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Safety, Recreation, and Visitation: An economic analysis of decision-making on coastal beaches

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SAFETY, RECREATION, AND VISITATION:

AN ECONOMIC ANALYSIS OF

DECISION-MAKING ON

COASTAL BEACHES

By

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THESIS ACCEPTANCE STATEMENT

On behalf of the Graduate Committee for Abigail Kaminski I affirm that this manuscript is the final and accepted thesis. Signatures of all committee members are on file with the Graduate School at the University of Maine, 42 Stodder Hall, Orono, Maine.

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Thesis Advisor: Kathleen P. Bell

An Abstract of the Thesis Presented
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Coastal beaches are important economic, social and cultural assets, hosting a variety of recreation activities ranging from wading in calm shallows to surfing in rough waters. Those who recreate on beaches often travel great distances to visit, suggesting that they place a high economic value on these resources. Despite the economic and cultural significance of beaches, little is known about the diversity of beachgoers and the ways they seek out safety information and make decisions on and between beaches. Safety risks are experienced differently across groups of beachgoers; those at higher risk of illness or injury include children, the elderly, the immunocompromised, weak swimmers, and those who engage in high-contact recreation activities. Safety information helps beachgoers understand the risks of recreating in the water on a beach visit, yet research suggests that few beachgoers seek such information. In this analysis, we use economic methods and data from a survey of Maine and New Hampshire beachgoers to examine safety information seeking and high-contact recreation behaviors and their impacts on visitation decisions.

In the first chapter, we analyze the safety information seeking behavior of beachgoers using three discrete regression approaches. We find systematic patterns among beachgoers'

information seeking behaviors. Beachgoers are more likely to seek out surf conditions information than water quality information, suggesting that they regard the risks associated with each differently. Those who engage in certain high-contact recreation activities in the ocean are more likely to seek out some type of safety information, and our results motivate future work further exploring the demand for water quality information specifically. Our findings also prompt interesting research extensions about whether beachgoers change their behavior in response to information, and how diverse beachgoers perceive their risks on the beach.

In the second chapter, we estimate a series of single-site recreation demand models for four diverse beaches in southern Maine and New Hampshire to test whether information seeking behaviors and recreation choices impact decisions to take a trip to the beach. Results differ between our study beaches in both sign and significance, suggesting that there is heterogeneity in the factors that impact beach visitation across the four sites. These results help to inform future models of trip demand, which could build on our generalized analysis to assess recreation behavior on specific beaches or regions.

Understanding how beachgoers use knowledge about safety conditions and recreation activities both on and between beaches is important for welfare estimation, safety communication, and public health. This research has implications for various natural resource management and policy strategies that communicate safety information to the public. Better understanding the choices that beachgoers make around beaches helps to establish relative risks, from both water quality and surf conditions, on publicly monitored beaches. These findings become increasingly important as future changes in the climate and increasing human development near the coast stresses the health and safety conditions on coastal beaches.

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CHAPTER 1

AN ECONOMIC EVALUATION OF COASTAL BEACH SAFETY INFORMATION SEEKING BEHAVIOR

1.1. Chapter Abstract

Little is known about the diversity of coastal beachgoers and the ways they seek out information about beach safety. In this paper, we employ economic methods to analyze the safety information seeking behavior of beachgoers. Using data from a survey of Maine and New Hampshire beachgoers we estimate a series of discrete models describing information seeking behaviors. We find interesting systematic patterns among beachgoers' information seeking behaviors; similarities in results across models suggest that the results are relatively robust to changes in estimation approaches. We find that exposure to and contact with coastal waters impacts safety information seeking behavior, and this impact differs between types of safety information. A higher proportion of beachgoers seek out surf conditions information compared to those seeking out water quality information, suggesting that beachgoers regard the risks associated with each differently. Individuals who engage in certain high-contact recreation activities in the ocean (e.g. swimming, surfing, fishing), are more likely to seek out safety information; these results are encouraging from a public health and safety perspective, as we expect these beachgoers to be at a higher risk on the beach than those who have less contact with water. These results help improve understanding of how beachgoers seek out and use safety information, which will become increasingly important to natural resource managers as changes in climate, built infrastructure, and other factors alter the health and safety risks of coastal recreation.

Keywords: information seeking behavior, water quality, risk, cost-effective risk communication

1.2. Introduction

Beaches are important economic, social and cultural assets. Coastal beaches host a range of recreation activities from wading in calm shallows to surfing in rough waters. These areas attract large numbers of visitors nationally: an estimated 43% of the U.S. population have visited a beach between 2005 and 2009 (Cordell, 2012). Those who recreate on beaches often travel great distances to visit, suggesting that they place a high economic value on these resources. Many studies estimate the value of a recreational day on beaches in diverse coastal systems across the nation. These estimates vary by region and study methods, and per person per day values[1] range from $24.22 beachgoers in San Diego County (Lew & Larson, 2008), to $77.56 for tourists on Florida beaches (Bell & Leeworthy, 1990), to as much as $97.09 for those on North Carolina beaches (Bin, Landry, Ellis, & Vogelsong, 2005). When aggregated across the large population who visit coastal beaches, this value becomes substantial. Coastal tourism and recreation also supports jobs and businesses in coastal communities and contributes significantly to national and state GDPs (NOAA, 2015).

Environmental change is impacting coastal resources and the economic and cultural services they provide. A diverse and fluctuating set of problems related to human development and climate change impact water quality and surf conditions, which affects the safety of coastal waters for recreation. Increasing levels of impervious surface, large-scale nutrient runoff, certain land-use changes, and failing or aging waste and transportation infrastructures can all have negative impacts on coastal water quality (Mallin, Williams, Esham, & Lowe, 2000; Doney et al, 2012). Heavy precipitation events, which are forecasted to occur more frequently in the coming years, are linked to increases in risk of waterborne illness through recreational contact (Charron et al., 2004; Patz, Vavrus, Uejio, & McLellan, 2008). Changes in nutrient loads in coastal waters and rising ocean temperatures are expected to cause increases in the duration, frequency, and

[1] All dollar values are adjusted to 2015 dollars.

severity of harmful algal blooms in fresh-, estuarine, and marine waters (O'Neil, Davis, Burford & Gobler, 2012). Rising oceans are expected to lead to increases in riptide activity and dangerous sea life (Diaz, 2006), and increases in ocean temperatures and changes in salinity are projected to expand the range of *Vibrio*[2] and other waterborne pathogens (Baker-Austin et al., 2013). As new environmental changes emerge, public health and safety risks on coastal beaches may increase in intensity and volume in response to human development near coastal regions and climate change; effective communication about safety issues at dynamic beach systems is increasingly both important and complex. Safety information about beach conditions can help users understand the inherent risks of recreating in coastal waters.

Risks on coastal beaches range in severity: riptides and high surf increase the likelihood of being injured or drowning while swimming (Leatherman & Leatherman, 2011); exposure to pathogens in water can result in ailments ranging from skin rashes and gastrointestinal illness to, in very rare cases, necrotizing faciitis[3] (Gomez, Fajardo, Patino, & Arias, 2003; Wade et al., 2010). Risk of serious consequences from swimming in coastal waters is experienced differently across groups; immunocompromised individuals, children, and elderly populations are typically at the greatest risk of the more serious health and safety issues on the beach. Children are more likely to develop gastrointestinal illness after contact with contaminated beach water (Wade et al., 2008). Those who swim in the water and fully submerge are also at a higher risk for illness associated with the bacteria or pathogens in contaminated water than those who have lower levels of water contact (Collier et al., 2015). In addition, children and other weak or inexperienced

[2] *Vibrio* is a group of bacteria found in coastal waters; it is most prevalent in the warmer months (May – October) and in areas with higher water temperatures. *Vibrio* infection can cause gastrointestinal distress or skin infections in humans who ingest or are exposed to the bacteria. <http://www.cdc.gov/vibrio/index.html>

[3] Necrotizing faciitis, often called 'flesh-eating bacteria,' is a skin infection that is very rare but can be life threatening. It can be contracted through contact with seawater that contains *Vibrio vulnificus* (Kuo, Shieh, Chiu, & Lee, 2007).

swimmers are more likely to be injured or drown in riptides or rough surf (Drozdzewski, Roberts, Dominey-Howes, & Brander, 2015; Gensini & Ashley, 2010).

Beach safety information is communicated on-site through flags and signage, and off-site through forecasting and public health websites, beach condition hotlines, and local media sources such as newspaper or radio. Studies addressing water quality information seeking behavior find many users are not aware of or do not seek out water quality information, and that many are misinformed about the quality of water at local beaches (Pendleton, 2001; Pendleton, Martin, & Webster, 2001; Pratap, Sarah, & Samuel, 2013). Studies assessing the effectiveness of rip tide and other dangerous surf communication report that, on average, less than half of users notice warning signs on the beach (Brannstrom, Brown, Houser, Trimble, & Santos, 2015; Matthews, Andronaco, & Adams, 2014). While this limited information seeking may be efficient (i.e., consistent with small health risks), widespread gaps in understanding of visitor awareness, visitor health risks, beach and water conditions, and health outcomes undermine assessment of current trends, and raise questions about the design and performance of current programs.

Surprisingly, no published studies of which we are aware consider the decision to seek out these two types of safety information together. Though the risks associated with surf conditions and water quality differ, both information types allow beachgoers to better understand and assess the safety of the same resource. Oftentimes this information is available in close proximity: water quality advisory signs and surf conditions flags are frequently co-located on lifeguard stands and can sometimes be found on the same website. By focusing studies on only one type of safety information, researchers forgo interesting insights about those beachgoers who seek out different types of safety information and the ways that beachgoers value various beach safety information.

Responding to these broad and specific gaps in understanding, we employ economic methods to assess information seeking behavior for water quality and surf conditions information. We address two research questions: (1) Do beachgoers’ exposure to and contact with coastal beach waters impact their decisions to seek out beach safety information? (2) Do the factors impacting decisions to seek out information differ between water quality information and surf conditions information?

1.3. Context

Social science theory offers a valuable lens through which to view safety information seeking behavior. Economic theory and research suggests that individuals seek out information when the expected benefits of the information outweigh the expected costs; information helps reduce the uncertainty associated with consumption decisions (Stigler, 1961; Stiglitz, 2000). Psychology and communications studies indicate that the costs associated with seeking out information can be complex. Individuals may actively choose to ignore or avoid information if they perceive that the information will cause them stress or anxiety (Case, Andrews, Johnson, & Allard, 2005). Individual perceptions about the usefulness of information to decision-making can impact whether an individual actively seeks out information, and may be more influential than personal perceptions about a lack of knowledge about the issue at hand (Osimani, 2012).

The value of safety information for an individual varies based on personal perceptions of risk as well the as factors that influence personal recreational risk (Alberini, Leiter, Rheinberger, McCormick, & Mizrahi, 2009). Information and perceptions about site condition, safety, and environmental quality have an impact on the way recreators make visitation decisions (Freeman III, Herriges, & Kling, 2014). Safety information may influence the way individuals perceive the environmental or physical quality of a recreation site. For example, anglers were more likely to visit sites with high environmental quality ratings, and as the perceived hazards of fishing at a site increase, the probability that an angler will visit the site decreases (Jakus & Shaw, 2003). Similarly, research on beach recreation choices find that beachgoers are less likely to visit a beach with poor water quality history when making decisions between beaches (Murray, Sohngen, & Pendleton, 2001; Parsons, Kang, Leggett, & Boyle, 2009; Song, Lupi, & Kaplowitz, 2010; Yeh, Haab, & Sohngen, 2006). Although few studies include perceptions of quality in their models, there is some evidence that water quality perceptions are also negatively correlated with decisions to take day trips to a beach (Jeon, Herriges, Kling, & Downing, 2005). Some studies suggest that the relationship between safety and visitation decisions differs depending on recreational activity choice, family composition, and other visitation preferences (Beharry-Borg & Scarpa, 2010; Hilger & Hanemann, 2006; Jeon et al, 2005). Beachgoers generally prefer safe swimming conditions, in terms of both water quality and wave height (Penn, Hu, Cox, & Kozloff, 2016), though, preference for calmer waters is not pronounced when considering smaller wave heights (Loomis & Santiago, 2013).

