Healthcare workers willingness to work during a pandemic

Scientific Evidence Base Review

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Healthcare workers willingness to work during an influenza pandemic

Scientific Evidence Base Review

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This review was commissioned by the Department of Health in October 2010. The document was subsequently reviewed and endorsed by the Scientific Pandemic Influenza Advisory Committee (SPI).

It is anticipated that additional informative studies in this area will be published over the course of 2011 and 2012. The review will therefore be updated periodically to reflect any additions to the scientific literature that might alter any of its conclusions.

Contents

Executive summary

Background

In order for health services to run effectively during the challenges posed by a pandemic, it is essential that health care workers are willing to work. Health care workers (HCWs) are at the forefront of managing both the pandemic response and also are at increased risk of exposure to infection. It is essential to establish in advance of a future pandemic what the rate of absenteeism is likely to be and to develop interventions to mitigate any absenteeism.

Objectives

To investigate (a) the likelihood that HCWs will work during a pandemic, (b) factors associated with willingness to work, (c) whether absenteeism can be mitigated by interventions.

Methods

A systematic review of the published literature to 27 October 2010 was undertaken. Inclusion criteria included studies of reported rates of willingness to work during a pandemic, studies which included associations between demographic characteristics, attitudes and reported intentions or behaviour, studies published in English. The list of papers generated by the search was sifted for relevance by title, abstract and full text. Due to the heterogeneity of identified studies a narrative approach was adopted for data synthesis.

Results

367 articles were identified, 21 of which met the study inclusion criteria. Eighteen of these studies were carried out before the 2009 H1N1 pandemic. In addition to these 21 papers, a review paper was included, and two papers providing data on changes in working practices during the 2009 H1N1 pandemic. Most of the studies did not base their measures on theoretical models of behavior and therefore this limits the confidence with which we can draw conclusions from the data.

The evidence suggests that during a mild pandemic, such as the 2009 H1N1 pandemic, most health care workers will work, though as many as a third may not. However, there is evidence that in a more severe pandemic, which would inevitably lead to more absenteeism due to sickness, only a minority of HCWs are likely to be willing to work and this could cause major disruption.

Demographic and job based factors are associated with willingness to work with men, older people, those without dependents, doctors and full time employees being more willing to work. The research also suggests that psychological factors play a part in willingness to work during a pandemic with fears about safety for self or family being important, as well as feelings of having a duty to work.

There is some evidence that absenteeism could be mitigated if effective measures are used to reassure HCWs about their safety. However, there have been no studies to develop and test such interventions during an outbreak of pandemic influenza.

1. Background

The commitment of health care providers to work despite increased personal risk is essential to an effective response to a pandemic. The delivery of health care services will likely be challenged by the combination of increased patient care demands and staff shortages due to illness. Additional shortages related to non-illness absenteeism could lead to severe system problems where it will be difficult for the health services to maintain an effective service both for 'routine' cases and the increase of pandemic influenza infection.

Health care workers (HCWs) are at the forefront of managing both the pandemic response and also are at increased risk of exposure to infection. We need to know what the rate of absenteeism is likely to be and to develop interventions to mitigate any absenteeism. These may be safety measures such as provision of personal protective equipment and vaccination but crucially need to include measures to increase confidence in the effectiveness of such measures. Voluntary absenteeism may result from fear of contagion but also from personal obligations that may compete with, or override, professional obligations.

This paper addresses the following:

- What is the likelihood that HCWs will work during a pandemic?
- What factors are associated with willingness to work?
- Can absenteeism be mitigated by interventions?

2. Methods

This review draws on evidence from studies which have examined willingness to work and factors affecting this amongst HCWs during a pandemic.

Criteria for inclusion in the review were:

(1) Population: health care professionals (clinical and non-clinical populations)
(2) Behaviour: reported willingness to work during a pandemic
(3) Psychological variables and demographic characteristics had to be included and associations between these and willingness to work reported.
(4) Date: no restriction
(5) Language: published in the English language.

Exclusion
(1) Population: workers not based in a health care facility/other types of worker
(2) Type of study: willingness to work during a pandemic not reported; studies focusing solely on ethics of working during a pandemic
(3) Language: non-English

Search Strategy

Web of Science and PubMed were searched on 26 and 27 October 2010 with no time period restrictions. Appendix 1 gives details of the search terms used.

