HEALTHCARE WORKERS' WILLINGNESS TO REPORT TO WORK DURING AN INFLUENZA PANDEMIC: A SYSTEMATIC LITERATURE REVIEW

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This manuscript is dedicated to my mother, Evelyn Rosely Schutze who's lifelong encouragement made this possible; to my husband David, for his love and support, and my children Valerie and Andrew for their patience throughout this lengthy process.

ABSTRACT

HEALTHCARE WORKERS' WILLINGNESS TO REPORT TO WORK DURING AN INFLUENZA PANDEMIC:
A SYSTEMATIC LITERATURE REVIEW

by Caren Rossow

Objective

To systematically evaluate the evidence of healthcare workers' willingness to report to work during a pandemic influenza.

Design

Systematic review of published articles.

Data Survey

Cinahl, CSA Illumina, Healthcare Reference Center, Health Sciences, Health Source: Nursing /Academic Edition, Nursing and Allied Health, Medline, ProQuest, PubMed Central, Google Scholar and Citation Lists.

Review Method

Articles describing healthcare workers' willingness to report to work during an influenza pandemic and associated outcomes were selected for review. Only scholarly journals were accepted. Group contrasts were analyzed using identical measurements and numerical scales.

Results

Of the 206 studies reviewed, 28 studies met inclusion criteria. Of these, 18 studies, split into two methodologically homogenous groups, were included in the quantitative analysis. In 10 studies researchers elicited responses using a scale with a midpoint, unsure or an undecided

option, which were coded as "not willing to report to work." In these studies, mean willingness to report to work was 56.12% (SD = 21.36, range = 59.20). In 8 studies researchers elicited responses using a forced choice scale without a midpoint, coding the top half of the scale as "willing to report to work". In these studies, mean willingness to report to work was 75.26%, (SD = 10.81, range = 33.10). Means differed significantly by study group, as indicated by Mann-Whitney nonparametric U test, U =17.00 , p = 0.043. A detailed meta-analysis could not be performed due to vast variation in study design, such as use of scale points, dichotomization methods and coding of HCW groups.

Conclusion

There is little consistency in findings that summarize percent of healthcare workers willing to report to work. A large proportion of them (up to 40%) may fall into the “unsure” group, which needs to be carefully studied. Scales without a midpoint systematically overestimated willingness to report to work and the magnitude of this overestimation was high (about 20%). To enable generalization, we recommend ways to standardize the design and reporting of future studies. Specifically, we recommend scales with the option of unsure or not applicable, inclusion of tables that show willingness to report to work by HCW type, gender, and scale point.

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KEY TO ACRONYMS

AI – Avian Influenza

AIDS – Acquired Immunodeficiency Syndrome

CCU – Critical Care Unit

CI – Confidence Intervals

CS – Convenience Sample

CSS – Cross Sectional Survey

DNK – Do Not Know

DO – Doctor of Osteopathic

ED – Emergency Department

ER – Emergency Room

EMS – Emergency Medical Services

EMT – Emergency Medical Technician

EPPM- Extended Parallel Process Model

FG – Focus Group

GP – General Practitioner

HCW – Heath Care Worker

HSS – Health and Human Services

ICU – Intensive Care Unit

INT - Interview

IT – Information Technology

LPN – Licensed Practical Nurse

MD – Medical Doctor

NA – Not Applicable

NRS – Non-random Sample

OR – Odds Ratio

PAC – Physician Assistant Certified

PCP- Primary Care Physicians

PEDS – Pediatrics

PhD – Doctor of Philosophy

PPE – Personal Protective Equipment

RCP – Respiratory Care Providers

RN – Registered Nurse

RR - Response Rate

RS – Random Sample

SMO-Senior Medical Officer

SRS – Stratified Random Sample

US – United States

WHO – World Health Organization

CHAPTER I

INTRODUCTION

Pandemics have long been described since the 16th century in degrees of gravity, impact, and intervals fluctuating between 10 and 50 years.[1] In the 20th century three pandemics, particularly the severe Spanish Flu pandemic of 1918 "killed more people in six months than acquired immunodeficiency syndrome (AIDS) has killed in the last 25 years and more than were killed in all of World War I." [2] Caused by subtype H1N1, the 1918 pandemic was accountable for illness of approximately 20 to 40 percent of the population globally and death in 50 million individuals.[3] The US alone experienced an estimated 675,000 deaths in an eight month period of time.[3]

Less severe pandemics followed including the Asian Flu in 1957 and the Hong Kong Flu in 1968, which killed approximately 70,000 and 34,000 Americans respectively.[3] In 2009 the H1N1 Swine Flu pandemic caused illness in an estimated 43 million to 88 million in the US, with an estimated 195,086 to 402,719 hospitalizations and 8,868 to 18,306 deaths.[4] The World Health Organization (2010) estimates that 20–40 percent of populations in regions of the globe were infected by the H1N1 virus.[5]

These differences largely relate to the severity and virulence of the influenza viruses that cause the pandemics. However, 20th century pandemics reveal commonality. In each, about 30 percent of the US population developed the illness, approximately half-seeking medical care.[6] Children under the age of 18 tended to have the highest rate of illness.[7] The pandemics spread swiftly with all communities experiencing outbreaks in a relatively short period of time.[7]

Present day pandemic threat is linked to an outbreak of avian influenza by the H5N1 strain of the influenza A virus.[2] Transmitted by infected poultry, hundreds of millions of

chickens, ducks, turkeys and geese have died or been culled to prevent the spread of the virus. [8] A total of 574 human confirmed cases were reported to the WHO between January 2003 and 2011 from a number of countries in Asia, the Near East, Africa, and Europe.[9] The virus currently seems limited to poultry workers and has shown an inability to spread from human to human. The widespread nature of H5N1 in birds and the possibility of mutations over time raise fears and apprehensions that the virus will become communicable between humans with disastrous consequences.[3]

Federal planning efforts, based on these characteristics assume that the number of patients seeking medical care will be approximately 50 percent.[6] Those afflicted with the disease and the worried well could overwhelm the healthcare systems.[6] If extremely virulent, the "pandemic influenza may quickly rise to raise the level of a catastrophic incident resulting in mass casualties, placing overwhelming demanding on religious, cultural, and emotional burdens on local communities and families of victims."[6]

The need for inpatient acute care and intensive care beds with ventilation services could increase by more than 25 percent.[6] Non-urgent and elective medical and surgical procedures will cease.[10] Alternate care sites will open utilizing public schools, stadiums, churches, and other settings; converted to provide needed medical services.[10] This devastating impact on society may include a 40 to 50 percent absentee rate, an overwhelmed healthcare system, interruption impacting transportation, the supply chain, including medical supplies, water, electricity, financial systems, and the overall economy. [10] The duration and multiple waves of a severe pandemic are predicted to last several months to more than a year.[11] The national response and contingency plans suggests healthcare worker (HCW) shortages will occur primarily due to illness and mortality amongst the health care providers.[11]

Preparing for the influx or surge in patients begins with identifying critical staffing and services necessary to provide medical care.[6] Medical, nursing, respiratory therapists, pharmacists, and laboratory personnel are vital for health care delivery. The current nationwide shortage of HCWs worsens the staffing dilemma.[12] Medical students ran inpatient wards in the 1918 pandemic, performing both medical and nursing duties.[13] A recommended strategy in the US Department of Health and Human Services Pandemic Flu Plan is cross training staff for areas such as the emergency department and intensive care.[6] Ancillary support personnel are also essential for infrastructure support: food, environmental services, medical supply stores, maintenance and other services.[11]

Pandemic healthcare workforce planning is essential to mitigate the loss of life. An effective health care response ensures adequate amount of supplies of a variety of skilled HCWs who are willing, able, and available to serve in a pandemic event. Reallocating healthcare providers from non-acute outpatient and community care sites to emergency response assignments in acute care will optimize the workforce potential.[6] Recruiting retired HCWs, qualified volunteers, reserve or retired military medical and nursing providers, as well as dentists, dental assistants, pharmacists, and health professional students will be essential to meet the overwhelming workforce demands.[6]

In a systematic review of 27 articles published between 1991 and 2007 Chaffee identifies certain factors influencing the willingness to work, including the type of disaster. [14] Inclusive of several disaster scenarios: weather related, radiological, nuclear, biological, and chemical, Chaffee cites a biological outbreak as a significant barrier to willingness to work.[14] The systematic review discusses the lowest willingness to report to work rate that was observed in response to a scenario of a hypothetical pandemic influenza outbreak in New York City. A mere

11 percent of health care aides and 37 percent of registered nurses were willing to take care of patients infected with the influenza.[15] Chaffee recommends that future researchers enhance their measurement tools in order to build confidence in the data and utilize information for preparedness planning. This study is a systematic review of studies that specifically examined HCWs' willingness to report to work during influenza pandemics. How can preparedness planning be informed by generalizing the results of these studies to future influenza pandemics?

CHAPTER II

MATERIALS AND METHODS

Subjects

The population of interest includes all HCWs such as employees in any sector of healthcare (pre-hospital, hospital, community, and public health), clinical personnel (doctors, nurses, paramedics EMTs, allied health, students), non-clinical personnel (clerical, environmental services, maintenance, food services, and laundry staff), and administrative staff members (administrators, management, and supervisors) who participated in a survey of willingness to report to work.

Literature Search Strategy

Information sources were obtained from nine databases: Cinahl (1950 – 2011); CSA Illumina (earliest – 2011); Healthcare Reference Center (all); Health Sciences (1879 – 2011); Health Source (all); Nursing and Allied Health (all); Medline (1992 – 2011); ProQuest (all); PubMed Central (all); and Google Scholar (1950- 2011) in December 2009, with an updated search in December 2010, and May 2011. Date ranges were selected based on advanced search availability on the databases. Terms included key words: HCWs' willingness: to report to work, to respond, to risk one's life and care for patients, to provide clinical services, likelihood of reporting, of working or continuing to work in a pandemic influenza, as well as barriers and strategies to enhance willingness. The researcher reviewed all scholarly journals. Reference lists of all eligible articles were manually searched to identify additional relevant studies.

Study Screening and Inclusion Criteria

The researcher reviewed all titles and abstracts. Duplicates were removed. A full review was completed if inclusion criteria requirements were met. Studies that reported only subjective perspectives or commentary on willingness to report to work were not included.

Table 1. Inclusion/Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Key Respondents - healthcare workers Time Frame - oldest on record to May 2011 Distinguishing Features - healthcare sector: EMS, hospital/hospital based system, homecare, community, and other Distinguishing Features - reported finding on willingness/likelihood to report or to work or respond to an influenza pandemic Research Method - qualitative or quantitative Publication Type - peer reviewed research articles and abstracts	The study was not in English The study did not assess willingness to report to work The study was not relevant to the research questions The study did not present original work The study was a meeting abstract or editorial

Study Selection Data Abstract and Processing

All articles and abstracts meeting the inclusion criteria (n = 206) were thoroughly examined in full text by the researchers (Appendix A-I). Abstracted data from eligible studies included: first author, year of publication, country, influenza or avian pandemic, healthcare sector, population, study design, and statistical analysis of measures (Appendix B-I). Research

articles were further examined utilizing methodology modified from Shi (2008).[16] The researchers built comparative tables that showed response rates, sampling methods and respondent characteristics (Appendix B-II); operational definitions of dependent variables and author-stated percentage of willingness to report to work (Appendix B-III); as well as any other significant findings and notes (Appendix B-IV). Finally, the quality of the research design was analyzed for each of the included studies, such as sampling procedures, response bias and statistical analysis.

CHAPTER III

RESULTS

Literature Search

A systematic literature review of nine electronic data bases completed in May 2010 revealed 263 records with any of the following keywords HCWs' willingness to report to work, willingness to respond, likelihood of reporting to work, likelihood of working and likelihood of continuing to work during a pandemic. As shown in Figure 1, a total of 111 articles were identified through database search; 152 by reference list and Internet search. After duplicates were removed, 206 were screened to identify abstracts that met inclusion criteria. One hundred-twenty were removed because they failed to meet inclusion criteria. For the remaining 83 abstracts, complete study records were obtained and reviewed in depth. Based on the review, 52 articles were eliminated for failure to meet inclusion criteria. The remaining studies were mostly quantitative (28 out of 31). The number of qualitative studies (N = 3) was too small to conduct a separate review. Consequently, a review was performed on 28 quantitative studies (Figure 1).

