

## Attitudes and Behaviors of International Air Travelers Toward Pandemic Influenza

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**Background.** Air travelers play a significant role in the spread of novel strains of influenza viruses; however, little is understood about the knowledge, attitudes, and practices of international air travelers toward pandemic influenza in relation to public health interventions and personal protective behaviors at overseas destinations.

**Methods.** Prior to the 2009 H1N1 influenza pandemic, we surveyed a convenience sample of 404 departing international travelers at Detroit Metropolitan Wayne County Airport. Presented with a hypothetical pandemic influenza scenario occurring overseas, the participants predicted their anticipated protective behaviors while abroad and recorded their attitudes toward potential screening measures at US ports of entry (POE). The survey also qualitatively explored factors that would influence compliance with health entry screening at POE.

**Results.** Those who perceived pandemic influenza to be serious were more likely to state that they would be comfortable with screening ( $p = 0.006$ ), and if they had influenza-like illness (ILI) overseas, would be more willing to see a physician and delay return travel ( $p = 0.006$  and  $0.002$ , respectively). Other demographic variables, including age and race, were associated with protective behaviors in response to ILI. Travelers also identified diverse information requirements which would influence their behavior in response to entry screening, including characteristics of the pandemic, severity of illness, and screening operations.

**Conclusions.** Demographic characteristics and perceived severity of illness are important factors that may influence the protective behaviors of travelers overseas. Our results indicate that educational material and advice directed to international travelers could be differentially tailored to traveler subpopulations.

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In April 2009, the 2009 pandemic influenza A (2009 H1N1) virus was identified in North America.<sup>1</sup> In the following weeks, travelers departing from Mexico transported the virus to destinations throughout the world.<sup>2</sup> The World Health Organization raised the worldwide pandemic alert level to Phase VI on June 11, 2009, signifying that a global pandemic was in progress.<sup>3</sup> In early 2010, 2009 H1N1 continued to be the predominant influenza virus in circulation globally.<sup>4</sup> Khan and colleagues have noted the importance of air travel in the spread of 2009 H1N1.<sup>2</sup>

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Studies of travelers returning to Hong Kong and Taiwan conducted during the 2003 severe acute respiratory syndrome (SARS) epidemic assessed preventive and risk behaviors. These studies provided useful information about travelers' journey home during an outbreak, as well as influences on travelers' decisions whether to seek care or delay travel.<sup>5,6</sup> Other studies have attempted to evaluate the effectiveness of screening protocols employed during the SARS crisis.<sup>7,8</sup> One study in 2009 examined how air travelers departing from Swiss airports would respond to a hypothetical respiratory disease pandemic.<sup>9</sup>

Few studies have explored the knowledge, attitudes, and practices (KAP) of international air travelers with respect to exposure to pandemic influenza while abroad. Apart from broader assessments of willingness to take travel-related health risks,<sup>10,11</sup> studies have primarily

addressed KAP regarding the introduction of pandemic influenza into countries and communities.<sup>12–14</sup> Other research has focused on KAP toward H5N1 avian influenza.<sup>15,16</sup> These results may not be generalizable to air travelers, who play a significant role in the spread of novel strains of influenza viruses.<sup>17–20</sup> To better inform future research and preparedness efforts, we assessed travelers' attitudes toward health screening for pandemic influenza at US ports of entry (POE) and their potential overseas behaviors in response to a hypothetical influenza pandemic. This study was conducted prior to the advent of the 2009 H1N1 influenza pandemic.

## Methods

The study protocol was reviewed and approved by the University of Michigan Health and Behavioral Science Institutional Review Board (IRB) and received IRB exemption from the Centers for Disease Control and Prevention (CDC). Eligible participants were US citizens or residents who had lived in the United States for at least 12 months, were 18 years or older, and were proficient in reading English.