Study selection and data extraction

The titles of all papers identified by the searches were scanned. Some were excluded at this point for not being relevant or for being duplications. Abstracts of the papers which seemed to meet the inclusion criteria were read. Full text papers were obtained for those which were relevant or for those where further clarification of relevance was needed (e.g. if the abstract was very brief).

The following data were extracted for each paper: author & date of publication, country of study; study design and method; type of pandemic, sample characteristics; reported willingness to work; factors associated with reported willingness.

Quality assessment

Studies with unrepresentative samples were excluded once the full text of the papers had been read.

Data synthesis

The data synthesis involved a narrative approach, summarising rates of willingness to work during a pandemic across different countries and different type of pandemic.

3. Results

The search identified a total of 367 papers, 21 of which met the study inclusion criteria. Eighteen of these studies were carried out before the 2009 H1N1 pandemic. In addition to the 21 papers, a review paper was included (Chaffee 2009), and two papers providing data on changing in working practices during the 2009 H1N1 pandemic (US Department of Health and Human Services 2009; Santos, Bristow et al. 2010).

The evidence shows that a biological threat, such as an influenza pandemic, is associated with less willingness to work than other types of disaster. For example, a systematic review of 27 studies published between 1950 and 2007 of willingness to work during a disaster (Chaffee 2009) found that respondents indicated they were more willing to work in weather-related disasters and mass casualty events than in radiological, nuclear, biological, or chemical disasters. Biological outbreaks were a significant barrier to willingness to work.

Most of the research studies in this area have not been based on a theoretical model, and the majority have been carried out in advance of a pandemic and therefore report on expected willingness to work during a pandemic rather than actual attendance at work. This somewhat limits the confidence with which we can draw conclusions from the data. Most of the studies were carried out in the USA with a few from the UK, Canada, Australia and the Far East (see table 1 for details of the studies).

What is the likelihood that HCWs will work during a pandemic?

Evidence of attendance at work during the 2009 H1N1 pandemic

There is some evidence about changes in working practices during the 2009 pandemic. In some regions of Argentina, as many as 40% of health-care workers stayed away from work during the peak of the disease. In Australia, rates of work absenteeism during the 2009 H1N1 season were higher than those observed during the 2007 and 2008 influenza seasons (US Department of Health and Human Services 2009). In one recently published study (Santos, Bristow et al. 2010) mean hours of sickness absence for HCWs employed by a major New York City medical system were nearly 24% higher in June 2009 than June 2008. The study found that the department with the highest increase in absenteeism rates was also the department with the lowest rate of infection, suggesting that the absenteeism was influenced by factors other than illness related ones.

Evidence of reported willingness to work

Studies carried out before the 2009 H1N1 pandemic

The evidence from several countries suggests that the majority of HCWs would be willing to work during an influenza pandemic; however, a significant minority would not. Lower rates of willingness to work have been observed in studies examining willingness to care for patients with Severe Acute Respiratory Syndrome (SARS) or avian flu than pandemic influenza.

The highest rates of willingness to work have been observed in studies from the USA, with typically over three quarters of workers stating a willingness to attend for work, but rates reducing sharply if there are safety concerns. The data for these studies were all collected during 2006 and 2007 (i.e. post SARS and pre the H1N1 2009 pandemic), which may have affected their results. All the studies were hospital based (with the exception of two which included GPs (Damery, Wilson et al. 2009; Damery, Draper et al. 2010) and two which included community health workers (Gershon, Magda et al. 2010; Wong, Wong et al. 2010).

A USA study of emergency medical workers found that 93% of the 753 participants said they would report for duty if required to do so and 88% would be willing if asked, but not required. However, notably this willingness to work reduced to only 48% if there was a potential that the disease could be transmitted to family members (Barnett, Levine et al. 2010). An online USA survey of 1,835 hospital staff found that 84% were willing to respond to pandemic flu (regardless of its severity) (Barnett, Balicer et al. 2009).

