Research Paper

An empirical evaluation of the determinants of tourist’s hurricane evacuation decision making

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A R T I C L E   I N F O

Article history:
Received 13 February 2013
Accepted 22 October 2013
Available online 27 November 2013

Keywords:
Tourists
Evacuation
Decision-making
Florida
Probit modeling

A B S T R A C T

Tourists are vulnerable in the event of a crisis. This article is focused on examining aspects of tourists that potentially influence whether or not they evacuate in the event of a hurricane. In general the results of this study suggest that individual characteristics (risk belief, connectedness, knowledge, and past experience with hurricanes), travel related variables and the socio-demographic characteristics of tourists influence their decision regarding whether or not to evacuate in the event of a hurricane, with tourists who are not local showing higher risk beliefs regarding hurricanes, with low connectedness and knowledge about hurricanes, without past experience with hurricane impacts, traveling with a larger party, traveling with children, traveling for the first time to the destination, traveling by plane and personal vehicle, older age groups, female, with an annual income more than $125,000 are more likely to evacuate. Managerial implications of the findings are discussed.

1. Background of the study

Over the last decade, the tourism industry worldwide has experienced ample crises ranging from naturally induced crises such as wild fires, tornadoes, earthquakes, tsunamis, and human induced crises such as political unrest and terrorist attacks. The aforesaid crises have contributed to a decline in tourists’ visitation and have had a negative impact on the economy of the tourism industry in multiple places (Pennington-Gray, London, Cahyanto, & Klages, 2011; Schaper, 2012). A VISIT FLORIDA® survey found that 20% of potential visitors were concerned with returning to Florida during 2005s hurricane season, indicating that if all those people stayed away, it would result in a $6.7 billion loss in expenditures (Pain, 2006).

Key West, Florida lost approximately $1.5 million a day from commerce and tourism when an evacuation order was issued during the 2008 hurricane season (Miami Herald, 2009).

Faulkner (2001) and Ritchie (2004) argued that there is a scarcity of research on the crisis phenomenon in the tourism industry, albeit within the last five years there have been a substantial number of research articles published on crises affecting the tourism industry. Publications on tourism crisis management can be seen from two angles. The first angle focuses on the supply side of tourism, while the second angle focuses on the demand side of tourism. Recent publications, however, focus primarily on the supply side of the tourism system and can be further categorized into two major themes. The first theme focuses on the impacts of a crisis on the tourism industry and studies on how the tourism industry, such as destination management organizations, responds to crises (e.g. Carlsten, 2006; Chacko & Marcell, 2007; Chandler, 2004; Cheung & Law, 2006; Cooper, 2005). The second theme examines how tourists might respond effectively to crises. Specifically, research in this area concentrates on crisis management models and attempts to offer the most effective model to save lives and mitigate risks to tourism businesses that can be implemented by destination management organizations (e.g. Evans & Elphick, 2005; Faulkner, 2001; Hystad & Keller, 2006; Ritchie, 2004).
Ritchie (2009) argued that research from the demand side, such as how tourists respond to crises is still lacking and suggested that future researchers examine tourist behavior during crises. This focus on behavior is pivotal to understanding tourist behavior in the event of a crisis in order to effectively design ways to develop assistance to ensure the safety of tourists in the event of a crisis. Furthermore, Phillips and Morrow (2007) contend that tourists are vulnerable in the event of a crisis, with one of the main reasons being that tourists may not speak and/or read the host language and may lack knowledge of the risks that hurricanes present. Hence, tourists may experience difficulty in receiving, interpreting, and responding properly to risk messages. Tourists are often unfamiliar with their surroundings and lack support systems from their home community (Burby & Wagner, 1996; Faulkner, 2001; World Tourism Organization (WTO), 1998). While in unfamiliar environments, tourists may not know who their “protectors” are as they do not know from whom to seek assistance. Thus, the impacts to tourists in risky situations may be greater than to those in the general resident population. Due to the need to better understand tourists’ behaviors in the event of a crisis, this study, unlike previous studies in the area of tourism crisis, will focus on tourists’ behaviors in the event of crisis, specifically on their behaviors in the event of hurricanes.

Hurricanes are one of the most disruptive natural disasters to destinations, not only because of the costs associated with the impacts, but also due to the time full recovery takes following a hurricane strike. According to the National Hurricane Center (NHC) (2006), the 2005 Atlantic hurricane season was considered the most active and harmful season in recorded history in the United States, causing approximately 2300 deaths and over $130 billion in damages. Furthermore, the economic losses associated with hurricanes from fishing, agriculture, commerce, and tourism are long lasting, usually taking several years from which to recover (Lindell & Perry, 2004).

An extensive body of research has identified many factors that influence households’ responses to hurricanes (e.g. Drabek, 1986, Lindell & Perry, 2004; Riad & Norris, 1998). The research has examined gender (Bateman & Edwards, 2002; Dash & Gladwin, 2007; Gladwin & Peacock, 1997), wealth (Burton, Kates, & White, 1993; Viscusi, 1995; Whitehead, 2003, 2005), past experiences related to hurricanes (Burton & Kates, 1996; Peacock, Brody, & Highfield, 2005; Vitek & Berta, 1982), hurricane knowledge (Daniels & Loggins, 2007; Dow & Cutter, 1998) and race and ethnicity (Gabe, Falk, & McCarty, 2005; Niga, Barnshaw, & Torres, 2006).

Unfortunately, little attention has been focused on transient populations such as tourists (Phillips & Morrow, 2007). Consequently, while general findings in hurricane studies have facilitated emergency managers and policy makers to develop plans that make realistic assumptions about the general nature of human behaviors related to hurricanes, such studies may not be sufficient to provide the information that emergency management, policy makers, and the destination management organizations need for specific predictions about the behavior of tourists in their communities.

The few noteworthy contributions which examine tourist behavior during hurricanes were published in the early and mid 1990s and largely by one author (Drabek, 1991, 1993, 1994, 1995, 1996, 1999, 2000) with a focus on evacuation strategies and policies from a supply viewpoint. A recent study conducted by Matyas et al. (2011), Pennington-Gray, Kaplanidou, and Schroeder (2012) and Villegas et al. (2012) were the only studies focused on the tourist population. These studies examined the interplay between tourists’ perceived risks and their likelihood to evacuate, and found that those who perceived higher risk are more likely to evacuate in the event of hurricane warning. This study expands on Matyas et al. (2011) by employing decision theory to examine determinants that influence tourists’ evacuation decision making in the event of hurricanes.

Given the paucity of academic research on tourists’ evacuation behavior and the urgency to conduct such studies, this paper is focused on examining aspects of tourists that potentially influence whether or not tourists evacuate during a hurricane. Specifically, this study is guided by three interrelated questions:

1. What are the effects of a tourist’s individual characteristics on decisions regarding whether or not to evacuate?
2. What are the effects of travel related variables on a tourist’s decisions regarding whether or not to evacuate?
3. What are the effects of socio-demography on decisions regarding whether or not to evacuate?

2. Literature review

In this section we discuss the guiding theory for this study as well as three areas that are presumed to influence tourists’ evacuation decision making: Individual characteristics, travel related variables, and socio-demography.

2.1. Decision theory under uncertainty

As this study intends to examine the decision making of tourists with regard to their evacuation choices, the study employs decision-making theory as a theoretical lens. The decision theory typically can be divided into two major parts: A description of the agent to which the theory applies and normative claims about how the agent should behave.