Recreation demand models provide an important context in which to explore the potential economic significance of information seeking behaviors. We posit that safety information is used by individuals to make decisions about beach visitation. For example, before embarking on a trip to the beach, a beachgoer checks a water quality monitoring website and notes that there is an active water quality advisory at her local beach. This impacts her perceptions of the environmental quality of the beach, and given this information she may choose not to take a trip to this beach on this day. More formally, we can incorporate the decision to seek out safety information into a generalized single-site recreation demand model. In this model, utility (U) is a function of the number of trips taken to a beach site (x), the perceived environmental or physical quality of a beach site (Q), and a numeraire good (z). Perceived beach quality (Q) is a function of the safety information (S) that an individual seeks out.

When deciding on the number of trips to a particular beach site, an individual maximizes their utility, subject to monetary and time constraints (EQ[1]):

$$\text{EQ[1]} \quad \underset{(x,\,S,\,z)}{\text{Max}\ U} \quad U(x, Q(S), z) \text{ s.t. } M + wT \geq z + x(C_x + wt_S + p_S S).$$

An individual's total income (which includes both exogenous income: M, and wage income: wT) is greater than or equal to the costs of consuming a numeraire good with price normalized to one and the cost of their beach trips. The costs of a beach trip is a function of travel costs and information costs. The travel costs associated with a beach trip (C_x) include: access fees, round trip transportation costs, and the time costs associated with traveling to and recreating on the site. The price of information includes the time costs associated with searching for and processing information (wt_S), and the price of the information (p_S). Though safety information is made freely available through many resources, we include an explicit price for information, as access to the internet or specialized apps greatly increases the ease of finding this information. In this model, information search costs and the price of information access combined represent the full cost of seeking out information to an individual.

In turn, the Lagrangian function of our constrained utility maximization problem yields the following first order conditions (FOCs):

$$\text{EQ [2]}\ \frac{\partial L}{\partial x} = \frac{\partial U}{\partial x} - \lambda\left(c_x + wt_S + p_S S\right) = 0,$$

$$\text{EQ [3]}\ \frac{\partial L}{\partial S} = \frac{\partial U}{\partial Q}\frac{\partial Q}{\partial S} - \lambda\left(xp_S\right) = 0, \text{ and}$$

$$\text{EQ [4]}\ \frac{\partial L}{\partial z} = \frac{\partial U}{\partial z} - \lambda = 0.$$

These first order conditions show relationships between variables at the margin. Assuming an interior solution, these FOCS will hold at the optimal solution to this constrained maximization problem. At the optimal number of beach trips (x), an individual equates the marginal utility of an additional trip to the cost of the trip weighted by the Lagrangian multiplier (λ), which represents the marginal utility of full income (EQ [3]). Similarly, at the optimal level of safety information (S), the effect of safety on marginal utility is equal to a trip-weighted cost of safety weighted by the Lagrangian multiplier (EQ [4]). The ratio of EQ [3] and EQ [5] equates the marginal rate of substitution of beach trips for private good consumption to the ratio of their prices. Similar to classic single-site recreation demand models, when selecting the number of visits to a given beach, an individual considers their enjoyment of such beach visits (x) relative to the consumption of private goods (z) and the time and monetary costs of beachgoing.

The search for safety information changes the classic single site demand model by introducing new trip costs and an additional choice variable. All else equal, we expect to see fewer trips taken as trip and information costs rise. The relative magnitude of travel and information seeking costs could have interesting impacts on trip demand. On net, it is difficult to sign or summarize the ultimate impact of safety information behavior effects because the impact of S on site quality (Q) is ambiguous. While we assert that increased information may lessen uncertainty around individuals' perception of site quality, we recognize that information search can result in both decreases and increases in perceptions of site quality. Prior studies, which often assume full or homogenous uptake of advisory information, offer limited guidance. Jakus and Shaw (2003) is a notable exception, providing an interesting complement to our model.

Additionally, in this study we represent information seeking behavior in a static manner, but it can also be considered dynamically. In the context of angler decision-making, fishing location decisions may be adjusted continuously in response to search and information efforts that help to reduce uncertainty about potential catch rates (Mangel and Clark, 1983). This concept can be applied to beachgoers decision-making: beachgoers adjust their visitation decisions to information about safety on beaches – future information searches and visitation decisions may be influenced by previous information searches and experiences. We are excited by the opportunities for future research that more extensively considers information search and recreation behavior decisions and acknowledges the implications of this improved understanding for natural resource managers and other professionals charged with communicating beach safety and health risks to beachgoers.

In this study, we explicitly model decisions to seek out beach safety information. By doing so, we contribute to the broader recreation demand literature and draw attention to the incomplete understanding of how users seek out and use safety information. The theoretical basis of our empirical analyses emerges from aforementioned economic theory, noting that people seek out information when the expected benefits of the information outweigh the expected costs (Stigler, 1961; Stiglitz, 2000). Using unique data that documents whether or not beachgoers seek different types of beach safety information, we consider the influences of socioeconomic characteristics, including income, and individual variation in exposure to water on the beach on expected benefits and costs and, ultimately, the net expected returns from information search.

1.4. Methods

We model discrete decisions to seek out different types of beach safety information. Using binary data on search behaviors for water quality and surf conditions, we respond to our focal research questions, addressing the potential importance of contact and exposure to beach resources and heterogeneity across these two types of beach safety information.

1.4.1. Data

Our analysis draws from a 2014 web survey of southern Maine and New Hampshire beachgoers (see Appendix A for the full survey instrument). We designed the Maine and New Hampshire Beachgoer Survey to collect information from beachgoers to fill key information gaps identified by regional stakeholders and to support research addressing a range of human behavior and attitudes relating to beach use and beach safety. We developed the questionnaire following scientific, tailored design principles (Dillman, Smyth, & Christian, 2014), and refined the content iteratively with input from stakeholders and colleagues across disciplines and institutions. Our web survey gathered follow-up information from beachgoers who participated in a short intercept survey in the summer of 2014. The intercept survey administration was conducted on three beach systems in southern Maine and coastal New Hampshire. As a part of that intercept survey, we asked respondents whether they would be interested in sharing their email addresses to participate in a follow up survey about beach visitation in Maine and New Hampshire. We contacted 1,259 respondents through email and asked them to complete a web-based survey. We collected responses from 435 beachgoers, 336 of whom answered the survey in full (a completed response rate of 29%).

Because respondents were not required to answer all questions throughout the survey, some of these respondents were dropped, and our final sample for this analysis consists of 299 beachgoers. This sample of beachgoers represents those who participated in the intercept survey, provided their email address for further contact, and completed the follow up survey in full; as such they can be considered a motivated and engaged beachgoer group. Our sample consists of beachgoers primarily from northeast United States and southeast Canada, though we have respondents from as far west as California and as far south as Florida. Our sample demographics closely match those of the intercept sample, and our sample of Maine and New Hampshire beachgoers are more likely to be older, female, and college graduates with household incomes over $100,000 than those of the general state populations (see Appendix B).

1.4.1.1. Dependent variable(s)

To collect data on beachgoers' information seeking behavior, we asked respondents whether they seek out beach safety information. Specifically, we model responses to the question: 'Do you seek out beach safety information, and which type of information do you seek out?' Respondents could either seek out: (1) water quality information only, (2) surf conditions information only, (3) both water quality and surf conditions information, or (4) no safety information at all. Responses to this question form our distinct dependent variables (Table 1.1.).

Table 1.1. Variable descriptions and dataset mean values

Variable name	Mean dataset value	Variable description
Information search		
SURF INFO	34%	1 if respondent seeks out only surf conditions information; 0 otherwise
WQ INFO	10%	1 if respondent seeks out only water quality information; 0 otherwise
BOTH INFO	16%	1 if respondent seeks out both surf conditions and water quality information; 0 otherwise
NO INFO		1 if respondent seeks out no safety information; 0 otherwise
Socioeconomic characteristics		
INCOME	119.5	Annual household income in thousands, calculated as the midpoint of 10 income brackets ranging from $10,000 to $200,000; lower bound of $10,000 and an upper bound of $250,000
AGE	50.40	Age of respondent
EDUCATION	16.29	Approximate years of education (10=less than high school; 12=high school graduate; 14=some college or associates degree; 16=bachelor’s degree; 20=graduate degree)
FEMALE	63%	1 if female; 0 otherwise
ENVORG	16%	1 if member of an environmental organization; 0 otherwise
CANADIAN	14%	1 if respondent has a Canadian home address; 0 otherwise
SM CHILD	10%	1 if household contains at least 1 child younger than 7; 0 otherwise
CHILD	22%	1 if household contains at least 1 child between 7 and 13; 0 otherwise
RISK INDEX	10.55	Summed responses to a series of 4 questions assessing respondents risk behaviors (summed values range from 4 to 28); higher values indicate tendency toward more risky behavior
Exposure to beach water resources		
FULL DAY	41%	1 if respondent spends more than 5 hours on the beach on an average beach trip; 0 otherwise
SWIMMING	82%	1 if respondent engages in coastal swimming; 0 otherwise
FISHING	17%	1 if respondent engages in coastal fishing; 0 otherwise
SURFING	15%	1 if respondent surfs; 0 otherwise
FREQVIS	45%	1 if respondent visits an ocean beach more than once a month; 0 otherwise
LIVES COAST	18%	1 if respondent lives within 20 km of the coast; 0 otherwise

1.4.1.2. Explanatory variables

We break the factors that may impact information seeking behavior into two categories: socioeconomic and personal characteristics (P) and exposure or contact proxy variables (E) (Table 1.1). Socioeconomic factors impact the costs of searching for and processing information and the anticipated benefits of knowing that information. Exposure and contact with coastal water impacts an individual's health and safety risks and the potential value of information to the individual.

As specified, INCOME and EDUCATION will impact the time costs of seeking out information. A higher income implies higher time costs of searching for information. These time costs may be proportionally less important than the time costs for those with less income, as those with lower incomes may have greater constraints in the time that they have available to perform information searches. We hypothesize that education will reduce the costs of safety information. Those with higher education levels may be better prepared to search for information and process that information.

AGE may impact the decision to seek out information through differences in risk perceptions between cohorts and the connections that different age groups make between risky behavior and health impacts. Younger populations tend to underestimate their risk of health impacts when engaging in some risky behaviors (Viscusi, 1991). The relationship between age, exposure to pollutants, and health is complex, and may vary depending on the specific disease or safety issue; for example, beliefs that air pollution cause asthma decrease with age, while beliefs that air pollution cause bronchitis increase with age (Howel, Moffatt, Bush, Dunn, & Prince, 2003). Age decreases the likelihood of eating risky foods, but had little effect on perceptions of risk, except in older cohorts, where risk perceptions were lower (Fein, Lando, Levy, Teisl, & Noblet, 2011). We include AGE^2 to test whether the relationship between age and information seeking behavior is linear; we expect that as age increases, the probability that an individual will seek out safety information will increase but will do so at a decreasing rate and, at a certain point, we might see the effect reverse.

Many studies find that gender impacts information seeking behavior, and in the case of safety and environmental issues, this is often because risk attitudes or perceptions differ between men and women. We expect that women (FEMALE) will seek out beach safety information at a higher rate than men. Women are generally found to engage in less risky behaviors than men – especially in recreation and health domains (Byrnes, Miller, & Schafer, 1999; Harris, Jenkins, & Glaser, 2006; Nicholson, Soane, Fenton-O'Creevy, & Willman, 2005). It follows that women will place a higher value on safety information and will be more likely to seek it out.

Belonging to an environmental organization (ENVIRON ORG) may indicate increased awareness of environmental issues, and there is some evidence of a positive correlation between environmental attitudes and environmental knowledge (Arcury, 1990). We expect that environmental group membership will increase the likelihood of seeking out safety information, because users in these groups may be more concerned with and knowledgeable about and environmental issues like coastal water quality impairment.

Those who are CANADIAN may seek out information differently from US citizens because of cultural differences. Canadians are generally more rule-abiding and risk averse than American citizens (Lipset, 1991). We expect that this will be reflected in their information seeking behavior, and that Canadians will be more likely to seek out safety information than Americans.