A study in the USA of 3,426 public health department employees (Balicer, Barnett et al. 2010) found that 72% were willing to work and 83% would work if required to do so. Similarly in another USA study of 2,864 hospital employees (Garrett, Park et al. 2009), it was found that the mean willingness to work score during an influenza pandemic was 75.6 (on a scale of 0-100), indicating that the workers were more likely than not to report for duty. A smaller cross-sectional study of how 288 hospital physicians and nurses intended to respond to a potentially highly virulent influenza pandemic in two urban hospitals in Georgia, found that 77% intended to work (Butsashvili, Triner et al. 2007). A small study in Baltimore with 292 HCWs in an intensive care unit (i.e., internal medicine house staff, pulmonary and critical care fellows and faculty members, nurses, and respiratory care professionals) found that 80% said they would report for work during an influenza pandemic (Daugherty, Perl et al. 2009).

One study carried out in a specialist centre had slightly lower rates of stated willingness to work. A cross sectional survey of 738 workers at a children's hospital in Colorado found that 60% of people would be willing to work during a pandemic (Cowden, Crane et al. 2010).

Rates in the UK are lower than in some USA studies. Work has been carried out by a team in Birmingham assessing willingness to work during a pandemic under various circumstances (Damery, Wilson et al. 2009). The study of 1,034 HCWs included: hospital doctors, nursing staff, professions allied to medicine (PAM) (e.g. pharmacists, radiographers, and phlebotomists), healthcare managers, ancillary staff (e.g. porters, hotel services, and mortuary attendants), GPs and community HCWs. Only 13% said they would continue to work if their children were ill, 23% would work if their partner was ill, 60% would work even if they had to work more hours than normal and 63% would be willing to work if they had to work with untrained volunteers. Only 14% said they would be likely to work under all these circumstances.

A cross-sectional investigation of a convenience sample of 1,079 Australian clinical and non-clinical HCWs found that in the event of an influenza pandemic, 84% of respondents indicated that they would present for work if a patient in their ward/department had an influenza like illness (ILI), whilst 79% would if a colleague had an ILI and 61% would if a family member had an ILI (Seale, Leask et al. 2009).
Slightly lower rates have been observed in other Australian studies. For example, a cross sectional study of 560 hospital workers found that 47% would attend work in the event of an influenza pandemic but 17% would work only if immunizations and/or antiviral medications were immediately available (Martinese, Keijzers et al. 2009). The scenario they were given was that multiple cases of pandemic influenza had been admitted to their hospital. Similarly, just over half (57%) of 725 ambulance workers indicated that they would be willing to work during pandemic conditions; one-quarter indicated that they would not be prepared to work even if they had personal protective equipment; and one-third would refuse to work with a colleague exposed to a known case of pandemic human influenza (Tippett, Watt et al. 2010).

Lower rates of willingness to work have been found in relation to Severe Acute Respiratory Syndrome (SARS) or avian flu. A study of 6,428 health care workers from 47 health care facilities in New York City and the surrounding metropolitan region was carried out to determine ability and willingness to report to work during various catastrophic events. Forty-

eight per cent reported that they would be willing to work during an outbreak of SARS (Qureshi, Gershon et al. 2005). A similar rate was found in a study of 750 nurses carried out in Hong Kong after the 2002 SARS outbreak: 43% reported that they would be willing to care for a patient affected with SARS (Ko, Feng et al. 2004).

Half of the respondents to a USA survey carried out in 2006 in a trauma centre with 169 health care workers (34% doctors, 33% nurses, and 33% clerical and other associates) said that they would be willing to attend work in an avian flu pandemic (Irvin, Cindrich et al. 2008). A similar rate (57%) of 225 Taiwanese nurses were willing to care for avian flu patients in the event of a pandemic even though the majority thought that their hospital was not prepared for an outbreak (Tzeng and Yin 2006).

Some studies have shown that rates for willingness to work amongst community health workers can be substantially lower than that observed in hospital workers. For example, a study of 384 home health care workers found that only 11% of home health workers and 37% of registered nurses would be willing to provide care for patients during an outbreak of avian influenza (Gershon, Magda et al. 2010).

Studies carried out during the H1N1 2009 pandemic

Studies in the USA and Canada have found two thirds of HCWs willing to work during the 2009 H1N1 pandemic but lower rates have been observed in Hong Kong.

