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# The relationship between obsessive compulsive beliefs and symptoms, anxiety and disgust sensitivity, and Swine Flu fears

Joseph Brand\*, Dean McKay, Michael G. Wheaton, Jonathan S. Abramowitz

Fordham University &amp; University of North Carolina, Department of Psychology, 441 East Fordham Road Bronx, NY 10458, United States

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## ABSTRACT

Using the 2009 Swine Flu outbreak as a contemporary example of pandemic fears, this study examined the relationship between various symptoms related to anxiety sensitivity and Swine Flu fears. It was hypothesized that both obsessive-compulsive (OC) beliefs and OC symptoms would significantly predict Swine Flu fears. It was also hypothesized that symptoms of anxiety, including measures of anxiety sensitivity and disgust sensitivity would significantly mediate the relationship between both OC beliefs and OC symptoms and Swine Flu fears. A total of 393 undergraduate students completed measures of Swine Flu fears, anxiety sensitivity, OC beliefs and symptoms, and disgust sensitivity. It was found that both OC beliefs and OC symptoms significantly predicted Swine Flu fears. While disgust sensitivity significantly mediated the relationship between both OC beliefs and OC symptoms and Swine Flu fears using the Sobel test, anxiety sensitivity was a significant mediator only for OC symptoms. Additionally, path modeling showed that anxiety sensitivity mediated the relationship between OC symptoms and Swine Flu fears best. The results of this study may be useful for treating individuals suffering from anxiety in light of future pandemics, as well as continuing to research the role of anxiety symptoms in predicting pandemic fears.

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## 1. Introduction

The Swine Flu (officially called the H1N1 Flu) first infected people in the United States in April (Center for Disease Control and Prevention, 2009). By June 2009, the Swine Flu became a pandemic (World Health Organization, 2009). Similar to traditional, seasonal strains of influenza, Swine Flu is very contagious, and can spread through coughing, sneezing, or touching (Center for Disease Control and Prevention, 2009). Although the Swine Flu does not significantly differ in symptomology compared to the traditional, seasonal flu, it garnered much attention in the media and became a significant health concern for many during the 2009 Swine Flu pandemic. It is possible that some individuals have significantly greater fears related to being infected by Swine Flu.

The 2009 Swine Flu pandemic provided researchers with an opportunity to examine relationships between pandemic fears and health anxiety. Other recent pandemics showed that anxiety was elevated among individuals living in urban areas associated with the outbreak. For example, during the outbreak of Severe Acute Respiratory Syndrome (SARS), which had primary outbreaks in Hong Kong and Toronto, it was shown that there was high anxiety regarding the risk of illness in general population of Hong Kong (Cheng & Cheung,

2005) and for individuals who attending a conference in Toronto (Stinson, McCartney, Leung, & Katz, 2004). The incidence of psychiatric disturbance following the SARS outbreak was limited primarily to those with prior psychiatric histories (Lancee, Maunder, & Goldbloom, 2008). Collectively, these studies show that widely publicized pandemics are associated with increased anxiety and potentially exacerbations of psychiatric disturbance. In the case of psychiatric disturbance, obsessive-compulsive disorder (OCD) is an especially important condition that may be influenced by pandemic outbreaks. Those already suffering from symptoms of anxiety may be at greater risk of Swine Flu fears, and may also be more susceptible to taking excessive measures to reduce the likelihood of contracting Swine Flu. Additionally, given the common symptoms of contamination fears in individuals suffering from OCD (American Psychiatric Association, 2000; Ball, Baer, & Otto, 1996), it is possible that individuals with obsessive-compulsive (OC) symptoms or OC beliefs are more likely to fear exposure to Swine Flu, along with taking excessive measures to prevent contracting this illness. Understanding these relationships could benefit clinicians in developing treatment plans for clients with significant pandemic fears, or anticipate the primary concerns of clients at risk for these fears when there are outbreaks presented in media reports of flu or other viral infections.

### 1.1. Health-related anxiety

Fear of Swine Flu or other illnesses can be considered a specific type of anxiety called *health-related anxiety*. Taylor and Asmundson

\* Corresponding author. Tel.: +1 718 817 4498; fax: +1 718 817 3785.

E-mail addresses: [jbrand4@fordham.edu](mailto:jbrand4@fordham.edu) (J. Brand), [mckay@fordham.edu](mailto:mckay@fordham.edu) (D. McKay).