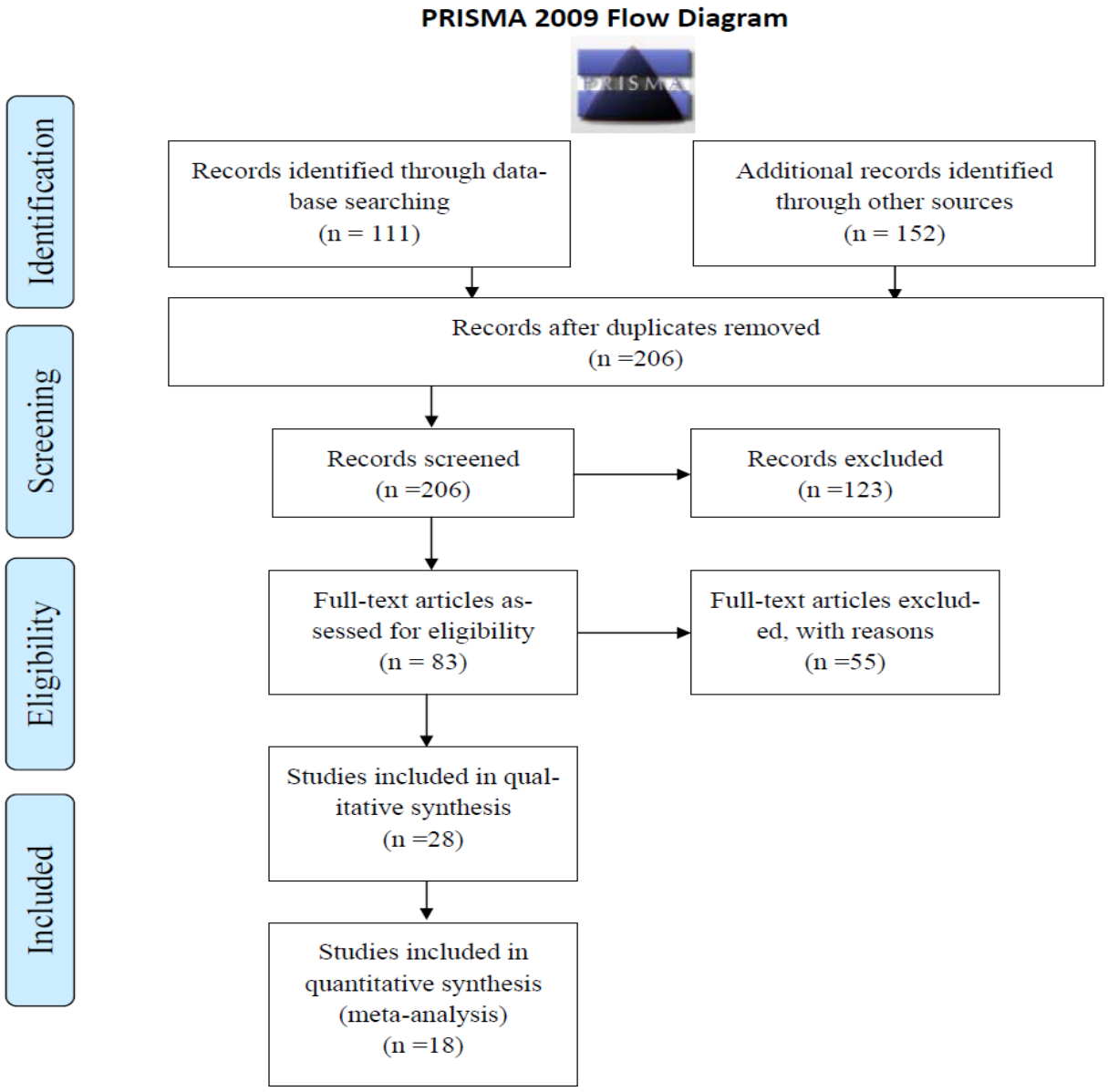

Figure 1. Process Flow of the Literature Survey Method from Survey to Analysis of Data From: Moher D, Liberati A, Tetziaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analysis [17]

Characteristics of the Included Studies

Quality Assessment

Quality characteristics of the 28 included studies (Appendix B-II) were examined, such as the purpose of the study, study design, and sampling. The explicit purpose of the study was

well stated in all studies, and three studies listed hypotheses. Random samples were employed in 9 out of 28 studies. Potential bias and limitations were reported in 26 of the 28 selected studies. Concerns of potential study design bias were stated in eight of the studies, selection bias in 12 studies, response rate in six studies, and non-response bias in seven studies (Appendix C-I). Survey instrument bias due to wording or survey instrument bias or phrasing were noted in four studies. Anonymity concerns or the lack of privacy and confidentially during respondent completion of the survey were voiced in two studies. In 13 studies, the authors stated concerns related to social desirability bias or the inability to predict whether HCWs who reported willingness to work during a pandemic will actually be working during this event.

Statistical procedures were performed in all 28 studies (Appendix C-II). Specifically, the authors computed odds ratio to measure effect size (14 studies), conducted regression analyses for predicting outcomes (14 studies), and calculated chi-square (13 studies), Student's t (6 studies) and Spearman's correlation (2 studies). Descriptive statistics for dependent variables were reported in all studies (Appendix C-II), however, the level of detail provided varied from an overall count or percent of workers willing to report to work (multiple scale points on the high end of the scale) to frequencies by scale point. Scale points are discussed in greater detail below.

Geographic location

Of the 28 studies, 15 (54%) were conducted in the US (Appendix C-III). The remaining studies 13 (46%) came from Australia, China, Egypt, Japan, Taiwan and the United Kingdom. Approximately one-half (53%) of all study participants were US HCWs, n= 16,847.

Event

In most studies (n = 24) researchers asked HCWs if they would be willing to work during an influenza pandemic, the remaining studies examined HCWs' willingness to work during an avian influenza that is associated with particularly high death rates. One study presented both an influenza and avian influenza. In addition to pandemic influenza, the authors of two studies, 6,[23] 20[36], measured willingness to report to work during other disasters, such as an earthquake, ice storm, hurricane and a chemical or radiation event.

Number of study participants

A total of 28 studies and 31, 663 respondents were included in the review. The minimum number of respondents per study was 56 and the maximum was 7,378. The mean sample size was 1131.14 (SD = 1490.15) (Appendix C-IV).

Healthcare Sector

There were nineteen unique categories of the healthcare sectors represented in the study. The largest healthcare sector was represented by hospitals and hospital based systems (18 studies), EMS (two studies), home care (one study) and local health department (three studies). The category "other," as shown in Table 2, included homecare, medical reserve corps, community nurses, licensed nurses in Maryland, and primary-care physicians. Table 2 also shows the number of study participants by sector.

Table 2. Number of Studies and Participants by Healthcare Sector

	Number of studies	Number of study participants
Hospitals	18	23,792
EMS	2	1,311
Public Health	3	4,557
Home Care	1	384
Other	4	1,619
Total	28	31, 663

HCW Type

Many different types of HCWs were studied by the authors of the 28 studies included in this review. Overall, of 204 different HCW groups covered by the studies, there were 148 HCW groups with unique labels, for example, attending physician, administrator and community health staff. The number of groups included in a study varied from 1 to 22 with the mode of 2 and the mean of 7 (Appendix C-IV). In three of the studies, categories were listed extremely broadly, such as "all categories of healthcare workers," "hospital staff" and "categories of professional classifications." Descriptions of professional groups also varied widely. For example, nurse groups (mentioned in 25 of 28 studies) were labeled as follows: nurse (9 studies), clinical nurse consultant, clinical nurse specialist, community nurse, early childhood nurses, ER nurse, licensed practical nurse, any nurse, nurse educators and nurse managers, nurse practitioners, nurse unit manager, nursing, nursing administration (2 studies), nursing staff (2 studies), nursing assistant (2 studies), nursing students with a lesser degree nursing credential enrolled in a bachelor degree program. Similarly, 17 different labels applied to physician or doctor groups: attending

physicians, doctors (2 studies), dentist (2 studies), ER physicians, general practitioners, hospital doctors, house staff/resident or fellow, intern, consultant, internal Medicine House Staff, MD, DO/PhD, medical registrar, medical staff, medical staff specialists, practitioners, registrars (2 studies), and residents. The category of "other" was noted in 5 studies (Appendix C-IV).

Several studies referred to department-based groups, such as administration, maintenance and engineering, community health workers, laboratory services, occupational therapy, pharmacy and telecom to name a few. Finally, some authors used broad classifications of professionals, such as allied health professionals, clinical staff, non-clinical staff, clerical staff, management and supervisors.

The authors of 11 studies collapsed several HCW groups into two to six broader categories of professionals. After duplicates were removed, there were 40 unique categories (Appendix C-IV). Nurses were in a stand-alone category in seven of the eleven studies. Other common categories represented clerical, clinical, non-clinical, allied health, community and public health. Generally, the collapsed categories were broader in nature in their representation of HCWs but there was little consistency in how HCW groups were collapsed. For example, in study 2[19] HCW groups were labeled clinical staff vs. non-clinical staff and in study 8[25] HCW group labels were doctors, nurses, allied professionals, ancillary workers, managers, general practitioners, and community health workers. Willingness to report to work was not always reported by HCW type or group. When such reports were available, they could not be easily compared across studies due to differences in group composition. Thirteen out of 28 studies reported willingness to report to work for nurse-related groups. These results are summarized below.

Participant's Gender

Gender was reported in 24 out of the 28 studies. As shown in Appendix C-V, most respondents (71.21%) were female however, percent of females ranged from 34.10% to 96.20% across the 24 studies. Only eight studies contained gender-specific reports on willingness to report to work, which limited our ability to examine gender effects (Appendix C-VI).

Conceptualization of Willingness to Report to Work

The authors of the 28 studies conceptualized willingness to report to work in different ways. As can be seen in Table 3, in addition to willingness to report to work, dependent variables with significant conceptual overlap were likelihood of reporting to work, willingness to care for patients, willingness to volunteer to work, being available to work and willingness to come in to work. Variables with a lower degree of conceptual overlap were willingness to accept the risk of contracting pandemic influenza, willingness and ability to come to work to perform one's job for additional worked hours beyond your contracted hours at standard overtime pay rates and acceptance of the risk of contracting avian influenza as part of the job. In all studies the items were worded positively, except for the article in which HCWs reported if they would refuse to work when asked to deal with H1N patients.

Hypothetical Scenarios

Eleven studies utilized hypothetical scenarios, that is, measured willingness to report to work under conditions that were described with a greater degree of specificity than working under a general threat of pandemic influenza. There was also a great variability of scenarios and events. Two studies 6[23] and 20[36] presented lists of disasters in addition to pandemic influenza. Earthquakes, ice storms, snow storms, tornados, floods, hurricanes, biological, chemical, and

radiation related events were a few of the conditions offered to choose from. Six of the studies 15[31], 18[34], 20[36], 22[38], 26[42], and 28[44] examined a hypothetical avian influenza pandemic.

Most conditions related to the nature of the event, availability of treatment or the need to provide direct patient care, for example, scenarios involving a transmissible agent with only experimental prophylaxis/treatment, multiple patients admitted with a new strain of human influenza during a pandemic influenza, confirmed cases of H5N1 avian influenza, avian pandemic with patient being treated at the hospital, and widespread human-to-human transmission occurring with work duties requiring direct face-to-face contact with people who could be infected. Two studies assessed willingness to report under more than one scenario, such as natural disasters vs. bioterrorism. Finally, three studies utilized the Witte's Extended Parallel Process Model, citing scenarios. If studies presented multiple pandemic scenarios, the worst-case scenario was chosen for inclusion in this study. For example, study 5[22] presented a scenario of pandemic peak, high-risk job duties requiring direct face to face contact with patients who could be infected, represented worst-case, whereas early pandemic, low-risk job duties not requiring direct face to face contact was not considered worst-case.

Realistic Pandemic Threats

The notes for Table 3 identify four studies that were conducted during the global 2009 H1N1 pandemic influenza. First, study 19[35] in Egypt was conducted when the country was on the edge of the pandemic. Secondly, the study of Hong Kong community nurses, study 27[43] was conducted during the peak of the pandemic, WHO pandemic alert level 6. The remaining two studies were conducted during the second wave of the pandemic.

Scaling of Responses

Specific differences that could potentially affect the study findings included item working, scale type, scale point labels, use of a midpoint or additional response options (do not know and not applicable), and a method used for dichotomizing responses into willing to report vs. unwilling to report. The scaling differences are discussed below.