A study of 1,103 essential workers (medical personnel, fire officers and prison staff) in New York carried out at the beginning of the H1N1 2009 pandemic (April 2009) found that 65% would be willing to work during the pandemic (Gershon, Magda et al. 2010). Similarly, a large Canadian study of 4,046 HCWs carried out during August and September 2009 found that 69% reported that they would come to work if a patient in their unit was seriously ill with H1N1 influenza, and 65% would come to work if a colleague was seriously ill with it (Kaboli, Astrakianakis et al. 2010).

Lower rates were observed in a study in Hong Kong carried out with 401 community nurses employed by the Hospital Authority when the WHO pandemic alert level reached 6 for the H1N1 2009 pandemic (Wong, Wong et al. 2010). Twenty-three per cent of participants were willing to report for work to take care of patients during the H1N1 influenza pandemic, 33%

were not willing and 44% were unsure. The rates here are in line with those observed in the study of home health workers carried out by Gershon and colleagues.

Factors associated with willingness to work

Demographic factors

Gender, age and caring responsibilities have all been found to have an influence on willingness to work during a pandemic.

Gender

Research in the UK and the USA has found that women are less likely to be willing to work than men during a pandemic (Butsashvili, Triner et al. 2008; Irvin, Cindrich et al. 2008; Damery, Wilson et al. 2009; Cowden, Crane et al. 2010). The study by Damery and colleagues in the UK found that the difference between men and women was particularly stark in the case of working while children were ill. Some results may have been confounded by the fact that more nurses are women and nurses have been found to be less likely to intend to work than doctors (see below).

Age

One UK study and two US studies found older respondents more likely to report a willingness to work (Damery, Wilson et al. 2009; Balicer, Barnett et al. 2010; Cowden, Crane et al. 2010).

Having dependents

Research in the UK and USA has found that health care workers with dependents (children or elderly relatives) are significantly less likely to be willing report for work than those without (Damery, Wilson et al. 2009; Daugherty, Perl et al. 2009; Balicer, Barnett et al. 2010).

Ethnicity

There is insufficient good evidence to report on ethnic differences in willingness to work during a pandemic.

Job based factors

Job Role

Studies in UK, USA and Australia have found that hospital doctors and GPs are more likely to be willing to work during a pandemic than nurses, ancillary workers and community health care workers (Qureshi, Gershon et al. 2005; Butsashvili, Triner et al. 2007; Irvin, Cindrich et al. 2008; Damery, Wilson et al. 2009; Martinese, Keijzers et al. 2009; Seale, Leask et al. 2009; Balicer, Barnett et al. 2010). Research in the UK found that doctors would be more likely than nurses or ancillary workers to continue to work despite personal risk to themselves, or risk of infection in family members (Damery, Wilson et al. 2009). This is particularly the case if staff were asked to work at a different site or take on duties for which they were not trained.

Part-time work

Part-time workers have been found to be less willing to work during a pandemic than full-time workers in studies carried out in the UK and Australia (Damery, Wilson et al. 2009; Martinese, Keijzers et al. 2009). This may be because more women work part-time than men and women are less likely to be willing to work during a pandemic.

Perceived threat presented by pandemic

One USA study found that a belief that a pandemic was likely and severe was associated with unwillingness to work during it (Balicer, Barnett et al. 2010). A small study carried out in Taiwan found that those nurses who thought that an avian flu pandemic was likely and who were fearful of this pandemic were less willing to work during a pandemic (Tzeng and Yin 2006).

Safety concerns for self and family

Studies in the UK, USA, Australia and Hong Kong have identified safety concerns as influencing willingness to attend for work during a pandemic. For example, an internet based study carried out with over 2,000 hospital employees in the USA found that the most significant barrier to attending for work during a pandemic was fear caused by the perceived lack of safety of working, both for themselves and their family (Garrett, Park et al. 2009). This was more marked amongst women than men. High levels of concern and fears for personal safety have been found to be associated with unwillingness to work in a number of studies (Qureshi,

Gershon et al. 2005; Balicer, Barnett et al. 2010; Barnett, Levine et al. 2010; Cowden, Crane et al. 2010; Gershon, Magda et al. 2010; Wong, Wong et al. 2010).