Under the typical decision theory, the agent in which the theory applies satisfies the following conditions: First, the agent’s belief state at the time can be represented by a probability function over a space of possibilities that indicates the agent’s confidence that the possibility is true, with greater values indicating greater confidence. Second, the agent’s evaluative state at the time that can be represented by a function which assigns positive numbers to elements in the space of possibilities, referred to as a utility. Utilities indicate the extent to which the agent values that possibility of obtaining the act. Higher numbers indicate higher utilities. Third, the agent’s potential acts in a decision situation that can be represented by a unique set of mutually exclusive propositions \(a_1, ..., a_n\) where “\(a\)” can be considered as the proposition that the agent performs the ith available act. Typical decision theory also posits that the agent would only perform a potential act if the utilities of this act are at least as large as the expected utilities of any alternatives. This assertion is also known as utility maximization (Jones, Boushey, & Workman, 2006; Meacham, 2010).

Within decision theory, there are two competing schools of thought regarding individual choice. The first is the rational choice that assumes that individuals behave as if they were acting as pure utility maximizers to deduce patterns of outputs from social systems (Friedman, 1953). The second is bounded rationality that acknowledges psychological restrictions on human decision-making, premised on the assumption that individuals would maximize the utility of alternatives that are available for them at that time. Decision theory has been widely used in order to examine various fields from transportation behaviors (Kitazawa & Batty, 2004), insurance purchasers (Kunreuther & Pauly, 2004) as well as evacuation decision makers (Burton et al., 1993; Letson, Sutter, & Lazo, 2007; Viscusi, 1995).

In tourism literature, decision theory has long been used to examine travel decision-making, purchase behaviors, as well as
factors that influence decisions (Moutinho, 1987; Sirakaya & Woodside, 2005; Woodside & MacDonald, 1994). Woodside and MacDonald (1994) applied decision theory to understand destination choices. In their study they found that often tourist choices of destination are not always rational. The choices are attributed to the interaction of individual preferences and the influences of travel party members. Sirakaya and Woodside (2005) provide a comprehensive development of theories of decision making by tourists. While they argue that decision theory has been frequently used to understand travel behavior, there is still a need to advance current understanding of tourist decision-making by applying the theory to other facets of travel experiences.

Decision theory under bounded rationality expands our understanding of tourist's decision making. During a crisis situation that is characterized by uncertainty, high threats, and a short decision time, individuals often do not have the luxury of time and information to assist them in decision making. Thus, these individuals are more likely to make a decision based on limited options available. Burton et al. (1993) and Vescusi (1995) argued that individuals make choices under the uncertainty of the threat by maximizing their expected utilities. To do so these individuals might be willing to forgo their wealth including their income, capital, and property in order to minimize those threats. Burton et al. (1993) elaborates further by contending that under the threat of environmental hazards, an individual hazard response is influenced by four major elements: Prior experience with the specific hazard, an individual's wealth, their intrinsic characteristics, and their interaction with society.

To date, there is no empirical evidence that the same decision making processes apply to tourists differently than to residents. This is due to tourists lack of ties to the destination and that they are transient populations compared to residents who have resided in the destination and have greater knowledge of the destination. This study specifically focuses on the variables that are assumed to influence tourists' evacuation choices as identified in the evacuation literature which is focused on residents.

2.2. Individual characteristics and evacuation

We defined individual characteristics as multiple internal variables beyond typical socio-demographic variables. Specifically, we focused on four variables: Individual risk belief with hurricanes, level of individual connectedness to hurricanes, hurricane knowledge, and past hurricane experience.


When individuals hold higher perceptions of controllability, they are less likely to perceive that they are at risk (Burby & Wagner, 1996). Similarly, individuals with lower perceptions of the controllability of an event are much more likely to perceive that they are at risk. Consequently, those who are less confident with their ability to overcome risks associated with hurricanes are more likely to perceive higher risks leading to their evacuation decision (Sorensen & Sorensen, 2007; Whitehead, 2003).

Individual risk beliefs have been found to be predictors of future travel behaviors (Sonmez & Graefe, 1998a, 1998b) and also influence the evaluation of destination alternatives and information acquisition (Roehl & Fesenmaier, 1992). Research suggests that specific locations are more risky than other destinations in terms of perceptions of risk by tourists (Sonmez & Graefe, 1998a). For example, destinations which have experienced previous natural disasters (i.e., Miami or Key West) may be perceived as riskier than destinations which have not been hit by past natural disasters (Sonmez & Graefe, 1998b). In addition, Floyd and Pennington-Gray (2004) found that tourists perceived national parks, natural areas and museums to be less risky locations than theme parks. Coastal versus non-coastal areas may have varying levels of perceived risk, particularly as they relate to hurricanes, therefore, in this study risk belief is predicted to positively influence evacuation.

H1. Tourists with higher risk belief regarding hurricanes are more likely to evacuate than those with lower risk belief.

The level of individual connectedness refers to how personally connected an individual feels to an issue (Aldoory et al., 2010; Grunig, 1989; Petty & Cacioppo, 1986; Slater et al., 1992; Siramesh et al., 2007). Typically, the level of individual connectedness can be determined by examining three attributes: Interest, importance, and curiosity that individuals have concerning a specific issue (Greenwald & Leavitt, 1984; Hallahan, 2000; Zaichkowsky, 1985). Past studies on individual connectedness to hurricanes and evacuation predictions have been inconclusive. However, several researchers argue that personal connectedness to hurricanes can elevate perceptions of risk, leading to higher evacuation rates (Burton & Kates, 1964; Vitek & Berta, 1982). Peacock et al. (2005) argued that this occurs because those who are personally connected to hurricanes will be more receptive to warning messages, compared to those who are not personally connected to hurricanes. However, other researchers such as Lindell and Perry (2000) found that those with personal connectedness to hurricanes are resistant to warning messages as they are more likely to perceive that they are in control of the situation, leading to a lower evacuation rate.

H2. Tourists with low individual connectedness to hurricanes are more likely to evacuate than those with higher individual connectedness to hurricanes.

Current knowledge has been found to influence the travel related decision making of tourists (Gursoy & McCleary, 2004; Ratchford, 2001; Vogt & Fesenmaier, 1998), who can gain prior knowledge from their experiences with the destination from the experiences of others, the mass media, and the Internet. Hoogenraad, Eden, and King (2004) assert that independent tourists are more vulnerable to natural hazards as they travel separate from recognized groups and that they often take more risks, while Murphy and Bayley (1989) argue that due to the nature of pleasure travel, tourists tend to dismiss risks and display a low level of natural disaster awareness. Research conducted by Johnston et al. (2002 in Johnston et al., 2007) found that 46% of US visitors were unaware of tsunami warning systems compared to 28% of locals and only 19% of visitors had seen tsunami hazard maps.

Similarly, a study of backpackers in North Queensland Australia found that this group had a low awareness of cyclones, with only 30% receiving information concerning cyclones during their trip, thus leading to an increase in their vulnerability (Hoogenraad et al., 2004). These studies suggest that current hurricane knowledge may influence tourists' decisions regarding evacuation. Those who lack knowledge of hurricanes are more likely to experience a higher risk perception preceding their evacuation choice. Conversely, those who possess a sufficient level of hurricane knowledge tend to be better able to decide in an appropriate manner (Griffin, Dunwoody, & Neuwirth, 1999). Therefore, it is predicted that the level of hurricane knowledge has a negative correlation with choosing to voluntarily evacuate during hurricanes.

