



# The influence of health concern on travel plans with focus on the Zika virus in 2016

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## ABSTRACT

Tourists consider many factors, including health, when choosing travel destinations. The potential for exposure to novel or foreign diseases alone can deter travelers from selecting high-risk locations for disease transmission. The 2015–2016 Zika Virus (ZIKV) outbreak in the Americas and Caribbean prompted the World Health Organization (WHO) to declare a Public Health Emergency of International Concern. This study investigated factors that may contribute to travel avoidance to areas experiencing ZIKV transmission while also considering different levels of health concern and awareness among groups with varying demographics. An online survey was administered February 10–12, 2016 to a sample of U.S. residents ( $n = 964$ ). Demographics, information about travel behaviors, and levels of health concern were collected. Ordered logit models were employed to assess the impacts of the ZIKV outbreak on travel planning. Respondents giving higher levels of attention to general health were more likely to avoid travel to areas experiencing ZIKV transmission. It is anticipated that the findings of this study may be of interest to public health officials, healthcare providers, and government officials attempting to mitigate impacts of ZIKV. Disease outbreaks in regions of the world typically frequented by vacation or leisure travelers are particularly problematic due to the increased amount of exposure to disease in an immunologically naïve population that may then contribute to the outbreak through their travel plans. Avoiding travel to destinations experiencing outbreaks of disease due to health concerns may be interpreted positively by the public health community but can have negative economic consequences.

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## 1. Introduction

Personal health has long been recognized as a consideration, or risk factor, for travelers. Concerns include increased exposure to common cold and flu viruses on public transportation or by staying in close quarters with large numbers of people, and locale-specific disease exposure which may not exist in one's home country or region. Depending on the specific destination, health impacts from disease vectors, like mosquitoes, may be a problem (or concern) for even experienced and educated travelers. And, perhaps least mentioned but widespread in impact, are concerns about maintaining physical fitness and obtaining regular exercise. Efforts to cater to health-conscious travelers have driven investment in gyms, fitness equipment, and personal health services by many hotels, resorts, and even modes of transportation – like cruise ships.

According to the United Nations World Tourism Organization (UNWTO, 2015) tourism worldwide contributes 9% of the total GDP (including direct, indirect, and induced impacts). Over half of the total travel reported in 2014 was for the purpose of leisure, recreation, and

holidays (UNWTO, 2015). The Americas was the fastest growing region for tourism in 2014 (UNWTO, 2015). *“The Americas (+8%) saw the highest relative growth across all world regions in 2014, welcoming 13 million more international tourists, increasing the total to 181 million arrivals. International tourism receipts in the region reached US\$ 274 billion in one year, an increase of 3% in real terms. The region increased its share of worldwide arrivals to 16%, while its share of receipts was 22%.”* (UNWTO, 2015).

### 1.1. ZIKV in 2016

ZIKV was declared a Public Health Emergency of International Concern by the World Health Organization (WHO) in February 2016 following reports of a widespread epidemic in the Americas and Caribbean (Petersen et al., 2016). The mosquito-borne arbovirus was first isolated in Africa in 1947 (Dick et al., 1952), but ZIKV was not recognized as important in terms of human health impact until the ZIKV disease outbreak on Yap Island in the Federated States of Micronesia in 2007 (Duffy et al., 2009). Though most of the population of Yap were infected by ZIKV, only mild symptoms of disease were reported, primarily fever, headache, and rash (Duffy et al., 2009).

In 2013 a ZIKV outbreak occurred in French Polynesia that resulted in 29,000 suspected cases of disease (Ioos et al., 2014) and a subsequent

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increase in cases of an auto-immune disease, Guillain-Barré syndrome, which can cause temporary paralysis (Willison et al., 2016). ZIKV continued to spread to other Pacific Islands from 2013 to 2014 (Musso, 2015) and was first detected in Brazil in early 2015 (Campos et al., 2015). The majority of patients with ZIKV infections have no clinical signs of disease. When symptoms do manifest they are most commonly reported to be similar to signs of other arboviral infections, such as rash (90%), arthritis or arthralgia (65%), fever (65%), conjunctivitis (55%), myalgia (48%), headache (45%), and retro-orbital pain (39%) (Buathong et al., 2015). However, more severe clinical signs have been associated with the ZIKV epidemic in Brazil, notably a drastic increase in the number of microcephaly cases detected in fetuses and newborns (Broutet et al., 2016) as well as death of a limited number of patients (Arzuza-Ortega et al., 2016; Sarmiento-Ospina et al., 2016). It is speculated ZIKV induces brain injury in the fetus that results in cell death and brain shrinkage which ultimately results in the diagnosis of microcephaly, which may result in impaired cognitive development.

## 1.2. Health concerns and travel in 2016

The intersection between health concerns and travel is especially apparent during disease outbreaks. Disease outbreaks in regions of the world typically frequented by vacation or leisure travelers may be problematic from an economic standpoint if travel to such destinations is avoided, which is precisely what is recommended by public health officials. Most tourists visit destinations within their own region (UNWTO, 2015), making the Caribbean a sought after destination for visitors from the Americas. Arrivals in the Caribbean were up 6% overall where several locations, including Turks and Caicos Islands, Montserrat, Grenada, Haiti, and the Cayman Islands, all posted doubled-digit increases in arrival numbers (UNWTO, 2015). ZIKV remains a worldwide concern as people travel to/from popular destinations that are within impact zones; one recent example was concern over travel to the 2016 Olympic Games.