Three-quarters of respondents in a UK study stated that their primary responsibility was to themselves and their family. Those agreeing that family responsibilities were important reported being less likely to work than those who disagreed (Damery, Draper et al. 2010). Personal responsibilities to others were also identified as barriers to willingness to work in a USA study (Qureshi, Gershon et al. 2005).

Other studies carried out in the USA with hospital workers and Australia with ambulance workers have found that a lack of confidence in an employers' response to the pandemic to protect the worker is associated with unwillingness to attend work during a pandemic (Irvin, Cindrich et al. 2008; Tippett, Watt et al. 2010).

Emotional factors

A study in Hong Kong during the 2009 H1N1 pandemic found that those community health workers who had higher levels of depression and who found their jobs more stressful were less willing to work during the pandemic (Wong, Wong et al. 2010).

Confidence in knowing how to protect oneself and others

Studies from the UK, USA, Canada, Australia and Hong Kong have found that confidence in ability to minimise the risk of being infected with influenza is associated with willingness to work (Kaboli, Astrakianakis et al. 2010). For example, a Hong Kong study found that the strongest predictor of an intention to care for patients with SARS was the nurses' confidence in knowing what to do in this circumstance (Ko, Feng et al. 2004). A USA study of 1,103 essential workers found that having been trained in the wearing of personal protective equipment, and intending to wear it during a pandemic were associated with an increased willingness to work in a pandemic (Gershon, Magda et al. 2010). An Australian study of ambulance workers found that perceived knowledge about what to do in a pandemic was associated with willingness to work (Tippett, Watt et al. 2010).

The perception of one's effectiveness or importance in the response to a disaster was a significant factor in willingness to report for duty identified by two USA studies, one involving public health department personnel and the other emergency medical personnel (Balicer,

Barnett et al. 2010; Barnett, Levine et al. 2010). The latter study found that people who were confident in their own ability to respond to a pandemic threat were significantly more likely to be willing to work than those who were less confident.

One Australian study of 1,079 HCWs found that lack of correct knowledge about what a pandemic is was associated with unwillingness to work during one (Seale, Leask et al. 2009).

Duty to work

A UK study found that nearly 30% of nurses, 25% of hospital doctors and 18% of GPs did not think that they had a duty to work where doing so would pose a risk to themselves or their families (Damery, Draper et al. 2010). The study explored whether likelihood of working during a pandemic was associated with views about the duty to work. It found that a perception of a duty to work despite personal risk was correlated strongly with stated likelihood of working during a pandemic.

A qualitative study carried out with 60 GPs in Australia found that all GPs expressed the view that they would continue to work during a pandemic as declining to work would be unethical. GPs described a strong personal work ethic, being primarily influenced by their sense of personal responsibility for their patients' welfare and seeing not working as abandonment of their responsibilities to both their patients and their colleagues, in particular, the rest of the general practice workforce (Shaw, Chilcott et al. 2006).

A study carried out in the US found that 77% of HCWs reported a belief that they had an obligation to work during a pandemic. It found that those who believed their job was essential were more likely to report a willingness to work during a pandemic (Cowden, Crane et al. 2010).

An important flip side to this perceived duty to work is a belief that the employer should ensure the workers' safety. For example, whilst all 60 participants in the Shaw et al 2006 study of Australian GPs indicated that they would be willing to work in a pandemic influenza outbreak, nearly 92% stated they would cease to work if personal protective equipment was not available. UK research has found that health care workers think that their employer has a duty to take special measures to mitigate the risks they face in performing their role by, for example, the provision of personal protective equipment and vaccination (Damery, Draper et al. 2010).

Theoretical integration of factors

Most of the research studies in this area have not followed a theoretical model. The exception is work by Balicer in colleagues (Balicer, Barnett et al. 2010) who have adopted an extended version of the parallel processing model (Witte 1998) and Ko and colleagues (Ko, Feng et al. 2004) who used the Theory of Planned Behaviour (Ajzen, 1991) (see Appendix). This work highlights the importance of preparing workers for a pandemic, increasing their confidence in their ability to respond and motivating them by increasing their awareness of how their role makes a difference. Theories of health behaviour would suggest that healthcare providers' perceptions of the threat posed by working during a pandemic and the efficacy of protective measures may positively or negatively influence willingness to attend for work. The evidence suggests that this is the case but that demographic and job based factors are also important.