H3. Tourists with low hurricane knowledge are more likely to evacuate than those with higher hurricane knowledge.
In the area of hazards, past studies have used past experience as a predictor of several dependent variables ranging from individual perceptions of risk (Griffin, Dunwoody, & Zabala, 1998), information seeking regarding the hazard (Johnson & Meischke, 1993; Lenz, 1984), and evacuation choices (Baker, 1991; Lindell, Lu, & Prater, 2005; Phillips & Morrow, 2007; Whitehead, 2003). Whitehead (2003) contends that the main goal of hurricane evacuations is to alleviate the risk of injury or death and that people who are in flood prone areas have demonstrated a higher likelihood of evacuation than those who are not in at risk areas. Phillips and Morrow (2007) found that having past experience with hurricanes affect residents’ decisions as to whether or not they evacuate. Thus, residents of hurricane-prone regions who have experienced the impacts of hurricanes tend to have a greater familiarity and thus better comprehension of hurricane-related terminology than tourists who have not had prior hurricane experience. It is also important to note that another study by Lindell et al. (2005) found that past experience with hurricanes do not significantly influence evacuation choices. While several studies regarding residents’ evacuation behavior have addressed the relationship between past experience to current evacuation behavior, little analysis has been done within the context of tourism. One study by Matyas et al. (2011) on tourists’ evacuation behavior found a significant relationship between tourists’ past experience with hurricanes and their likelihood to evacuate in the event of hurricane warnings with those who experienced hurricane impacts in the past demonstrating a much lower propensity to evacuate than those who have never experienced a hurricane in the past. They did not, however, specifically ask respondents about the severity of hurricanes that they had experienced in the past and whether or not they were asked to evacuate in the past. Nonetheless, the Matyas et al. (2011) study has helped shed light on the need to examine the relationship between past experiences and evacuation behaviors. In this study it is predicted that tourists with past experience with hurricanes have a positive association with the decision to voluntarily evacuate.

H4. Tourists with past experience with hurricane impacts are less likely to evacuate than those without such experience.

2.3. Travel related variables

This study focuses on the size of the travel party, the number of visits to the destination, the composition of the travel party, and mode of transportation. The tourism literature has found that the travel party size influences travel related decisions such as where to eat, where to stay, and what to do (Decrop & Snelders, 2005). In the context of evacuation, familial size and having a united family are relevant factors, with a larger family size having been found to positively correlate with a higher propensity to evacuate (Sorensen, 2000) with one possible reason being the desire to protect the entire family. Therefore it is predicted that the size of the travel party is positively associated with tourists’ decisions to choose to voluntarily evacuate in order to safeguard all members of the travel party.

H5. Larger travel parties are more likely to evacuate than those with smaller travel parties.

In the resident evacuation literature, the length of residence has also been found to influence evacuation decisions, with longer lengths of stay being correlated with a lower likelihood of evacuation in the event of a potential hurricane strike (Gladwin & Peacock, 1997). Likewise, the tourism literature has also found that those who have never visited the destination before exhibit higher perceptions of risk than those who have been in the destination before (Sonmez & Graefe, 1998b). One possible reason is that those who have previously been in the destination have more familiarity with regard to the destination and may also have developed support systems there. Thus, first time tourists are more vulnerable in the event of a crisis as they lack the requisite hurricane related knowledge. This lack of familiarity may cause higher perceptions of risks associated with hurricanes and lead to an effort to alleviate the uncertainty by evacuating. Therefore, in this study it is predicted that those who have never been in the destination are more likely to evacuate than those who have been in the destination before.

H6. First time tourists are more likely to evacuate than those who are not.

Tourism research has documented the roles of travel party composition in travel related decision making (Decrop & Snelders, 2005; Egelhoff & Sen, 1992; Fesenmaier & Jeng, 2000; Hyde, 2004). The role of children in household may significantly affect decision-making with regard to travel related decisions (Nickerson & Jurowski, 2001). Similarly, the presence of children and the elderly have been found to significantly influence evacuation choices. Dash and Gladwin (2007) and Solis, Thomas, and Letson (2010) found that households with children display a higher propensity for evacuation. One of the reasons is that the social expectation to protect children from any possible danger increases the likelihood of evacuation. However, it is also important to note that the study by Matyas et al. (2011) found that although the presence of children increased perceptions of risk, it did not lead to a higher likelihood of evacuation by tourists. However, they argued that this finding might be caused by the unfamiliarity of the destination and not knowing where to go when an evacuation order is issued. Thus, they called for further examination on the effect of children on evacuation decisions. Several studies such as Solis et al. (2010) and Dash and Gladwin (2007) also found that households with elderly persons showed a lower probability to evacuate. They argued that health issues that might limit mobility or over reliance on personal experience or knowledge might discourage the elderly to evacuate. For those who travel with elderly, other travel members may need to accommodate elders needs that might decrease the likelihood of evacuation. Based on prior studies, this study predicts that the presence of children in the travel party will increase the likelihood of evacuation, while the presence of elderly will decrease the likelihood of evacuation.

H7. Those who travel with children are more likely to evacuate than those without children.

H8. Those who travel with elderly are less likely to evacuate than those without.

Access to transportation has consistently been determined to be a factor that influences hurricane evacuation decision making among residents, with those who have access to transportation being more likely to evacuate than those without access (Solis et al., 2010). With regard to tourists however, Matyas et al. (2011) found that tourists who fly to the destination and those who rent vehicles in the destination exhibit lower rates of evacuation than those who do not fly or rent a vehicle in the destination. In this study, those who fly to the destination and those with personal vehicles are predicted to have a positive association with evacuation likelihood, while those with rental vehicles are predicted to have a negative association.

H9. Tourists who fly to the destination are less likely to evacuate than those who do not fly.

H10. Tourists who rent a vehicle in the destination are less likely to evacuate than those who do not.
2.4. Socio-demography and evacuation

Past studies on hurricane evacuation have consistently utilized demographics as a factor in predicting evacuation choices ranging from ethnicity, age, gender, education, and wealth, with conflicting results (Baker, 1991; Dow & Cutter, 1998; Lindell et al., 2005; Solis et al., 2010; Whitehead et al., 2000). Dow and Cutter (1998) found no differences in factors such as race, gender between evacuees and non-evacuees, while other researchers (Bateman & Edwards, 2002; Dash & Gladwin, 2007; Gladwin & Peacock, 1997) found the aforesaid factors to be significant in influencing evacuation decisions.

With regard to the influence of tourists’ socio-demographic variables to their evacuation choices, Matyas et al. (2011) found that international tourists in coastal destinations are more likely to evacuate than domestic tourists. One plausible explanation was that international tourists tend to be less familiar with the destination compared to domestic tourists and coastal destinations are considered risky destination with regard to hurricanes. Furthermore, the study also found a significant relationship between a tourist’s age and the likelihood of evacuation with younger tourists being more likely to evacuate than tourists aged 50 or higher, although these tourists demonstrated the highest perception of risks, which is consistent with previous studies (Baker, 1979; Drabek, 1986; Eisenman, Cordasco, Asch, Golden, & Glik, 1997).