We expect that individuals with children (SM CHILD, CHILD) will be more likely to seek out either (or both) types of safety information because children face a greater risk of injury from surf conditions or illness due exposure to pathogens.

We also include a RISK INDEX variable that aims to provide an approximate measurement of an individual’s risk behavior. Respondents were asked to indicate (on a scale from 1-7 where 1 = never and 7 = often) how often they engage in certain potentially risky behaviors, including: not washing hands before eating, exposing themselves to the sun without sunscreen, eating raw foods, and eating expired foods. We sum the responses to this question to create a risk index.[4] We expect that as the risk index increases, i.e. the more risky behaviors the individual reports engaging in, the likelihood that the individual will seek out information of either type will decrease, as not seeking out safety information can be interpreted as a risky behavior in itself.

Exposure to or contact with beaches or beach water may impact the risks that individuals face on beaches, in turn, impacting the benefits associated with safety information. However, the risk literature notes that those who participate and regard recreational activities positively may underestimate the risks associated with those activities (McComas, 2006; Slovic, Finucane, Peters, & MacGregor, 2004). There may be a disconnect between actual risk levels and perceived levels of risk based on media coverage or personal recall of incidences that may bias beachgoers' risk perceptions, either causing them to underestimate or overestimate the probability that they will experience a given risky event (Fischhoff, 1993; McComas, 2006; Sunstein & Zeckhauser, 2011).[5] We include several proxies for exposure to beach resources including both intensity of exposure (FULL DAY, FISHING, SWIMMING, SURFING), and frequency of exposure (FREQVIS). We also include a dummy variable for distance to the nearest coast (LIVES COAST*)*, because we expect these users will also be indirectly exposed to ocean resources more often than those who live further away. We hypothesize that these exposure and contact variables will influence the perceived risk of illness or injury on beaches, in one of two ways. These users

[4] We tested the variables we include in our risk index for reliability using Chronbach's alpha, which is used to test the strength of the relationship between multiple related variables. The Chronbach's alpha value for the four risk variables is 0.414. Variables with a strong relationship typically have Chronbach's alpha values of 0.7 or above. With these test results in mind, we made the decision to sum the variables, rather than use the average value across the four variables. Summing the variables allows for us to better model ranges of responses, while averaging may smooth responses and eliminate interesting variation.

[5] The most commonly referenced example relates to shark attacks. In 2001, there was an increase in media coverage of shark attacks and an associated fear of swimming in ocean waters by the general public. There was no statistical increased risk of shark attack in 2001 (and some statisticians note that there were actually fewer recorded shark attacks than there were in previous years).

may understand that they are at a higher risk of becoming sick or injured from recreating in ocean waters, perhaps recalling past experiences where they have had safety issues during beach recreation. They may seek out safety information to help mitigate this risk. Alternatively, if beachgoers have positive associations with coastal recreation, they may assume that their risks are low and will choose not to seek out safety information. There may be differences between water quality and surf conditions information seeking behaviors, as there are different risks associated with each and there may be differences in past experiences linked with each.

1.4.2. Analysis

We employ three approaches to model respondents' choices among these four alternatives: binary probit, bivariate probit and multinomial logit. All of the modeling specifications share a common empirical foundation, where we assume that the utility derived from a particular information seeking behavior is a function of individual characteristics ($\mathbf{X}_i$), and unobservable factors (ε_{ij}). We represent individual characteristics ($\mathbf{X}_i$) using vectors of socioeconomic characteristics ($\mathbf{P}_i$), including income, and individual variation in exposure to water on the beach ($\mathbf{E}_i$). We assign the indirect utility derived by individual i from selecting a given information seeking alternative j as V_{ij} and denote this as a linear, additive function of $\mathbf{P}_i$ and $\mathbf{E}_i$, a vector of associated parameters to be estimated, and ε_{ij}. All of the approaches hinge on the assumption that an individual chooses the alternative that conveys her with the highest expected utility. In all cases, the model and parameters are estimated using maximum likelihood estimation.

The approaches differ with respect to how they treat the distinct information seeking options and assumptions about the random disturbances. The binary and multinomial specifications employ distinct dependent variables. By doing so, they represent the decisions and choice sets differently.

Binary probit models. The binary probit modeling approach represents these four options as two distinct binary choices: (1) seeks any water quality information versus (0) seeks no water quality information and (1) seeks any surf conditions information versus (0) seeks no surf conditions information.

Bivariate probit model. The bivariate probit model also represents these four options as two distinct binary choices: (1) seeks any water quality information versus (0) seeks no water quality information and (1) seeks any surf conditions information versus (0) seeks no surf conditions information. This approach extends the simple binary approach by allowing for correlated disturbances across the two choices.

Multinomial logit model. The multinomial logit model directly models choices across the four information seeking options: (1) water quality information only, (2) surf conditions information only, (3) both water quality and surf conditions information, or (4) no safety information at all.

1.5. Results & Discussion

The majority of our sample report that they seek out some type of safety information, with most seeking out only surf conditions information, followed by both surf conditions and water quality information, and the smallest proportion seeking out only water quality information (Table 1.2.). These results suggest that there are differences in the ways that beachgoers value surf conditions information and water quality information.

Table 1.2. Respondents in each information seeking category

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Water quality</th></tr>
<tr><th>Yes</th><th>No</th><th>Total</th></tr>
<tr><td rowspan="3">Surf Conditions</td><td>Yes</td><td>48
16%</td><td>101
34%</td><td>149
50%</td></tr>
<tr><td>No</td><td>29
10%</td><td>121
40%</td><td>150
50%</td></tr>
<tr><td>Total</td><td>77
26%</td><td>222
74%</td><td>299</td></tr>
</table>

The results of the binary probit, bivariate probit, and multinomial logit models reveal interesting patterns about the factors that impact decisions to seek out safety information (Table 1.3.). Global significance tests reveal that the models outperform the intercept-only model in all estimation approaches. When comparing our results across the three models, there are many similarities in the statistical significance of parameters. Notably, some variables change in significance between the binary models of water quality and surf conditions and our multinomial logit model. For example, the variable ‘fishing’ is significant across both water quality and surf conditions binary logit models, but in our multinomial logit model, it is only significant in the overlapping ‘both’ category. These differences in the results of the multinomial logit model, where there is a separate category for those who seek out both types of information, offer additional insight into the information seeking behavior of beachgoers who seek out information at different intensities. Similarities in findings across models suggest that the results are relatively robust to changes in estimation techniques.

Table 1.3. Results of beach safety information seeking models[a]

	Binary Probit		Bivariate Probit		Multinomial Logit[b]		
	(1) WATER *yes = 77*	(2) SURF *yes = 149*	(3) WATER *yes = 77*	(4) SURF *yes= 149*	(5a) WATER *n=29*	(5b) SURF *n=101*	(5c) BOTH *n=48*
	1.106	*1.109*	***0.333***	***0.360***	*2.951*	*2.197*	*2.597*
AGE	-0.069	-0.060	**-0.022***	-0.021	0.093	-0.018	**-0.209****
	0.044	*0.045*	***0.013***	*0.014*	*0.125*	*0.089*	***0.104***
AGE^2	0.001	**0.001***	0.000	**0.000***	-0.002	0.000	**0.002****
	0.000	***0.0004***	*0.000*	***0.000***	*0.001*	*0.001*	***0.001***
FEMALE	*-0.207*	**0.466*****	-0.055	**0.145*****	-0.362	**0.984*****	0.269
	0.181	***0.178***	*0.053*	***0.057***	*0.489*	***0.357***	*0.414*
INCOME	**0.002***	-0.001	**0.001***	0.000	-0.001	**-0.005***	0.004
	0.001	*0.001*	***0.000***	*0.000*	*0.004*	***0.003***	*0.003*
ENVORG	0.150	**0.460****	0.037	**0.147****	**1.040***	**1.171*****	0.787
	0.227	***0.222***	*0.067*	***0.072***	***0.640***	***0.444***	*0.541*
CANADIAN	**0.590****	-0.364	**0.179****	-0.088	**1.945*****	-0.369	0.158
	0.263	*0.273*	***0.077***	*0.084*	***0.651***	*0.576*	*0.649*
SM CHILD	*-0.280*	-0.105	-0.124	-0.052	-1.086	-0.318	-0.347
	0.293	*0.279*	*0.103*	*0.112*	*0.834*	*0.527*	*0.635*
CHILD	0.039	-0.045	0.011	-0.006	**-1.304****	**-0.703***	0.465
	0.220	*0.021*	*0.040*	*0.044*	***0.656***	***0.426***	*0.495*
RISK INDEX	-0.012	**-0.045****	-0.002	**-0.015*****	-0.035	**-0.086****	-0.073
	0.022	***0.021***	*0.006*	***0.007***	*0.058*	***0.042***	*0.053*
FULL DAY	-0.065	**0.328****	-0.010	**0.113****	-0.475	0.419	0.541
	0.176	***0.167***	*0.051*	***0.055***	*0.505*	*0.326*	*0.395*
SWIMMING	**0.651****	**0.604*****	**0.172*****	**0.184*****	**1.923*****	**1.227*****	**1.388****
	0.254	***0.229***	***0.066***	***0.072***	***0.726***	***0.442***	***0.636***
FISHING	**0.559*****	**0.391***	**0.192*****	**0.137***	0.005	0.097	**1.361*****
	0.215	***0.222***	***0.066***	***0.072***	*0.726*	*0.473*	***0.458***
SURFING	**-0.790*****	**0.598*****	**-0.215*****	**0.189*****	-0.995	**1.453*****	-0.609
	0.271	***0.234***	***0.069***	***0.075***	*0.900*	***0.450***	*0.684*
FREQVIS	0.293	**0.339****	0.087	**0.123****	0.633	**0.603***	**0.844****
	0.188	***0.173***	*0.053*	***0.058***	*0.538*	***0.334***	***0.415***
LIVES COAST	-0.087	**-0.759*****	-0.021	**-0.241*****	-0.010	**-1.361*****	**-1.278****
	0.225	***0.225***	*0.065*	***0.071***	*0.540*	***0.452***	***0.602***
σ	--	--	**0.409*****	**0.444*****	--	--	--
ρ	--	--	**0.146*****		--	--	--
AIC	338.000	375.000	739.000			706.000	
Log likelihood	-153.000	-172.000	-334.000			610.000	
Global Wald Test	30.810***	55.750***	36.880***	78.890***		97.700***	

[a] Standard errors shown in italics under coefficient values

[b] The multinomial logit model results present parameter estimates for each of the information seeking behaviors compared with the reference category: "no safety information"

* = Statistically significant at the 10% level; ** = Statistically significant at the 5% level; *** = Statistically significant at the 1% level

Table 1.4. Statistically significant exposure and contact variables

	Binary Probit	Bivariate Probit			Multinomial Logit[a]		
	(1)	(2)	(3)	(4)	(5a)	(5b)	(5c)
	WATER	SURF	WATER	SURF	WATER	SURF	BOTH
	yes = 77	*yes = 149*	*yes = 77*	*yes= 149*	*n=29*	*n=101*	*n=48*
FULL DAY	-0.065	**0.328****	-0.010	**0.113****	-0.475	0.419	0.541
SWIMMING	**0.651****	**0.604*****	**0.172*****	**0.184*****	**1.923*****	**1.227*****	**1.388****
FISHING	**0.559*****	**0.391***	**0.192*****	**0.137***	0.005	0.097	**1.361*****
SURFING	**-0.790*****	**0.598*****	**-0.215*****	**0.189*****	-0.995	**1.453*****	-0.609
FREQVIS	0.293	**0.339****	0.087	**0.123****	0.633	**0.603***	**0.844****
LIVES COAST	-0.087	**-0.759*****	-0.021	**-0.241*****	-0.010	**-1.361*****	**-1.278****
Wald test statistic	**24.20*****	**41.10*****	**28.26*****	**49.71*****	9.54	**32.10*****	**26.21*****

[a] The multinomial logit results present parameter estimates for each of the information seeking behaviors compared with the reference category: 'seeks out no safety information.'