Interventions to increase willingness to work/mitigate absenteeism

Four studies (one in the UK, two in the US and one in Australia) have been carried out to examine potential interventions which may increase willingness to work during a pandemic. All were conducted prior to the 2009 H1N1 influenza pandemic. They have all involved asking HCWs about their willingness to work and then asking whether a variety of mitigating scenarios would change that willingness. No studies have been carried out during the H1N1 pandemic to examine changes in actual attendance at work. Gender differences in willingness to work should also be considered when carrying out interventions as some categories of hospital workers are predominantly female, such as the nursing workforce. The types of scenarios used in the above studies are described below.

Preferential access to antiviral medication and/or vaccination

Research in the UK (Damery, Wilson et al. 2009) has found that indicating that the worker and their family would be provided with vaccination was the intervention which increased reported willingness the most. Significant increases in HCW reported willingness to work were observed in a USA intervention study carried out in 2007 where the HCW was told that they and their family would be given preferential access to antiviral medication (Garrett, Park et al. 2009). A further USA study found that reported willingness to work increased if vaccination and daily preventive medications were made available to the workers (Balicer, Barnett et al. 2010).

Provision of personal protective equipment

A USA study found that willingness to work decreased if personal protective equipment (PPE) was not made available to workers (Balicer, Barnett et al. 2010). Another USA study found that an effective intervention in terms of it increasing willingness to work was the provision of PPE for the employee as well as their immediate family (Garrett, Park et al. 2009). A UK study (Damery, Wilson et al. 2009) found that other than providing vaccination, the second most important intervention was the provision of PPE. An Australian study found that of possible incentives for staff to work during a pandemic the most important were the provision of full preventative measures for staff and provision of alternative accommodation for staff attending work in order to reduce the risk of transmission to their families (Martinese, Keijzers et al. 2009).

Arranging child-care

Studies have also examined the influence of providing child care support on willingness to work. Garret et al (2009) found that whilst people were worried about childcare they were not amenable to mitigation strategies to help with this (such as the hospital proving a child carer for them) and Damery et al (2009) found that the provision of childcare was the least influential intervention in terms of it increasing reported willingness to work.

Monetary incentives/Changes to working conditions

Garrett et al (2009) in the US found that the impact of offering additional monetary or time off compensation for working during a disaster was influential but less so than other options such as providing antivirals, vaccination or personal protective equipment. Another study carried out in the USA found that even tripling pay would not encourage people to attend for work during an avian influenza pandemic (Irvin, Cindrich et al. 2008).

Damery et al (2009) in the UK found limited influence on willingness to work of having employers accept liability for any mistakes made and being able to work flexible hours during a pandemic.

4. Conclusions

As can be seen the provision of measures to keep HCW safe during a pandemic are important to them. Such interventions (providing antivirals, vaccination and PPE) may be effective by their ability to address the safety concerns as highlighted in section 2 above.

Face masks may in fact be ineffective in reducing the risk of a HCW contracting influenza. A recent systematic review of the use of face masks to prevent transmission of influenza virus (Cowling, Zhou et al. 2010) found that there is some evidence to support the wearing of masks or respirators during illness *to protect others*, however, there are fewer data to support the use of masks or respirators *to prevent becoming infected*. However, the intervention results above suggest that the provision of PPE may confer a psychological benefit in that they reduce concerns about safety and therefore increase willingness to work.

It should also be noted that in fact the measures preferred by the HCW would be in place for workers during a pandemic and this, therefore, has implications for effectively communicating what pandemic preparedness plans are in place in each health care setting.

5. Key messages

What is the likelihood that HCWs will work during a pandemic?

- The evidence suggests that during a mild pandemic, such as the 2009 H1N1 pandemic, most health care workers will work, although as many as a third are likely to fail to attend for work.
- Willingness to work is particularly low in community health workers.
- There is evidence that in a more severe pandemic, which would inevitably lead to more absenteeism due to sickness, only a minority of HCWs are likely to be willing to work and this could cause major disruption

What factors are associated with willingness to work?