The survey was initially piloted in 10 travelers to assess readability and acceptability. The questionnaire was then administered to a convenience sample of international travelers departing from Detroit Metropolitan Wayne County Airport, via direct flights to a destination outside North America from November 2008 through February 2009. Researchers were able to gain access to secure areas of the airport through existing employment with the CDC Detroit Quarantine Station, located in the Federal Inspection Service area of the airport. Researchers approached subjects at their gates 1 to 2 hours prior to departure. Participants were asked if they would be willing to complete a voluntary, 10-minute, self-administered, anonymous questionnaire about pandemic influenza. A candy was offered as a small reward for participation, along with an informational pamphlet on pandemic influenza.<sup>21</sup>

The survey evaluated 16 items in total, including demographic information, international travel excluding North American destinations, frequency and current reason for travel, knowledge and attitudes toward pandemic influenza and health screening at US POE, and anticipated health behavior overseas. After reading the definition of pandemic influenza (Table 1), participants were asked to rate their knowledge of pandemic influenza and their personal perception of its severity. Using scenarios (Table 1) included on the questionnaire, participants were asked to rate the likelihood of seeking a physician's care or delaying return travel in response to personal illness with influenza-like illness (ILI). Another outcome measured was passengers' comfort with health screening at US POE. Participants also responded to multiple-choice items assessing reasons one might not see a doctor overseas, might not delay return travel, or be uncomfortable with entry screening. An open-ended question investigated

**Table 1** Definition and scenarios used on survey of international passengers: Detroit Metropolitan Airport, November 2008 to February 2009

Definition of pandemic influenza	"It's a new human flu virus that can make people very sick. It can be spread from person to person by coughing and sneezing and can spread around the world. The current bird (or avian) flu outbreak is in birds; it is not a pandemic flu because it is not a human flu that can be spread easily by people. Right now, there is no pandemic flu and no vaccine against pandemic flu."
Scenario describing pandemic influenza situation at an overseas destination	"Imagine that you have left the United States and there are cases of pandemic flu in the country you are visiting. Imagine the government of that country is checking people for pandemic flu before they will be allowed to travel. Now imagine that you also have flulike symptoms, such as fever or cough, sore throat or muscle pains."
Scenario describing possible screening measures at US POE	"Imagine there is screening for pandemic flu at US airports on your trip back home. Screening travelers might delay the spread of pandemic flu to the United States. One way to screen travelers is to have them fill out a short survey about their health. Another way to screen travelers is to check their temperature. Sick people might be checked by a health worker at the airport and even prevented from traveling."

POE = ports of entry.

factors affecting compliance with screening measures. Open-ended responses were classified into one or more of nine categories, which were independently reviewed by two researchers. Differences in opinion regarding classification were resolved through consensus.

For each Likert-type question, the four options were collapsed to create binary variables used in the univariate data analysis. "Don't know" responses were excluded from the descriptive analyses and estimations of odds ratios. Although recommended Office of Management and Budget race and ethnicity categories were used, only 7% of participants identified themselves in categories other than White or Asian; therefore, race was collapsed into a binary variable (White/non-White) and ethnicity was excluded for statistical analysis. Data were entered into a Microsoft Access 2003 database (Microsoft, Seattle, WA, USA) and analyzed using SPSS 16.0 for Windows (SPSS, Chicago, IL, USA). Odds ratios (ORs) were calculated by univariate logistic regression. Significant variables were then entered into a multivariate backward stepwise logistic regression analysis comparing travelers who "strongly agree[d]" with protective behaviors to all others. An  $\alpha$ -level of  $\leq 0.01$  was employed in the analysis.

**Table 2** Demographic and travel characteristics of 404 travelers completing surveys at Detroit Metropolitan Airport, November 2008 to February 2009

Variable	No. (%)
Sex and age	
Female	173 (42.8)
Median age: 47 y	
Age range: 18–77 y	
Male	231 (57.2)
Median age: 45 y	
Age range: 18–77 y	
Race	
White	270 (66.8)
Asian	105 (26.0)
Other	29 (7.2)
Education	
High school or less*	77 (19.1)
Bachelor's degree	168 (41.8)
Graduate degree	157 (39.1)
Travel frequency	
First-time travelers	65 (16.2)
Once per year	144 (36.0)
2 to 3 times per year	128 (32.0)
4 or more times per year	63 (15.8)
Travel reason†	
Visiting friends and relatives	157 (37.7)
Business	118 (28.4)
Tourism	88 (21.1)
Volunteer work	31 (7.5)
Study abroad	20 (4.8)
Other	2 (.5)

\*Includes those with some college.