In 14 of the 28 studies, researchers used a variety of Likert-type scales that produced ratio data: 1-4 (one study), 1-5 (five studies), 1-6 (one study), 1-7 (one study), 1-9 (one study), 1-10 (four studies), and 1-100 (one study). It is important to note not only the varying number of scale points but also variations in the presence of a midpoint, which may indicate neutrality. Midpoint was present in scales with an odd number of response options, such as 1-5, 1-7, and 1-9. In five studies where a 1-5 scale was used, all researchers dichotomized responses (willing vs. unwilling to report) by including participants who selected a midpoint of 3 into the unwilling group. But in a study that used a 1-9 scale, everyone who selected a midpoint of 5 (neutrality) was excluded from subsequent calculations of the percent of respondents who were willing vs. unwilling to report to work. Two studies utilizing a 1-10 scale also had an option of checking do not know. These respondents were assigned the median value on the Likert scale. One study provided an option of not applicable which was excluded from the denominator.

Table 3. Analysis of Scale Points and Dichotomization Methods

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
1 [18]	How likely are you to report to work during an IP related emergency?*	|-------|-------| 1 3 5	1 = very likely to report to work, 5 = not likely at all. Dichotomized as 1-2 vs. 3-5 [M1]	Midpoint of 3 included in the not likely response	53.8% likely to report to work (1-2)
2 [19]	I will report to work if required*	|----------|---------| 1 5 9 [ ] DNK***	1 = strongly agree, 5 = neutrality, 9 = strongly disagree. An option of DNK. Dichotomized as 1-4 vs. 6-9	Neutrality and DNK were excluded from the analysis	82.5% likely report to work if required (1-4)
3 [20]	I will report to work if required.*	|--------------------| 1 10 [ ] DNK***	1 = strongly agree, 10 = strongly disagree. An option of DNK. Dichotomized as 1-5 vs. 6-10	DNK were assigned the median value of the Constructs in the Likert scale responses	93.1% willing if required (1-5)

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
4 [21]	I will report to work if required.*	|----------| 1 10 [ ] DNK***	1 = strongly agree, 10 = strongly disagree. An option of DNK. Dichotomized as 1-5 vs. 6-10.	DNK were assigned the median value of the Constructs in the Likert scale responses	92% willing to report to work if required (1-5)
5 [22]	Peak pandemic: If your work duties did require you to have direct face-to-face contact with people who could be infected, how likely would you be to report to work?	|-------|-------| 1 3 5	1= very likely, 2 = somewhat likely, 3= neither likely nor unlikely, 4= somewhat unlikely 5= very unlikely. Dichotomized as 1-2 vs. 3-5	Midpoint of 3 excluded	56.2% peak pandemic, high risk duties if required (1-2) Nurses: 68.7%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/ NA	Percent willing to report to work (scale points used as an indicator of willingness)
6 [23]	During which of these disasters you would be willing and able to come to work to perform your job for additional worked hours beyond your contracted hours, at standard overtime pay rates? Assume that roads and conditions are safe and passable and that your family is sage and taken care of. Earthquake, ice storm, snowstorm, tornado, flood, hurricane, flu epidemic, biological event, chemical event, radiation event, fire/rescue/collapse.	[ ] Flu pandemic (there were 10 other options, ranging from fire rescue to a biological or chemical event)	Dichotomized as checked vs. not checked [M2]		72% willing to report to work during flu pandemic

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
7 [24]	I am willing to report to work in a pandemic influenza. *	[ ] Yes, [ ] No, [ ] Unsure	Dichotomized as yes vs. no and unsure [M1]	Unsure included in the no response	60% willingness to work (yes) 34% Unsure
8 [25]	If there was an outbreak of pandemic influenza how likely is it that you would work?	[ ] Likely, [ ] Unlikely, [ ] DNK, [ ] N/A	Likely = 5, Unlikely = 3. Likelihood score = Likely/total answered x 100	DNK and N/A were excluded from the denominator	59.3% mean likelihood of working Nurses: 49.3% Physicians: 67%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
9 [26]	How likely are you to come to work during an influenza pandemic?	|----------| 1 4 [ ] Unsure***	1=do not agree, 4=agree Dichotomized as 1-2 vs. 3-4 [M1]	Unsure was included in the study with the do not agree	79% likely to report to work (3-4) 6% Unsure Nurses: 78% Physicians: 87%
10 [27]	Are you willing to report to work, report to duty?*	|----------| 0 100	0 = absolutely will not report for duty; 100 = absolutely will report. No dichotomization method reported		75.6% willingness to report to work

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
11 [15]	Are you willing to care for new patients during a pandemic outbreak?	[ ] Willing, [ ] Not Willing, [ ] Not Sure	Dichotomized as willing vs. not willing or not sure [M1]	Not sure included in the not willing	27% willing to care for new patients

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
12 [28]	Are you willing to report to work during future pandemics?	|----------| 1 10	1 = agree, 10 = disagree Dichotomized as definitely agree 1-3 vs. others 4-10		47% willingness to report to work (1-3) Only nurses were studied
13 [29]	I am willing to respond if required *	|----------| 1 10	1 = agree, 10 = disagree. Dichotomized as agreeing 1-3 vs. others 4-10		67% willing to report if required (1-3) Nurses: 65% Physicians 67%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
14 [30]	I would accept the risk of contracting pandemic influenza at work.	|----------| 1 6 [ ] NA***	1=strongly agree, 2=agree, 3= probably agree, 4= strongly disagree, 5= disagree, 6= probably disagree. Dichotomized as 1-3 vs. 4-6 [M2]	NA excluded from the study	74.5% accept risk of contracting disease at work (1-3) Nurses: 49.9%
15 [31]	Would you report to work as usual?α	[ ] Yes [ ] Maybe [ ] No	Dichotomized as yes vs. no vs. maybe [M1]	Maybe excluded from dichotomization	50% willing to report to work as usual (yes) 42% Maybe Nurses: 44% Physicians: 73%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
16 [32]	I am willing to care for H1N1patients.*π	|-------|-------| 1 3 5	1=completely agree, 2= agree, 3= neither agree nor disagree, 4=disagree, 5= completely disagree. Dichotomized as 1-2 vs. 3-5 [M1]	Midpoint of 3, included in the study with the disagree responses	82.3% willing to care for H1N1 patients (1-2)
17 [33]	Would you work during the flu pandemic?*π	[ ] Yes, [ ] No	Dichotomized to yes vs. no [M2]		90.1% reported they would work (yes) Only nurses were studied

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
18 [34]	Multiple patients admitted with a new strain of human influenza during a pandemic. Would you continue to work?α	[ ] Yes, [ ] No	Dichotomized to yes vs. no [M2]		36% would not attend work (yes) Physicians: 66%
19 [35]	I would refuse to work if asked to deal with H1N1 patients.π	[ ] Would work, [ ] would not work, [ ] DNK	Dichotomized as work vs. not work; DNK excluded	DNK excluded	41% would not be willing to work Nurses: 59%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
20 [36]	Six confirmed cases of H5N1 avian influenza in NYC. One suspect case in Nassau. Nassau to distribute antivirals to identified at-risk populations with assistance of MRC. Are you willing to volunteer? A	[ ] Willing, [ ] Not willing, [ ] Not sure	Dichotomized as willing vs. not willing/not sure [M1]	Not sure included with the not willing	79% willing to volunteer

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
21 [37]	I would report to work in a patient in my ward or department had an influenza like illness.*	[ ] Would Respond, [ ] Would not	Dichotomized as would respond vs. would not [M2]		83% willing to work if a patient in their ward had an influenza like illness
22 [38]	I would volunteer to work in an avian influenza, if provided with the necessary input, protection, tools, and education. *α	[ ] Would Volunteer, [ ] Would Not Volunteer	Dichotomized as would volunteer vs. would not volunteer [M2]		79% would volunteer Nurses: 76.6%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
23 [39]	I would expect to be available to work in a pandemic.	|----------| 1 5	1=strongly disagree to 5=strongly agree, 3=unsure Dichotomized as agree vs. unsure vs. disagree [M1]	Midpoint of 3, included in the study with the disagree responses	67% stated they would be available to work (agree) 23% Unsure Nurses: 70%
24 [40]	The CDC identifies the agent as transmissible with only experimental treatment. Your workplace has asked you to come in to work, will you come in?	[ ] Yes, [ ] Probably Yes, [ ] Undecided, [ ] Probably No, [ ] No	Dichotomized as yes, probably yes, vs. no, probably no, and undecided [M1]	Undecided included in the probably no, no	40% willing to come in to work (yes, probably yes) Physicians: 73%

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/NA	Percent willing to report to work (scale points used as an indicator of willingness)
25 [41]	I would be willing to work in an influenza pandemic.	|----------| 1 5	Dichotomization not specified.		56.3% willing to work to work.
26 [42]	I am willing to care for patients with bird flu.*α	0 No, 1 Yes	Dichotomized as yes vs. no [M2]		57% willingness to care for patients infected with bird flu Only nurses were studied
27 [43]	I am willing to take care of patients during H1N1 IP.*π	[ ] Not Willing, [ ] Not Sure, [ ] Willing	Dichotomized as not willing and unsure vs. willing [M1]	Not sure included in the not willing	23.1 Willing 43.6 Not Sure Only nurses were studied

Table 3. Analysis of Scale Points and Dichotomization Methods (continued)

ID	Item*	Scale end points and, if available, midpoint	Scale point labels and dichotomization method for calculating percent willing to report to work	Midpoint/ DNK/Unsure/ NA	Percent willing to report to work (scale points used as an indicator of willingness)
28 [44]	I accept the risk of contracting avian influenza as part of the job. α	|----------| 1 6	1=Strongly disagree, 2= disagree, 3=not sure but probably disagree, 4=not sure but probably agree, 5= agree, and 6=strongly agree. Dichotomized as 1-3 vs. 4-6*** [M2]		82.5% willing to accept the risk (4-6) Physicians: 82.5%

π Survey distributed during pandemic influenza.

α An avian influenza scenario was used.

[M1] Dichotomization method one

[M2] Dichotomization method two

*Reconstructed from an operational definition.

**DNK = Do not know.

*** Not stated specifically by the authors but implied in their descriptions of methods or results.

Some authors designed nominal measures using check boxes. Specifically, in one study respondents indicated willingness to respond by checking a box labeled “pandemic influenza." If this field was left unchecked, it was counted as unwillingness to respond. In addition, participants’ reactions were elicited using yes vs. no checkboxes (6 studies), likely vs. unlikely (1 study), willing vs. not willing (3 studies), and would work/respond/volunteer vs. would not work/respond/volunteer (3 studies). A checkbox of do not know was available to respondents in five studies, an option of unsure/undecided/not sure was given in five studies and a not applicable option was available in two studies. To calculate the final percent of willing to report to work, do not know and not applicable responses were either excluded from calculations (3 studies) or included in the percentage of respondents who were unwilling to report to work (two studies). These two strategies use different comparative bases for calculating percent of respondents; therefore, their results cannot be compared.

Common Dichotomization Methods

The pronounced variation in scale point labels and dichotomization methods utilized by the researchers restricted the ability to perform statistical analyses, limiting this study to descriptive statistics and recommendations for standardizing design and reporting to improve researchers’ ability to generalize findings across studies. Of the 28 studies, two groups of studies could be identified with similar scale points and dichotomization methods. The first method of dichotomizing results was based on coding a midpoint as an unwilling to report response, studies 1[18], 7[24], 9[26], 11[15], 15[31], 16[32], 20[36], 23[39], 24[40], and 27[43] (Table 3). Percent of respondents willing to report to work, as reported in these ten studies, is displayed in a stem-and-leaf plot in Figure 2. It shows an asymmetrical shape with a low of 23.10% and a high of 82.30%. Five studies listed

percent of respondents who were unsure or checked a do not know option. Their results are listed in Table 3 under percent willing to report to work. The unsure group was always (with one exception, possibly an outlier) larger than the unwilling group, M =29.72, SD = 15.57, median = 34.

Two of ten studies were conducted during an actual H1N1 pandemic influenza; their authors found higher than average willingness to report to work of 82.3%, study 16[32] and 76.9%, study 27[43]as compared to the mean of 56.1 for all ten studies. In addition, the group included two studies of hypothetical avian events that produced somewhat different results, namely, 50% and 79% of HCWs willing to report to work.