- Men are more willing to work during a pandemic than women
- Doctors are more likely to be willing to work than nurses
- Those with dependents are least likely to be willing to work
- Attitudes associated with unwillingness include concerns about the safety of working and a lack of confidence in professional ability to cope.
- A perceived professional duty of care to work during a pandemic is associated with willingness

Can absenteeism be mitigated by interventions?

- There is evidence that reported willingness can be increased. However, no behavioural data are available.
- Reassuring HCWs of their own, and their family's, safety by providing personal protective equipment and vaccination or access to antiviral medication may be effective.
- Monetary incentives and practical help would be less persuasive.

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Table 1: Studies included in review showing rates of willingness to work and factors associated with this

Author & Date	Country	Study design and method	Disease	Sample characteristics	Level of willingness	Demographic and psychological variables associated with willingness/unwillingness
Balicer et al 2009	USA	Cross sectional Online questionnaire based on the Extended Parallel Processing Model.	Pandemic Flu	N=3,426 workers at the Johns Hopkins Hospital	72%	*Willingness to work associated with:* Being older, having dependents, being a doctor. Perceiving pandemic influenza as a threat, believing in the importance of one's role in the response to the pandemic threat. *Unwillingness to work associated with:* fears for ones safety
Barnett et al 2009	USA	Cross sectional Online questionnaire based on the Extended Parallel Processing Model.	Pandemic Flu	N=1,835 local public health employees in three US states	84%	*Unwillingness to work associated with:* fears for ones safety
Barnett et al 2010	USA	Cross sectional. Online questionnaire based on the Extended Parallel Processing Model.	Pandemic Flu	N=753 Emergency Medical Staff from a nationally representative, stratified random sample	88%	*Willingness to work associated with:* Confidence in one's own ability *Unwillingness to work associated with:* fears for ones safety
Butsashivili et al 2008	USA	Cross sectional. Self-administered or	Pandemic Flu	N=288 hospital based doctors and	77%	*Willingness to work associated with:* Being

		interviewer administered questionnaire		nurses from 2 hospitals		male, being a doctor
Cowden et al 2010	USA	Cross sectional. Questionnaire	Pandemic Flu	N=738 workers at a Children's Hospital	60%	*Willingness to work associated with:* Being older, perceiving a duty to work during a pandemic. *Unwillingness to work associated with:* fears for ones safety
Damery et al 2009	UK	Intervention study Questionnaire survey	Pandemic Flu	N=1,034 randomly selected HCWs across three purposively sampled healthcare trusts in the West Midlands	63% if had to work with unqualified staff, 60% if had to work more hours, 13% if children ill	*Willingness to work associated with:* Being male, being older, being a doctor. *Unwillingness to work associated with:* Having dependents, working part-time, perceiving a responsibility for one's family
Daugherty et al 2009	USA	Cross sectional. Questionnaire survey	Pandemic Flu	N=292 HCWs from two Baltimore hospitals	80%	*Unwillingness to work associated with:* having dependents
Garrett et al 2009	USA	Intervention Online questionnaire	Pandemic Flu	N=2,864 convenience sample of HCWs across 5 urban health care facilities	75 (on scale of 1-100)	*Unwillingness to work associated with:* safety concerns and having dependents to care for
Gershon et al 2010	USA	Cross sectional Questionnaire survey	Pandemic Flu	N=384 convenience sample of home care workers & community nurses	11% home care workers, 37% nurses	*Unwillingness to work associated with:* fears for ones safety

Gershon et al 2010	USA	Study took place during 2009 outbreak Cross sectional. Questionnaire	Pandemic Flu	N=1,103 essential workers	65%	*Willingness to work associated with:* being trained in the use of personal protective equipment and intending to wear it
Irvin et al 2008	USA	Cross sectional. Questionnaire	Avian Flu	N=169 convenience sample of hospital workers	50%	*Willingness to work associated with:* Being a doctor, being male *Unwillingness to work associated with:* Lack of confidence in hospital's ability to protect worker
Kaboli et al 2010	Canada	Study took place during 2009 outbreak (Aug-Sept 2009) Cross sectional. Online Questionnaire	Pandemic Flu	N=4,046 HCW from all 6 health authorities in British Columbia	69% if patients ill, 65% if colleague ill	*Willingness to work associated with:* confidence in how to protect oneself against disease
Ko et al 2004	Hong Kong	Cross sectional Questionnaire	SARS	N=750 nurses in one hospital	43%	*Willingness to work associated with:* Confidence in what to do to minimise personal risk of developing disease
Martinese et al 2009	Australia	Intervention Questionnaire survey	Pandemic Flu	N=560 HCWs at one hospital	47%	*Willingness to work associated with:* Being a doctor. *Unwillingness to work associated with:* working part time
Qureshi et al 2005	USA	Cross sectional Questionnaire survey	SARS	N=6,428 HCWs in 47 health care facilities in New York	48%	*Willingness to work associated with:* Being a doctor. *Unwillingness to work*

