

## Effects of Influenza Strain Label on Worry and Behavioral Intentions

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Persons who read information about a hypothetical influenza strain with scientific (H11N3 influenza) or exotic-sounding (Yarraman flu) name reported higher worry and vaccination intentions than did those who read about strains named after an animal reservoir (horse flu). These findings suggest that terms used for influenza in public communications can influence reactions.

Influenza strains are referred to in several ways by infectious disease experts, public health officials, clinicians, and the media when communicating with the public. These influenza strain labels can focus on where the strain originated (e.g., Spanish flu), the animal reservoir (e.g., avian/bird flu), or the hemagglutinin and neuraminidase surface proteins of the strain (e.g., H1N1 influenza).

Changes in terms used to describe a health risk can shape responses to those risks (1–5). For example, using metaphors to describe influenza (e.g., the flu as an army invading the body) may increase influenza vaccination intentions of the public compared to literal descriptions (e.g., the flu is a virus infecting the body) (1). Labels could affect health behavior by the emotional responses they evoke (e.g., worry about infection) as a result of the terms used (6).

We tested how influenza labels affect vaccination intentions and worry about infection in a number of countries that have different cultures (1), vaccination policies (2), and experience with epidemics (3,7). After receiving exempt status from the University of Michigan Medical School institutional review board, we randomly recruited adults from a panel of internet users identified by using Survey Sampling International (SSI) (<https://www.surveysampling.com/>). Users were from 11 countries, the United States ( $n = 1,787$ ) and 10 countries in different regions of Europe: northern [Finland ( $n = 1,554$ ), Sweden ( $n = 1,539$ ), Norway ( $n = 764$ )]; southern [Italy ( $n = 1,509$ ), Spain ( $n = 1,604$ )]; eastern [Hungary ( $n = 998$ ), Poland ( $n = 1,509$ )]; and western [Germany

( $n = 1,546$ ), the Netherlands ( $n = 1,938$ ), the United Kingdom ( $n = 1,762$ )]. We established quotas for age and gender to approximate the distribution of these characteristics in each country. Participants received modest compensation.

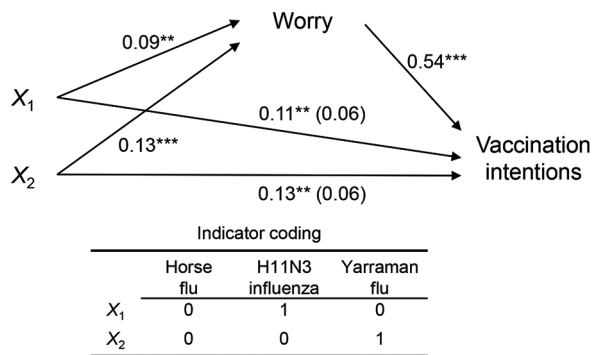
Respondents read a mock news article, ostensibly from an interview with a national health organization of the participant's country, describing the spread of a pandemic influenza strain within their country (online Technical Appendix, <https://wwwnc.cdc.gov/EID/article/23/8/17-0364-Techapp.pdf>). Each article contained information about the spread, symptoms, and severity of the virus and about the development of a vaccine.

Each version of the article referred to the influenza strain by using 1 of 3 randomized labels: 1) "H11N3 influenza," a surface protein label; 2) "horse flu," an animal reservoir label; or 3) "Yarraman flu," an exotic-sounding label (Yarraman is an Australian aboriginal term for "horse"). We used novel labels to avoid associations with and reactions to established influenza labels. The study included additional factors that were cross-randomized with the label factor and are not discussed here.

After reading the article, participants were asked to imagine that the described scenario was actually occurring and then rate the level of their worry about contracting influenza and plans to receive vaccination once a vaccine for this strain of influenza became available. Responses were on 7-point scales; higher values indicated greater worry or vaccination intentions. We tested for main effects of reactions to labels by using 1-way measured analysis of variance (ANOVA) with Bonferroni-adjusted planned contrasts. We used additional 2-way ANOVA tests to determine whether effects of the label manipulation differed across countries. We used the PROCESS macro for IBM SPSS Statistics 23 (IBM, Armonk, NY, USA) to conduct a mediation analysis and test for the effect of labels on vaccination intentions, controlling for worry.

Of 20,138 participants, 16,510 (82.0%) completed the full survey. The average participant age was 46.8 (range 18–99, SD 16.2) years; 49.8% were female.