(2004) describe health anxiety as a useful function for humans to react to physical ailments with a certain level of concern. This normal level of anxiety often causes us to take the necessary measures to prevent and alleviate illness. Health anxiety becomes problematic when the anxiety is chronic and excessive, or when the anxiety is significantly greater than the severity of the health-related threat (Taylor, McKay, & Abramowitz, 2012). This kind of anxiety can be disabling, and is a common symptom in myriad psychological disorders, such as hypochondriasis, OCD, panic disorder, and specific phobias (Taylor et al., 2012).

Persons suffering from excessive health anxiety often seek reassurance that they are not ill, but the relief experienced from reassurance seeking generally does not last long and can actually increase long-term severity of health anxiety (Taylor & Asmundson, 2004). Excessive health anxiety is also often accompanied by excessive checking in many aspects, including bodily checking and checking medical sources about diseases.

Due to preoccupations with health concerns and physical symptoms, it follows that health-related anxiety is commonly experienced in individuals suffering from symptoms of anxiety disorders such as OCD and panic disorder, where individuals often interpret benign physical symptoms (particularly anxiety-related arousal) as harmful (called anxiety sensitivity; Taylor et al., 2007). Additionally, a common OC belief includes overestimation of threat. In contamination-based OCD, this overestimation of threat may include health anxiety-based symptoms such as obsessions with becoming ill or contaminating others (Cisler, Brady, Olatunji, & Lohr, 2010). It is important to note that OC beliefs are not specific to OCD and are often experienced by individuals suffering from other anxiety disorders as well (Tolin, Worhunsky, & Maltby, 2006). Finally, those who are more likely to experience disgust may also endorse a greater number of pandemic-related fears. Disgust sensitivity is seen in anxiety disorders such as OCD and certain phobias, and has been shown to play a critical role in those suffering from OCD, especially when symptoms are contamination-based (Thorpe, Patel, & Simonds, 2003).

### 1.2. Previous research on Swine Flu attitudes and behaviors

A telephone survey study in the UK examined how perceptions of Swine Flu affected behaviors taken to reduce Swine Flu (Rubin, Amlot, Page, & Wessely, 2009). Participants in this study were asked questions about specific behaviors they had engaged in over the previous few days relating to fear of Swine Flu. The researchers found that individuals with higher levels of anxiety about Swine Flu were significantly more likely to carry out avoidance behaviors recommended by the government than those who did not have high levels of anxiety (Rubin, Amlot, Page, & Wessely, 2009).

Goodwin, Haque, Neto, and Myers (2009) conducted an internet and paper-based survey in Malaysia and Europe, which examined “attitudinal and behavioral responses” related to the Swine Flu pandemic. In terms of anxiety regarding Swine Flu infection, about half of the participants reported being at least “somewhat concerned” by catching Swine Flu, and this percentage was significantly higher in the Malaysian sample (71% indicated they were at least “somewhat concerned”) (Goodwin et al., 2009). Interestingly, the researchers found that while participants in the European sample were more likely to discuss their fears with their friends when compared to the Malaysian sample, Malaysian participants were more likely to contemplate behavioral changes (i.e., not using public transportation, and purchasing masks and other goods in preparation of an outbreak) (Goodwin et al., 2009). These findings, plus the higher level of overall anxiety in the Malaysian population, shed light on some potential cultural differences when examining Swine Flu fears. This could be based on multiple factors, such as

access to health care, access to information regarding Swine Flu, and cultural differences about emotional expression to friends and family.

Another study used a cross-sectional survey to ascertain the beliefs and attitudes of Australians about the Swine Flu during the WHO Phase 5 (Pandemic H1N1, 2009; Seale et al., 2009). While this study did not directly examine the relationship between anxiety and Swine Flu, it did find that almost half of the participants felt they did not have enough information regarding the pandemic, and only 33% of the participants felt that being infected by Swine Flu would affect their lives “very seriously” (Seale et al., 2009). Perhaps, there is a relationship between media exposure and perceived threat of Swine Flu, considering many participants in this study felt under-informed. While the effects of media exposure on Swine Flu anxiety are beyond the scope of this paper, it is an important point to consider in future studies of epidemic attitudes and behaviors.

While the research above describes different factors that may affect attitudes toward Swine Flu, none of these studies have directly examined the effect of psychological symptoms on Swine Flu attitudes. A 2011 study examined the relationship between Swine Flu fears and various symptoms related to health anxiety, including contamination fears, panic symptoms, and disgust in an undergraduate sample (Wheaton, Abramowitz, Berman, Fabricant, & Olatunji, 2012). Using regression analyses, Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012) found that health-related anxiety, disgust sensitivity, and contamination fears all significantly predicted Swine Flu fears. This study was the first to demonstrate a relationship between various symptoms of anxiety and fears related to Swine Flu.