The same study also found that female tourists have a relatively higher risk propensity and are more likely to evacuate than males in the event of a hurricane warning. In addition, Matyas et al. (2011) also found that tourists traveling in their own vehicle indicate a higher evacuation likelihood and perception of risk than those who did not travel in their own vehicle. These findings are parallel with previous studies regarding residents’ evacuation decisions (Dow & Cutter, 2002; Lindell et al., 2005). Nonetheless, as Matyas et al. (2011) were focused on seeking relationships between tourists’ socio-demographic characteristics and their evacuation choices, further study needs to be conducted to examine the causality of tourists’ socio-demographic variables with respect to their evacuation choices as relationship does not assume causality (Agresti & Finley, 2009).

The effect of race on the evacuation decisions of residents have been examined by several researchers (e.g. Bateman & Edwards, 2002; Solis et al., 2010). The studies consistently found that African Americans are less likely to evacuate than Caucasians. One reason is that African Americans often demonstrate a lack of trust toward governments that might discourage them from evacuating (Solis et al., 2010). Likewise, as evacuation might trigger unexpected expenses such as rebooking flights, transportation, and meals, having discretionary income that can be accessed during evacuation might increase the likelihood of evacuation. Additionally, we posit that international tourists are more likely to evacuate than domestic tourists due to unfamiliarity and knowledge regarding the destination and hurricanes in general.

Based on the literature, the hypotheses for this study were specified as followed:

**H11.** Tourists who take personal vehicles to the destination are more likely to evacuate than those who do not.

**H15.** Tourists with higher income are more likely to evacuate than those with lower income.

**H16.** International tourists are more likely to evacuate than tourists from Florida.

3. Methods

3.1. Sample and sampling frame

The population of this study was tourists who were currently visiting Florida. This study utilized an intercepting approach in data collecting to sample tourists. In this study, a tourist was defined as “any person who participates in trade or recreation activities outside the county of his or her permanent residence or who rents or leases transient living quarters or accommodations” (Florida Statue 125.0104(3)(a)). Screening questions were utilized to ensure the eligibility of the respondents. To maximize the randomness of participants, the survey administration used every nth formula. Every third eligible tourist in each site was approached and asked to complete the survey after verifying their eligibility.

3.2. Study design

This study used a stated preference survey to elicit tourists’ evacuation decisions. The use of stated preference surveys allowed elicitation of evacuation decision-making choices based on multiple hypothetical hurricane scenarios (McKelvey & Zavoina, 1975; Smith, 1990; Solis et al., 2010). Data collection for this study was conducted in August-September 2011 during the Atlantic hurricane season based on the preposition that during the hurricane season, people are more likely to cognitively ponder and seek information about hurricanes. Surveys were administrated in two sites in Orlando and Fort Lauderdale Beach, Florida.

Students were hired to administer and intercept surveys in each site. Prior to the actual survey administration, training was conducted for student surveyors. A pilot study in the form of a focus group and qualitative interviews was administered to validate the findings and the design of the survey instrument as well as the time needed to complete the survey to minimize any potential systematic errors (Dillman, Smyth, & Christian, 2009). The survey took approximately 25 min to complete.

3.3. Operationalization

There were sixteen independent variables and one dependent variable in this study. The independent variables were: Risk-specific beliefs, individual connectedness to hurricanes, current knowledge, hurricane past experience, size of travel party, prior visit to destination, presence of children, presence of elderly persons, the use of an airplane, rental vehicles, personal vehicles, gender, age, ethnicity, income, and place of residency. The evacuation decision was the dependent variable. Table 1 summarizes the variables and their measurements.

To elicit the evacuation choice, eight hypothetical hurricane scenarios were developed, with each containing a combination of three attributes, each with two levels. The attributes and the levels were: Projected hurricane path (passing through the destination and offset the destination), projected intensity at landfall (category 1 and category 4) and time to the destination (48 h and 36 h). Each respondent was given 4 scenarios to evaluate, then they were asked to state their choice of evacuation for a given scenario using a 5 point Likert scale with 1 = most likely to stay to 5 = most likely to evacuate. Fig. 1 illustrates the scenario used to elicit respondents’ likelihood of evacuation.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement</th>
<th>Adapted from</th>
</tr>
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<tbody>
<tr>
<td>Individual characteristic</td>
<td></td>
<td></td>
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<tr>
<td>Risk specific beliefs</td>
<td>Four statements using a 5-point Likert scale (strongly disagree to strongly agree) asking respondents’ perception on hurricanes.</td>
<td>Rohrmann (2000)</td>
</tr>
<tr>
<td>Individual connectedness to hurricanes</td>
<td>Three statements measuring the level of individuals’ interest, importance, and curiosity with regard to hurricanes with a 5-point Likert scale.</td>
<td>Major (1998)</td>
</tr>
<tr>
<td>Hurricane knowledge</td>
<td>Four T/F questions about hurricanes.</td>
<td>Matyas et al. (2011)</td>
</tr>
<tr>
<td>Past hurricane experiences</td>
<td>One Y/N question about past experiences with hurricane impacts.</td>
<td>Solis et al. (2010)</td>
</tr>
<tr>
<td>Travel-related</td>
<td></td>
<td></td>
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<tr>
<td>Size of travel party</td>
<td>One Y/N question asking the number of travel party.</td>
<td>Decrop and Snelders (2005)</td>
</tr>
<tr>
<td>First visit to destination</td>
<td>One Y/N question asking whether or not a respondent has been to the destination before.</td>
<td>Sonmez and Graefe (1998b)</td>
</tr>
<tr>
<td>Presence of children</td>
<td>One Y/N question asking the presence of children in the travel party.</td>
<td>Nickerson and Jurowski (2001)</td>
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<tr>
<td>Presence of elderly</td>
<td>One Y/N question asking the presence of elderly in the travel party.</td>
<td>Dash and Gladwin (2007)</td>
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<tr>
<td>Plane</td>
<td>One Y/N question asking whether or not the respondent flew to the destination.</td>
<td>Matyas et al. (2011)</td>
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<tr>
<td>Rental vehicle</td>
<td>One Y/N question asking whether or not the respondent rents a vehicle in the destination.</td>
<td>Matyas et al. (2011)</td>
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<tr>
<td>Personal vehicles</td>
<td>One Y/N question asking whether or not the respondent uses personal vehicles in the destination.</td>
<td>Matyas et al. (2011)</td>
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<tr>
<td>Socio-demography</td>
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<td>Gender</td>
<td>One question asking the respondent’s gender.</td>
<td>Solis et al. (2010)</td>
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<tr>
<td>Age</td>
<td>One question asking the respondent’s age.</td>
<td>Solis et al. (2010)</td>
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<tr>
<td>Ethnicity</td>
<td>One question asking the respondent’s ethnicity.</td>
<td>Solis et al. (2010)</td>
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<tr>
<td>Income</td>
<td>One question asking the respondent’s income.</td>
<td>Whitehead et al. (2000)</td>
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<tr>
<td>Place of residence</td>
<td>One question asking the respondent’s place of residence.</td>
<td>Matyas et al. (2011)</td>
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<tr>
<td>Dependent variable</td>
<td></td>
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<tr>
<td>Evacuation decision</td>
<td>A 5-point Likert scale on the likelihood to evacuate. (most likely to stay to most likely to evacuate)</td>
<td>Whitehead et al. (2000)</td>
</tr>
</tbody>
</table>

**Hurricane 3-day Forecast**

You are in the middle of your trip. The star on the map indicates your current location. This is expected to be a Category 1* hurricane within your location.