†Some individuals selected more than one option for the Travel Reason item ( $N = 416$ ).

## Results

The survey participation rate was approximately 65%. A total of 404 questionnaires were completed. The median age of respondents was 46 years (range 18–77); 57.2% of the participants were male. The majority were White US citizens who had at least a bachelor's degree (Table 2). Flight destinations included three European sites (Amsterdam, Netherlands; Frankfurt, Germany; and London, England; 51.2%) and three Asian sites (Narita, Japan; Nagoya, Japan; and Osaka, Japan; 48.8%). Most participants (68%) reported that they had traveled internationally one to three times in the previous 12 months, typically for business or to visit friends and relatives (Table 2).

When asked to rank their knowledge of pandemic influenza, 53.1% claimed to know “not much” or “nothing” about pandemic influenza, while 46.9% reported they knew “some” or “a lot.” Perceived knowledge did not significantly differ across age, gender, or race. However, travelers with a graduate degree were more likely to rate themselves as knowledgeable about pandemic influenza than those with a high school education or less ( $OR = 2.56, p = 0.006$ ).

Most (59.4%) of the respondents rated personal infection with pandemic influenza as “very serious” to “quite serious,” while 40.6% considered it “somewhat serious” or “not at all serious.” There were no statistically significant differences in perceived seriousness of pandemic influenza based on age, gender, race, education level, travel frequency, or reason for travel.

Most travelers (87.1%) reported that they would likely seek a physician's care if they had ILI, defined as fever or cough, at their destination site. Of the respondents who identified concerns with seeking care, the primary reasons were that “flulike symptoms are not serious” (26.9%) and “the language or culture is unfamiliar” (16.2%). Travelers who perceived pandemic influenza to be serious were more likely to be willing to see a physician overseas ( $OR = 2.56, p = 0.006$ ). Passengers whose main reason for travel was visiting friends and relatives were also more likely to report willingness to see a physician at their overseas destination ( $OR = 3.03, p = 0.003$ ).

Most respondents (70.1%) stated that they would likely delay travel back to the United States if they had ILL. Of those who selected a reason for not delaying travel, 35.3% reported that they would not delay travel because they would want to “return to the comfort of [their] own home and community.” Expense and concerns regarding quarantine or isolation abroad were reported by 30.2 and 22.8% of respondents, respectively. Passengers who perceived pandemic influenza to be more serious and those who reported greater perceived knowledge about pandemic influenza were more likely to be willing to delay travel back to the United States ( $OR = 2.15, p = 0.002$  and  $OR = 1.79, p = 0.009$ , respectively). Increasing age was the only demographic variable correlated with a reported willingness to delay travel ( $OR = 1.03, p = 0.001$ ).

Most respondents (77.1%) rated themselves as generally comfortable with screening. For those who identified problems with screening in response to a multiple-choice question, time-consumption (29.0%) and disruption of travel (27.2%) were both selected as potential problems. Privacy concerns and the possibility of “targeting the wrong people” were noted by 16.7 and 14.6% of participants, respectively. Those who perceived pandemic influenza to be serious and those who reported greater perceived knowledge of pandemic influenza were more likely to be comfortable with screening at US POE ( $OR = 2.12, p = 0.006$  and  $OR = 1.95, p = 0.007$ , respectively).