The second common method of dichotomizing was in studies that used a scale that was easy to split in half because there was no neutral midpoint studies 6[23], 14[30], 17[33], 18[34], 21[37], 22[38], 26[42], and 28[44] (Table 3). In these studies, the respondent did not have an option to express neutrality. Participants with neutral attitudes may have chosen not to answer at all or they may have been forced to choose between positive and negative responses. The stem-and-leaf plot in Figure 2 displays willingness to report to work findings from eight studies, one of which was conducted during an actual H1N1 pandemic influenza, study 17 [33]and four of which were based on hypothetical avian influenza scenarios, studies 18[34], 22[38], 26[42], and 28[44] that are associated with particularly high death rates. As compared to method one, method two in Figure 2 is more symmetrical with a low of 57%, and a high of 90.10%, and the mean of 75.26 %. Oddly, the mean willingness to report to work is higher for articles that used dichotomization method two than for articles based on method one. The former included four avian flu studies and the latter included only two. In conclusion, the two dichotomization methods differ in how they handle mid-range attitudes. The first group of studies

consistently included these responses into an unwilling group. Yet, in the second set of studies it is unknown how these attitudes were distributed between willing vs. unwilling to report to work because study participants were not given an opportunity to pick a mid-range response.

Next, we recreated stem-and-leaf plots after removing avian flu studies due to high morbidity and fear associated with avian influenza. The stem-and-leaf plots for the remaining studies (Figure 3) demonstrate the same differences as the initial stem-and-leaf plot (Figure 2): no-midpoint scales produce higher means and less variation across studies in the percent of respondents willing to report to work than odd-numbered scales with midpoints. The same pattern was observed in stem-and-leaf plot that excluded studies conducted during the 2009 H1N1 influenza pandemic (Figure 4).

Mann-Whitney nonparametric U test for independent samples was used to determine if the distribution of willingness to report to work was the same across methods. The mean willingness to report to work for all studies coded as method one differed significantly from the mean willingness reported in method two studies (Figure 2), $U = 17.00$, $p = 0.043$. After removing the avian influenza studies (Figure 3), the difference in mean willingness remained significant $U = 4.00$, $p = 0.048$. No statistically significant difference was observed when H1N1 studies were removed (Figure 4), $U = 12.00$, $p = .072$. The means for method two studies are consistently higher than the means for method one studies. In addition, two out of three Mann-Whitney nonparametric U tests indicate statistically significant differences in willingness to report to work.

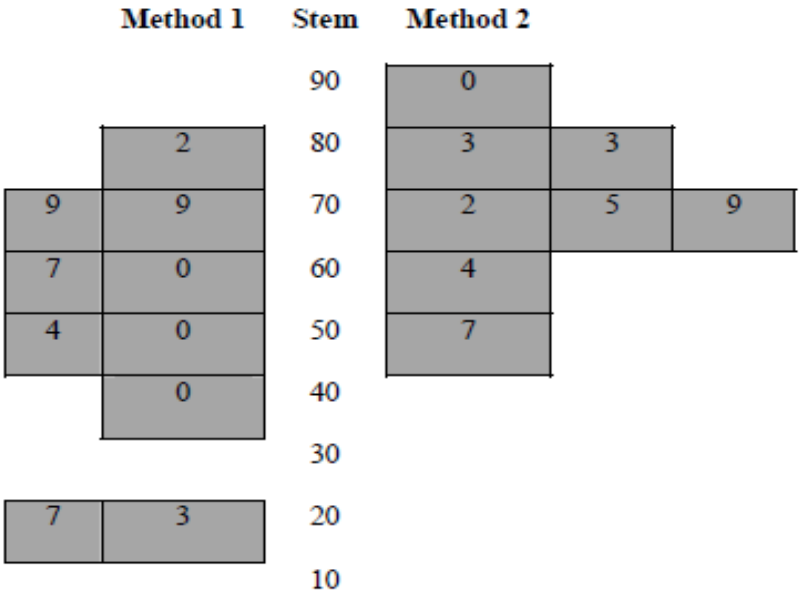

Figure 2. Percent of HCWs' Willing to Report to Work: Ten Studies that Used the First Method of Dichotomization (midpoint indicates unwillingness to report) and Eight Studies that used the Second Method of Dichotomization (a scale without a midpoint split in the middle)

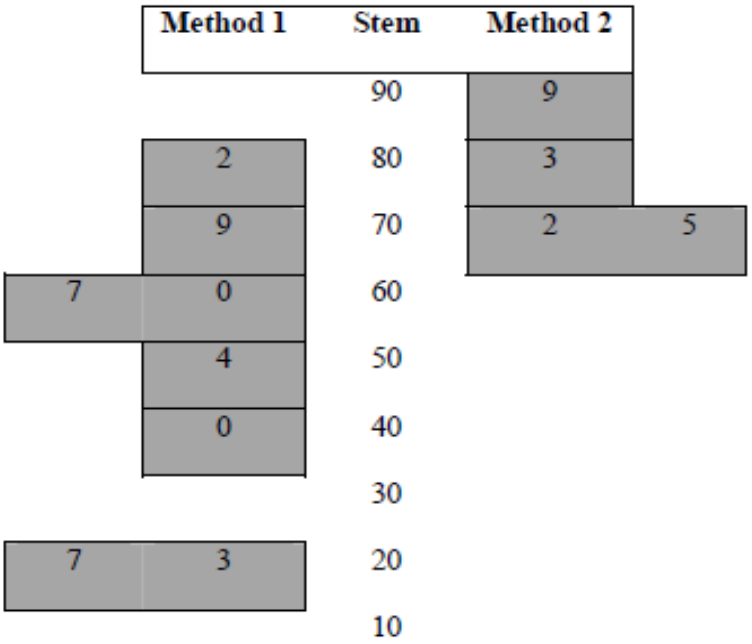

Figure 3. Percent of HCWs' Willing to Report to Work: Eight Studies (without avian influenza) that Used the First Method of Dichotomization (midpoint indicates unwillingness to report) and Four Studies (without avian influenza) that Used the Second Method of Dichotomization (a scale without a midpoint split in the middle)

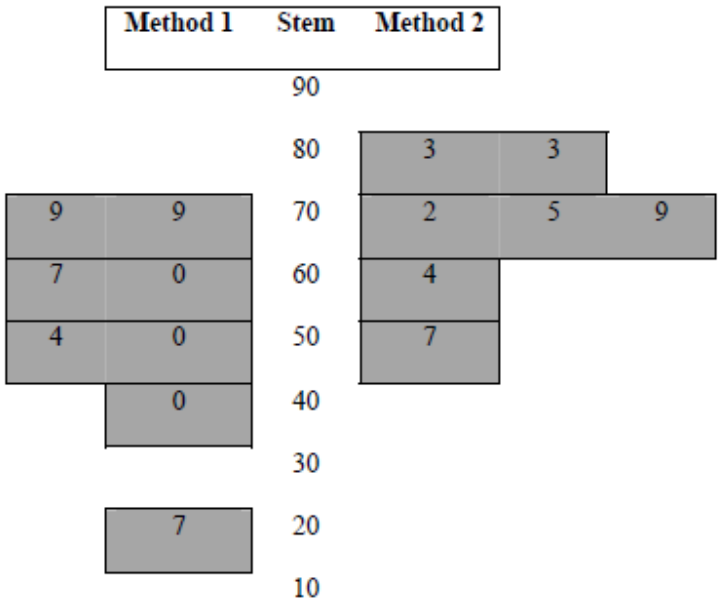

Figure 4. Percent of HCWs' Willing to Report to Work: Eight Studies (without H1N1) that Used the First Method of Dichotomization (midpoint indicates unwillingness to report) and Seven Studies (without H1N1) that Used the Second Method of Dichotomization (a scale without a midpoint split in the middle)

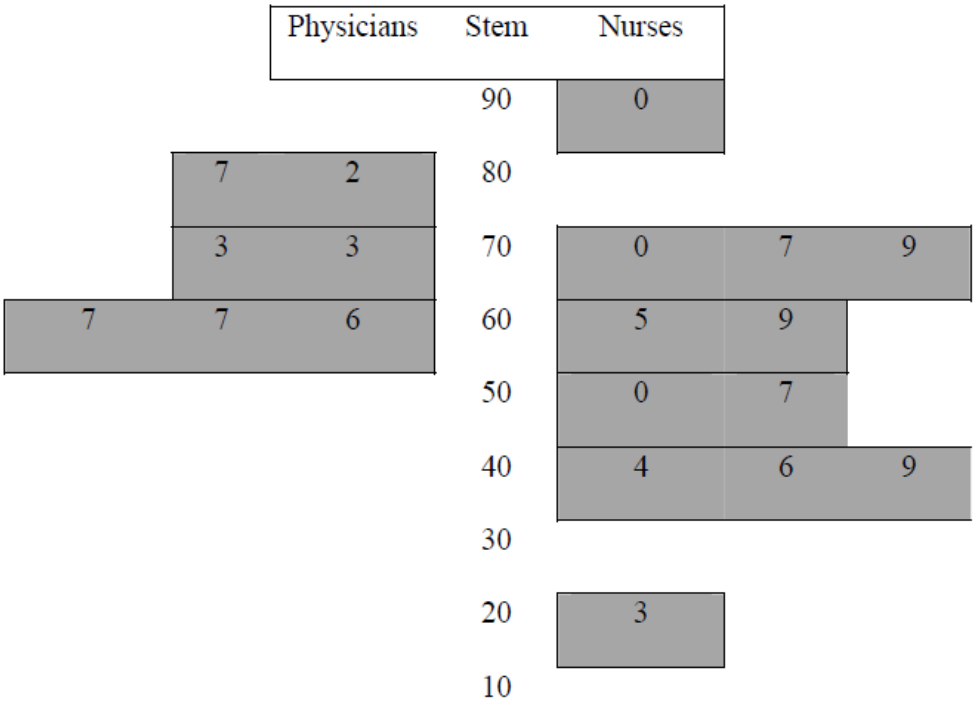

Figure 5. Percent of HCWs' Willing to Report to Work: Seven Studies that Reported Physicians and Twelve Studies that Reported Nurses

Finally, we attempted to understand if results differed significantly by HCW type. Physicians and nurses were the only two group for whom willingness to report to work could be examined, although the number of studies was still small (N = 7, and N= 13) respectively (Figure 5). The method of dichotomization could not be taken into account because there were only three studies for method one and two studies for method two available for physician group and four studies available for each method for the nurse group. Mean willingness to report to work for physicians was 73.64% (median 73.00%, SD = 8.20) and nurses was 59.82% (median 59.00%, SD = 17.60). As compared to nurses, physicians demonstrate a higher willingness to report to work (mean difference is +13.82%). Caution should be exercised when interpreting due to the small number of studies, methodological heterogeneity and great variation in findings.

As can be seen in Table 3, there were four studies that included no other HCW group but nurses. The studies produced a wide range of results on willingness to report to work, from 23.1% study 28[44] to 90.1% study17[33]. Interestingly, both studies were completed during H1N1 pandemic influenza.

In the remaining nine studies the mean percent of nurses willing to report to work (M = 63.67, SD =13.15) was similar to the mean percent of all HCWs in a study (M = 62.28, SD =12.38). However, as compared to all HCWs' willingness to report to work, in three studies the nurses were more willing to report to work (mean difference is +11%) and in six studies they were less willing to report to work (mean difference is -8%).

CHAPTER IV

DISCUSSION

Summary of Evidence

A comprehensive review of 28 studies on willingness to report to work during a pandemic influenza was completed. Researchers studied different dependent variables, which were all related to willingness to report to work, yet had varying degrees of conceptual overlap. Most authors gave detailed operational definitions of their dependent variables. When not provided (12 studies), we could still reconstruct these definitions using available information.

Despite our bests efforts to provide a systematic review with meta-analysis we faced several challenges. Gender data was limited. Even though 24 out of 28 studies offered the number of male and female respondents, only eight studies specified percent of respondents, by gender, who were willing to report to work.

The researchers studied many HCW types. Some were specifically interested in a particular group of HCWs: study 26[42] studied nursing students, 27[43] studied community nurses and 28[44] examined primary care physicians. The greatest diversity in HCW groups was found in studies of hospitals and healthcare systems. For example, study 2[19] initially provided 18 categories of HCWs spanning foodservice/linen to hospital staff, clinical staff, physicians and nurses. Categories were then collapsed to clinical and non-clinical staff. Study 8[25] initially provided ten categories of HCW groups that were collapsed into seven categories doctors, nurses, allied professional, ancillary, manager, general practitioner and community healthcare workers. In the majority of the studies, willingness to report to work by HCW category was absent. Therefore, it is premature to generalize HCW-specific findings across available

studies. The only exception is the comparison of physicians and nurses, which showed higher willingness to report to work among physicians.