* = Statistically significant at the 10% level; ** = Statistically significant at the 5% level; *** = Statistically significant at the 1% level

Table 1.5. Variables that are statistically significantly different between the water quality and surf conditions models

	Binary Probit			Bivariate Probit			Multinomial Logit					
	(1)	(2)	(1 & 2)	(3)	(4)	(3 & 4)	(5a)	(5b)	(5a & 5b)	(5c)	(5a & 5c)	(5b & 5c)
	WATER *yes=77*	SURF *yes=149*	**Wald test statistic[b]**	WATER *yes=77*	SURF *yes=149*	**Wald test statistic[b]**	WATER *n=29*	SURF *n=101*	**Wald test statistic[c] WATER vs. SURF**	BOTH *n=48*	**Wald test statistic[c] WATER vs. BOTH**	**Wald test statistic[c] SURF vs. BOTH**
AGE	-0.069	-0.060	0.04	-0.022*	-0.021	0.00	0.093	-0.018	0.68	-0.209**	**4.38****	**3.16***
AGE^2	0.001	0.001*		0.000	0.000*		-0.002	0.000		0.002**		
FEMALE	*-0.207*	0.466***	**13.80*****	-0.055	0.145***	**7.76*****	-0.362	0.984***	**6.56****	0.269	1.25	**2.73***
INCOME	0.002*	-0.001	**5.66****	0.001*	0.000	**2.99***	-0.001	-0.005*	1.47	0.004	1.29	**7.99*****
CANADIAN	0.590**	-0.364	**13.13*****	0.179**	-0.088	**6.31****	1.945***	-0.369	**9.69*****	0.158	**4.86****	0.53
CHILD	0.039	-0.045	0.15	0.011	-0.006	0.05	-1.304**	-0.703*	0.74	0.465	**5.70****	**4.83****
FULL DAY	-0.065	0.328**	**5.01****	-0.010	0.113**	3.29	-0.475	0.419	**2.89***	0.541	**3.18***	0.91
FISHING	0.559***	0.391*	0.61	0.192***	0.137*	0.34	0.005	0.097	0.016	1.361***	**3.42***	**7.49*****
SURFING	-0.790***	0.598***	**26.22*****	-0.215***	0.189***	**18.24*****	-0.995	1.453***	**7.58*****	-0.609	0.14	**10.01*****
LIVES COAST	-0.087	-0.759***	**8.93*****	-0.021	-0.241***	**6.09****	-0.010	-1.361***	**4.88****	-1.278**	**2.99***	0.02

[a] The multinomial logit results present parameter estimates for each of the information seeking behaviors compared with the reference category: 'seeks out no safety information.'
[b] We performed Wald tests where the null hypothesis is that the coefficient values are equal across water quality and surf models
[c] We performed Wald tests of significance where the null hypothesis is that the coefficient values are equal across: (1) water quality and surf conditions, (2) water quality and both types of information and (3) surf conditions and both types of information alternatives
* = Statistically significant at the 10% level; ** = Statistically significant at the 5% level; *** = Statistically significant at the 1% level

To address our first research question, ‘Do beachgoers’ exposure to and contact with coastal beach waters impact their decisions to seek out beach safety information?’ we test the joint hypothesis that the coefficients for the exposure and contact proxy variables are all equal to zero (Table 1.4).

Joint tests of significance indicate that exposure and contact coefficients are significant in all models except for the water quality only alternative in the multinomial logit model (Table 1.4). Consistent with our expectations, our models reveal many statistically significant, positive results among our high-contact recreation variables (swimming, fishing and surfing). Those who have high contact with water resources are also at a greater risk of illness or injury from hazardous water quality conditions, and safety information may be more valuable to their decisions to engage in these activities on a given day. Those who swim in coastal waters are more likely to seek out all types of safety information; swimmers are more likely to be exposed to pathogens in water or be impacted by high surf conditions than those beachgoers who do not swim. Those who fish in coastal waters are more likely to seek out both surf conditions and water quality conditions; the quality of a day for fishing may be impacted by surf conditions and it is logical that those who fish would want to ensure that their catch was coming from reliably healthy waters.

Those who surf in coastal waters are more likely to seek out surf conditions information; surf conditions information influences decisions to surf, though it may be that these users are not seeking out this information to avoid risk, and high surf positively influences their decision to make a trip to the beach. We also observe a negative relationship between surfing and seeking out water quality information. This is counter to what we might expect from the risk profiles of recreation activities: surfing presents greater risks of illness from exposure to polluted waters than other beach recreation activities, as surfers are more likely to involuntarily ingest water or unexpectedly submerge than typical recreational swimmers (Tseng and Jiang, 2012; Turbow et al, 2008; Harding, Stone, Cardenas, and Lesser, 2015). In fact, high surf frequently occurs after or during a storm event when water quality is often compromised (Scott and Williams, 2016). However, it is likely that surfers are less risk averse than the general population when it comes to beach recreation; they seek out information not to mitigate their risk but to find whether the conditions are favorable for surfing, and water quality information might not serve a purpose to surfers in this context. We find some evidence of this in our sample, the ‘risk index’ of surfers is slightly higher than that of non-surfers; we expect that actual beach risk perceptions to differ more dramatically between surfers and non-surfers, as our risk index does not include recreation-based risk taking behaviors. Surfers as a group can be considered sensation seekers and risk takers (Stranger, 1999); and many surfers consider surfing to be a risky sport (Scott and Rogers, 2016). Some evidence suggests that surfers have knowingly chosen to surf during a water quality advisory (29% to 37%, depending on the study and region) or when they otherwise suspected that the water quality was impaired (Harding et al, 2015; Scott and Rogers, 2016). Additionally, surfing is popular in the off-season, when beach water quality conditions are not regularly monitored or communicated to the public.

Indirect exposure to beaches also impacts information seeking behaviors. Those who visit beaches at least once month are more likely to seek out surf conditions information and both types of information, while those who live within 20 km of the coast are less likely to seek out water quality and both types of information. This result is interesting – it may be that those who live by the beach rely on experiential knowledge or their familiarity with beaches to make decisions about visiting a beach. It could also be that these beachgoers have a beach that they consistently visit, and they may use their past experiences at this beach to inform their decisions about safety, rather than formal information.

In closing, we conclude that overall, the exposure and contact variables impact beach safety information seeking behavior, though the impact differs between the approach used for estimation and the exposure or contact proxy variables.

To address our second research question, 'Do the factors impacting decisions to seek out information differ between water quality information and surf conditions information?,' we also use tests of joint significance (Table 1.5.). We test the null hypotheses that the coefficients for each variable are equal across different information specifications. In the binary and bivariate probit models, we test for differences between surf conditions information and water quality information coefficient values. In the multinomial logit model, we test for differences between the coefficient values of: (1) water quality only and surf conditions only alternatives, (2) water quality only and both types of information alternatives, and (3) surf conditions only and both types of information alternatives.

We conclude that there are some differences in the factors that impact decisions to seek out different types of safety information. This difference varies between explanatory variables and, to some extent, the estimation technique. Of the socioeconomic variables, FEMALE, INCOME, and CANADIAN coefficients are significantly different between water quality and surf conditions across all modeling approaches. Female are more likely to seek out surf conditions information; this generally aligns with our expectations, as females are typically more risk averse and will seek out safety information in accordance with their risk profiles. However, we expect this relationship to hold between females and water quality information as well, and our results indicate a negative, though insignificant, relationship between females and water quality information (though we do find a positive, insignificant relationship between females and seeking out both types of information). We find that Canadians are more likely to seek out water quality information. In addition to socio-cultural differences between Canadians and Americans (Lipset, 1990), these results may reflect differences in the way water quality information is displayed on Canadian beaches. Notably, 26 beaches in Canada are certified 'Blue Flag' beaches; Blue Flag beaches meet a set of criteria that includes environmental education outreach and compliance with rigorous water quality monitoring and communication standards. Currently, no

U.S. beaches participate in the Blue Flag program, and this may help to explain the difference in water quality information seeking behaviors between Canadians and U.S. citizens.

In the multinomial logit model, *child* is significantly negatively associated with seeking out 'surf conditions information only' and 'water quality information only.' This goes against expectations, and may reflect differences in the time costs between those who have children in this middle age range and those who do not. Examining the breakdown of information seeking behaviors in households with children more closely (Figure 1.1.), we observe that those with children under 13 are less likely to seek out information of any type when compared with the full sample, but seek out both types of information in about the same proportion as those in the full sample (full sample: 16%, households with children 7 to 13: 20%, households with children under 7: 17%). One possible explanation for this result is that those who seek out both types of information may do so in response to their general concern for safety on the beach, and they may

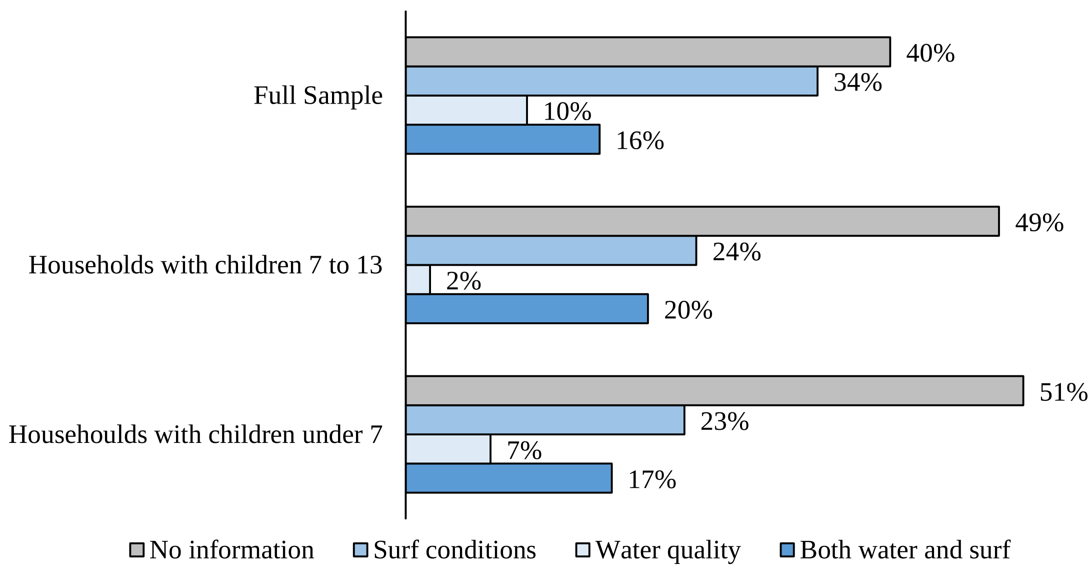


Figure 1.1. Information seeking in households with children, compared with full sample

be less sensitive to the time costs of seeking out information than those who seek out only one type of information. Therefore, when the time costs of information increases due to the additional responsibilities of children, behavior does not change much. Interestingly, Alberini et al (2009) find a similar negative relationship between the value of avalanche safety information and parents of children, and Hilger and Hannemann (2008) find that families with children have a lower willingness to pay for improvements in water quality on beaches. Given that children are at a higher risk for multiple health and safety risks in recreation contexts, the relationship between information seeking behaviors and the presence of children in the household merits future investigation.

There are also some significant differences in the impact of the exposure and contact proxy variables across the water quality and surf models. Those who typically spend a full day on the beach when they visit are more likely to seek out surf conditions in all modeling approaches, though the variable FULL DAY is not significant in the multinomial logit model, where the Wald test statistic is only significant at the 10% level. The coefficient on FULL DAY is negative, though insignificant, for the water quality models. The coefficient on FISHING does not significantly differ between water quality and surf conditions models in the binary and bivariate probit approaches, but in the multinomial logit model, fishing is positively associated with seeking out both types of information, while fishing has no significant impact on seeking out only water quality or only surf conditions information. The SURFING coefficients are statistically significantly different in all modeling approaches, aligning with our prior findings on contact and exposure. Finally, we find a statistically significant difference between the coefficients on LIVES COAST. Though the coefficient on this variable is negative in water quality and surf conditions models across all modeling approaches, the effect is small in the water quality models, and only the surf conditions coefficients are statistically significantly negative.