These studies highlight how epidemics can impact an individual's mental and emotional state. Especially in the field of health care, these anxieties can affect attitudes and behaviors both professionally and personally. The current study aims to build on the literature discussed above by examining how previous anxiety and other factors contribute to pandemic anxiety.

The aims of the current study are to investigate the relationship between symptoms of various anxiety problems (e.g., panic, obsessive-compulsive disorder) and fear of contracting Swine Flu. Measuring these relationships will help clarify the role of anxiety in pandemic fears, which could be useful information for clinicians treating patients with such fears.

Based on the findings from Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012), the current study examined the mediating effects of various symptoms of anxiety between OC symptoms and OC beliefs and Swine Flu fears and behaviors. Mediation analyses allow for identification of possible causal pathways (MacKinnon, 2008) unexamined in the prior report. It is expected, based on the literature reviewed here, that OC symptoms and beliefs are intermediate causal factors between anxiety symptoms and the experience of Swine Flu fears. First, it was hypothesized that both OC beliefs and OC symptoms will significantly predict levels of Swine Flu fears and behaviors. Then, it was hypothesized that measures that target symptoms of panic and disgust, will significantly mediate the relationship between both OC symptoms and OC beliefs, and Swine Flu fears and behaviors.

## 2. Methods

### 2.1. Participants and procedure

Participants consisted of undergraduate students at Fordham University and the University of North Carolina ( $N=393$ ), primarily in Introductory Psychology courses. The sample from Fordham University included 208 participants, while the sample from University of North Carolina included 185 participants. Data collected from the University of North Carolina sample were also used for analysis

in Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012). The sample consisted of 267 females (68%) and 126 males (32%). The mean age of participants was 20.13 years old. A majority of participants identified as Caucasian ( $N=269$ ; 68%), 52 identified as Hispanic (13%), 29 identified as Asian (7%), 24 identified as African American (6%), and 19 participants identified as "Other" (5%). Participants completed a computer-administered online questionnaire. After reading and signing an informed consent form, participants answered a series of questionnaires measuring attitudes and behaviors related to Swine Flu, anxiety symptoms, and media exposure. Upon completing the survey, participants submitted their responses, which could only be viewed by the principal investigator or faculty sponsor. Participants received compensation in the form of required research credits for their courses. Data were collected during the Swine Flu outbreak of 2009 and concluded in 2011. During this time frame there continued to be substantial reports regarding Swine Flu in the region around one data collection site (Fordham University, located in New York City).

While the current study uses part of its sample from that of Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012), it extends this research by including comprehensive mediation analyses that more thoroughly examine the relationships between Swine Flu fears and anxiety symptoms. Specifically, we employed path analysis to evaluate mediation models using the recommendations from MacKinnon (2008). Therefore, all subscales of the OBQ, OCI-R and ASI-3 were evaluated in the mediation model tests using LISREL.

The first step of data analysis included running a series of linear regressions to find the relationships between OC beliefs and symptoms and Swine Flu fears and behaviors. Mediation models were then examined using the Sobel test (Baron & Kenny, 1986). Using structural equation modeling, full path models using manifest scale variables were also run, and best fitting models were determined using goodness-of-fit indices, including the Tucker Lewis Index (TLI), the Comparative Fit Index (CFI), Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC). This was done to more fully examine the mediating relationship between anxiety and disgust sensitivity on Swine Flu fear and obsessive compulsive symptoms and beliefs (MacKinnon, 2008).

## 2.2. Measures

The following measures were used in this study.

**Obsessive-Compulsive Inventory-Revised (OCI-R;** Foa et al., 2002). The OCI-R is an 18-item, self-report inventory developed from the earlier 42-item Obsessive-Compulsive Inventory (Foa, Kozak, Salkovskis, Coles, & Amir, 1998). Each item describes a symptom commonly associated with obsessive-compulsive disorder. The measure utilizes a 5-point scale, with participants rating from 0 to 4 the degree to which each item has caused distress in the last month. Higher scores indicate greater levels of distress due to symptoms. The total score, ranging from 0 to 72, is then divided into subscales to reflect the severity of symptoms in the following six dimensions of OCD: washing, checking, ordering, obsessing, hoarding, and neutralizing (Abramowitz & Deacon, 2006). The OCI-R demonstrates good internal consistency and test-retest reliability, along with strong convergent validity.