						associated with: Having responsibilities for others, concerns for one's own safety
Seale et al 2009	Australia	Cross sectional Questionnaire survey (paper and online)	Pandemic Flu	N=1,079 a convenience sample of clinical and non-clinical HCWs from two tertiary-referral teaching hospitals in Sydney	84% if patients ill, 79% if colleague ill, 61% if family member ill	*Unwillingness to work associated with:* Being a nurse, not correctly knowing what a pandemic is
Shaw et al 2006	Australia	Qualitative semi-structured interview study	Pandemic Flu	60 GPs purposively selected to maximize diversity within the sample	100%	*Willingness to work associated with*: a duty to do so.
Tippett et al 2010	Australia	Cross sectional. Postal questionnaire.	Pandemic Flu	N=725 national, stratified, random sample of the Australian emergency pre-hospital medical care workforce	57%	*Willingness to work associated with:* Knowledge about what to do in a pandemic and confidence in the employers response to the pandemic
Tzeng & Yin 2006	Taiwan	Cross sectional Questionnaire survey	Avian Flu	N=225 nursing students from one university hospital	57%	*Willingness to work associates with:* having sufficient infection control measures *Unwillingness to work associated with:* fear of avian influenza, family's fear of avian influenza, perceived likelihood of avian influenza pandemic

Wong et al 2010	Hong Kong	Study carried out during 2009 outbreak Cross sectional Questionnaire study	Pandemic Flu	N=401 community nurses employed by hospital authority in Hong Kong	23%	*Unwillingness to work associated with:* Fears for personal safety, finding work stressful, higher levels of depression

Appendix 1: Search strategy

Web of Science and PubMed databases were searched on 27 and 28 October 2009

Willingness to work pandemic
Willingness to work influenza
Willingness to work H1N1
Willingness to work H5N1
Prophylactic absenteeism
Prophylactic absenteeism pandemic
Prophylactic absenteeism influenza
Precautionary absenteeism pandemic
Precautionary absenteeism influenza
Health care worker influenza pandemic
Worker influenza pandemic

Appendix 2: Extended Parallel Processing Model

According to this model, the threat and efficacy components are processed in parallel by the message recipient, and both components must be accepted by the recipient to achieve the desired behaviour or practice (at both individual and collective levels), in this case attendance at work. Threat in this context is concern and worry about the pandemic and efficacy is confidence in oneself and others to alleviate the threat. If the threat portion is not accepted, the message is rejected. If the threat portion is accepted, but the efficacy portion is not, the acceptance of the threat portion alone triggers fear, which can result in maladaptive responses such as denial or avoidance.

The Theory of Planned Behaviour (TPB)

The TPB, an expansion of the theory of reasoned action which was devised by Fishbein and Ajzen (1975) to explain social behaviour, has been widely applied to a variety of behaviours – both health and non-health related (see Conner & Sparks, 1996, for a review and meta-analyses by Godin & Kok, 1996 and Sheppard, Hartwick, & Warshaw, 1988). The TPB postulates that the proximal determinant of a behaviour is an intention to perform it. In turn, intentions are determined by three constructs: attitude towards the behaviour, subjective norm, and perceived behavioural control (PBC).

Attitude towards the behaviour refers to the person's overall evaluation of the behaviour, which may be positive or negative. Subjective norms involve perceptions of how other people think the individual should behave in relation to the particular behaviour in question and also how these other people themselves behave. PBC aims to take account of differences in abilities, skills, access to resources, confidence, etc. between individuals.