1.6. Conclusions

A greater proportion of beachgoers seek out surf conditions information, compared with water quality information, and this, in addition to our regression results, suggests that beachgoers regard the risks associated with each differently. Our models are less successful at explaining water quality information seeking behaviors, and this motivates future work to further explore the factors that drive decisions to seek out water quality information. Those who engage in certain high-contact recreation activities in the ocean (swimming, surfing, fishing), are more likely to seek out safety information; these results are encouraging from a public health and safety perspective, as we expect these beachgoers to be at a higher risk on the beach than those who have less water contact. Jointly communicating information about water quality with surf conditions information may allow this information to reach a broader audience.

While we find interesting systematic patterns among beachgoers' information seeking behaviors, we would also like to address a few limitations of our study in terms of scope and specificity. We designed the survey question to be intentionally broad, in part because we were limited in terms of space and in part because we were interested in general patterns in information seeking behavior from our respondents. Future work should alter the question design to better assess the scale at which the individual searches for information, and the time they dedicate to finding information. In addition, we analyze a sample that is drawn from an intercept sample of beachgoers, this limits the application of our results to broader groups of people. Finally, our analysis is performed statically, while some may argue that information seeking is a dynamic problem – beachgoers may learn from information or experiences over time, which may impact their risk perceptions and their behaviors.

This study lends itself to some interesting extensions for future work. For those who look to quantify the value of improvements in water quality on our coastal beaches through recreation demand modeling, it may not be valid to assume that beachgoers know about the safety and environmental quality conditions at the beach. Incorporating targeted information seeking behaviors into site choice models will allow for the evaluation of information seeking behaviors in the context of measured, site-specific water quality levels. This approach may advance the understanding of relationships that may exist between information seeking behaviors and actual conditions, and prove invaluable to public health officials who are charged with ensuring that health and safety information is communicated effectively to beachgoers. In addition, media coverage of harmful events on beaches may impact the way individuals perceive risks on beaches and seek out safety information (McComas, 2006; Sunstein & Zeckhauser, 2011), as Fein et al (2011) find with risk perceptions and behaviors related to food-borne illnesses. A media analysis of the coverage of illnesses related to water quality or surf-related injuries would help place beach behaviors and risk perceptions in the broad context of information available to beachgoers.

Additionally, seeking out information does not necessarily lead to changes in behavior; behavior occurs over stages and the framing of information can impact behavioral responses in different ways depending on the stage (Pelletier and Sharp, 2008). Framing should help alert individuals about the intrinsic costs and benefits over extrinsic costs and benefits; this helps motivate behavior changes and the maintenance of these behavior changes over time (Pelletier and Sharp, 2008). Building upon this work by exploring the impact of safety information on decisions to visit beaches or engage in high-contact ocean recreation activities will help us to conceptualize how diverse beachgoers perceive their risks on coastal beaches and how they modify their behavior in response to safety information.

Our research establishes connections between recreation activity engagement and safety information seeking behavior. These results begin to fill critical information gaps for coastal resource managers and public health officials who monitor the safety of beaches for public use, but know little about who seeks out this safety information. Better understanding how users seek out and use safety information becomes increasingly important as future changes in climate and human development near the coast may increase the health and safety risks of coastal recreation.

CHAPTER 2

RECREATION, SAFETY, AND COASTAL BEACH VISITATION

2.1 Chapter Abstract

Beachgoers often travel to recreate on coastal beaches, making choices between beaches that vary in length, width, character and amenities. While economic models of recreation demand have established systematic relationships and raised questions about the influence of beach characteristics on trip decisions, less attention has been given to the roles of recreation engagement and safety knowledge and perceptions. An improved understanding of how beachgoers' behaviors impact beach decisions becomes more important as beach managers and other decision-makers tackle issues like erosion, extreme storm events, and various water quality issues which may increase in magnitude over the coming years as a result of coastal development and climate change. In this paper, we focus on the impacts of beach recreation activities and beach safety information seeking behavior on trip decisions.

Using survey data from a sample of Maine and New Hampshire beachgoers, we estimate a series of negative binomial count data models for four beach sites in southern Maine and coastal New Hampshire that vary with respect to beach attributes, including water quality. We find significance in recreation and safety information seeking variables in some of the study site models, and results differ between our study beaches in both sign and significance, suggesting that there is heterogeneity in the factors that impact visitation across the four sites.

2.2. Introduction

Coastal beaches are one of the leading tourist destinations in the United States (Houston, 2008), attracting an estimated 102 million visitors between 2005 and 2009 (Cordell, 2012). Beachgoers sometimes travel great distances to recreate on coastal beaches, making choices between beaches that vary in length, width, character and amenities. While economic models of recreation demand have established systematic relationships (e.g., a negative relationship between travel costs and beach demand) and raised questions about the influence of beach characteristics in distinct geographies (e.g., beach width, wave height, parking, and restrooms), less attention has been given to the roles of recreation engagement and safety knowledge and perceptions. In this paper, we contribute to the beach recreation literature by focusing on the impacts of recreation activities and safety information seeking behavior on demand for beach visits. We address these themes through two research questions: (1) Do the recreation activities individuals engage in on beaches impact visitation decisions? (2) Does information about safety risks on beaches impact visitation decisions?

2.2.1. Beach recreation

Recreation activities can impact site choice and the welfare that an individual derives from a trip. Activity choice may impact the utility derived from changes in attributes in substantial ways (Cutter, Pendleton, & DeShazo, 2007). Most studies that attempt to isolate the welfare impacts of certain activities do so by only modeling the behavior of a certain type of recreationist – this type of study has been completed with a variety of recreation activities including hunting (Adamowicz, Swait, Boxall, Louviere & Williams, 1997), fishing (Bockstael, McConnell, & Strand, 1989), biking (Chakraborty and Keith, 2000), mountain climbing (Hanley, Koop, Alvarez-Farizo, Wright, & Nevin, 2001) and ice climbing (Anderson, 2010). Beach recreation is often approached as a single recreation activity, though users engage in diverse activities on the beach. Two beachgoers may not face the same welfare impacts when attributes like water quality degrade, depending on the types of activities they engage in on the beach (Cutter et al., 2007). When beaches have poor water quality or rough surf conditions, individuals can choose to substitute away from the beach site, or substitute away from higher contact recreation activities if they want to reduce their recreation risks for a beach trip.

2.2.2. Beach safety information

Water quality on some public beaches is monitored by state and local organizations, and the associated test results are used to determine whether the water can be considered safe for swimming. When monitoring results indicate high levels of bacteria in the water, these organizations may declare a beach advisory, which warns beachgoers of the health risks of coming into contact with contaminated water. Water quality and water quality advisories can impact beach visitation decisions, and a subset of the recreation demand literature estimates the impact that water quality changes or advisories have on visitation decisions or beach values (Hilger & Hanemann, 2006; Murray et al., 2001; Parsons et al., 2009; Parsons & Stefanova, 2010; Song et al., 2010; Yeh et al., 2006). Yeh et al (2006) examine the welfare losses of additional advisory days between users who go on different types of trips, comparing single- and multiple-day users; they find that multiple-day users suffer greater welfare losses than the single-day users with increases in advisory days. Parsons et al (2009) also note a negative relationship between beach visits and a recent history of beach closures or advisories, while Hilger & Hanneman (2008) find that, perhaps counter to expectations, those who go to the beach with children have a lower willingness to pay for improvements in water quality than those who visit without children. They attribute this surprising finding to cognitive dissonance – because the water keeps their kids occupied and happy, some parents view the water quality as adequate (Hilger and Hanneman, 2008). These and other studies' findings (Loomis & Santiago, 2013; Penn et al., 2016) highlight the importance of water quality to recreation decisions on coastal beaches, and the economic significance of removing a recreation site from a beachgoers' choice set because of a water quality related closure.

Water quality, along with surf conditions, influences the potential health risks of recreating on the beach. Exposure to pathogens in contaminated water can result in a myriad of illnesses including gastrointestinal distress, respiratory tract infections, eye/ear infections, and skin infections (Gomez et al., 2003). Beachgoers engage in a variety of activities on beaches, from high energy, high-contact activities like swimming, surfing, and paddleboarding, to more leisurely activities like walking along the beach, collecting shells, photography, and enjoying scenic views, and some recreation activities on beaches hold greater risks to human health and safety than others. High-contact water activities, in particular, are associated with higher illness risks on beaches (Collier et al., 2015; Dorevitch et al., 2012). In addition to the risk of illness due to exposure to poor water quality, those who engage in high water contact activities also risk injury/drowning in riptide or rough surf conditions (Drozdzewski et al., 2015; Gensini & Ashley, 2010). When beachgoers make decisions between beaches, they do so in the context of their recreation preferences, risk perceptions, and their affinity for risk.

2.2.3. Expected contribution

The diversity of recreation demand studies and the differences in methods and issues of focus between studies and regions demonstrates the complexity of recreation demand modeling and the importance of conducting analyses in the context of geography, the market for visitation, the communities in which the beaches are located, and local environmental quality. There are relatively few beach recreation demand studies for the New England region, especially in recent years (Kline & Swallow, 1998; McConnell, 1986). Prior stated preference research focused on beaches in Maine and New Hampshire demonstrated the value of erosion controls on beaches, emphasizing the need to better understand the value of a beach day when making decisions about beach renovation and restoration policies (Huang, Poor, & Zhao, 2007). In addition to calling attention to beach recreation activities and safety information, this study also fills geographic and temporal gaps in the existing literature and adds to the broad beach valuation literature. To address our focal research questions, we construct and estimate travel cost recreation demand models to four diverse beaches in Maine and New Hampshire, conduct hypotheses tests, and synthesize the results of our statistical modeling and testing.

2.3. Methods

Following conventions for single-site recreation demand models (Parsons, 2003), our empirical analysis centers on four count regression models of annual beach visitation.

2.3.1. Survey

We gathered data on beach visitation through a web survey of beach users in Maine and New Hampshire. We designed and administered the survey using methods tailored for web surveys (Dillman et al., 2014). We developed our survey content iteratively using input from key stakeholders and interdisciplinary colleagues; we also administered a pilot version of the survey to recreators on beaches, and incorporated their feedback into our final survey instrument. In the survey, we ask respondents to share information about their short and long term visitation patterns. We asked respondents to recount the number of day trips they took to beaches in Maine and New Hampshire over the previous year. We also asked respondents to share about their preferences for coastal beaches, the recreation activities they engage in, and whether they seek out information about water quality and surf conditions on coastal beaches (see Appendix A for the full survey instrument).

We sent the link to our web survey to a sample of beachgoers intercepted on ocean beaches in Southern Maine and New Hampshire in the summer of 2014. These intercepted beachgoers completed a brief survey on-site and were also asked if they would be interested in participating in a follow-up survey at a later date; 1,259 of 3,183 (40%) intercepted beachgoers shared their email addresses for future contact. We administered a detailed follow-up survey to these respondents in late fall of 2014. We received 336 surveys that were completed in full (a response rate of 29%). Our final samples include only those who have visited a beach in southern Maine and coastal New Hampshire during the summer of 2014; onsite samples tend to include more frequent and enthusiastic beach users, which may bias results (Egan & Herriges, 2006; Parsons, 2003). We anticipate our sampling of this onsite sample further intensified this bias and endogenous stratification.

2.3.2. Study beach sites and substitute beach sites

Southern Maine and coastal New Hampshire provide a particularly interesting study area for this analysis for several reasons: (1) the coasts are adjacent, allowing beachgoers to easily substitute between beaches and regions; (2) beaches across the states vary in both attributes and water quality conditions. We selected our four study beaches using three criteria. First, we chose beaches in or near the initial intercept region with reported day trip visitation over the past year. Second, we chose beaches to reflect some of the diversity of beach attributes across southern Maine and New Hampshire beaches. Finally, we selected beaches that have some differences in water quality measurements and beach safety conditions. The EPA recommends posting a swimming advisory in marine coastal waters when the fecal indicator bacteria (FIBs) Enterococci reach a density of 70 colony forming units (CFUs) per 100 mL of water. There are a variety of waterborne bacterial, protozoan, and viral pathogens, and high FIB densities signal that one of any number of these pathogens may also be in the water (U.S. Environmental Protection Agency, 2014). In New Hampshire, all public swimming beaches are monitored by the NH Department of Environmental Services. In Maine monitoring is conducted by town officials or trained volunteers through the Maine Healthy Beaches Program, and towns choose whether they would like to be a part of the program. All of our study beaches currently monitor and communicate water quality conditions through one of these organizations.