*Sustained winds 74-95 mph or 119-153 km/hr

Fig. 1. Example of hypothetical hurricane scenario.
3.4. Data analysis

Data analysis for this study involved two stages. First, descriptive statistics were performed on the variables, which allowed for a closer look at the nature of the data pattern. Next, in the second stage, multivariate analysis was performed. This study employed an ordered response model (McKelvey & Zavoina, 1975) procedure to relate all individual characteristics and evacuation choices. As the responses to evacuation choices were measured using a Likert scale (1–5), an ordered probit model was employed. The ordered probit model recognizes the inherent ordering in the outcome variables of interest and allows for calculation of the probability of each level of outcome as a function of explanatory factors. In the ordered probit model, a positive parameter indicates that the corresponding factor is associated with a higher likelihood of evacuation and a negative parameter indicates the opposite effect. The beta values and the odd ratios are the two main ways in which people typically report the main effects of the ordered response model (McKelvey & Zavoina, 1975). However, unlike logistic regression, the ordered probit model does not produce odd ratios. The odd ratio of ordered probit model was obtained by taking the exponent of the beta coefficient. The parameters of the model were estimated using the maximum likelihood estimation.

We focused on one model with all potential explanatory variables rather than multiple models with subsets of variables, as our goal was to develop a descriptive model and not necessarily a predictive model. Therefore, assessing accuracy in prediction was not a focus. The next step of the study would be further data collection with more samples. Future studies could then use the model to do predictive assessments with the new data sets. It is believed that this provides a better sequence of testing rather than splitting the data randomly into two samples and conducting cross validation with the same dataset.

We used a main effect model to calculate the effect of each variable while holding the other variables constant. Using one model with all potential explanatory variables reduces the risk of one variable picking up the effect of another variable due to internal correlations. For instance, if people with children are generally more risk averse, and one of the two is excluded in the model, then this relationship is not accounted for in the final model. However, if both variables are included in the model and both variables are significant, it is expected that each variable has picked up the “true” effects of each variable. Prior to estimating the model, the dataset was converted from a person-based data set to a scenario-based data set to better reflect choices based on hypothetical hurricane scenarios. A statistical analysis was performed using the SPSS 18 package.

4. Results

4.1. Profile of the respondents

A total of 632 eligible tourists were approached in all sites. Five hundred and forty four agreed to participate (response rate = 86%). Out of the total of 544 completed surveys, 533 were deemed usable due to the completeness of the responses, and therefore were used for this study. Out of 533, females encompassed 56%. Domestic tourists from outside of Florida encompassed 50% of the sample, followed by international tourists (38%) and domestic tourists from Florida (12%), with a median travel party of three people in the group. The youngest respondent’s age was 20 years old and the oldest was 88, with a median age of 44. More than half of the respondents (54%) indicated that they have been in the destination before. A majority of respondents did not travel with children (64%) and without elderly persons (79%) in their travel party. Caucasians represented the majority of the sample (69%) followed by Hispanic (12%) and African Americans (8%). Forty four percent of respondents earned $50,000 to $99,000 annually. A comparison with the actual profiles of Florida’s tourists indicated that while the sample was compatible, females were overrepresented by 4% (Florida Department of Transportation, 2012) and international tourists by 22% (Visit Florida®@, 2012). These discrepancies were considered in the managerial implication. Table 2 outlines the descriptive information about the respondents.

A reliability test was employed for “risk belief” and “individual connectedness to hurricanes” items to ensure the consistency of the construct measurements. The overall Cronbach alpha for risk belief was 0.91, while the overall Cronbach alpha for “individual connectedness to hurricanes” was 0.90, higher than a minimum value of 0.70 (Zinbarg, Revelle, Yovel, & Li, 2005) that indicated a high consistency among items in each scale. Consequently, a single value was calculated from each scale to represent individual aggregate “risk belief” and “individual connectedness to hurricanes.” The mean for aggregate risk belief was 3.2 (S.D. = 1.0), while the mean for overall individual connectedness to hurricanes was 2.4 (S.D. = 1.0) in a 5-point Likert scale to indicate that in average respondents had medium risk belief regarding hurricanes and low individual connectedness to hurricanes with hurricanes. With regard to knowledge of hurricanes, an aggregate score was calculated based on respondents’ responses to four hurricane related questions. The overall mean score for hurricane knowledge was 1.5 (S.D. = 1.5) with 4 as a maximum score, which indicated overall low hurricane knowledge among participants.

4.2. Results of ordered probit model

As one person responded to four different scenarios, the sample for the ordered probit model was 2137. The −2 Log likelihood at convergence was 4246.393 ($\chi^2 = 524.080$, df = 27, sig. 0.001)
indicating a significant improvement from the baseline model. The model with all independent variables accounted for 23% of the variance in the evacuation likelihood. As our intent was to develop a descriptive model, the percentage of variance explained reflected how the aggregate performance of the model is likely to be should we undertake a predictive assessment. Table 3 outlines the results of the ordered probit model.

### 4.2.1. Individual characteristics

The ordered probit model indicated that there were significant effects of individual risk belief with regard to hurricanes, individual connectedness to hurricanes, hurricane knowledge, and their past hurricane experiences in predicting evacuation decisions. Those with higher risk beliefs with regard to hurricanes were more likely to evacuate than those with lower risk belief (β = 0.07) that upheld Hypothesis 1. The odd ratio of risk belief was 1.07 suggesting that for one unit increase in risk belief, the likelihood of evacuation would increase by 1.07.

Two individual characteristics, individual connectedness to hurricanes with hurricane topics and hurricane knowledge also negatively affected the likelihood of evacuation, β = −0.09 and β = −0.09 respectively. Thus, it upheld Hypothesis 2 and 3. For each one unit increase in the individual connectedness to hurricanes scale the evacuation likelihood declined by 92. Likewise for one unit increase in the hurricane knowledge scale, the evacuation likelihood declined by 92.

Past hurricane experience contributed to the decrease of evacuation likelihood (β = 0.49). The contribution of this variable in predicting likelihood of evacuation was found to be very significant, with having past hurricane experience decreasing the evacuation likelihood by 61. As past hurricane experience showed negative association, Hypothesis 4 was supported.

### 4.2.2. Travel related variables

With regard to travel related variables, the ordered probit model indicated that the size of travel party, first visit, presence of children, presence of the elderly, and modes of transportation used all had significant effects on evacuation likelihood. The size of travel party was found to have a positive effect on evacuation likelihood (β = 0.09) with odd ratio of 1.09, that upheld Hypothesis 5. This indicated that the larger the travel party, the higher the likelihood to evacuate.

Those who have never been in the destination before showed a higher propensity to evacuate than those who visited the destination for the first time (β = 0.24). The odd ratios indicated that those who were first time tourists were 1.27 times more likely to evacuate than those who were not first time visitors. With this finding, Hypothesis 6 was upheld.