Social Desirability Bias

All studies in this review examined HCWs' self-reports, that is, what they said they would do during a pandemic influenza. Behavioral intentions and actual behaviors may indeed be different when confronted with a real life situation. The desire to present oneself in a favorable way is manifested in social desirability bias, which was acknowledged as a possible threat in 13 of 28 studies.

A serious barrier to researchers' ability to generalize results across the 28 studies included in this review is the scaling of responses. First, the majority of authors did not list the number (or percent) of study participants who selected each scale response option when they reported on their willingness to work. Second, most authors attempted to dichotomize their findings by sorting study participants into willing vs. unwilling to report to work but this was not done in a consistent manner.

In scales with midpoints (method 1), midpoint (neutral) responses were either excluded from calculations or lumped with a not willing response, resulting in mean willingness of 56.12%. For scales without midpoint, responses were evenly split in the middle but there was no choice for those who were unsure. These respondents might refrain from providing their ratings or pick the closest available response on either positive or the negative side of the scale, thus inflating the number of those who were willing to report to work. This resulted in a significantly higher mean of 75.26%, which is nearly 20% higher than for studies included in the method one

group. This pattern was replicated when we recalculated means after removing studies on avian influenza and 2009 H1N1, although the latter finding was not statistically significant.

Of the ten studies in method one, five reported percent unsure. Two out of five studies had over 40% of respondents in the unsure group. This evidence is consistent with the finding of 20% greater willingness to report to work in studies without an unsure option, as compared to studies with that option. Assuming that the unsure responses can be evenly split between the willing and the unwilling groups, when an unsure or do not know option is not provided, a 20% overestimate is to be multiplied by two, resulting in 40% of unsure respondents. This convergence of evidence provides additional support for our conclusion that the even-numbered scales are prone to systematic bias that may lead researchers to overestimate the percent of respondents who are willing to report to work.

Implications for Research

The findings of this study have important implications for research. Foremost, conducting studies that truly assess the HCWs' willingness to report to work is extremely difficult. Even hypothetical scenarios with decisions points still rely on the respondents' truthfulness in answering the survey. Therefore, social desirability bias must be acknowledged. The evidence from this study suggests that generalization of research findings is problematic when different scales, scale points, and dichotomization methods are utilized. Taken together, these results suggest that opportunity exits to enhance rigor and the validity of future studies.

Implication for Clinical Practice and Preparedness Planning

An influenza pandemic will place tremendous burden on the healthcare system, therefore, pre-pandemic planning is essential to maintain the continuum of care. An effective response

begins with an adequate healthcare workforce ready and willing to respond to the surge of patients. It is imperative for workforce planning to have accurate data demonstrating HCWs' willingness to report to work.

These 28 studies demonstrate great variability in results from a low of 23.1% study 27[43] of community health nurses (during the 2009 H1N1pandemic) to a high of 93.1% study 3[20] of EMS providers. Based on these findings, worst case scenario planners may assume the low of 23.1% willingness to report to work. Taking into account all studies with responses scaled using midpoints (which was coded as unwillingness to report) the mean willingness is 56.12%. With much caution, 56% might be the best available estimate of HCWs' willingness to report to work. Based on our findings, we recommend not including results from studies that did not have a midpoint or some other unsure option because such studies overestimate willingness by about 20%.

HCWs who are unsure or do not know if they would report to work during an influenza pandemic (fence-sitters) represent a group that is not yet well understood. There is evidence that this group can be trained to increase willingness. For example study 12[48] reported pretest willingness of 47%. After completion of an on-line training module and one day exercise on pandemic influenza, a posttest survey demonstrated results of 82%, enhanced by 35%. Because many HCWs are likely to fall into the fence-sitter group, the pandemic response can be greatly improved if many of these individuals become willing and able to report to work during a pandemic influenza event. To develop a strategy for engaging the fence-sitters, the size of this group and its members' motivations need to be understood. How do unsure HCWs differ from those who are not willing? This information can be used to develop tailored interventions, which can be evaluated by assessing these individuals' intentions and behaviors during simulated and actual events.

Once again, social desirability bias remains a serious threat to the validity of estimates obtained with the use of hypothetical scenarios. Research-practitioner collaborations during a real-life influenza pandemic event are perhaps the best opportunity to estimate willingness while minimizing social desirability bias.

Implications for Policy

Preparedness training for pandemics and other disasters remains an important national, state, and professional priority. Disaster training exercises are mandated by regulatory agencies, and are aimed at enhancing response and mitigating the loss of life. Yet, minimal data is available on the effectiveness of this training in changing HCWs' willingness to report to work. Great variability in findings from studies conducted during a H1N1 real-life event, coupled with large dispersion of results by researchers who gave hypothetical scenarios indicates that it would be premature to use any single-point estimate for HCWs' mean willingness to report to work. A reasonable approach may be to plan separately for the worst-case scenario while standardizing training programs and other interventions that produce the biggest change in the number of HCWs who switch from being unsure to being willing to report to work. This knowledge must be shared with disaster response, academic, and regulatory communities in order to prioritize funding, education, training, and ultimately improve disaster response.

CHAPTER V

LIMITATIONS

A number of important limitations need to be considered. The most important limitation lies in scale bias amongst the 28 studies. Different scales, scales points, and dichotomization methods limited the systematic review and quantitative analysis. The absence of HCW gender, worker group, and healthcare sector information limited the ability to draw inferences on HCWs' willingness to report to work. In addition, the studies were limited to English. The studies included in the review were published as of May 2011 and after this time newly published articles may include relevant data. This analysis comprised only studies conducted for the purpose of evaluating willingness to report to work in a pandemic influenza. Studies that accessed ability to report to work were not included unless they were in addition to willingness. This systematic review did not explore enticements, incentives, or interventions both positively and negatively associated with willingness to report to work.

CHAPTER V

CONCLUSIONS

Major methodological limitations and insufficient reporting in studies prevent us from generalizing the results across studies on HCWs' willingness to report to work during the influenza pandemic. Below, we highlight several important methodological shortcomings, suggest ways of remedying them and refer to specific studies that could serve as a model for future research efforts.

CHAPTER VI

FUTURE RESEARCH

To facilitate generalization of results, future researchers should follow the following recommendations. First, they should carefully design their scales paying special attention to the unsure group. A serious thought should be given to the inclusion of such response options as midpoints (which are often interpreted as neutral or unsure), do not know and not applicable. The not applicable option may be needed if some respondents are not in a position to make decisions, for example in the study 8[25], not applicable option was provided for a question inquiring about decisions on who not to treat or care for. Not applicable may also be used when HCWs are reporting on how family obligations, care of a partner, and children affect their willingness to report to work. Studies 1[18], 16[32], and 23[39] provide examples of measures with neutral midpoints and replicable methodologies for dichotomizing results. This technique reveals the extent of indecisiveness and, therefore, offers an opportunity to enhance willingness to report to work.

Second, we also encourage authors to provide a chance for respondents to explain their position, especially if they are unsure or do not know. Understanding of this group's motivations and concerns will help individuals involved in emergency preparedness to plan their strategies for involving these HCWs.

Third, we strongly recommend inclusion of tables that show willingness to report to work by HCW type, gender, and scale point. To assist with emergency planning analysis, it is imperative that HCW groups be we explained. For example, are nurse categories inclusive of student nurses, nursing assistants, and patient care technicians? Future meta-analyses will benefit from researchers'

explanations of how they collapsed HCW groups into categories. As a model, study 7 provides a detailed description of occupational categories that would be relevant to many researchers.

Forth, researchers should include expanded operational definitions of their dependent variables that explain the context (scenarios or events) and specify how the items were worded, scaled and dichotomized.

Finally, the use of scenarios enhances the rigor and validity of the study. Study 5[22] provides specific scenarios to determine the relationship between willingness to report and pandemic stages. In addition, study 5[22] provides a definition low-risk job duties, those with no direct face to face contact and high-risk job duties, those with direct face to face contact. Study 24[40] also provides an evolving scenario developed from a federal table top exercise. In each case fear escalates and respondents reach decisions points when they must indicate their willingness to report to work. Both provide insight for emergency preparedness planners in the development of specific response plans.

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APPENDICES

APPENDIX A-I

LITERATURE REVIEW

Appendix A-1: Articles Generated Through Databases and Other Sources

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APPENDIX B-I

ADDITIONAL METHODS

Appendix B-I: Characteristics of the Research Studies, HCWs' Willingness to Report to Work During a Pandemic Influenza

Study ID	First Author, Year of Publication	Country 1 = US 2= Non-US	Events 1= IP 2= AI	Events other than PI/AI included in research Yes/No	Healthcare Sector 1=EMS 2=Hospital/system 3=Public health 4=Homecare 5=Other	Populations of Healthcare Workers	Study Design 1 = Quantitative 2 = Qualitative	Statistical A[cut off] of Measure
1[18]	Balicer et al., 2006	1	1	No	3	Professional Technical/support staff	1	Odds ratio, l[cut off] regression
2[19]	Balicer et al., 2010	1	1	No	2	Hospital staff Clinical staff: physicians, nurses, physician extenders, med/nursing students Non-clinical staff: foodservice/linen, IT legal, executive officers, nursing administration, parking, pharmacy, safety, social workers, supply chain telecom	1	Odds ratio, l[cut off] regression

3[20]	Barnett et al., 2010	1	1	Yes	1	Paramedics and EMTs	1 and 2	Odds ratio, logistic regression
4[21]	Barnett et al., 2009	1	1	Yes	3	Clinical and non-clinical staff	1	Odds ratio, logistic regression
5[22]	Basta et al., 2009	1	1	Yes	3	Nursing and non-nursing staff	1	Odds ratio
6[23]	Cone et al., 2006	1	1	Yes	2	Primarily emergency department: nurses, physicians, mid-level providers, clinical and non-clinical staff	1	Descriptive statistics, students t-testing, x^2 testing
7[24]	Cowden et al., 2010	1	1	No	2	Physicians, pediatric residents and fellows, hospital based nurses, allied health, and med/technical	1	Odds ratio, chi square, logistic regression, student t-test, Spearman's correlation
8[25]	Damery et al., 2009	2	1	Yes	2	Doctors, nurses, allied professional, ancillary manager, general practitioner, community	1	Odds ratio, logistic regression
9[26]	Daugherty et al., 2009	1	1	No	2	Critical care clinicians, faculty, fellows, nurses and RCP	1	Logistic regression

10[27]	Garnett et al., 2009	1	1	Yes	2	Clinical: nursing, physicians, dentists Operational: security, administration, facilities Support: laboratory, blood bank	1 and 2	Student t-test, percentages
11[15]	Gershon et al., 2010	1	1	No	4	Home health aides Home attendants Personal care workers Registered nurses	1	Odds ratio, logistic regression, basic descriptive statistics, Pearson's X^2
12[28]	Hope et al., 2009	2	1	Yes	2	Clinical nurse consultants, nurse educators and nurse managers from areas defined as not critical during early phase of an influenza pandemic.	1	Chi-square, basic descriptive statistics
13[29]	Hope et al., 2009	2	1	Yes	2	Hospital staff Select community health staff: nurses, social workers, early childhood nurses, aboriginal workers.	1	Chi-square, logistic regression
14[30]	Imai et al., 2008	2	1	No	2	Physician, nurses, and other	1	Chi-square, logistic regression, Spearman's correlation

15[31]	Irvin et al., 2008	1	1	Yes	2	Doctors, nurses, clerical, and other	1	Descriptive statistics
16[32]	Ma et al., 2011	2	1	No	2	Healthcare workers: Physicians, nurses, and others	1	Odds ratio, Chi-square , student t-test
17[33]	Martin, 2011	1	1	No	5	RNs LPNs	1	The Z-test
18[34]	Martinese et al., 2009	2	2	Yes	2	Medical, nursing, allied health, and support staff	1	Odds ratio, logistic regression, Pearson's X^2, student t-test, regression.
19[35]	Saleh et al., 2010	2	1	No	2	Nurses, student nurses	1 and 2	Odds ratio, logistic regression
20[36]	Schechter, 2007	1	1, 2	Yes	5	Physicians, nurses, psychologists, dentists, social workers and veterinarians	1	Descriptive statistics
21[37]	Seale et al., 2009	2	2	No	2	Medical, nursing, allied health personnel, ancillary	1	Proportions
22[38]	Shabanowitz et al., 2009	1	2	No	2	MD/DO, PhD, PAC, nurse. research personnel, business personnel, support staff, administrative and other	1	Chi-square