Participants reported higher levels of worry about contracting the influenza strain when it was reported as "Yarraman flu" (mean 3.86, SD 1.83) or "H11N3 influenza" (mean 3.83, SD 1.82) compared with "horse flu" (mean 3.74, SD 1.86;  $F$  statistic [2–16,339] = 7.73,  $p < 0.001$ ). Participants also reported higher vaccination intentions when the strain was reported as "Yarraman flu" (mean 4.67, 1.99) or "H11N3 influenza" (mean 4.66, SD 2.03) compared with "horse flu" (mean 4.54, SD 2.04,  $F$ [10–16,339] 6.48;  $p = 0.002$ ). The effect of the influenza label on vaccination intentions was mediated by worry (Figure). Despite differences in reports of worry ( $F$ [10–16,339] = 100.07,  $p < 0.001$ ) and vaccination intentions ( $F$ [10–16,384] = 58.27,  $p < 0.001$ ) of participants in the 11 countries, the effects of the influenza label on



**Figure.** Regression coefficients for the effect of influenza labels on worry for infection and intentions for vaccination. Label conditions were dummy coded to estimate the effects of “H11N3 influenza” (X<sub>1</sub>) and “Yarraman flu” (X<sub>2</sub>) labels compared with the “horse flu” label. The effect of influenza labels on vaccination intentions, controlling for worry, is in parentheses. \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

worry ( $p = 0.281$ ) and vaccination intentions ( $p = 0.467$ ) did not significantly interact with country status.

Our results indicate that the choice of disease labels for public communications about outbreaks cannot be made by personal preference. In this study, an animal reservoir label evoked weaker responses from participants than other labels. Although these results could be specific to the animal we chose, using an animal reservoir label may produce greater misconceptions (e.g., exposure to the animal necessary for transmission) that undermine suspicions of risk. Further research is needed to determine whether this effect is context-specific or generalizes to other animal reservoir labels for infectious diseases and whether our findings replicate in a nonhypothetical context.

All authors contributed to the intellectual property of this manuscript, including contributing to study design, interpretation of data, and writing of the report. We have no competing interests to declare. All of the authors have had full access to the data, have seen and approved the submission of this version of the manuscript, and take full responsibility for the integrity of the data, the accuracy of the data analysis, and the manuscript.

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Dr. Scherer is an Associate of Internal Medicine at the University of Iowa. His research focuses on the psychological mechanisms that shape our responses to health risks in order to better design effective health risk communication.

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## Zika Virus Screening among Spanish Team Members After 2016 Rio de Janeiro, Brazil, Olympic Games

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# Effect of Influenza Subtype Label on Worry and Behavioral Intentions: A Multi-Country Experiment

## Technical Appendix

### Scenarios

In this study, participants read a mock news article describing the spread of a pandemic influenza within their country. To test how influenza labels affect worry about infection and vaccination intentions, participants received one of three different labels for the influenza strain described in the mock news article. Specifically, participants received a scenario which described the influenza strain by using either a surface proteins label (i.e., H1N3 influenza), an animal reservoir label (i.e., Horse flu), or an exotic-sounding label (i.e., Yarraman flu). Example scenarios that participants in the United States received are included below. For the purpose of this appendix, labels are in bold text, but appeared in normal font for study participants.

#### Scenario 1: Use of surface protein label - H1N3 Influenza

CDC Reports H1N3 Influenza Infecting the US

The **H1N3 Influenza** has been infecting the US. The number of people reported to have **H1N3 influenza** has risen recently according to health officials at the Centers for Disease Control and Prevention (CDC).

Health officials are confident that this outbreak will be a bad one. “**H1N3 Influenza** is a virus quickly infecting the US,” says Dr. Alexander Dewitt, the lead expert with the CDC. “We are seeing it progress and move from city to city with alarming speed.”

“**H1N3 Influenza** is a severe virus, and people are at risk for serious illness or death,” said Dr. Dewitt. “Although we believe that many people will only have relatively mild to moderate symptoms, we expect to see some severe cases, some of which will lead to death.”

Most of those who have gotten sick have experienced moderate fever with cough and body aches. Symptoms generally go away without medicine. Some extreme cases have required patients seeing a doctor and 1–2 days of hospitalization. These individuals experienced difficulty breathing, sudden dizziness, and severe persistent coughing.

Dr. Dewitt emphasized that the estimates of the symptoms that those with **H11N3 Influenza** will experience are based on the information currently available to health officials.

With a growing number of cases of people getting the virus, Dr. Dewitt promised that the soon to be released vaccine will prevent people from getting **H11N3 Influenza**. Vaccines stop the spread of diseases by using the body's natural response to prevent us from getting sick. Specifically, the **H11N3 Influenza** vaccine will create antibodies, the proteins of the body that identify a virus so the immune system can respond more quickly to **H11N3 Influenza** when it is encountered again.