We selected substitute beaches by choosing beaches that were of similar scale, popular with tourists and visitors (especially those visitors in our sample), and in similar regions as our study beaches. In addition, choosing substitute beaches that were too close to our sample beaches resulted in closely correlated travel costs. Highly correlated study site and substitute site travel costs may inflate standard errors, leading us to erroneously conclude that the variables are insignificant, when in reality they are not (Type II error). To avoid this problem, we selected substitute beaches that are sufficiently far enough away from our study beaches, ensuring that the study site and substitute site travel costs were not correlated to a troublesome extent.

In the following sections, we provide details about the four study beaches and the two substitute beaches that we chose according to this criteria (see Table 2.1. for a summary of the beach characteristics).

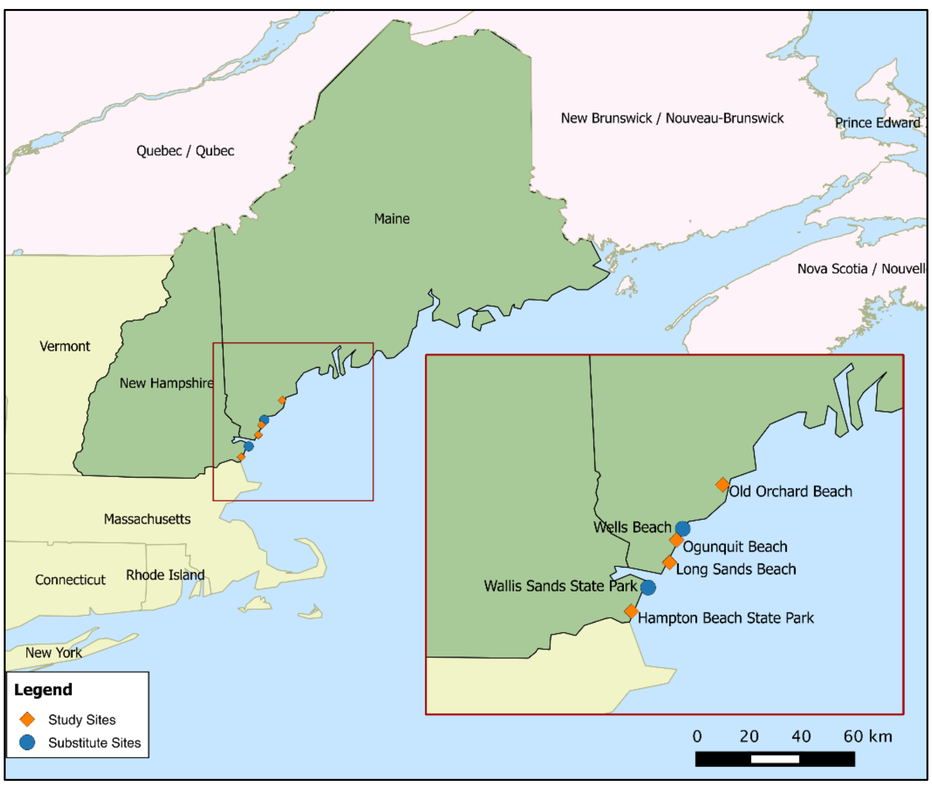


Figure 2.1. Map of southern Maine and New Hampshire study beach sites and substitute beach sites

2.3.2.1 Old Orchard Beach, ME

Old Orchard Beach (OOB) is located on Saco Bay in the town of Old Orchard Beach. It is the northernmost of our case study beaches and the longest, extending over 7 miles. OOB is a well-established tourist destination and is bordered by hotels, an amusement park, restaurants, shops, and a prominent 500 foot pier in the middle of the beach. There are popular fishing spots along or nearby the beach. OOB can be reached by bus or train, and parking lots around the beach range in price depending on the level of crowding but average around $10/day. OOB has restrooms adjacent to the beach, accessible by a fee ($0.50/person). The area around the beach is the most highly developed of our study beaches. In terms of water quality, OOB has had relatively few bacterial exceedances over the last 5 years, with the exception of 2012, where there were 6 advisory days during the beach season.

Images (left to right) Satellite image of Old Orchard Beach (Google images);
Right: Crowded beach day on Old Orchard Beach;

Figure 2.2. Old Orchard Beach images

2.3.2.2. Ogunquit Beach, ME

Located 27 miles south of Old Orchard, Ogunquit Beach in Ogunquit, ME is another popular tourist beach. The beach is located on a peninsula and is about 3.5 miles long; bordered by dune grass, natural vegetation (including a salt marsh) and some residences; the area immediately surrounding the beach is less developed than OOB. Parking at Ogunquit is available in large lots with a cost of $15/day. Beach amenities are relatively sparse, but do include restrooms with flushing toilets and changing rooms/showers, along with a trolley stop. Ogunquit is a well-known surfing beach, especially at the mouth of the river, an area that is also popular for shore fishing. Like OOB, Ogunquit has good/safe water quality conditions; the beach has typically been open between 98-100% of the beach season. There were 8 advisory days in 2007, which was the only year on record where Ogunquit experienced more than 2 advisory days.

Images (clockwise from left): Satellite image of Ogunquit Beach (source: Google images); access to Ogunquit Beach (courtesy of VisitMaine.org); rocky cliff jetty on Ogunquit Beach (source: VisitMaine.org)

Figure 2.3. Ogunquit Beach images

2.3.2.3. Long Sands Beach, ME

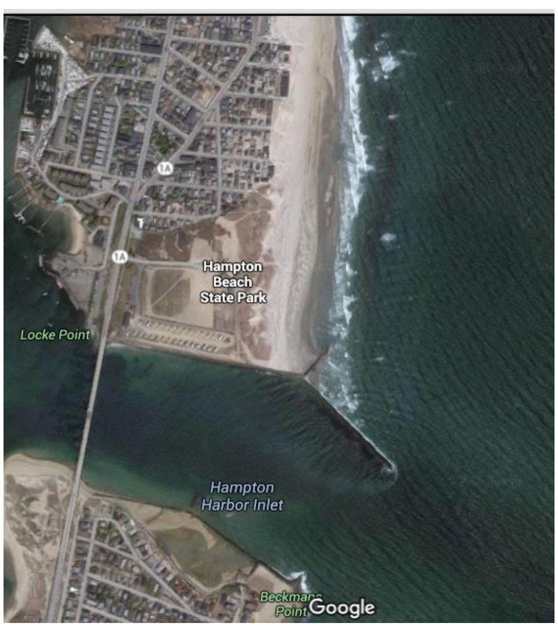
Long Sands Beach is located about 7 miles south of Ogunquit, nearby the Nubble Lighthouse, a historic and oft-photographed Maine lighthouse. It is bordered by a residential area, and limited metered street parking is available on the street bordering the beach. Long Sands is nearly two miles in length, with access points from the street down the length of the beach. The site has adjacent restrooms, but no beach concessions or changing rooms. Long Sands is a popular surf beach, and a local surf shop holds classes on the beach during the summer months. The site has also had high numbers of advisory days within the past five years, compared to the other study beaches. In 2010 Long Sands had 39 advisory days, prompting those who monitor the beach to add extra sampling sites in the following years. In recent years, these numbers have declined; among the beach's three sampling sites, the number of advisory days per year have ranged from a low of 0 (Long Sands main sampling site) to a high of 14 (Long Sands north sample site) between 2011 and 2015.

Images (left to right) Satellite image of Long Sands Beach (source: Google images); Long Sands Beach

Figure 2.4. Long Sands Beach images

2.3.2.4. Hampton Beach State Park, NH

About 30 miles to the south of Long Sands beach, our southernmost study beach is Hampton Beach State Park in Hampton, NH. This beach differs from the others described in that it is the only beach with an entrance fee; this $15/car fee also covers parking. It should be noted that the beach can be accessed by foot from beaches to the north or south of the state park without incurring this fee. The state park beach is bordered immediately by dune grass and some natural landscapes, but Hampton Beach, which is immediately adjacent, is in a much more highly developed area. The state park has nearby campsites and picnic areas amid the typical beach amenities like restrooms, changing rooms, and concessions. Water quality at Hampton Beach State Park is exceptional; there have been a total of two advisories at the beach over a ten year period.



Images (clockwise from left): Satellite imagery of Hampton Beach State Park; Hampton Beach State Park, groomed sand (source: NHstateparks.org); Hampton Beach State Park lifeguard (source: NHstateparks.org)

Figure 2.5. Hampton Beach State Park images

2.3.2.5. Substitute Site: Wells Beach, ME

Wells beach is located north of Ogunquit and Long Sands beaches, and south of Old Orchard beach, and is bordered by residences and a National Estuarine Research Reserve. Like the other three Maine beaches in this study, Wells Beach is popular with tourists in the summer months. Those who surf and fish tend to do so near the jetty on the beach. The water quality at Wells is similar to that of Ogunquit and Old Orchard beach – there have been relatively few advisory days in the past five years; the only year that exceeded 3 advisory days was 2014, when there were 7 advisory days.

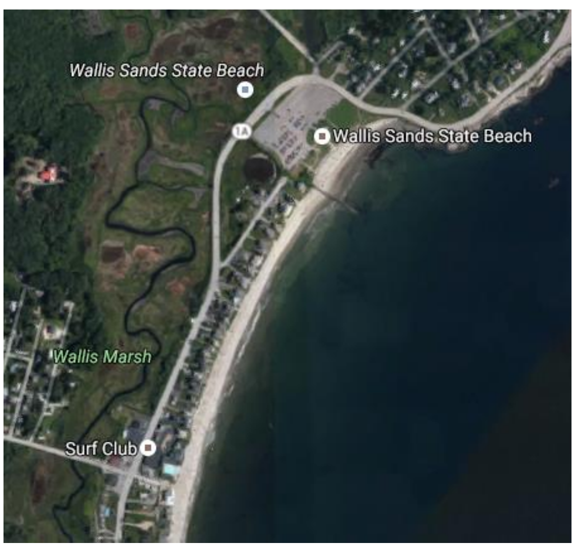
Images (clockwise from left): Google satellite imagery of Wells Beach; Wells beach (source: wellsmaine.com); Wells beach at low tide (source: visitmaine.net)

Figure 2.6. Wells Beach images

We chose Wells beach as the substitute beach for all three of our Maine study beaches for several reasons. Like the towns where Long Sands, Ogunquit, and Old Orchard are located, Wells is located in a popular beach town with plenty of shops, restaurants and off-the-beach entertainment options. Wells beach is a popular destination beach. Of our beachgoer sample, Wells Beach is frequented by those who visited Long Sands Beach, Ogunquit Beach, and Old Orchard Beach; this suggests that Wells beach is a desirable destination for our sample group and, as such, is a reasonable substitute site. Wells, Ogunquit, and Long Sands beaches are all served by the shoreline explorer, a trolley that visitors can use to travel along the coast of southern Maine, connecting the beaches and allowing for easy substitution between beaches in the region.

2.3.2.6. Substitute site: Wallis Sands State Park Beach, NH

Wallis Sands State Park Beach is located about 10 miles north of Hampton Beach State Park. Wallis Sands Beach is also a state park bordered at the north by a rocky point and to the south by a jetty that separates this beach from an adjacent beach. There is a $15/car entrance fee for the beach for those who arrive in a car. Wallis Sands beach has a number of amenities including concessions, restrooms, a bathhouse, and a picnic area with a field. Like Hampton Beach State Park, Wallis Sands beach has excellent water quality, with only 3 beach advisory days over 5 years of water quality monitoring.



Images (clockwise from left): Google satellite imagery of Wallis Sands State Beach; two views of Wallis Sands State Beach (nhstateparks.org)

Figure 2.7. Wallis Sands State Park Beach images

We chose Wallis Sands State Park Beach as our substitute site for Hampton Beach State Park. Both beaches are New Hampshire state beaches, as such they have identical entrance fees and share similar amenities including large parking lots near the beach, picnic and recreation areas, restrooms, bathhouses, and concessions. Though Hampton Beach State Park is located in a popular beach town, Wallis Sands is only a short drive from Portsmouth, another popular coastal city with restaurants, shops and entertainment. In addition, many of those in our sample who visited Hampton Beach State Park also visited Wallis Sand State Park; this overlap in visitation and similarities in beach amenities and nearby attractions supports our decision to choose Wallis Sands as a substitute site for Hampton Beach State Park.