23[39]	Stuart et al., 2008	2	1	No	2	Medical, nursing, clerical support, administration, hotel services	1	Pearson's X^2 test
24[40]	Syret et al., 2006	1	1	Yes	2	ER physicians, nurses, and support staff EMS/Fire	1	Odds ratio, percentages, Pearson's $X^{2,}$
25[41]	Tippett et al., 2010	2	1	No	1	Emergency pre-hospital medical care providers, administration, educators, and management	1	Odds ratio, logistic regression
26[42]	Tzeng et al., 2006	2	2	No	2	Nursing students	1	Chi-square, descriptive statistics, Student t-test
27[43]	Wong E et al., 2010	2	1	No	5	Community nurses	1	Odds ratio, logistic regression
28[44]	Wong TY et al., 2008	2	2	No	5	Primary care physicians	1	Chi-square, logistic regression

APPENDIX B-II

ADDITIONAL METHODS

Appendix B-II: Research Design: Purpose and Sampling

Study ID	Purpose of the Study	Sampling	Sample	Response Rate (%)	Respondents	Respondent Characteristics (%)
1	To understand local public health workers' perceptions towards a pandemic influenza response.	Non-randomized Convenience Sample	Three health departments ranging in size from 132 to 225 employees.	58	308	Female, 83
2	To understand public health workers' perceptions toward pandemic influenza.	Non-randomized Convenience Sample	A 984 bed tertiary-care academic teaching hospital	18.4	3426	Female, 73.7
3	To identify the relative influences of perceived threat and efficacy on EMS workers' response	Simple Randomized Sample	Nationally representative sample of EMS personnel	38	586	Female, 34.1

	willingness in the face of a pandemic threat, and to uncover additional relevant barriers and facilitators of pandemic influenza response willingness among this cohort.					
4	To examine the relative influences of perceived threat and efficacy on public health workers' response willingness to pandemic influenza.	Non-randomized	Four clusters of local public health departments in the midwest and eastern US.	83	1835	Female, 81
5	To determine how informed health department employees are about pandemic response and how willing they are to report to work during a pandemic.	Random Sample Stratified Cluster Sample	Sixty-seven county health departments in Florida	51	2414	Female, 77.9 .
6	To assess hospital employees' attitudes and needs regarding work commitments during disasters.	Non-randomized Convenience Sample	Nine large hospitals, most academic centers distributed amongst five states.	85.3	1711	Female, 67

7	To determine the relationship between health care worker reporting willingness to report to work during a pandemic and perception of job importance, belief that one will be asked to work,	Non-randomized Convenience Sample	Free standing tertiary Children's Hospital	31	778	Female, 76.9
8	To investigate the factors associated with willingness to work during an influenza pandemic, and to promote the continued presence at work of the health care workers otherwise unwilling or unable to attend.	Randomized Sample	Trusts included a wide range of health care settings.	34.4	1032	Female, 56.4
9	To assess ICU health care workers' knowledge, attitudes, and expected behaviors in the event of an influenza pandemic..	Non-randomized Convenience Sample	Two hospitals in Baltimore Maryland: 945-bed tertiary care academic medical center and a 310-bed community teaching hospital.	88	256	Female, 60

10	To evaluate interventions intended to mitigate absenteeism in hospital workers and provide recommendations to emergency planners.	Focus Groups Non-randomized Convenience Sample	Five large urban facilities: medical centers, pediatric, community, and behavioral health hospitals.	17	2864	Female, 75.4
11	To assess willingness of home health care workers to care for clients with a serious infectious disease.	Convenience Sample Cross-sectional Survey	Home attendant and home health care agencies.	Not cited.	384	Female, 96
12	To determine the appropriateness of engaging advanced nurses as public health surge staff and to evaluate whether a training package and exercise participation changed individual's perceptions and confidence of working.	Non-randomized	Regional area of New South Wales.	87 93 52	Training: n= 47 Pre-exercise: n= 56 Post exercise: n=32	Gender demographics not cited.

13	To determine front line staffs' perceived willingness to work during three public health emergency scenarios: weather event, influenza pandemic, and bioterrorism event.	Random Sample Cross-sectional Survey	Acute and community facilities in the Hunter New England	66	868	Female,77
14	To assess individual preparedness among health care workers, as determined by their recognition of preventive measures, perceptions of institutional measures, and attitude toward coping with risk; institution preparedness as determined by reported expertise in dealing with infectious diseases, general measures for infection control, and specific measures related to pandemic influenza; and the inter-relationship between individual and institutional preparedness.	Non-randomized Convenience Sample	Seven tertiary hospitals, two designed to accommodate patients with severe infectious diseases.	68.7	7,378	Female,72.6

15	To determine the willingness to hospital personnel to report to work in a hypothetical avian influenza and factors that may influence their decisions.	Cross-sectional Survey	Trauma Center with 600 - beds.	90	169	Female, 68
16	To assess the knowledge and attitudes of critical care clinicians in Chinese ICU's during the current influenza pandemic. To identify independent predictors of unwillingness to work in order to formulate an effective strategy to improve the preparedness of health care workers.	Random Sample	Twenty-one adult Intensive Care Units	89.9	695	Female, 43
17	To determine factors affecting nurses' ability and willingness to work during a pandemic flu.	Simple Random Sample	Approximately 22,000 nurses with a Maine home address.	61.3%	735	Female, 95.3

18	To describe how an avian or pandemic influenza threat would affect hospital staff in an Australian setting. Effects are described in terms of expected absentee rates, work attitudes, concerns, and incentives, which may enhance work attendance should an patient admission occur with influenza or a pandemic.	Convenience Sample	A major metropolitan hospital – 570 beds	98	560	Female, 64.8
19	To assess the effect of the 2009 H1N1 pandemic on nurses' working behavior, to identify the nurses' willingness to work, concerns and persuading factors towards working during infectious disease epidemics.	Cross-sectional study	A tertiary care hospital, primary health care facility, university, and secondary technical nursing school	Not cited	266	Female, 91
20	To determine the ability and willingness of the Medical Reserve Corp volunteers to work in a public health emergency.	Non-randomized Convenience Sample	Medical Reserve Corp Volunteers	61.1	198	Female, 65

21	To extend previous research by assessing the knowledge and intended behavior during an influenza pandemic amongst clinical and non-clinical hospital staff.	Random Sample	Two tertiary teaching hospitals, adult, and pediatric	74.5	894	Female, 74.8
22	To garner opinions from health care workers' themselves on their perceived duty to treat and how they might respond to a severe avian influenza pandemic.	Non-randomized	Rural tertiary and quaternary care health system	9	1003	Female, 74
23	To solicit the opinions of health care workers as to their attitude to working in a pandemic.	Non-randomized	Large metropolitan health service	14	1440	Female, 61
24	To determine emergency health care providers' willingness to report to work during a mass casualty incident.	Non-randomized Convenience Sample	A hospital designated as a primary receiving for mass casualty events and decontamination hospital	100	180	Gender demographics not cited.

25	To investigate the association between knowledge and attitudes regarding avian influenza on likely behavioral responses of emergency pre-hospital medical health care providers' in a pandemic condition	Stratified Random Sample	Nine ambulance services providing hospital pre-hospital care	24.7	725	Gender demographics not cited.
26	To illustrate the factors contribute to nurses' fear about an avian influenza and their willingness to care for infected patients.	Convenience Sample	Nursing students attending a two year bachelor's degree nursing program.	95.3	225	Gender demographics not cited.
27	To explore the willingness of community nurses to continue to work during the H1N1 influenza pandemic	Cross-sectional Survey	Forty-eight centers affiliated with hospitals and organizational groups.	66.6	401	Female, 96.2
28	To examine and compare concerns, perceived impact and preparedness among primary care physicians in the private and public primary-care outpatient clinics for a possible avian influenza pandemic.	Random Sample Cross-sectional Survey	Eighteen polyclinics and private clinics	72.7	285	Female, 45

APPENDIX B-III
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ADDITIONAL METHODS

Appendix B-III: Context, Dependent Variable, Operational Definition and Percent of Willingness to Report to Work

Study ID	Context	Dependent Variable (s)	Dependent Variable Operational Definition	Survey Scale	Overall % Willing to Report to Work
1	Pandemic influenza related emergency	Likelihood of reporting to work	Operational definition not provided.	Likert scale 5point: very likely to not likely at all Dichotomized into responses with a score of 2 or less and all others	53.8% indicated they would likely report to work during an emergency
2	Pandemic Influenza	Willingness to respond 1. Willingness to respond but not required	Operational definition not provided	Likert scale 9 point: 1 – strong agreement, 5 indicating neutrality, 9 – strong disagreement, and a DNK	Willingness to respond to an influenza pandemic:

			2. Willingness to respond if required.		Dichotomized into categories of ≤ 4 positive responses and ≥ 6 negative responses	1. 72% if asked but not required 2. 82.5% if required to respond
3	Pandemic Influenza	Willingness to report to work 1. If required: willing to report to work during pandemic flu emergency 2. If asked, but not required: willing to report to work during pandemic flu emergency	Operational definition not provided		Like scale 10point: strong agreement to strong disagreement Dichotomized into categories < 5 positive and > 5 negative responses, and don't know option	1. 93% if required willing to report to work 2. 88% if asked, but not required willing to report to work

4	Four scenarios: weather related emergency, pandemic influenza, dirty bomb radiological terrorism event, and inhalational anthrax bioterrorism.	Willingness to respond to a pandemic flu emergency 1. If required: willing to report to work during pandemic flu emergency 2. If asked, but not required: willing to report to work during pandemic flu emergency	Operational definition not provided	Likert scale 10point: response of 1 indicating strong agreement, 10 indicating strong disagreement, and a DNK Dichotomized into categories $\leq$ 5 positive response, agreement and $\geq$ 6 negative response, disagreement	1. 92% if required: willing to report to work during a pandemic 2. 86% if asked but not required: willing to report during pandemic flu emergency

5	Pandemic Influenza 1. Early pandemic, low risk duties 2.Early pandemic, high risk duties 3. Peak pandemic, low risk duties 4. Peak pandemic, high risk duties	Likelihood of reporting to work 1. Likely to report to work if your work required direct face to face contact with infected patients. 2. Likely to report to work if work required direct face to face contact with infected patient.	"If your work duties did not required you to have direct face-to-face contact with people who could be infected, how likely would you be to report to work" "If your work duties did require you to have direct face-to-face contact with people who could be infected, how likely would you be to report to work"	5-point Likert scale: very likely, somewhat likely, neither likely nor unlikely, somewhat unlikely, or very unlikely Dichotomized into those likely to report compared with those not likely. Neither likely nor unlikely were excluded from the analysis.	1. 92.3% early pandemic, low risk duties 2. 66.4 % early pandemic, risk duties 3. 82.7% peak pandemic, low risk duties 4. 56.2% peak pandemic, high risk duties

6	Various disaster scenarios: mass casualty, biological, chemical radiological events and natural disasters, flu pandemic	Staff willing and able to come to work, perform job, and work additional hours	"From the list below, check off those types of disasters during which you would be willing and able to come to work to perform you job for additional worked hours beyond your contracted hours, at standard overtime pay rates"	Respondents provided flu epidemic tick box.	72% willing to work flu pandemic
7	Pandemic Influenza	"The primary dependent variable assessed in the study was willingness to report to work in a pandemic influenza."	Operational definition not provided	Respondent scale: Yes, No, and Unsure Dichotomized as yes vs. no and unsure	60% of staff willing

	8	Pandemic Influenza	Likelihood of working in various conditions.	"If there was an outbreak of pandemic influenza how likely is it that you would work in the following circumstance: if there was a greater than usual risk of become infected at work and falling ill yourself."	Respondent scale: Likely, Don't know, Unlikely, N/A. Responses were calculated with a likelihood score. DNK/NA excluded from the denominator	59.3% likelihood of working if there was greater than usual risk of becoming infected at work and failing ill.
90	9	Pandemic Influenza	The likelihood of not reporting to work in the event of a pandemic.	Operational definition not provided	Likert scale 4 point: categorized as agree if the response was a 1 or 2, and not agree if the response was a 3 or 4. Unsure option. Unsure included in the not likely.	20% reported not being likely to report to work during a pandemic 79% reported being likely to report to work during a pandemic

10	Moderate hypothetical influenza pandemic.	Willingness to work before and after a series of interventions in a pandemic	Operational definition not provided.	Respondent scale: 0 to 100 scale with 0 absolutely not willing to report to duty and 100 absolutely willing report to duty.	75.6% baseline willingness to report to work
11	Pandemic Influenza	Willingness to report to duty during a pandemic 1. Willingness to care for current patients during a pandemic outbreak. 2. Willingness to care for new patients during a pandemic outbreak.	Operational definition not provided	Respondent scale: willing, not willing, and not sure Dichotomized into two categories: willing versus not willing/not sure	1. 43% willingness to care for current patients during a pandemic outbreak. 2. 27% willingness to care for new patients during a pandemic outbreak.

