 (73)[e] | |



**Table 1.** Willingness to Respond during Infectious Disease Emergencies

Abbreviations: MMAT, Mixed Methods Assessment Tool; EPPM, Extended Parallel Process Model; EMS, Emergency Medical Services; HCW, health care worker; EMT, emergency medical technician; NGO, nongovernmental organization; SARS, Severe Acute Respiratory Syndrome; ED, emergency department; PPE, personal protective equipment.

[a] Rounded to nearest percentage.

[b] N/a: data not available.

[c] Willingness calculated as % reporting willingness level as: *extremely*, *quite a bit*, or *moderate amount.*

[d] Willingness measures % disagreement with the statement "*It would be ethical for health care personnel to abandon their workplace during a pandemic to protect themselves and their families.*"

[e] Willingness was calculated from % agreement with statement "*I should not be looking after bird flu patients.*"

[f] Willingness was measured using the question "*Would you remain on duty to treat/care for patients with smallpox if . . .* " followed by a series of scenarios for personal protection. % willingness indicates responses of: *probably* or *definitely*. Other response choices were: *definitely not*, *probably not*, or *maybe*.

| Study Citation, Year (Location) | Outbreak Type(s) (N = Natural; B = Bioterrorism) | Identified Facilitators[a] (ordered in strength of association, where applicable) | Identified Barriers[a] (ordered in strength of association, where applicable) |
|---|---|---|---|
| Alexander & Wynia, 2003[11] (United States) | B | • Feeling personally prepared to aid in a bioterrorism incident<br>• Belief in professional duty to treat patient in epidemics or with HIV<br>• Having "learned a lot about physician's roles in responding to bioterrorism since 9/11" | • Perceived duty to treat may diminish over the course of an epidemic |
| Ballicer et al 2006[12] (United States) | N | • Perception of capacity to communicate effectively<br>• Perception of role in agency<br>• Perception of familiarity with role-specific response requirements | • Lack of training<br>• Concern for family |
| Balicer et al, 2010[21] (United States) | N | • Perception of role in agency<br>• Treatment/vaccine availability<br>• Availability of PPE | • Lack of training<br>• Concern for family |
| Barnett et al, 2009[22] (United States) | N | • Perception of capacity to communicate effectively<br>• Perception of role in agency<br>• Perception of familiarity with role-specific response requirements | • Lack of training<br>• Concern for family |
| Barnett et al, 2010[23] (United States) | N | • Understanding of role within a pandemic<br>• Understanding importance of role in a pandemic<br>• Confidence about safety at work | • Risk to family |
| Barnett et al, 2010[24] (United States) | N & B | • Being psychologically prepared<br>• Confidence in personal safety at work<br>• Perceived ability to perform duties | • Public health funding<br>• Poorly prepared by agency |
| Basta et al, 2009[13] (United States) | N | • Read state/county pandemic preparedness plan<br>• Higher level qualifications<br>• Low-risk duties | • High-risk duties<br>• Concern for family safety<br>• Concern for personal safety |
| Butsashvili et al, 2007[25] (Georgia) | N | | • Required duties: HCWs responsible for patient resuscitation were less willing to respond |
| Cheong et al, 2007[26] (Singapore) | N | | • Perceived risk of personal exposure/risk to family<br>• Concern about stigma towards HCWs<br>• Conflict between colleagues due to staffing shortages |
| Cone et al, 2006[2] (United States) | N & B | • Support needs for self/family that would enable respondents to stay at hospital for prolonged periods:<br>  • Local phone service<br>  • Long distance phone service<br>  • E-mail access<br>  • Pet care<br>  • Child care<br>  • Adult/elder care<br>  • Property safety<br>  • Transportation issues<br>• WTR assumed the following conditions:<br>  • "Family's basic safety, food, and shelter needs" met<br>  • "Roads and conditions are safe and passable"<br>  • Standard overtime rates apply<br>  • "Adequate rest, food, showers, etc" between shifts | • Other emergency response obligations, including paid and volunteer positions |



**Table 2.** Facilitators and Barriers to Willingness to Respond during Infectious Disease Emergencies *(continued)*

| | | | |
|---|---|---|---|
| Considine & Mitchell, 2009[27] (Australia) | N | • Strong social supports<br>• Experience or training in handling chemical, biological, and radiological incidents | • Child care responsibilities |
| Crane et al, 2010[28] | B | • Benefits available<br>• Previous training drills<br>• Seriousness of event | • Level of risk<br>• Proximity of event (less willing to respond to events further from home) |
| Damery et al, 2009[14] (United Kingdom) | N | • Vaccine provided to HCW and family<br>• Available PPE<br>• Employer emergency plan shared w/employees<br>• Employers accepting liability for any mistakes<br>• Ability to work flexible hours<br>• "Top up salary" which reflects extra duties required<br>• Receiving life and/or disability insurance<br>• Child care services provided<br>• Transportation provided<br>• Accommodation provided<br>• Ability to work nearer home | • Responsibility to care for one's own ill children, partner<br>• Being required to work more hours than normal<br>• Working with untrained volunteers |
| DiMaggio et al, 2005[3] (United States) | B | • Hands-on bioterrorism, weapons of mass destruction, or other terrorism training<br>• Sense of responsibility<br>• Ability to provide care<br>• Code of ethics<br>• Part of response team<br>• Belief that colleagues would respond | • Concern for family<br>• Concerned about disease<br>• Spouse or partner also required to respond to emergency<br>• Volunteer EMTs less willing to respond than paid EMTs |
| Errett et al, 2013[9] (United States) | N & B | • Perceived ability to perform duties<br>• Improving confidence<br>• Awareness of positive impact of responding | • Concern for family<br>• Concern about becoming ill |
| Gee & Skovdal, 2017[29] (International) | N | • Previous experience in dangerous situations<br>• Trust in organization<br>• Humanitarian ethos<br>• Duty of care<br>• Curiosity | • Family perception of risk to HCW<br>• Competing media messages |
| Gershon et al, 2009[30] (United States) | N | • Targeted training<br>• Confidence in knowledge<br>• Training on use of respiratory PPE (N95 masks) | • Inadequate training on N95 mask use |
| Gershon, et al, 2010[15] (United States) | N | • Being given a vaccine for protection<br>• Being confident that a respirator mask would protect them<br>• Being given a respirator mask<br>• Belief that HCWs' patients really needed them<br>• Guarantees that the HCWs' families would receive vaccine quickly | • Fear for family's safety<br>• Fear for personal safety |
| Gullion, 2004[8] (United States) | N & B | • Belief in obligation to care for a patient, even if doing so may put them at risk<br>• Amount of education received on bioterrorism after 9/11 | • Less willing to care for patients when there is personal risk |