Table 2.1. Summary of study beaches and substitute beaches attributes

	Old Orchard Beach	Ogunquit Beach	Long Sands Beach	Hampton State Park Beach	Wells Beach (substitute)	Wallis Sands State Beach (substitute)
Length	7 miles	3.5 miles	About 1.5 miles	About 1.5 miles	About 1 mile	About 0.75 miles
Development level	Higher development; immediately adjacent to shops, restaurants, an amusement park, etc	Lower development; located on a peninsula of beach and dunes	Moderate development; adjacent to a residential area	Moderate development; Hampton is immediately outside of the state park	Moderate development; Surrounded by residential areas and protected reserve;	Moderate development, surrounded by the town of Rye, NH,
Parking	Private lots (fees range with demand – average around $10/day)	Lot: $15/day	Metered parking ($1.00/hour) and permit parking ($35/year for residents)	Entrance fee includes parking: $15/car	Public parking available in lots: $16/day	Entrance fee, includes parking: $15/day
Facilities	Restrooms near beach ($0.50/person), bus/trolley stop, lifeguards	Restrooms, changing rooms, showers, bus/trolley stop, lifeguards	Restrooms, lifeguards	Restrooms, changing rooms, showers, concessions, lifeguards	Bus/trolley stops lifeguards;	Restrooms, bathhouses, changing rooms, concessions, lifeguards, picnic area
Recreation attributes	500 foot pier off the middle of the beach; shore fishing is popular in some areas;	Freshwater inputs are popular fishing areas; well-known surfing beach	Surf classes take place on the beach	Some areas for surfing on or near the beach	Some shore fishing and surfing near the jetty on the beach	Large field areas for sports and other recreation activities adjacent to the beach;
Nearby attractions	Amusement park adjacent to beach; restaurants; shops; boardwalk	Marginal Way – walk along cliff past lighthouse	Nubble lighthouse – one of the most frequently photographed lighthouses in Maine	Camping available in the park; nearby dining and shops (Hampton, NH)	Restaurants and shopping in nearby Wells; National Estuarine Research Reserve	Short drive from shopping and restaurants in Portsmouth
Water quality	Few bacterial exceedances, with the exception of 2012: 6 advisory days	Few bacterial exceedances; besides having 8 advisory days in 2007, have not had more than 2 advisory days/year	Higher number of bacterial exceedances; 39 advisory days in 2010; recently, the number of advisory days per year have ranged from 0 to 14 days	Exceptional water quality – only two advisory days in the past 10 years	Few bacterial exceedances; the only year that exceeded 3 advisory days was 2014, when there were 7 advisory days.	Exceptional water quality – only three advisory days in the past 5 years

2.3.3. Data

We combined our survey data with new data generated to describe respondents' travel costs to provide the foundational data resource for the single-site count regression models of beach visitation.

2.3.3.1. Dependent variables

For all models the dependent variable stems from the counts of day trips to the given beach (OOB, OG, LS, HAMP*)*. In our survey we asked respondents to indicate the number of day trips they took to beaches throughout the Maine and New Hampshire coast by selecting a short range of trips that best represented their visitation patterns in the region. We use the lower end of the range as the trip counts for each respondent. Consequently, total trip counts represent the lower estimation of actual trip counts to the region. The maximum number of trips that a respondent was able to select was 'more than 15 trips.' This method likely underestimates the number of trips that nearby residents take in a given year but may well capture day trips by residents from other parts of New England.

We limit our analysis to day trip data and assume that day trips to the beach are single-purpose trips (Parsons, 2003). We included beachgoers within 5 hours driving distance of each study beach in our samples. We chose this value based on day trips reported by our respondents. The five hour limit allows us to include the bulk of our respondents who reported day trips, while allowing us to eliminate beachgoers who might face different travel costs, such as air travel costs or lodging costs on their way to the beach. Our beachgoer sample sizes vary by beach and by model specification, and our final samples range in size from 231 to 254 respondents.

2.3.3.2. Explanatory variables

Consistent with the recreation demand literature (Bockstael, McConnell, & Strand, 1991; Freeman III et al., 2014; Parsons, 2003), we include a number of variables that might impact trip behavior (Table 2.2). Travel costs (TC) are comprised of both transportation and time costs. Calculating transportation and time costs requires knowing the distance and time that it will take a respondent to get to a beach. We estimate these values in R, using the package ggmaps to calculate Google Maps Distance Matrices from respondent's home zip codes (or postal codes, for Canadian respondents)[6] to each study beach, and substitute study beaches (Kahle & Wickham, 2013). The Google Maps API distance matrix calculates the shortest driving route from an origin (a zip/postal code centroid) to a destination (a beach), and includes driving distance and time between the two points in its output. We chose this route-based method over using Euclidean (straight-line) distances because route-based methods more accurately represent the driving distance and time it takes to get from the respondent's home to a beach. Transportation costs represent the round trip costs of driving to the beach. Following Song et al (2010) and Whitehead et al (2008), we use the AAA vehicle operating costs for the survey year (in this case, 2014).[7] Consistent with these studies (Song et al., 2010; Whitehead, Dumas, Herstine, Hill, & Buerger, 2008) we chose the most conservative value to represent driving costs: $0.397/mile. Time costs represent the opportunity costs of taking a trip to the beach. In this study, we only consider driving time, and not time spent on the beach, in the time cost calculations. To estimate time costs, we calculate the wage rate from the midpoint of the income range that respondents selected.[8] Following others, we define time costs as one third of the wage multiplied by the round trip driving time (Parsons et al., 2009; Parsons & Stefanova, 2011; Song et al., 2010; Whitehead

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[6] 5 digit Zip codes (US) and 3 digit postal codes (Canada) are the only geographic information we have about our respondents. As a result, driving distances and times are approximations. Real driving distances and times may deviate from our estimated value, depending on the size of the zip/postal code and where respondents live within the zip/postal code.

[7]Source: 'Your Driving Costs: How much are you really paying to drive?' http://exchange.aaa.com/wp-content/uploads/2014/05/Your-Driving-Costs-2014.pdf

[8] We asked respondents to choose a range that represented their total (pre-tax) household income, choosing from 10 categories: <$10,000; $10,000-$14,999; $15,000-$24,999; $25,000-$34,999; $35,000-$49,999; $50,000-$74,999; $75,000-$99,999; $100,000-$149,999; $150,000-$199,999; >$200,000. We assigned incomes as the midpoint of the range for all options except for the lowest and highest. We assigned respondents who selected an income of less than $10,000 a midpoint income of $10,000 and we assigned respondents who selected an income of greater than $200,000 a midpoint income of $250,000. To calculate the wage rate we divided this midpoint income by 2040, where 2040 is the number of hours we assume the average full time employee works over a year.

et al., 2008). To find the total travel cost, we sum transportation and time costs. In line with traditional demand theory, we expect that as the price of a beach trip (TC) increases, the quantity demanded of beach trips will decrease.

Table 2.2. Model variable definitions

Variable name	**Definition**
Dependent variables	
OOB	Day trips to Old Orchard Beach, ME
OG	Day trips to Ogunquit Beach, ME
LS	Day trips to Long Sand Beach, ME
HAMP	Day trips to Hampton Beach State Park, NH
Travel cost variables	
TC: OOB TC: OGUN TC: LONG TC: HAMP	Travel costs of taking a trip to the beach – comprised of transportation costs and time costs
Substitute travel costs	
TC SUB: WELLS TC SUB: WALLIS	Travel costs to substitute beach sites (other than study site beaches); we use two alternate beach sites: Wells beach in ME and Wallis Sands State Beach in NH
Socioeconomic variables	
AGE	Age of respondent
FEMALE	1 if respondent is female; 0 otherwise
RETIRED	1 if respondent is retired; 0 otherwise
HIGHINC	1 if respondent falls into the 'high income' bracket: annual household income of $100,000 or higher
EDYEARS	Number of years of education (12= high school degree; 20=graduate degree)
CHILD	1 if respondents have children under 12 in the household; 0 otherwise
Recreation variables	
FULLDAY	1 if respondent spends over 5 hours on the beach on a typical beach day; 0 otherwise
FISH	1 if respondent engages in coastal fishing; 0 otherwise
SURF	1 if respondent surfs; 0 otherwise
ANYSWIM	1 if respondent reports engaging in both coastal swimming *and* freshwater swimming; 0 otherwise
CSTSWIM	1 if respondent reports engaging only in coastal swimming; 0 otherwise
Safety information seeking behaviors	
INFOWQ	1 if respondent seeks out water quality information; 0 otherwise
INFOSURF	1 if respondent seeks out surf conditions information; 0 otherwise

Table 2.3. Model variables descriptive statistics by beach site sample

	Old Orchard Beach			Ogunquit Beach			Long Sands Beach			Hampton Beach State Park		
	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
Dependent variables												
OOB	286	0.28	1.61	292	0.27	1.59	298	0.27	1.58	307	0.26	1.55
OG	286	0.33	1.47	292	0.32	1.46	298	0.32	1.45	307	0.31	1.42
LS	286	0.16	1.00	292	0.16	0.99	298	0.15	0.98	307	0.15	0.97
HAMP	286	0.33	1.62	292	0.32	1.60	298	0.31	1.58	307	0.30	1.56
Travel cost variables												
TC: OOB	264	155.56	105.15	269	160.95	111.81	275	166.40	117.46	283	175.86	129.77
TC: OGUN	264	136.84	101.06	269	142.34	108.12	275	148.77	116.21	283	158.95	130.49
TC: LONG	264	132.40	98.33	269	137.84	105.44	275	129.24	113.56	283	154.26	127.82
TC: HAMP	264	117.82	92.40	269	123.06	99.44	275	153.49	107.57	283	138.97	121.60
Substitute travel cost variables												
TC SUB: WELLS	264	141.46	101.40	269	147.08	108.77	275	153.49	116.78	283	163.84	131.46
TC SUB: WALLIS	264	127.08	95.83	269	132.45	102.97	275	138.61	110.78	283	148.42	124.64
Socioeconomic variables												
AGE	270	51.74	12.38	276	51.69	12.34	281	51.62	12.32	288	51.34	12.45
FEMALE	280	0.66	--	286	0.67	--	292	0.66	--	300	0.66	--
RETIRED	285	0.16	--	291	0.16	--	297	0.16	--	306	0.16	--
HIGHINC	267	0.51	--	272	0.51	--	278	0.51	--	286	0.53	--
EDYEARS	285	16.20	2.51	291	16.22	2.52	297	16.20	2.51	306	16.24	2.53
CHILD	286	0.26	--	292	0.26	--	298	0.26	--	286	0.26	--
Recreation variables												
FULLDAY	280	0.41	--	286	0.41	--	292	0.40	--	297	0.40	--
FISH	276	0.42	--	282	0.42	--	288	0.42	--	297	0.42	--
SURF	276	0.42	--	282	0.41	--	288	0.41	--	297	0.40	--
ANYSWIM	276	0.15	--	282	0.15	--	288	0.15	--	297	0.14	--
CSTSWIM	276	0.18	--	282	0.18	--	288	0.18	--	297	0.18	--
Safety information seeking variables												
INFOWQ	279	0.25	--	285	0.26	--	291	0.26	--	300	0.26	--
INFOSURF	279	0.53	--	285	0.53	--	291	0.52	--	300	0.51	--

We also calculate the travel costs to substitute sites (TC SUB), Wells Beach and Wallis Sands State Beach, using the methods described. We expect that as the travel costs to substitute sites increase, the number of trips to the modeled site will also increase, as individuals substitute away from the more expensive site to the less expensive site.

Beyond travel costs, we include 3 categories of individual characteristics: (1) socioeconomic characteristics, (2), participation in water recreation behaviors and (3) safety information seeking behavior.