12	Pandemic Influenza	Influenza pandemic. Four hour on-line training and four day pandemic exercise 1. Pre intervention 2. Post intervention	"Willing to work in the future if required"	Respondent scale 10 point: 1 as agree and 10 disagree. Dichotomized into those who definitely agree 1-3, and others 4 -10.	1. 47% pre interventions 2. 82% post interventions
13	Three scenarios: weather related event, influenza pandemic, and bioterrorism event.	Willingness to respond if required to an influenza pandemic.	Operational definition not provided.	Respondent scale: 10 point with 1- agree to 10-disagree. Dichotomized in to those agreeing 1- 3.	67% willing to report to work during an influenza pandemic.
14	Pandemic Influenza	Accept the risk of contracting pandemic influenza at work.	"Do you feel that you would accept the risk of contracting pandemic influenza at work in the event of an influenza pandemic?"	Respondent scale: 7-point, strongly agrees, agree, probably agree, probably disagree, disagree, and strongly disagree.	74.5% acceptance of risk of contracting disease at work

					Dichotomized into positive responses, strongly agree, agree, probably agree, and negative responses strongly disagree, disagree, and probably disagree	
15	Pandemic Influenza	Willingness to report to work with patients being treated at the hospital with a 50% mortality rate with treatment and 10% of the general population was sick.	"In the event of an avian influenza pandemic and patients were being treated at St. John's Hospital and medical Center, would you report to work as usual?"	Respondent scale: yes, no, maybe. Maybe excluded from dichotomization.		50% willing to report to work as usually.

16	Pandemic Influenza H1N1.	Willingness to care for H1N1 patients	Operational definition not provided.	Respondent scale 5point 1=completely agree to 5=completely disagree. Dichotomized as completely agree/agree vs. disagree, completely disagree. Midpoint of 3 included with disagree response.	82.3% willingness to care for H1N1 patients.
17	Pandemic Influenza	Willingness to work during a pandemic flu.	Operational definition not provided.	Respondent scale: yes and no, researcher noted if left blank	90.1% reported they would work
18	Hypothetical influenza scenarios	Willingness to continue to work during a pandemic.	"If there was a patient with a confirmed case of avian influenza admitted to this hospital tomorrow,	Respondents scale: yes, no	1: 13% would not attend work, 87% would attend.

		1. “A single patient with avian influenza admitted.” 2.”Multiple patients admitted with a new strain of influenza during a pandemic.”	would you continue to work?” “If there were many patients admitted to the hospital with this new strain of human influenza that had merged with the avian influenza virus, would you continue to work?”		2:36% would not attend work, 64% would attend
19	2009 H1N1 Influenza Pandemic	Willingness and concerns with working during infectious disease pandemics.	Operational definition not provided.	Respondents scale – work, not work, and DNK DNK excluded	41.5% would not be willing to report to duty,

20	Avian Influenza Scenario: Six confirmed cases of H5N1 (Avian) Influenza in NYC. One suspected case in Nassau.	Willingness to volunteer	"Would you be willing to volunteer with the Nassau MRC?"	Respondent scale - willing to volunteer, not willing to volunteer, not sure. Dichotomized as willing vs. not willing/not sure	79% willing to volunteer in an Avian Influenza
21	Pandemic influenza	Would be present to work if a patient in the ward or department had influenza like illness.	Operational definition not provided.	Respondent scale: world responds vs. would not.	83.3% willing to work if a patient in their ward had an influenza like illness
22	Avian Pandemic	Willingness (volunteer) to work in the event of a virulent avian pandemic.	"Would volunteer, if all above were provided"	Respondent scale: would volunteer, and would not volunteer	79% Would volunteer to work if they were provided PPE,etc. .

23	Pandemic Influenza	Availability to work during a pandemic.	"I would expect to be available to work in a pandemic"	Respondent scale: 5 point scale, strongly disagree, disagree, undecided, agree and strongly disagree. Dichotomized to positive responses strongly agree, or agree. Midpoint of 3 included with the disagree responses.	67% stated they would be available to work if provided necessary input, protection, tools, and education.
24	Biological Event: 1. Non-transmissible with proven prophylaxis/tx 2. Transmissible with only experimental prophylaxis/tx	Responding to an influenza illness like outbreak	"Your work place has asked you to come in to work, will you come in?"	Respondents scale: Yes, probably yes, vs. undecided, probably no, and no.	1. < 80% willing to report to work before nature of incident was known 2. < 40% when agent was identified as being transmissible

25	Avian Influenza	Willingness to work	Operational definition not provided.	5 point Likert scale Dichotomization not specified.	43% state they are unwilling to work during a pandemic condition
26	Avian Influenza	Willingness to care for patient with bird flu.	"According to your understanding, if there were a bird flu epidemic as a result of human-to-human transmission, would you be willing to care for infected patients?"	Respondent scale Yes, no	57% willingness to care for patients infected Avian Influenza.
27	H1N1 influenza pandemic with approximately 50 new cases per day.	Willingness to continue to work during H1N1 pandemic influenza	Operational definition not provided	Respondent scale: not willing, not sure, and willing. Dichotomized as not willing/not sure vs. willing	76.9% not willing to continue to work, 23.1% willing

28	Avian Influenza	Willingness to accept the risk of contracting bird flu.	"I accept the risk of contracting bird flu as part of the job".	6 point Likert scale: strong disagree, disagree, not sure but probably disagree, not sure but probably agree, agree, and strongly agree. Dichotomized into positive responses: strongly agree, agree, and probably agree and negative responses: strongly disagree, disagree, and probably disagree.	82.5% willing to accept the risk of contracting Avian Influenza as part of their job

Study ID	Other Findings
1	(58.6%) or 163 respondents indicated they would likely report to work. Variability was noted among job classifications with clinical staff significantly more likely to report to duty compared to others.
2	(32%) HCWs would not be willing to work if the pandemic was severe Respondent data was consistent amongst various departments.
3	(93%) would be willing to report to work if required. (88%) would be willing to report to work if asked, but not required. (48%) would be willing to report to work if there was a possibility for disease transmission to family existed. (96%) of EMS workers indicated they probably or definitely report to work if they were guaranteed a pandemic influenza vaccine. Knowing one's role in a pandemic more than doubled and EMS workers' likelihood of voluntarily reporting and the importance of one's role increased willingness by six-fold.

4	Overall (16%) of the workers were not willing to respond to a pandemic flu emergency regardless of its severity. Those health care workers with a perception of high threat and high efficacy had the highest declared rates of willingness to respond to and influenza pandemic (31.7%) times higher than those fitting a low threat/low efficacy profile. Self-reported willingness to respond if required revealed a (92%) agreement. Self-reported willingness to respond if asked but not required (86%) agreement. Adjustments for demographic characteristics did not change the relationships of EPPM categories as predictors for any of the attitude belief questions
5	Willingness to report to work varied by stage of the influenza pandemic and type of job duties; (92%) with the low risk scenario to (56.2%) with the highest risk scenario. Those who have read either the state of county pandemic influenza plan were significantly more likely to report to a willingness to respond to all four scenarios than those who had not. Nurses were significantly more likely to report a willingness to respond to three of the four scenarios than those who were not nurses.
6	(72%) willing to work during a flu epidemic.
7	(60%) of respondents were willing to work in a pandemic (68.2%) Clinical staff (38.8 %) Patient and family support staff

(58.1) Healthcare associated field

(52.1%) Hospital infrastructure support

Most important factors associated with willingness to report to work are a sense of professionalism, responsibility and the belief that one will be asked to work.

8 Only (14.4%) of all individuals indicated they would be likely to work during all potentially adverse conditions.

Considerable variation within demographics and employment categories.

Mean (percentage) likelihood of working

Doctor (67.0%)

Nurse (49.3%)

Professions Allied to Medicine (60.7%)

Ancillary (49.0%)

Manager (63.5%)

GP (71.4%)

Community Healthcare worker (55.7%)

9 Overall (21%) unsure that they would report to work.

Nurses 15 unlikely, 78 likely, and 6 unsure.

Respiratory Care 19 unlikely, 78 likely, and 7 unsure.

House staff 15 unlikely, 79 likely, and 7 unsure. PCCM faculty and fellows 8 unlikely, 87 likely and 5 unsure.

Demographics of race revealed a significant larger proportion of African Americans respondents (31%) were unwilling to come to work than whites (12%) and Asians (14%) (P=.004).

10 Initial mean WTWS 75.6 $\pm$ 1.1.

Access to Tamiflu and personal protective equipment were received positively.

The greatest increase in WTWS was seen with post intervention Tamiflu/family with a post WTWS 15.4 $\pm$ 1.3 to approximately (90%).

Family and personal safety were noted as the two most common barriers to reporting to work.

11 (62%) reported that they would not be able to report to work during a pandemic.

(43%) they would be willing to take care of current patients. (27%) would be willing to care for new patient that are infected.

Only (11%) of personal care workers reported they would care for patients quarantined with infectious disease exposure

Approximately (37%) of RN's would provide care for AI patient if proper PPE were made available.

Factors enhancing ability: more money, safe place for children and family, sick pay. Barriers to ability: transportation.

12 End of day one staff survey results: willingness to work in the future in required: n=36 (78%).

Willing to respond to future pandemic: pre n=28 (47%), post n=23 (82%). X^2 =9.42 with a p value of <0.01.

13 Willingness to respond to weather related event 78% (95% CI 75% - 81%) influenza pandemic: 67% (95% CI 64%-70%) and bioterrorism event 52 (95% CI 48%-55%).

Professional classifications: willing to respond to a pandemic:

Physicians (67%)

Nurse (65%)

Allied Health (69%)

Hospital Support (63%)

Adm/Clerk(66%)

Path/Tech (79%)

Participants who worked in community health facility were likely to indicate a willingness report to work during an influenza pandemic.

Front line staff less likely to work if lack confidence in their skills, lack of family preparedness, or belief that their role not important.

14 Attitude towards coping with risk, rates of positive or negative attitudes: learning about pandemics (79%), acceptance of risk (75%) fearful, accepting, and willing, fear of pandemic influenza (65%), job change (26%), and pointless to take precautions (24%).

(65)% of respondent felt fear and more than (26%) would consider changing their job.

Nurses ranking first fear of pandemic, and job change while physicians ranked first acceptance of risk, and pointless of taking precautions.

15 In an AI (50%) of those responding to the survey indicated they were willing to report to work. Doctors were most likely to report to work (74%) and nurses were more likely not to report to work (15%). Married individuals were more likely to report to work as usual (54%) than those not married (46%).

16 572 respondents, (82.3%) expressed willingness to care for H1N1 patients.

Physicians and nurses more willing to care for patients than other professions.

The most common reason given for unwillingness was infection of family members (55.5%), and themselves (33.0%).

No difference was noted based on characteristics.

Independent predictors of willingness to care for patients included profession, knowledge training before patient care, and level of confidences to protect themselves and their patients.

17 (90.1%) of nurses reported willingness to work

(92.5%) of nurses were willing to work if provided with full PPE, however, dramatically to (24.0%) with no gloves or mask.

Only (27.5%) would be willing to work pandemic influenza if it placed family at risk illness/death

Sick loved ones at home were cited as the most likely reason for inability to work (75%) followed by nurse being sick (68.2%).

Other reasons included dependent adult and child care and pet care.

18 Scenario One: (13%) of staff would not attend work if a single cased of AI was admitted.(25%) of staff would not work until specific antiviral preventive measures were provided (in spite of basic measures available). Total staff that would not work in scenarios one (38%), n= 208.

Scenario Two: (36%) would not attend work of the remaining (17%) would not work until specific antiviral preventive measures were provided (in spite of basic measures available). Total staff that would not work in scenarios two (53%), n= 291.

19 Fear of families' health was of greatest concern as well as increased workload at work. Most persuading factor to enhance willingness to report to work was treatment for self and family care.

20 Rate of willingness and ability among Medical Corp was (80%).

21 (83.3%), n= 899 of respondents would present to work in a patient in their department had an influenza like illness.

Willingness to work varied considerable according to knowledge and job classification with medical and nursing more likely to work.

(79%), n= 852 of respondents would present to work if a colleague had contracted pandemic influenza.

(60.6%), n= 654 would report to work if a family member had contracted pandemic influenza.