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**Table 3**

Result of the ordered probit model.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Parameter estimate</th>
<th>Odd ratio</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual characteristic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1. Risk belief</td>
<td>0.07</td>
<td>1.07</td>
<td>0.008*</td>
</tr>
<tr>
<td>H2. Individual connectedness to hurricanes with hurricane topics</td>
<td>−0.09</td>
<td>0.92</td>
<td>0.003*</td>
</tr>
<tr>
<td>H3. Hurricane knowledge</td>
<td>−0.09</td>
<td>0.92</td>
<td>0.001*</td>
</tr>
<tr>
<td>H4. With past hurricane experience (ref. = without)</td>
<td>−0.49</td>
<td>0.61</td>
<td>0.001*</td>
</tr>
<tr>
<td><strong>Travel – related</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5. Number of travel party</td>
<td>0.05</td>
<td>1.05</td>
<td>0.001*</td>
</tr>
<tr>
<td>H6. First visit to destination (ref. = no)</td>
<td>0.24</td>
<td>1.27</td>
<td>0.001*</td>
</tr>
<tr>
<td>H7. With children (ref. = without)</td>
<td>0.16</td>
<td>1.17</td>
<td>0.007*</td>
</tr>
<tr>
<td>H8. With elderly (ref. = without)</td>
<td>−0.2</td>
<td>0.82</td>
<td>0.002*</td>
</tr>
<tr>
<td>H9. Plane (ref. = no)</td>
<td>0.5</td>
<td>1.65</td>
<td>0.001*</td>
</tr>
<tr>
<td>H10. Rental vehicle (ref. = no)</td>
<td>−0.15</td>
<td>0.86</td>
<td>0.014*</td>
</tr>
<tr>
<td>H11. Personal vehicle (ref. = no)</td>
<td>0.25</td>
<td>1.28</td>
<td>0.002*</td>
</tr>
<tr>
<td><strong>Socio-demography</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H12. Female (ref. = male)</td>
<td>0.24</td>
<td>1.27</td>
<td>0.001*</td>
</tr>
<tr>
<td>H13. Age</td>
<td>0.01</td>
<td>1.01</td>
<td>0.001*</td>
</tr>
<tr>
<td>H14. Ethnicity (ref. = Caucasian)</td>
<td>−0.02</td>
<td>0.97</td>
<td>0.787</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.12</td>
<td>1.13</td>
<td>0.191</td>
</tr>
<tr>
<td>Other</td>
<td>0.07</td>
<td>1.07</td>
<td>0.426</td>
</tr>
<tr>
<td>H15. Income (ref. = &lt; 24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125 &lt;</td>
<td>0.32</td>
<td>1.37</td>
<td>0.019*</td>
</tr>
<tr>
<td>100–124.9</td>
<td>0.17</td>
<td>1.18</td>
<td>0.204</td>
</tr>
<tr>
<td>75–99.9</td>
<td>0.04</td>
<td>1.03</td>
<td>0.767</td>
</tr>
<tr>
<td>50–74.9</td>
<td>−0.04</td>
<td>0.96</td>
<td>0.749</td>
</tr>
<tr>
<td>35–49.9</td>
<td>0.13</td>
<td>1.14</td>
<td>0.346</td>
</tr>
<tr>
<td>24–34.9</td>
<td>−0.07</td>
<td>0.93</td>
<td>0.658</td>
</tr>
<tr>
<td>H16. Place of residence (ref. = Florida)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International</td>
<td>0.36</td>
<td>1.43</td>
<td>0.001*</td>
</tr>
<tr>
<td>Domestic outside Florida</td>
<td>0.24</td>
<td>1.28</td>
<td>0.003*</td>
</tr>
<tr>
<td><strong>Thresholds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evacuate = 1</td>
<td>−0.54</td>
<td>−</td>
<td>0.007</td>
</tr>
<tr>
<td>Evacuate = 2</td>
<td>−0.02</td>
<td>−</td>
<td>0.898</td>
</tr>
<tr>
<td>Evacuate = 3</td>
<td>0.75</td>
<td>−</td>
<td>0.001</td>
</tr>
<tr>
<td>Evacuate = 4</td>
<td>1.46</td>
<td>−</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Log likelihood at convergence (n = 2137) = −2.496.395 (χ² = 524.080, df = 27, sig. 0.001)

Pseudo R² Nagelkerke = 0.23

Ref. = reference group.

* p < 0.05.
A composition of travel party yielded interesting results. Those with children were 1.17 times more likely to evacuate than those without children ($\beta=0.16$) which found support for Hypothesis 7. The presence of elderly individuals in the travel group affected evacuation likelihood with those with elderly being 82 times less likely to evacuate than those without the presence of elderly in their travel group ($\beta=-0.20$). Therefore Hypothesis 8 was upheld. Mode of transportation was also found to significantly affect evacuation likelihood with airplane and personal vehicle usage specified to have positive effects $\beta=0.50$ and $\beta=0.25$ while the use of rental vehicles was specified to have a negative effect $\beta=-0.15$. The odd ratio indicated that those who flew to Florida were 1.65 times more likely to evacuate than those who did not fly to Florida. Those who utilized personal vehicles were 1.28 times more likely to evacuate than those who did not use personal vehicles. Interestingly, those who rented vehicles were 0.86 times less likely to evacuate than those who did not rent vehicles. Thus Hypothesis 9 was not supported, while Hypothesis 10 and 11 were supported.

4.2.3. Socio-demography

The results of the ordered probit model indicated that females were 1.27 times more likely to evacuate than males ($\beta=0.24$), which provided support for Hypothesis 12. However, the model indicated that the older the tourist was the more likely this tourist was to evacuate ($\beta=0.01$). The odd ratio indicated that for one unit increase in age, the evacuation likelihood increased by 1.01. This finding contradicted the findings in Hypothesis 13.

The result of the model did not find support for Hypothesis 14. In this study, race and ethnicity were not found to significantly affect the likelihood of evacuation. With regard to income, only those who earned more than $125,000 in annual household income were found to vary significantly such that they were 1.37 times more likely to evacuate than those who earned less than $24,000 annually. Therefore, Hypothesis 15 was upheld. Likewise, the residence of origin of tourists was found to positively affect evacuation likelihood. International tourists were 1.43 times more likely to evacuate than those who resided in Florida ($\beta=0.36$), while those who were from outside Florida were 1.28 times more likely to evacuate than those who were from Florida ($\beta=1.28$). This finding provided support to uphold Hypothesis 16.

5. Discussion

The use of decision theory under uncertainty and bounded rationality allowed for a detailed examination of the determinants of tourists’ evacuation. By applying the theory to the estimated model, it can be argued that the decision by the tourist regarding whether or not to evacuate is a dynamic complex phenomenon. The ordered probit model yields interesting results. Most hypotheses were upheld. Three hypotheses were not upheld: Hypothesis 9, 13, and 14. Those were the use of plane, effects of age, and race and ethnicity on evacuation likelihood. Variables associated with individual characteristics (i.e. risk belief, individual connectedness to hurricanes with hurricane, hurricane knowledge, and past hurricane experience) all have significant effects, with risk belief with hurricanes having a positive association with evacuation likelihood, while other variables including past experience, individual connectedness to hurricanes, and hurricane knowledge all having negative associations.