**Anxiety Sensitivity Index-3 (ASI-3;** Taylor et al., 2007). The ASI-3 is an 18-item, self-report inventory measuring fear of arousal-related sensations (Taylor et al., 2007). The measure utilizes a 5-point scale, with participants rating from 0 to 4 the degree to which they agree with certain statements about their anxiety sensitivity. Taylor et al. (2007) developed the ASI-3 on a non-clinical sample of 2,361 U.S. and Canadian participants. Research concluded that the ASI-3 has sufficient convergent and discriminant validity for this measure by comparing the ASI-3 to the 36-item, ASI-R, and the original, 16-item ASI. The study also confirms strong construct validity for the ASI-3 (Taylor et al., 2007).

**Swine Flu Inventory.** The Swine Flu Inventory is an 11-item, self-report, inventory examining attitudes and behaviors associated with fears of Swine Flu and measures taken to prevent getting Swine Flu. Participants rate their attitudes about Swine Flu on a 5-point scale from 1 to 5 for the first ten items. For item 11, participants use an 11-point scale describing how much they engage in certain behaviors because of Swine Flu. For the first two questions of the questionnaire, participants indicate whether or not they have ever had Swine Flu and whether or not they know somebody close to them who has had Swine Flu. In the present sample, the scale had high internal consistency, with  $\alpha=0.85$ .

**Obsessional Beliefs Questionnaire-44 (OBQ-44;** Obsessive Compulsive Cognitions Working Group, 2001). The OBQ-44 is a 44-item, self-report inventory developed

from the earlier 87-item obsessive beliefs questionnaire (OBQ). Each item describes beliefs related to obsessive-compulsive symptoms. Participants rate how much they agree with certain obsessive beliefs on a 7-point scale from 1 to 7. Woods, Tolin, and Abramowitz (2004) concluded that the OBQ-44 loads best on to four factors, including one large factor and three smaller factors. The large factor is called "OBQ general" because it involves general symptoms that may involve other anxiety disorders and are not necessarily specific to OCD. The three smaller factors are thought, perfectionism, and responsibility (Woods et al., 2004). The OBQ-44 has high internal consistency, and high convergent validity along with good criterion validity and test-retest reliability.

**Disgust Scale-Revised (DS-R;** Olatunji et al., 2007). The DS-R is a 27-item questionnaire developed from the full, 42-item Disgust Scale (DS; Haidt, McCauley, & Rozin, 1994). Those completing the measure rate on a likert scale from 0 to 4 the extent to which they find a particular stimulus or situation disgusting. Three subscales of the DS-R include core disgust, animal remainder disgust, and contamination disgust. The DS-R has demonstrated good internal consistency and good convergent and discriminant validity.

## 3. Results

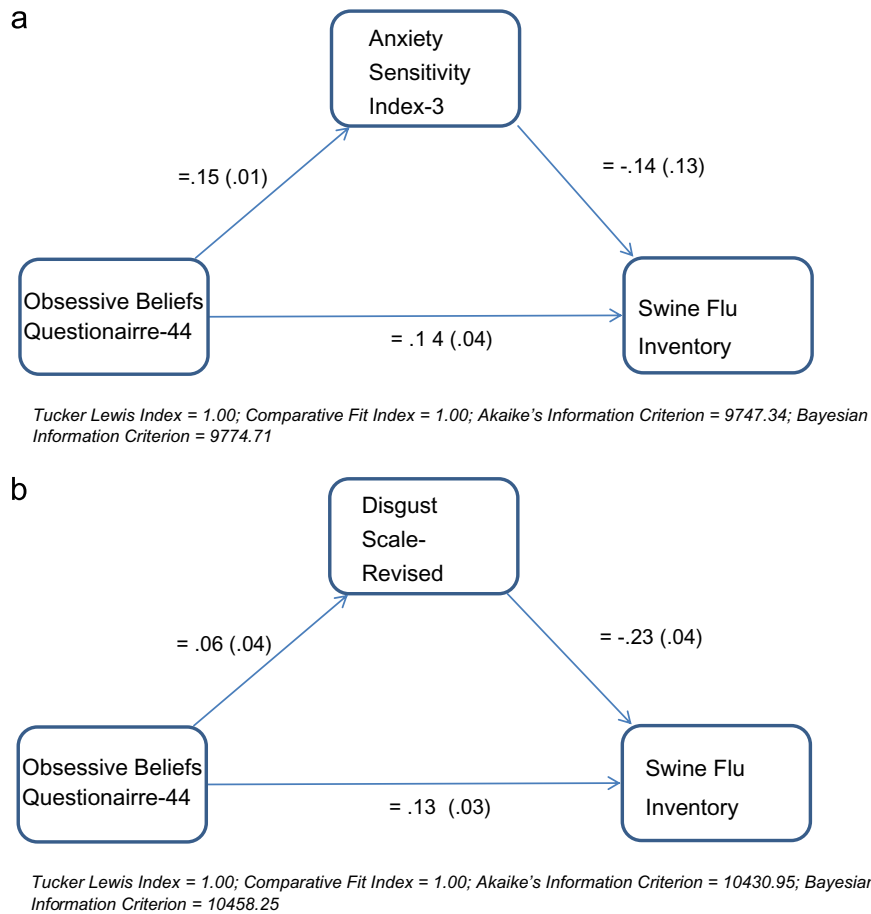
### 3.1. Path models and mediating factors between the OBQ-44 and Swine Flu Inventory