Multivariate analysis showed that only perceived seriousness of pandemic influenza was related to anticipated protective behaviors and attitudes about screening (Table 3). Increasing age was associated with anticipation of seeking a physician's care for ILI overseas and delaying travel back to the United States ( $OR = 1.02, p = 0.015$  and  $OR = 1.02, p = 0.006$ , respectively). In the multivariate analysis, non-White race was associated with a willingness to

**Table 3** ORs for multivariate models of anticipated protective behaviors overseas and beliefs with regards to screening at US ports of entry: Detroit Metropolitan Airport, November 2008 to February 2009

	See a physician OR (95% CI)	Delay return travel OR (95% CI)	Comfort with screening OR (95% CI)
Age	1.021 (1.004, 1.038)	1.025 (1.007, 1.042)	—
<i>p</i> value	0.015	0.006	—
Race			
White	—	1.00	—
Non-White	—	2.384 (1.410, 4.030)	—
<i>p</i> value	—	0.001	—
Perceived knowledge of pandemic influenza			
Low	—	—	1.00
High	—	—	1.757 (1.066, 2.899)
<i>p</i> value	—	—	0.027
Perceived seriousness of pandemic influenza			
Low	1.00	1.00	1.00
High	2.224 (1.372, 3.605)	2.098 (1.268, 3.470)	2.147 (1.304, 3.536)
<i>p</i> value	0.001	0.004	0.003
US citizen			
No	—	—	1.00
Yes	—	—	3.193 (1.331, 7.664)
<i>p</i> value	—	—	0.009

ORs = odds ratios; CI = confidence interval.

delay return travel (OR = 2.38,  $p = 0.001$ ). Greater perceived knowledge about pandemic influenza and US citizenship were significant in the multivariate model assessing travelers' comfort with screening (OR = 1.76,  $p = 0.027$  and OR = 3.193,  $p = .009$ , respectively). Visiting relatives and friends did not emerge as a significant factor in the multivariate analysis.

### Qualitative Results

A total of 240 individuals responded to the open-ended question investigating what would influence reporting of ILI symptoms during entry screening at US POE, producing a total of 304 categorized responses. A quarter of the participants (25.4%) indicated that the severity and type of symptoms were important influences on decision making. The availability of information about the pandemic strain and status at their overseas destination(s) was noted by 21.7% of the travelers surveyed. The "common good" was cited as a factor by 20.8% of respondents. The inconvenience of screening procedures, such as lost luggage or missed connections, was noted by 10.8% of respondents. Concerns about isolation and quarantine, home and work obligations, screening operations, personal health,

and cost were all mentioned by fewer than 10% of respondents.

### Discussion

Our results indicate that most travelers considered pandemic influenza to be serious and would take protective measures abroad in response to pandemic influenza. However, fewer than half of the participants felt that they were knowledgeable about the disease. Those with more education and those who traveled more frequently tended to report greater perceived knowledge of pandemic influenza. Highly educated travelers and individuals with the monetary and social capital to travel frequently may have greater access to information resources. Knowledge was associated with a higher likelihood of anticipated compliance with public health recommendations and comfort with screening measures. Greater understanding of pandemic influenza may result in better comprehension of public health recommendations. Greater perceived seriousness was also associated with acceptance of public health measures. Other studies have reported similar associations between perceived severity and anticipated compliance with public health measures.<sup>22–25</sup> Leggat and colleagues demonstrated that people who expressed concern about 2009 H1N1 were more likely to anticipate cancellation of air travel if they had ILI.<sup>26</sup> The qualitative results also suggest that the education of travelers regarding pandemic influenza and public health measures, including airport health screening, may increase acceptance of such measures.