The positive association of individual risk belief to evacuation is explicable as risk belief reflects personal belief on controllability and optimism bias (Rohrmann, 1995, 1999). Risk belief also reflects an individual’s level of confidence to overcome uncertainty (Quintal et al., 2010). Therefore, it is understandable that individuals with higher risk belief will feel more vulnerable and perceive less controllability when exposed to hurricane risks. As these individuals feel more threatened with hurricane risks, they would then prefer to leave the destination when hurricane warnings are issued to alleviate uncertainty (Sorensen & Sorensen, 2007). Likewise, higher individual connectedness with a certain topic has been consistently found to increase one’s self-confidence (Aldoory et al., 2010; Grunig, 1989), and therefore makes one less susceptible to external threats. As predicted, tourists with low individual connectedness to hurricanes showed a higher likelihood to evacuate than those with greater individual connectedness to hurricanes.

Additionally, the negative association of hurricane knowledge and evacuation likelihood indicated that those with higher hurricane knowledge are less likely to evacuate than those with low hurricane knowledge. One possible explanation is that level of knowledge of hurricane impacts and its risk help the person in their decision making with regard to evacuation. Sufficient knowledge about hurricanes will allow the individual to make a better decision, instead of allowing him or herself to be susceptible to external threats (Hoogenraad et al., 2004). Individuals are often based on their own knowledge to make a decision in a risky situation (Griffin et al., 1999). The samples for this study indicated that most of them have low knowledge with regard to hurricanes that might be resulted due to the nature of the tourist population. The effect of knowledge was consistent with what was found in past research, with leisure travelers demonstrating a low level of natural disaster awareness (Murphy & Bayley, 1989; Johnston et al., 2007). This study only used four questions that were designed to measure the level of hurricane knowledge that may affect the quality of responses. A better set of questions may be needed to fully capture the effect of hurricane knowledge on evacuation.

The result of the order probit model on risk belief, individual connectedness to hurricanes, and hurricane knowledge suggests the need to increase tourists’ self-confidence. Increasing individual confidence can be done in various ways. One possible way is to increase one’s knowledge level of hurricanes. As most tourists in this study indicated that they have low individual connectedness to hurricanes and minimal hurricane knowledge, it is suggested that activities aimed at increasing hurricane awareness among tourists is needed. This may include creating hurricane information in multiple formats that are easy to access. In this study past hurricane experience shows that those without past experience with hurricane impacts are more likely to evacuate than those that experienced hurricane impacts in the past. This finding was consistent with the Matyas et al. (2011) study. This is an interesting finding as most studies on residents and their evacuation behaviors indicate that past hurricane experience has no influence (Lindell et al., 2005) or positive association (Riad, Norris, & Ruback, 1999; Solis et al., 2010). One possible explanation is that people often used past experiences as a reference to make a decision in the same situation (Johnson & Tversky, 1983). For those without past experiences regarding the impacts of a natural disaster, past studies have found that these individuals would create a reference based on social cues on which to base their decisions to alleviate uncertainty (Major, 1998) and that those without past experiences have consistently indicated higher perceived vulnerability as they are uncertain about what to do in the event of natural disasters (Griffin et al., 1998). Therefore, it is understandable that tourists without past experiences with hurricane impacts are more likely to evacuate than those with hurricane experience as they felt that they were more vulnerable in the event of hurricanes.

Results of an ordered probit model also indicate the roles of travel related variables in predicting the likelihood of evacuation. As predicted, the larger the travel party the more likely tourists are to leave the destination in the event of a hurricane. One plausible
explanation is that with more people in the group, one will not only consider his or her own safety but also other individuals in the group. With regard to the result of the presence of children, the findings support the pre-specified hypothesis. As predicted, the presence of children was found to increase the likelihood of evacuation. Moreover, it was interesting to note that those who travel with elderly persons are more likely to remain in the destination, which is parallel with prior studies regarding residence evacuation (Gladwin, Gladwin, & Peacock, 2001). One possible explanation is seniors are at greater risk for health problems which could be exacerbated during evacuation. Local destination management organizations need to establish a system to respond to tourists who may have disabilities or are not as mobile. Contrary to widely held expectations, those who traveled by air and those who used their own vehicle were more likely to evacuate than those who rented a vehicle. One possible explanation is that those who come to Florida by plane feel more vulnerable than those who do not take an airplane. These are more likely to be international tourists and tourists from outside of Florida.

The findings with regard to owning a personal vehicle are parallel with Matyas et al. (2011), such that those with personal vehicles are more likely to evacuate than those without a personal vehicle. In addition, the findings also confirm prior studies of resident evacuation behaviors that argue that access to vehicles is an important factor in dictation evacuation likelihood, with those with access demonstrating a higher likelihood of evacuation than those without access (Eisenmann et al., 1997). One possible explanation is that concern over potential traffic associated with evacuation may motivate tourists who have access to personal vehicles to leave the destination as soon as possible in order to avoid traffic. As perception over potential traffic may play a role to both motivate tourists to leave the destination or to stay in the destination, it is essential to inform tourists of potential traffic information, main evacuation routes as well as secondary evacuation routes. One notable issue with hurricane evacuation is "shadow evacuation" (Wolshon, Urbina, Wilmot, & Levitan, 2005), where those who have not been ordered to evacuate decide to evacuate, contributing to major traffic in the interstate system. While the state of Florida has done well in posting evacuation route signs along evacuation routes, tourists who are not familiar with the routes and procedures may still need more information regarding evacuation routes.

The findings related to socio-demography were also noteworthy. With regard to gender, the findings of this study were consistent with several past studies that found females to demonstrate a higher propensity to evacuate than males (Lindell et al., 2005; Riad et al., 1999). This suggests that males and females view evacuation differently. In addition, we also believe that the difference is also due to socially constructed gender roles in other factors that influence the intention and capacity to evacuate. This may include but not limited to care-giving roles and perception of subjective risk. Due to the limitation of our data, ensuing research should examine more thoroughly gender differences in risk exposure and perceptions as well as their corresponding influences on the decision to evacuate.

The significance of the age of the tourist in predicting the likelihood of evacuation is parallel with Matyas et al. (2011). One possible explanation is that younger tourists have greater access to "evacuation incentives" (Perry, Lindell, & Greene, 1981). Evacuation incentives are factors that would seem to increase the probability that a threatened individual will comply with evacuation warnings, for instance greater mobility and greater access to transportation. Nonetheless, further research needs to explore more thoroughly the effect of age on evacuation decision. The findings indicated that race and ethnicity were not significant factors of the likelihood to evacuate, which is consistent with the findings by Dow and Cutter (1998) and Baker (1991). More recent studies however have found that race and ethnicity does affect evacuation rates with Caucasian being more likely to evacuate than African Americans (Elder et al., 2007; Pennington-Gray et al., 2012). This discrepancy may be due to the nature of our sample; however further research is needed to confirm this finding. As a transient population, tourists have different connections with the destination compared to residents who reside in the destination and that other variables better explain the intention to evacuate than ethnicity.

With regard to income, this finding partially supports the findings of previous studies on residents' evacuation behaviors (Solis et al., 2010) with higher incomes being associated with a greater likelihood to evacuate. This study also found that only tourists with incomes of more than $125,000 are more likely to evacuate than those who earned less than $24,000. One possible explanation is that changing travel plans often requires a substantial amount of money for related expenses such as changing flights and accommodation plans which could exceed their allotted budget. Therefore, it is understandable that those with substantially higher incomes are more likely to leave.