First a simple linear regression was performed to determine whether OC beliefs predicted Swine Flu fears and behaviors. It was found that the OBQ-44 significantly predicted scores on the Swine Flu Inventory ( $\beta=.124$ ,  $se=.033$ ,  $t(393)=3.713$ ,  $p<.0005$ ). To determine mediation effects between OC beliefs and Swine Flu fears and behaviors, Sobel tests of mediation were performed. The OBQ-44 was used as the IV in this mediation model, and the ASI-3 and DS-R were entered as separate MVs to compare their effects on the relationship between the OBQ-44 and the Swine Flu Inventory. The mediation models indicated that the DS-R was the most significant mediating factor between the OBQ-44 and the Swine Flu Inventory ( $z=-3.36$ ,  $p<.001$ ). Although linear regression analysis indicated that the OBQ-44 did not significantly predict scores on the DS-R ( $\beta=.065$ ,  $se=.041$ ,  $t(393)=1.609$ ,  $p=.108$ ). A significant relationship was found with the DS-R predicting scores on the Swine Flu Inventory ( $\beta=-.232$ ,  $se=.041$ ) while controlling for the OBQ-44 ( $t(393)=-5.589$ ,  $p<.0005$ ). The ASI-3 did not significantly mediate the relationship between the OBQ-44 and Swine Flu Inventory ( $z=-1.01$ ,  $p=.317$ ). Although the OBQ-44 was a significant predictor of the ASI-3 ( $\beta=.146$ ,  $se=.013$ ,  $t(393)=11.070$ ,  $p<.0005$ ), the ASI-3 did not significantly predict scores of the Swine Flu Inventory ( $\beta=-.137$ ,  $se=.131$ ,  $t(393)=-1.044$ ,  $p=.297$ ) while controlling for the OBQ-44. Table 1 outlines the beta coefficients for mediators between the OBQ-44 and the Swine Flu Inventory.

Using structural equation modeling, these relationships were further examined. A full path model with the DS-R as a mediator produced a TLI and CFI of 1.00. The AIC in this model was 10,430.953, and the BIC was 10,458.252. The AIC and BIC are relative measures of goodness-of-fit, and therefore compared against other models tests. Accordingly, no AIC or BIC index is considered in isolation, but instead in relation to other models tested (i.e., Moses & Holland, 2010; Richards, Whittingham, & Stephens, 2011). Fig. 1a and b shows the path models used for mediators between the OBQ-44 and Swine Flu Inventory.

**Table 1**  
Beta coefficients for mediation between OBQ-44 and Swine Flu Inventory.

	$\beta$	se	t	p
OBQ-44 (OC beliefs)→ASI-3 (anxiety sensitivity)	.146	.013	11.070	<.0005
ASI-3 (anxiety sensitivity)→Swine Flu inventory (control for OC beliefs)	-.137	.131	1.044	.297
OBQ-44 (OC beliefs)→DS-R (disgust)	.065	.041	1.609	.108
DS-R (Disgust)→Swine Flu inventory (control for OC beliefs)	-.232	.041	-5.589	<.0005



**Fig. 1.** (a) Path coefficients and goodness of fit indices for the ASI-3 predicting the OBQ-44 and Swine Flu Inventory. (b) Path coefficients and goodness of fit indices for the DS-R predicting the OBQ-44 and Swine Flu Inventory.