Older participants were more willing to delay return travel to the United States. Several other studies have noted greater perceived severity of pandemic influenza among older populations,<sup>22–25,27</sup> which may in part explain the greater acceptance of public health measures among older individuals in our sample. Furthermore, the mean age of tourists or volunteers was higher than that of other passengers. This finding suggests that elderly individuals may be less affected by the pressures of employment or other home obligations. Nishiura recently assessed the importance of age-specific travel patterns in the importation of 2009 H1N1 influenza cases to Japan.<sup>28</sup> Other studies have demonstrated that employment status is a serious concern affecting compliance with public health measures.<sup>29</sup> The most common response given overall for not delaying travel was "want[ing] to return to the comfort of own home," followed by cost. Our results are consistent with those of Lee and colleagues, who found that high medical fees functioned to discourage travelers from remaining in SARS-endemic areas for treatment.<sup>7</sup> Participants in our study may have also considered other logistic costs, such as fees for changing itinerary or extending accommodations. Although not directly assessed, perceptions of the quality of care available overseas may have also influenced participant responses.<sup>30</sup>

The qualitative results demonstrate the potential importance of disease information in affecting traveler compliance with screening. Travelers stressed the need for information regarding disease characteristics, pandemic status, and screening operations to support their decisions. Travelers' need for more information regarding influenza was corroborated in a recent survey study of Swiss business travelers.<sup>31</sup> Other research has described the need for specificity in communication of health information in the context of an influenza pandemic.<sup>32</sup> Overall, our results are consistent with the recent review by Bish and Michie, which found that being older, more educated, or non-White is associated with a greater probability of adopting protective behaviors in response to pandemic influenza.<sup>33</sup>

#### Limitations

This study had several limitations, including the use of a convenience sample obtained at one site. The participation rate (~65%) was relatively low and could reflect underlying selection bias. In particular, passengers who were willing to answer questions about health behaviors may be more likely to comply with such suggested behaviors and to be more comfortable with health screening at POE. Selection bias may also in part explain the increased acceptability of delaying travel back to the United States by non-White participants, the majority of whom were of Asian ethnicity, and who were flying to Asian destinations. Therefore, the observed greater willingness to delay return travel by non-White travelers may reflect a greater level of comfort or familiarity with the overseas destination(s) relative to White travelers included in the study. We did not address travelers' prior exposure to pretravel advice or information about pandemic influenza, which may be an important factor in traveler health-related behaviors overseas,<sup>34</sup> and cannot assess whether this may have contributed to observed differences in perceived knowledge or anticipated behaviors. Additionally, the passenger population represented at Detroit Metropolitan Airport may be less diverse than that of larger airports with direct flights to more international destinations, and therefore may not be generalizable to traveler populations at larger airports. Also, passenger final destinations were not assessed. These limitations prevented us from addressing some important questions regarding particular subpopulations. Although our questionnaire was in part based on previous survey instruments, our measures have not been validated. The survey also relied upon hypothetical scenarios that required the traveler's imagination. In their review of the literature, Leppin and Aro emphasize the need for clearly defined measures of risk perception that may be consistently operationalized across research settings and questions.<sup>35</sup> Currently, there is substantial variability in the use and measurement of terms, such as "severity" and "susceptibility." However, most literature on pandemic influenza KAP has relied on similar hypothetical scenarios and ill-defined terms.

Our findings may not reflect current traveler KAP toward 2009 H1N1 pandemic influenza, a milder pandemic than the hypothetical scenario used in this study; however, the results may still serve an important planning function and contribute to ongoing research in this area.

#### Conclusion

We believe that the issues identified by participants regarding public health measures are relevant. Our survey provides a valuable window into international air traveler KAP toward pandemic influenza and potential screening measures immediately prior to the emergence of 2009 H1N1. Public perceptions of pandemic influenza have changed during the events surrounding 2009 H1N1.<sup>36</sup> Our results may support future efforts to evaluate changes in KAP toward pandemic influenza among travelers due to awareness of 2009 H1N1, screening measures, and influenza more generally. Further research could also explore the relationship between traveler KAP and travel destination. Given the uncertainty surrounding how the 2009 H1N1 virus may (re)emerge in the future,<sup>37</sup> the results of the survey may assist in planning and response in the context of international travel. Our results suggest that education directed toward international travelers could be differentially adapted to traveler subpopulations, particularly with respect to race and travel reason.

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#### Disclaimer

The findings and conclusions in this manuscript are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention or the Michigan Department of Community Health.

#### Declaration of Interests

The authors state they have no conflicts of interest to declare.

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