Dr. Dewitt assured that the vaccine will be safe, effective, and is being tested extensively. “The **H11N3 Influenza** vaccine uses many of the same elements of vaccines from previous flu seasons and is undergoing standard development and testing. We have every reason to believe the vaccine will be effective, and it's the best option available right now to protect people against the **H11N3 Influenza** virus,” said Dr. Dewitt.

“The vaccine is the most effective way we have to prevent the growth of **H11N3 Influenza**,” he said.

Once the vaccine becomes available, Dr. Dewitt urged people to get vaccinated, even if they have questions about their risks of **H11N3 Influenza** or the effectiveness of the vaccine.

## **Scenario 2: Use of animal reservoir label – Horse flu**

### CDC Reports Horse Flu Infecting the US

The **Horse flu** has been infecting the U.S. The number of people reported to have **Horse flu** has risen recently according to health officials at the Centers for Disease Control and Prevention (CDC).

Health officials are confident that this outbreak will be a bad one. “**Horse flu** is a virus quickly infecting the US,” says Dr. Alexander Dewitt, the lead expert with the CDC. “We are seeing it progress and move from city to city with alarming speed.”

“**Horse flu** is a severe virus, and people are at risk for serious illness or death,” said Dr. Dewitt. “Although we believe that many people will only have relatively mild to moderate symptoms, we expect to see some severe cases, some of which will lead to death.”

Most of those who have gotten sick have experienced moderate fever with cough and body aches. Symptoms generally go away without medicine. Some extreme cases have required patients seeing a doctor and 1–2 days of hospitalization. These individuals experienced difficulty breathing, sudden dizziness, and severe persistent coughing.

Dr. Dewitt emphasized that the estimates of the symptoms that those with **Horse flu** will experience are based on the information currently available to health officials.

With a growing number of cases of people getting the virus, Dr. Dewitt promised that the soon to be released vaccine will prevent people from getting **Horse flu**. Vaccines stop the spread of diseases by using the body's natural response to prevent us from getting sick. Specifically, the **Horse flu** vaccine will create antibodies, the proteins of the body that identify a virus so the immune system can respond more quickly to **Horse flu** when it is encountered again.

Dr. Dewitt assured that the vaccine will be safe and effective. “The **Horse flu** vaccine uses many of the same elements of vaccines from previous flu seasons and is undergoing standard development and testing. We have every reason to believe the vaccine will be effective, and it's the best option available right now to protect people against the **Horse flu** virus,” said Dr. Dewitt.

“The vaccine is the most effective way we have to prevent the growth of **Horse flu**,” he said.

Once the vaccine becomes available, Dr. Dewitt urged people to get vaccinated, even if they have questions about their risks of **Horse flu** or the effectiveness of the vaccine.

### **Scenario 3: Use of exotic-sounding label – Yarraman flu**

CDC Reports Yarraman Flu Infecting the US

The **Yarraman flu** has been infecting the US. The number of people reported to have **Yarraman flu** has risen recently according to health officials at the Centers for Disease Control and Prevention (CDC).

Health officials are confident that this outbreak will be a bad one. “**Yarraman flu** is a virus quickly infecting the US,” says Dr. Alexander Dewitt, the lead expert with the CDC. “We are seeing it progress and move from city to city with alarming speed.”

“**Yarraman flu** is a severe virus, and people are at risk for serious illness or death,” said Dr. Dewitt. “Although we believe that many people will only have relatively mild to moderate symptoms, we expect to see some severe cases, some of which will lead to death.”

Most of those who have gotten sick have experienced moderate fever with cough and body aches. Symptoms generally go away without medicine. Some extreme cases have required patients seeing a doctor and 1–2 days of hospitalization. These individuals experienced difficulty breathing, sudden dizziness, and severe persistent coughing.

Dr. Dewitt emphasized that the estimates of the symptoms that those with **Yarraman flu** will experience are based on the information currently available to health officials.

With a growing number of cases of people getting the virus, Dr. Dewitt promised that the soon to be released vaccine will prevent people from getting **Yarraman flu**. Vaccines stop the spread of diseases by using the body's natural response to prevent us from getting sick. Specifically, the **Yarraman flu** vaccine will create antibodies, the proteins of the body that identify a virus so the immune system can respond more quickly to **Yarraman flu** when it is encountered again.

Dr. Dewitt assured that the vaccine will be safe and effective. “The **Yarraman flu** vaccine uses many of the same elements of vaccines from previous flu seasons and is undergoing standard development and testing. We have every reason to believe the vaccine will be effective, and it's the best option available right now to protect people against the **Yarraman flu** virus,” said Dr. Dewitt.

“The vaccine is the most effective way we have to prevent the growth of **Yarraman flu**,” he said.

Once the vaccine becomes available, Dr. Dewitt urges people to be vaccinated, even if they have questions about their risks of **Yarraman flu** or the effectiveness of the vaccine.