**Table 2**  
Beta coefficients for mediation between OCI-R and Swine Flu Inventory.

	$\beta$	se	t	p
OCI-R (OC symptoms)→ASI-3 (anxiety sensitivity)	.456	.046	9.871	<.0005
ASI-3 (anxiety sensitivity)→Swine Flu (control for OC symptoms)	-.268	.118	-2.283	.023
OCI-R (OC symptoms)→DS-R (disgust)	-.146	.138	-1.058	.291
DS-R (disgust)→Swine Flu inventory (control for OC symptoms)	-.205	.039	-5.319	<.0005

When the ASI-3 was entered into the path model in place of the DS-R, the TLI and CFI were again 1.00. The AIC was 9747.336, and the BIC was 9774.712, indicating that this model was stronger than the model with the DS-R as the mediator. Based on these analyses, and using the established standard whereby the lower AIC and BIC values indicate models with better fit, we would conclude that the models with the DS-R as a mediator had the best fit (Wicherts & Dolan, 2004).

All other subscales of the OBQ and OCI-R were associated with poor model fit when used in the mediation tests. Only the total score of the ASI-3 was associated with good model fit in the test of mediation. None of the subscales had adequate model fit.

**3.2. Path models and mediating factors between the OCI-R and Swine Flu Inventory**

To determine if OC symptoms significantly predicted Swine Flu fears and behaviors, a simple linear regression was performed. This regression indicated that the OCI-R significantly predicted scores on the Swine Flu inventory ( $\beta = .752, se = .108, t(393) = 6.956, p < .0005$ ).

To examine mediator models for OC symptoms and Swine Flu fears and behaviors, the OCI was used as the IV. The ASI-3 and DS-R still served as the MVs, and the Swine Flu Inventory still served as the DV. The ASI-3 was the most significant mediator between the OCI-R and Swine Flu Inventory ( $z = -2.17, p = .030$ ). In this model, the OCI-R significantly predicted scores in the ASI-3 ( $\beta = .456, se = .046, t(393) = 9.871, p < .0005$ ). The ASI-3 also significantly predicted scores in the Swine Flu Inventory when controlling for the OCI-R ( $\beta = -.268, se = .118, t(393) = -2.283, p = .023$ ).

As seen with the OBQ-44, the DS-R also significantly mediated the relationship between the OCI-R and Swine Flu Inventory ( $z = -3.56, p < .001$ ). The OCI-R did not significantly predict scores on the DS-R ( $\beta = -.146, se = .138, t(393) = -1.058, p = .291$ ). When controlling for the OCI-R, the DS-R significantly predicted scores on the Swine Flu Inventory ( $\beta = -.205, se = .039, t(393) = -5.319, p < .0005$ ). Table 2 displays the beta coefficients for mediators between the OCI-R and the Swine Flu Inventory, along with the Sobel test z-scores and significance.

For the path models including the OCI-R, DS-R, and Swine Flu inventory, a TLI and CFI of 1.00 was found. The AIC in this model was



10,063.628, and the BIC was 10,091.337. When the ASI-3 replaced the DS-R in the path model, the TLI and CFI were still 1.00, but the AIC dropped to 9338.985, and the BIC dropped to 9366.766. Given that the model including the OCI-R, ASI-3, and Swine Flu Inventory produced the lowest AIC and BIC values, this indicates that this path model produced the best fit (see Fig. 2a and b).