With regard to residence of origin, this study found that international tourists demonstrated a higher propensity to evacuate than those from other states and from Florida. This is consistent with the findings of Matyas et al. (2011). One possible explanation is that the proximity of residence has an effect on the familiarity of hurricanes. International tourists may not be familiar with hurricanes and perceive the threat differently than those who reside in Florida. Therefore, international tourists are more likely to leave the destination to alleviate uncertainty. Since most international tourists flew to Florida, it is understandable that the findings also reflect the finding on the use of airplanes with those who flew to Florida showing a higher likelihood of evacuation than those who do not travel by air. This suggests the need to provide educational information regarding hurricanes and evacuation orders. Such information should be made available in multiple languages to accommodate international tourists. International tourists are very vulnerable in the event of a hurricane evacuation, as they may not know what to do and how to seek information regarding the evacuation due to language and cultural barriers. Therefore, local Destination Management Organizations need to work with accommodations, policy makers and local emergency management organizations to ensure their awareness and safety.

6. Managerial implications

With regards to managerial implications, the results obtained in the estimated model may be a useful tool to identify the willingness to evacuate by broad tourist groups. This information may help destination management organizations and emergency management organizations in Florida to target resources more efficiently, focusing not only on groups of tourists with higher risks but also on those groups with a lower probability to evacuate.

Due to the background of tourists, who are not from the destination, the design of messages could be improved. For example, from this study, age was found to be a significant predictor of evacuation decision, thus, choosing age-appropriate warning characteristics by tailoring the physical characteristics of messages to compensate for age-related changes in perception is recommended.

For visual messages targeted at the elderly, typographical characteristics of text can be enhanced, such as utilizing san serif fonts such as Helvetica which has been found to increase text legibility for elderly (Hartley, 1999). Likewise, for auditory
messages, they need to be broadcast at frequencies that are not affected by noise-induced loss so that elderly can comprehend the message better. In addition, sometimes fast moving text-crawlers on the television screen may be subject to glare and use small text size and as such, international tourists who may not speak English may find it difficult to comprehend the content of the message. Slower movement and the use of larger fonts may be needed to aid international tourists to perceive the messages.

Another approach to improving tourists’ text comprehension for written warnings is to increase the readability by making the text message simple, direct and easy to understand. To do so, Mileti and Sorensen (1995) suggests the use of specific pieces of information anchors: Hazard, location, time and guidance. Therefore, messages directed at tourists need to have a simplified sentence structures with non-technical jargon. The content of the message needs to be written to lessen the need for inferential processing.

When new information is received, individuals typically interpret it in the context of their preexisting knowledge. As found in this study, when individuals are presented with hurricane advisory messages, they will likely tap into their past experience or their knowledge with hurricanes and other hazards and react based on the outcomes of those actions. Therefore, warning messages should be presented in a fashion that is consistent with what they already know. By doing so, the credibility of the warning message will also be amended. To assess what tourists already know about hurricane risk and evacuation procedures, efforts should be made to regularly review the effectiveness of tourists hurricane awareness programs. Because much of tourists’ knowledge about hurricanes, especially repeat tourists will be determined by exposure to general information materials such as pamphlets that are encountered during a hurricane season, it is critically important to determine what information is most comprehensible and memorable.

To assess tourists’ hurricane knowledge, emergency planners can collaborate with local destination management organizations to conduct surveys, structured interviews, or focus groups. One advantage of such programs is a better understanding of how tourists conceptualize hurricane risks. If tourists have misconceptions regarding the complexity of refund policies associated with hotels or flights, the hurricane awareness and warnings could be redesigned to focus and eradicate these misunderstandings.

Additionally, it is recommended that tourism organizations at the local level (e.g. hotels, CVBs) in Florida allocate funds and resources to respond to the threat or impact of a hurricane. These funds require policies which address who can access the fund, when the fund will be accessed (under what conditions), who makes the decision on when and how to use the funds, etc. In addition, resources need to be used specifically to meet tourists’ needs. This may include but is not limited to training employees and staff to be ready through drills, mock evacuations, as well as designing a shelter on the property or creating a brochure, which shows the location of the nearest shelters for the guests. By having reserved funds and resources, the tourism organizations will be able to provide a quicker response to meet the need of tourists. It is very challenging to address tourist needs in the event of a crisis without sufficient funds and resources.

Next, tourism organizations also need to establish collaboration and mutual aid agreements with the emergency agencies, other destination management organizations, and other key partners. Communicating hurricane risks to tourists is often overwhelming, especially for small organizations that may not have adequate resources. Collaboration and mutual agreements with other organizations allow organizations to gain access to resources that may not be available in their inventory. Tourism organizations also need to communicate regularly with the emergency agencies, especially at the county level to get current information during hurricane season. Assistance from local emergency agency may be needed if the situation worsens, and guests and tourists need to be evacuated. Collaboration with other organizations is crucial to allow resource sharing and speedy communication flow, which will be needed in the event of hurricanes.

Next, the tourism industry in Florida needs to develop guidelines to accommodate tourists. This may include a refund policy, local shelter information, and assistance, and other such measures. In addition, the tourism industry needs to provide mechanisms to inform hurricane risks to guests and tourists. These mechanisms can be in the form of hurricane brochures that can be placed in several major locations such as airports, rest areas on the Florida Turnpike and Florida Welcome Centers when evacuations are issued. The accommodation industry can also provide hurricane brochures in the hotel lobby or in the guest’s room when hurricanes are in the horizon. Adequate information about hurricane risks will help guests and tourists make well-informed decisions and help alleviate their perception of risk. In addition, the guidelines will help to ensure tourists’ needs are met and they are kept safe as well as send a signal to tourists that the hosts are caring and concerned for their well-being.

7. Conclusion

The study analyzes the determinants of tourist hurricane evacuation decision making based on the decision theory of bounded rationality. This study contributes to the literature by accounting for two issues normally neglected in previous evacuation studies. First, it focused on transient populations of tourists who are in the destination when a hurricane evacuation issued. Secondly, this study utilizes several variables that were not used in previous resident evacuation studies such as risk belief and individual connectedness to hurricanes with hurricanes.

This study also contributes to the practical implications by highlighting several areas that can be improved to strengthen the hurricane evacuation strategy for tourists in Florida. As the previous section indicates, there are a myriad of ways the tourist hurricane evacuation procedures in Florida can be improved, for instance, by improving the content of the messages, establishing partnerships between local CVBs with local emergency agencies, allocating budgets, and disseminating information. We believe that the findings can be generalized to other storm-prone destinations. Nevertheless, given that the study was conducted in the state of Florida that is considered to have a better hurricane information system compared to other locations, further research is needed to test the predictive assessment of the model by collecting larger samples and its application across different tourism destinations.

As tourists may already be in the destination for several days before they learn that a hurricane is coming, further study is needed to measure the effect of the amount of time between learning that a hurricane is coming and when the evacuation order is issued on their evacuation decision. Those who have been in the destination longer may be more likely to evacuate than those who hear that a hurricane is coming and an evacuation order is issued on the first day of their stay after they have experienced most of the destination. However, there is also a possibility that these groups are less likely to evacuate as the longer they stay the more familiar they are with the destination and its support systems. Thus, further study is needed to fully understand the effect of time when a tourist becomes aware of the hurricanes threat on their evacuation decision. Finally, while this study does not specifically address the effect of tourists’ social interaction in the process of evacuation decision, the significance of information gathering in
the process of deciding to evacuate while facing a hurricane threat is certainly complex and should be the subject of future studies.

References