Health when traveling has been a long discussed topic which has received attention from the travel industry, health professionals, and marketers. In recent years the growth in travel across the Americas (and specifically in the Caribbean) has intersected the ZIKV outbreak currently being experienced. The objectives of this paper are to (1) examine levels of health concern and awareness across demographics, (2) measure ZIKV awareness across various groups of respondents, and (3) investigate factors that may contribute to travel avoidance to various locales experiencing ZIKV transmission. Improved understanding of the potential relationships between demographics and health concerns of travelers, perceptions of ZIKV, and impacts on travel plans are important for the economies of the Caribbean which depend on tourism, as well as health officials within and outside the region as they seek to address the ZIKV outbreak.

## 2. Data and methods

An online survey with two focus areas, health concern (assessed as an individual's stated level of concern about seven key health issues) and travel, was administered on February 10th through the 12th, 2016. Respondents were identified and contacted through the use of a large opt-in panel database maintained by Lightspeed, GMI. Respondents were targeted to be representative of the U.S. population in terms of gender, income, education, and geographical region of residence according to the U.S. Census (U.S. Census Bureau, 2014) and were required to be 18 years of age or older to participate. In total 964 respondents participated in the survey.

In addition to basic demographics, respondents were asked about their recent travel behaviors as well as their level of concern for seven areas of health. Specific to travel intentions, respondents were asked about their likelihood to avoid travel to Florida, Texas, Puerto Rico, and Caribbean Islands in the next 12 months. The Caribbean and Puerto

Rico were selected for study based on their challenges with the recent ZIKV outbreak, while Florida and Texas were included given their proximity to the outbreak area and potential for eventual concern regarding ZIKV. The seven areas surrounding health concern investigated were physical fitness, heart health, mental health, cancer, flu, antibiotic resistant bacterial infection, and prenatal care. Precisely, respondents were asked, *On a scale of one (I do not give any thought to this at all) to five (I think about this constantly), please rank the level of attention or thought you provide to the following aspects of health and well-being. Please select the number on the scale that best represents your level of attention.* Three categories of health valuation were developed based on responses received, specifically "Does not think about often" represents respondents who gave a rank of 1 or 2, "Thinks about some of the time," are those who gave a rank of 3 and "Thinks about often/constantly" represents those who gave a rank of 4 or 5.

Finally, given the intended focus of this analysis on the intersection of health and travel, the current ZIKV outbreak (2016) was a specific health focus of this analysis. Respondents were asked about their ZIKV awareness, knowledge about the virus and its symptoms, and the prevention measures taken by respondents' households.

Basic summary statistics to questions about respondent demographics, household behaviors surrounding travel, mosquito-borne disease transmission prevention measures, travel experiences, and concern about health factors were completed. Cross tabulations are employed in this analysis to analyze relationships between health concerns and travel.

### 2.1. Ordered logit model

Given the focus of this analysis on assessing the potential impacts of the ZIKV outbreak on travel planning, in particular to affected regions, four ordered logit models were estimated to identify factors related to stated intentions to avoid travel to four different locations: Florida, Texas, Puerto Rico, and the Caribbean. The models were based on the question *At this point in time, how likely are you to avoid travel to the following locations in the coming 12 months due to concerns about the Zika virus on the provided scale of ONE to FIVE?* An ordered logit uses the ranked categories of the Likert scale to create thresholds (Baum, 2006). In this instance the dependent variable  $y$  was established as an ordered categorical dependent variable, with the values of 1, 2, 3, 4, and 5 as the ranked (in order of likeliness to avoid, on a scale of one to five) categories. Using  $k$  to represent thresholds, a rank would be established in the following way *If  $y^* < k_1$  then  $y = 1$ , If  $k_1 < y^* < k_2$  then  $y = 2$  and so on until  $k_4 < y^*$  then  $y = 5$  and  $y^*$  is a latent variable (Baum, 2006).* The probability of each rank outcome  $j$  can then be estimated  $\Pr(y_i = j) = \Pr(k_{j-1} < \beta X_i + u_i < k_j)$  (Baum, 2006). This states that the probability of a particular outcome  $j$  being chosen is dependent on  $\beta X_i$  falling between threshold  $k_j$  and  $k_{j-1}$  for each individual (Baum, 2006). The coefficients from this estimate provide the direction of change and significance but not the magnitude.

A number of dummy variables (two value categorical variables) were incorporated as explanatory variables in the ordered logit models. Male was a dummy where (1) represents being male. Two of the three age groups, *Age 18 to 34* and *Age 35 to 54* were used in the model, while the third category *Age 55 to 88* was the referent group. Region and income were treated similarly with dummy variables created for the *Midwest*, *South*, and *North* regions and the *West* being the referent. *Low income*, and *High income* were included in the logit model as dummy variables (both relative to *Medium income* which was the referent). Education was accounted for by the creation of a two category (dummy) variable which was (1) for those respondents having obtained a college degree and (0) for those who had not. Respondent's level of health concern (or thought devoted to health factors) was summed across the seven health categories investigated (physical fitness, heart health, mental health, cancer, flu, antibiotic resistant bacterial infection, and

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