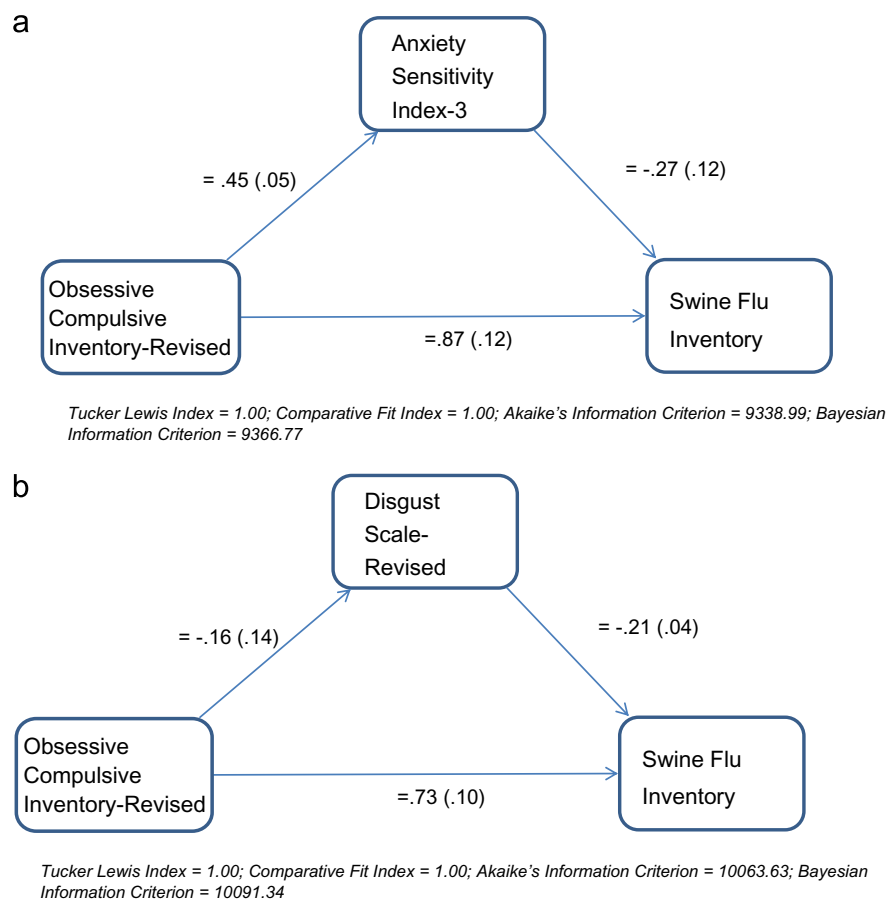
#### 4. Discussion

Health anxiety is a commonly occurring feature in anxiety disorders, including OCD, panic disorder, and phobias (Taylor & Asmundson, 2004). This study examined an anxiety mediation model that accounted for obsessive compulsive beliefs and symptoms, and anxiety sensitivity, in the prediction of pandemic fears and associated behaviors. Given that there was a recent pandemic outbreak, Swine Flu, this was used as a context for evaluating extreme health anxiety. Understanding these relationships would benefit clinicians treating individuals suffering from symptoms of health anxiety, as they may be able to determine who is at higher risk for fears surrounding future pandemics. Recent research from other pandemic outbreaks (i.e., SARS) shows that individuals exposed to information regarding these outbreaks experience higher anxiety (Cheng & Cheung, 2005) and, among at risk populations, there is a risk of exacerbation of preexisting psychiatric disturbance (Lancee et al., 2008). Although limited research exists regarding the specific relationship between health anxiety and pandemic fears, this study supports that these relationships may, in fact, exist, and that individuals suffering from OC symptoms or beliefs may be at higher risk for

pandemic fears, especially if they suffer from anxiety related to health concerns.

Based on the findings of this study, it appears that various symptoms of disorders related to health anxiety are significantly related to Swine Flu fears and behaviors. Consistent with the first hypothesis both OC beliefs and OC symptoms significantly predicted Swine Flu fears and behaviors. This is not surprising given the common symptoms of contamination fears found in OCD and ritualistic behavior to quell these fears. Further, this hypothesis is in line with OC beliefs regarding overestimation of threat that is postulated to exist among individuals with contamination fears (Cisler et al., 2010).

It was also found that, while both OC beliefs and symptoms were significantly mediated by disgust sensitivity, only OC beliefs were significantly mediated by anxiety sensitivity. This is not consistent with the study's second hypothesis, which predicted that of anxiety would significantly mediate OC symptoms and beliefs and Swine Flu fears and behaviors. This finding indicates that internal monitoring of physical reactions may not be as closely related to pandemic fears in individuals containing OC beliefs as opposed to actual OC symptoms. However, our findings show that anxiety sensitivity plays an intermediary role between obsessive-compulsive beliefs and Swine Flu fears. This finding builds upon the prior research by Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012), which relied on a regression model to evaluate simultaneous effects in predicting Swine Flu fears. However, mediation models allow for causal sequencing of variables (MacKinnon, 2008). Future research should evaluate multiple mediators (i.e., both anxiety and disgust sensitivity). The current study did not have adequate power to evaluate



**Fig. 2.** (a) Path coefficients and goodness of fit indices for the ASI-3 predicting the OCI-R and Swine Flu inventory. (b) Path coefficients and goodness of fit indices for the DS-R predicting the OCI-R and Swine Flu Inventory.

multiple mediator variables (MacKinnon, Fairchild, & Fritz, 2007), which based on the parameter estimates obtained would have required approximately triple the sample size reported here (Fritz & MacKinnon, 2007).