Additional data on quarantine measures, treatment adherences to antiviral meds, and PPE.

22 Would volunteer to work if were first to receive vaccine, first to receive antiviral, supplemental life/disability insurance coverage for family, PPE, training, and specialized training for virulent infectious disease.

MD/DO/PhD, PAC (93.7%)

Nurse (76.6%)

Others (77.6%)

Health care workers should be allowed to decide whether they report to work in a pandemic.

MD/DO/PhD, PAC (63.8%)

Nurse (66.3%)

Others (63.6%).

Most important factors contributing to willingness to work: first to receive vaccine and antivirals,

23 (67%) of all the respondents stated they would be available to work during a pandemic. Of this category, (26%) reported they would stay at home for childcare.

An overwhelming majority expected, PPE, antivirals and vaccine; (92%), (90%), and (89%). A majority also felt their families should be given antivirals and vaccines (64%) and (63%).

24 Commitment to report to work varied from (18%) to (84%).

Before causative agent was known commitment to work was less than (80%). With co-workers illness the rate fell to (55%). Even with treatment available and not transmissible respondent rates increased but remained under (80%). Causative agent identified, transmissible, and experimental treatment available the response rate fell to less than (40%). There was no significant difference between groups 1 and 2.

25 (43%) of the respondents indicated they would be unwilling to work during pandemic conditions. (25%) were unprepared for PPE, and (33%) were unwilling to work with colleague exposed.

26 (56.9%) of the respondents indicated they were willing to care for patient infected with Avian Influenza.

(58.7%) responded that if avian flu occurred the hospitals would not have sufficient infection control measures.

Approximately (41%) were fearful about an AI.

27 A total of (76.9%) of respondents were either not willing (33.3%) or unsure (43.6%). Reasons cited include psychological stress and fear of being inflected. Infection control measures were used by only (33%) of respondents and (74.5%) requested additional training and education.

28 A total of (82.5%) accepted the risk of contracting bird flu as part of the job. Private PCP's respondents were slightly higher at (86.7%) than those of public PCP's at (78.6%).

An overwhelming (89.9%) were afraid of falling ill with avian influenza. Over (55%) found it acceptable if a colleague resigned because of their fear.

Over one-fourth, (27.7%) felt they should not be looking after patients with bird flu. A higher rate was demonstrated by private PCP's (36.2%).

APPENDIX C-I

ADDITIONAL RESULTS

Appendix C-I: Quality Assessment of Bias

Study Number	NR Bias	Social desirability bias	Survey Instrument Bias (phrasing or invalidated)	Response Rate	Selection Bias	Sampling Bias	Other
1.	X						
2.		X	X				
3.	X						
4.		X	X				
5.	X						
6.		X	X		X		
7.	X	X	X		X		
8.	X						
9.	X				X		
10.					X	X	
11.		X		X			
12.				X			
13.		X				X	
14.		X			X	X	
15.		X		X		X	Anonymity
16.		X			X		

17.		X			X		
18.		X			X		
19.		X				X	
20.							
21.	X	X			X		
22.							
23.				X	X		
24.					X	X	Anonymity
25.				X			
26.					X	X	
27.				X		X	
28.							
Totals	7	13	4	6	12	8	

APPENDIX C-II

ADDITIONAL RESULTS

Appendix: C-II Statistical Treatment

Study Number	Odds Ratio	Chi Square	Pearson's X2	Logistic	Regression	Student t-test	Descriptive	statistics	Spearman's	Correlation	Proportions	Percentage	Z-test
1.	X			X									
2.	X			X									
3.	X			X									
4.	X			X									
5.	X												
6.		X				X	X						
7.	X	X		X		X			X				
8.	X			X									
9.				X									
10.						X						X	
11.	X	X					X						
12.		X					X						
13.		X		X							X		
14.		X		X					X				
15.							X				X		
16.	X	X				X							

17.									X
18.	X	X	X	X					
19.	X		X						
20.					X			X	
21.							X		
22.		X							
23.		X							
24.	X	X						X	
25.	X		X						
26.		X		X	X				
27.	X		X						
28.		X	X						
Totals	14	13	14	6	6	2	3	3	1

APPENDIX C-III

ADDITIONAL RESULTS

Appendix C-III: SPSS Detailed Study Information

Study	Country	Event	Sector	Respondents	Percent	Female
1	US	Influenza Pandemic	Public Health	308	53.80	83.00
2	US	Influenza Pandemic	EMS	3,426	82.50	73.70
3	US	Influenza Pandemic	EMS	586	93.10	34.10
4	US	Influenza Pandemic	Public Health	1,835	92.00	81.00
5	US	Influenza Pandemic	Public Health	2,414	56.20	77.90
6	US	Influenza Pandemic	Hospital or Healthcare System	1,711	72.00	67.00
7	US	Influenza Pandemic	Hospital or Healthcare System	778	60.00	76.90
8	Non-US	Influenza Pandemic	Hospital or Healthcare System	1,032	59.30	56.40
9	US	Influenza Pandemic	Hospital or Healthcare System	256	79.00	60.00

10	US	Influenza Pandemic	Hospital or Healthcare System	2,864	75.60	75.40
11	US	Influenza Pandemic	Home Care	384	27.00	96.00
12	Non-US	Influenza Pandemic	Hospital or Healthcare System	56	47.00	
13	Non-US	Influenza Pandemic	Hospital or Healthcare System	868	67.00	77.00
14	Non-US	Influenza Pandemic	Hospital or Healthcare System	7,378	74.50	72.60
15	US	Influenza Pandemic	Hospital or Healthcare System	169	50.00	68.00
16	Non-US	Influenza Pandemic	Hospital or Healthcare System	695	82.30	43.00
17	US	Influenza Pandemic	Other	735	90.10	95.30

18	Non-US	Influenza Pandemic	Hospital or Healthcare System	560	64.00	64.80
19	Non-US	Influenza Pandemic	Hospital or Healthcare System	266	58.50	91.00
20	US	Avian Influenza	Other	198	79.00	65.00
21	Non-US	Influenza Pandemic	Hospital or Healthcare System	894	83.30	74.80
22	US	Avian Influenza	Hospital or Healthcare System	1,003	79.00	74.00
23	Non-US	Influenza Pandemic	Hospital or Healthcare System	1,440	67.00	61.00
24	US	Influenza Pandemic	Hospital or Healthcare System	180	40.00	
25	Non-US	Influenza Pandemic	EMS	725	56.30	

26	Non-US	Avian Influenza	Hospital or Healthcare System	225	57.00	
27	Non-US	Influenza Pandemic	Other	401	23.10	96.20
28	Non-US	Avian Influenza	Other	285	82.50	45.00

APPENDIX C-IV

ADDITIONAL RESULTS

Appendix: C-IV Healthcare Worker Groups, Initial and Collapsed (number of studies that included them)

Unique Group Wording

Aboriginal workers

Administration

Administrative

Administrative and primary care

Administrators

All categories of healthcare workers

Allied health

Allied health professionals

Attending physicians

Building maintenance staff

Business personnel

Business/secretarial/registration/clerical

Cleaner

Clerical (3)

Clerical/administration

Clerk

Clinical and radiological technologist

Clinical nurse consultants

Clinical nurse supervisor

Clinical staff

Clinical support staff

Clinical support staff/radiology/pharmacy/lb

Community health staff

Community health workers

Community nurse

Computer entry staff

Computer health specialist

Consultant

Consultant/SMO

Dentists (2)

Dietician

Doctors (2)

Domestic services and catering

Early childhood nurses

ED support staff

Education and research staff

Educators (2)

Emergency pre-hospital medical care providers

EMS/fire personnel

EMT-basic

EMT-paramedic

Environmental health staff

ER Nurses

ER physicians

Executive officers

General practitioners

Health education

Health information data analysis

Home health worker

Hospital doctors

Hospital security/police

Hospital staff

Hospital staff including catering services and linen services

Hotel services (2)

House staff/resident or fellow

Housekeeping/environmental services

Intern/RMO

Internal medicine house staff

Interpreter

IT

Kitchen

Laboratory services

Laundry

Legal

Legal professional

Licensed cook

Licensed practical nurse

Maintenance/engineering

Management

Managerial staff

Managerial/administration

Managers

MD, DO/PhD

Medical imaging

Medical registrar

Medical staff

Medical staff specialist

Medical student (2)

Medical technicians

Mental health staff

Migrant interpreters

Missing

Mortuary attendants

Non-clerical staff

Non-clerical support staff

Non-nursing staff

Non-physician clerical providers

Nurse (any)

Nurse assistants (2)

Nurse educators and nurse managers

Nurse practitioners (2)

Nurse unit manager

Nurses (9)

Nursing

Nursing administration (2)

Nursing staff (2)

Nursing students with a lesser nursing credential enrolled in a bachelor degree program

Nutritionist

Occupational therapists

Occupational therapy

Other (5)

Paramedics

Parking

Pathology

Patient services attendant

Patient technician/aide

Pharmacist (3)

Pharmacy (3)

Phlebotomist

Physical therapists

Physician extenders

Physician's assistant (2)

Physicians (5)

Porterage/cleaning

Porters

Practitioners

Primary care physician

Psychologist

Psychotherapist

Psychotherapy

Public health communicable disease staff

Public health officials

Public information staff

Pulmonary and critical care faculty and fellows

Radiographers

Radiographic services

Registered nurses (5)

Registrars (2)

Research personnel

Resident (2)

Respiratory care professionals

Respiratory therapists

Safety

Security

Social work (3)

Social workers (3)

Speech therapists

Staff working in associated fields

Staff working in infrastructure support

Student nurses (2)

Students (med/nursing)

Sub-specialty fellows

Supervisors

Supply chain

Support staff

Telecom

Veterinarians

Workers in patient and family support

Collapsed Categories, Unique Wording

Administration	Paramedic
Administration/clerk	Pathology/technical
Allied health	Patient and family support
Allied health personnel	Physicians
Allied professional	Public health communicable
Ancillary (2)	disease staff
Clerical support	Public health official
Clinical (2)	Public information staff
Clinical healthcare professional	Respiratory care
Clinical staff	professionals
Community healthcare workers	Student
Doctors (2)	Technical/support staff
EMT-basic	
Faculty	
Fellows	
General practitioner	
Health care-associated field	
Hospital infrastructure support	
Hospital support services	
Hotel services	
House staff	

Manager

MD/DO/PhD/PAC

Medical (2)

Mid-level clinicians

Non-clinical staff (2)

Nurses (5)

Nursing (2)

Other

Other public health professional

staff

APPENDIX C-V

ADDITIONAL RESULTS

Appendix C-V: Descriptive Statistics for Gender

Females	N	Range	Minimum	Maximum	Std. Deviation
Percent Female	24	62.10	34.10	96.20	16.17799
Valid N (listwise)	24				

APPENDIX C-VI

ADDITIONAL RESULTS

Appendix C-VI: Gender Analysis

		Female Willingness		Male Willingness	
		Willing	Not	Willing	Not
1	Female 249, 83% Male 51, 17%				
2	Female 73% Male 27%	81.6%	18.4%	84.9%	15.1%
3	Female 34.1%				
4	Female 81%				
5	Female 77.9% Male 20.8% Missing 1.3%	54.5% 1020	29.5% 552	62.2% 310	25.0% 129
6	Female 1,152 Male 557				
7	Female 587, 76.9% Male 176, 23.1%	55.4% 325	44.6% 262	79.0% 139	21.0% 37

8	Female 615,69.6% Male 263, 29.8%	Mean likelihood score 56.4	Mean likelihood score 64.7	
9	Female 60%			
10	Female 75.4%			
11	Female 369, 96.1% Male 15, 3.9%			
12	No data			
13	Female 442 Male 126	67%	67%	
14	Female 72.6% Male 27.4%			
15	Female 67% Male 32%		66%	
16	Male 166,23.9% Total respondents =695		Willingness 140 24.5% (n=572)	Unwilling 26 21.5% (n=121)

17	Female 687, 93.5% Male 48, 6.5%				
18	Female 363, 64.8% Male 155, 27.7%		39.5% (34.3-44.5)		28.3 (21.6-35.7)
19	Female 239, 89.9% Male 27, 10.2%				
20	Female 62% Male 65%				
21	Female 807, 74.8% Male 245, 22.7% Not-specified 27, 2.5%				
22	Female 699 Male 239, 83.3%	77.4%	0	83.3%	0
23	Female 1186, 83% Male 231, 16%				

24		
25		
26		
27	Female 254, 96.2% Male 10. 3.8%	
28	Female, 105, 37% Male, 178, 63%	

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