**Table 2.** Facilitators and Barriers to Willingness to Respond during Infectious Disease Emergencies *(continued)*

| Study Citation, Year (Location) | Outbreak Type(s) (N = Natural; B = Bioterrorism) | Identified Facilitators[a] (ordered in strength of association, where applicable) | Identified Barriers[a] (ordered in strength of association, where applicable) |
|---|---|---|---|
| Hayanga et al, 2017[31] (United States) | N | • Education and training<br>• Clear role<br>• Psychological preparation | • Inadequate training and preparation |
| Hogg et al, 2006[32] (United States) | N | • Building partnerships between primary care and public health | • Lack of preparation of family practice office |
| Irvin et al, 2008[16] (United States) | N | • Confidence that the hospital can protect them | • Fear for personal safety<br>• Responsibility to care for ill family members |
| Kaiser et al, 2009[33] (United States) | N | • Specific clinical roles | • Inadequate training and education on health curriculum for disaster medicine and public health preparedness |
| Katz et al, 2006a[41] (United States) | B | • Additional bioterrorism preparedness and response training | |
| Katz et al, 2006b[42] (United States) | B | • Additional bioterrorism preparedness and response training | |
| Mas et al, 2006[40] (United States) | B | • Increase confidence in ability to diagnose or treat bioterrorism, through training opportunities | |
| Masterson et al, 2008[17] (United States) | B | • Sense of duty to occupation | • Concern for family health<br>• Concern for personal safety<br>• Concern for child care |
| Mortelmans et al, 2015[18] (Netherlands) | N & B | • Development and implementation of training guidelines | • Inadequate training and education in health curriculum |
| Qureshi et al, 2005[4] (United States) | N & B | • Marriage to a first responder<br>• Occupation: physician or EMT<br>• Availability of PPE<br>• Family preparedness planning and personal preparedness discussions with employer | • Fear and concern for family and self<br>• Personal health concerns<br>• Child care and elder care responsibilities<br>• Pet care and transportation issues identified as barriers to ability to respond |
| Rebmann et al, 2020[34] (United States) | N | • Feeling safe<br>• Pre-exposure prophylaxis | • Lack of PPE<br>• Poor influenza vaccination uptake |
| Rutkow et al, 2014[44] (United States) | N | • Laws to respond not a significant facilitator | |
| Rutkow et al, 2015[43] (United States) | N | • Laws to respond not a significant facilitator | |
| Rutkow et al, 2017[35] (United States) | N | • Availability of vaccinations and PPE<br>• Flexible work schedules and child care arrangements<br>• Information sharing via local health department training<br>• Perception of commitment to job/community | • Exposure to self and family<br>• Care responsibilities of children, elderly, and pets<br>• Role perception |



**Table 2.** Facilitators and Barriers to Willingness to Respond during Infectious Disease Emergencies *(continued)*

| | | | |
|---|---|---|---|
| Shabanowitz & Reardon, 2009[39] (United States) | N | • Available PPE and training, including vaccine<br>• Available infectious disease training<br>• Ability to volunteer to work, without risk of losing one's job for not volunteering<br>• Opportunities for personal or financial help<br>• Financial incentives for volunteering to work, including hazard pay and/or supplemental life or disability insurance | |
| Shaw et al, 2006[10] (Australia) | N | • Moral imperative during pandemic: not providing care seen as an abandonment of responsibilities to both patients and colleagues | • Workforce shortages<br>• Lack of personal protective equipment |
| Syrett et al, 2007[19] (United States) | B | • Effective treatment and available offered on site to workers<br>• Treatment dissemination methods that include providers' family members | |
| Taylor et al, 2018[36] (United States) | N | • Response education and training<br>• Expectation to respond from leadership<br>• Personal commitment to public health<br>• Professional code of ethics<br>• Previous response experience<br>• Availability of PPE<br>• Clear and strong leadership | • Uncertainty about the pathogen (novel virus)<br>• Family responsibilities |
| Tzeng & Yin, 2006[20] (Taiwan) | N | • Holistic health promotion for frontline HCWs<br>• Providing a safe environment | • Taiwan experience with Severe Acute Respiratory Syndrome (SARS) |
| Wong et al, 2008a[37] (Singapore) | N | | • Fear of infection risk for self, family, and friends<br>• Fear of stigma and ostracism for self, family, and friends |
| Wong et al, 2008b[38] (Singapore) | N | | • Fear of infection risk for self, family, and friends<br>• Fear of stigma and ostracism for self, family, and friends |



**Table 2.** Facilitators and Barriers to Willingness to Respond during Infectious Disease Emergencies

Abbreviations: PPE, personal protective equipment; HCW, health care worker; WTR, willingness to respond; EMT, emergency medical technician.

[a] Barriers and facilitators apply to all employment groups and infectious disease types queried in a given study.