The results from the path models also indicate that the ASI-3 was a stronger mediator than the DS-R. The best fitting model included the ASI-3 mediating the relationship between the OCI-R and the Swine Flu Inventory. The path models indicate that individuals suffering from OC symptoms and beliefs are at higher risk for having anxiety centered around ongoing pandemics if they also experience anxiety sensitivity, which are closely related to panic symptoms. The results of this study support past research that indicates overlap between health anxiety and OCD (Fallon et al., 1991; Hollander, 1993; Deacon & Abramowitz, 2008). Results from this study also support past survey data examining anxiety and Swine Flu, such as the research conducted by Rubin, Amlot, Page, & Wessely, 2009. As discussed earlier, Rubin, Amlot, Page, & Wessely, 2009 also found that higher levels of anxiety significantly predicted avoidance and safety behavior related to Swine Flu.

When examining both the path models and the Sobel tests of mediation, the only model that was significant using both analyses was the ASI-3 mediating the relationship between the OCI-R and the Swine Flu Inventory. These findings suggest that experiencing OC symptoms may more strongly predict pandemic fears than holding OC beliefs, which as stated earlier, are not specific to OCD (Taylor et al., 2007; Tolin et al., 2006).

The results of this study can significantly impact treatment decisions, particularly in settings with clients at risk for experiencing anxiety. Understanding the role of health anxiety in pandemic fears can help clinicians develop treatment plans for patients in light of future pandemics given that preexisting obsessive compulsive symptoms and beliefs will likely influence pandemic health related fears. Given the relationships found between Swine Flu fears and health anxiety symptoms, a person who is treated for health anxiety before a pandemic outbreak would experience less anxiety surrounding the pandemic compared to an individual with untreated health anxiety.

#### 4.1. Limitations and future directions

While the current study provides useful information regarding health anxiety and pandemic fears, there are several limitations to consider in order to improve future research in this area.

First, the time over which the data were collected may have impacted the results. Data were collected from November 2009 to March 2011. Over this time, two flu seasons occurred, when individuals are more likely to contract Swine Flu. The data-collecting period also included long stretches of time outside of flu season, when it is less likely for individuals to contract Swine Flu. Therefore, it is possible that more Swine Flu fears and behaviors were reported when the threat of the flu was more immediate. Researchers may examine future health threats and determine the historical effect of when the data were collected. In this case, future research may compare Swine Flu anxiety during flu season to Swine Flu anxiety out of flu season. However, given the results of this study that an increase in symptoms of anxiety appear to predict an increase in Swine Flu fears, it would still be expected that this would be the case outside of flu season. Further, during both flu seasons of data collection, there was regular reporting of Swine Flu in the media, including public health initiatives for receiving vaccines as well as reports on limitations in the efficacy of the vaccines.

Future areas of research with pandemic fears and health anxiety may also include examining other mediation models. For example, while the ASI-3 is a general measure of threat

appraisals associated with panic, panic disorder is heterogeneous in terms of symptom presentation. Future mediation analyses might investigate these relationships by examining different subtypes of panic disorder, which include respiratory, nocturnal, nonfearful, cognitive, and vestibular (Kirchanski, Phil, Craske, Epstein, & Wittchen, 2009). Additionally, researchers may also consider examining environmental factors, such as media exposure to a pandemic, and their relationship to pandemic fears. Although cognitive behavioral therapy (CBT) is an empirically-based treatment for health anxiety (Barsky & Ahern, 2004; Taylor et al., 2012). Wheaton, Abramowitz, Berman, Fabricant, & Olatunji (2012) note that exposure to media related to a pandemic may inhibit treatment effectiveness. In this vein, while the data collection extended past the primary pandemic period, this extended period was only at the New York site, where pandemic fears were especially pronounced given the severity of the outbreak in that region.

Finally, it may also be useful to replicate and extend the current study using different, future pandemic. One specific hypothesis that should be investigated is the degree that treatment for health anxiety may serve as a protective factor in warding off future health anxiety should another pandemic arise. This would provide a basis for the importance of focusing on health anxiety in clients with a wide range of anxiety disorders, and the need to treat symptoms and beliefs associated with OCD in order to alleviate likely future severe and potentially disabling health anxiety.

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