Following conventions established by prior beach recreation demand studies, we include the demographic variables age (Bell & Leeworthy, 1990; Bin et al., 2005; Egan & Herriges, 2006; Parsons, Massey, & Tomasi, 1999), gender (Egan & Herriges, 2006; Hilger & Hanemann, 2006; Parsons & Stefanova, 2010) and education (Bin et al., 2005; Egan & Herriges, 2006; Hilger & Hanemann, 2006; Lew & Larson, 2008; Parsons et al., 2009) in our models to control for socioeconomic differences between our respondents. Depending on beach profiles, differences in demographics may influence trip decisions. For example, younger beachgoers may choose to visit different beaches than older beachgoers perhaps reflecting inconsistencies in what different age groups value in a beach experience. We expect that if a respondent has children (CHILD), they will take less trips to the beach, reflecting the added costs (both monetary and time) of traveling with young children (see Hilger and Hannemann, 2008, or, for an alternate finding, Parsons and Stefanova, 2010). Previous studies find a significant relationship between income and trip counts (Bell & Leeworthy, 1990; Blackwell, 2007). We expect that respondents in high income households will take more beach trips because they have extra disposable income. All of these impacts may differ between beaches, depending on the profile and location of the beach.

We also expect recreation activities to impact trip behavior. People who engage in certain types of recreation may be more likely to take more trips to a beach, or may choose to take more trips at a certain type of beach. Those who surf may take more trips to the beach than those who do not, and may choose to visit beaches that are conducive to surfing. Likewise, those who fish in coastal waters may take more trips to the beach to engage in this pastime, and may choose to visit beaches near favorable fishing areas. Those who swim only in coastal waters might visit beaches more frequently, generally, to engage in this activity. Those who swim in both freshwater and coastal areas might have different visitation patterns. For example, they may choose to visit a given coastal beach less if the conditions are not ideal for swimming, choosing instead to visit a different beach or a lake. Alternatively, they may choose to visit beaches more, as they are avid swimmers. In addition, beachgoers who engage in high-contact recreation may choose to visit beaches with high water quality because they are at a higher risk of getting sick if the water is contaminated.

We expect knowledge of beach safety to impact trip behavior, and we expect this impact to differ between beaches of different types. Those who seek out beach safety information, may generally have an awareness or concern for safety issues on beaches. Those who seek out information may think about beach visits differently than those who do not; for example, they may choose to substitute away from beach visits if beach conditions are unsafe, choosing to postpone their visit or engage in a different recreation activity instead. Those who are aware of problems on beaches may take more trips to beaches with excellent water quality and less trips to beaches with water quality issues. Seeking out information about beach closures or advisories also impacts the cost of a trip to the beach; Murray et al (2001) find that the way that users seek out water quality information can impact their potential per trip welfare losses due to beach closures; those who seek out their information from the media experience lower welfare losses than those who seek out information using signs on the beach. These differences in relative costs could affect decision-making.

2.3.4. Travel cost model

Consistent with prior studies focused on single-site beach recreation demand models (Freeman III et al., 2014; Haab & McConnell, 2002; Parsons, 2003), we employed count regression methods to explain variation in annual day trips to our four study beaches. Following conventions, we began by reviewing the data and estimating Poisson regression models and then conducted over-dispersion tests. Contingent on the results of these tests, we considered additional models suitable for handling over-dispersion, including negative binomial models.

The count regression models we estimated shared a common structure, where we assume the reported annual counts of day trip beach visits to site j (y_{ij}) conditional on explanatory variables x_i take on a particular distribution and have a mean parameter with established properties. For example, in the case of the Poisson regression models, day trip beach visits to site j (y_{ij}) conditional on explanatory variables x_i are Poisson distributed with density

$$f\left(y_{ij} \middle| \mathbf{x}_i\right) = \frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!},$$

and mean parameter

$$\lambda_i = \exp(\mathbf{x}_i'\boldsymbol{\beta}),$$

where β is a vector of parameters to be estimated. The specification of the mean parameter delineates the contributions of our explanatory variables (x_i). Here, day trips reported by individual, *i*, to beach site *j* are assumed to be a function of the individual's travel costs to site *j* (TC_{ij}) and a substitute site *k* ($TC\ SUB_{ik}$), socioeconomic characteristics (E_i), individual variation in engagement in water recreation (R_i), and water quality and surf conditions safety knowledge (S_i).

The basic Poisson implies an equal mean and variance; the negative binomial regression model relaxes this assumption and therefore better handles over-dispersed data. Following Greene's notation (Greene, 2003), in the negative binomial, the distribution of y_i is conditioned on x_i and unobserved individual heterogeneity (u_i):

$$f(y_i|\mathbf{x}_i, u_i)= \frac{e^{-\lambda_i u_i}(\lambda_i u_i)^{y_i}}{y_i!},$$

where we assume that u_i is gamma distributed with an expected value of 1, such that:

$$g(u_i)= \frac{\theta^\theta}{\Gamma(\theta)} e^{-\theta u_i} u_i^{\theta-1}$$

The unconditional probability density for y_i is then:

$$\frac{\Gamma(\theta+y_i)}{\Gamma(y_i+1)\Gamma(\theta)} r_i^{y_i}(1-r_i)^\theta, \text{ where } r_t=\frac{\lambda_i}{\lambda_i+\theta'}$$

The conditional mean is the same as that of the Poisson (λ_i), but the conditional variance is defined as:

$$\lambda_i(1+\left({}^1/_\theta\right)\lambda_i),$$

where θ can be interpreted as the over-dispersion parameter. We can check for over-dispersion in the data by testing the hypothesis that θ is equal to zero. Over-dispersion is common with recreation demand data and results in underestimation of standard errors; the negative binomial model is an alternative to the Poisson that does not require the assumption that the conditional means and variance are equal (Haab & McConnell, 2002).

We parameterized our count regression models using maximum likelihood estimation. We use PROC COUNTREG in SAS/ETS 12.3 to estimate all models. We estimated three models for each of our study sites, in part to help compare the explanatory power of each group of variables. In our first models (OOB-1, OG-1, LS-1, and HAMP-1), we include only the travel costs, in our second models we add in the recreation variables (OOB-2, OG-2, LS-2 and HAMP-

2), and in our third model we add the information seeking variables (OOB-3, OG-3, LS-3, and HAMP-3). After running the Poisson models for each site, we completed tests for over-dispersion. Where appropriate, we ran negative binomial models.

2.4. Results

We addressed the two themes in our research questions by testing the joint significance of the recreation and safety information seeking variables. We tested the hypothesis that the parameters associated with our variables of interest (recreation variables and information seeking variables) are jointly equal to zero by using likelihood ratio tests, where the restricted models are specified without the variables of interest and the unrestricted models are the full models. To address our first research question: (1) Do the recreation activities individuals engage in on beaches impact visitation decisions?, we tested the hypothesis that the recreation variables are jointly significant at the 5% level. To address our second research question: (2) Does knowledge about safety risks on beaches impact visitation decisions?, we tested the hypothesis that information seeking variables are jointly significant at the 5% level.

For respondents within a 5 hour drive of each of our four beaches, on average, our respondents reported the most trips to Ogunquit Beach and the least number of trips to Long Sands Beach; this likely reflects the fact that Long Sands Beach was not one of the beaches where the initial intercept sample was conducted, from which our sample was drawn (Table 2.2). Of those who did visit our four study beaches, most only reported taking one trip over the previous year (Figure 2.8.)

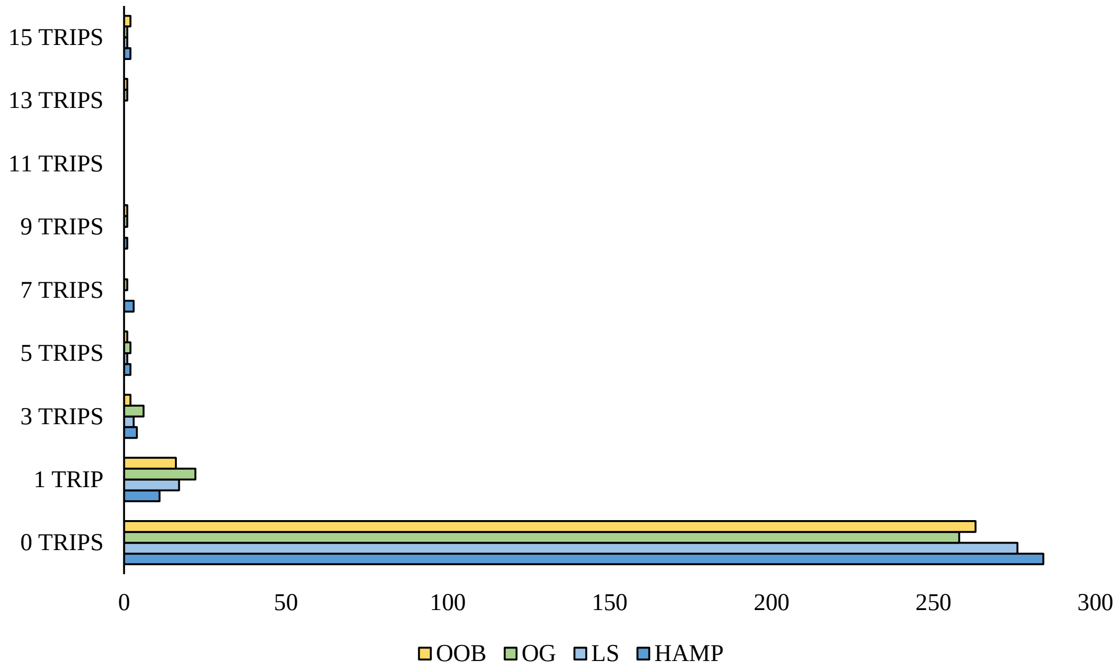

Figure 2.8. Frequency of day trips to each of the four study beaches

Lagrange Multiplier Tests used on Poisson regression model results indicated significant evidence of over-dispersion in our data (this is evident in the significance of the dispersion parameter, θ (Table 2.4.)). Accordingly, we focus our discussion on the results of our negative binomial models. For continuous variables, the coefficient values can be interpreted as the proportionate change in the conditional mean (λ) when the explanatory value changes by one unit (Cameron and Trivedi, p 81, 2001).

Overall, all model specifications outperform the intercept only models. The second specification, where we include both socioeconomic and recreation variables, is the preferred model for Old Orchard, Ogunquit, and Long Sands, while the third model, which also includes the information seeking variables, is the preferred model for Hampton.[9] All of the travel cost parameters and substitute travel cost parameters have the expected sign, but not all are

[9] We chose the preferred model by selecting the model specification where: (1) the log likelihood has the lowest absolute value and (2) the lowest AIC value.

statistically significant. The Long Sands models are particularly noisy, with no variables that are statistically significant at the 5% level in any of the specifications. This likely reflects the sampling technique: Long Sands was the only beach in the sample that was not included in the initial intercept survey.

We find significance in some of the socioeconomic parameters. At Ogunquit and Hampton RETIRED is significant and positive in all model specifications; this aligns with our expectations: those who are retired have more time available for leisure and recreation. We do not find significant evidence of this relationship in the Old Orchard and Long Sands models. HIGHINC is significant in only the Old Orchard model; the positive sign indicates that having a high household income is positively related to the expected number of trips to Old Orchard Beach. EDYEARS is significant in the full Hampton model (HAMP-3) and in the Ogunquit models (OG-2 & OG-3), though their signs are different. An increase in years of education has a negative impact on the expected number of trips to Hampton, but a positive impact on the expected number of trips to Ogunquit. Finally, CHILD is negative in the socioeconomics specification of trips to OOB. Having children under the age of 12 is negatively associated with the trips to OOB, perhaps reflecting the increased time costs of traveling with children; this significance does not hold once the recreation and information variables are introduced into the model.

Table 2.4. Negative binomial count regression results

	Old Orchard Beach			Ogunquit Beach			Long Sands Beach			Hampton Beach State Park		
	OOB-1	**OOB-2**	**OOB-3**	**OG-1**	**OG-2**	**OG-3**	**LS-1**	**LS-2**	**LS-3**	**HAMP-1**	**HAMP-2**	**HAMP-3**
INT	-7.196	-6.192	-6.689	-7.087	-9.217	**-9.212***	-9.615	**-13.088***	-11.300	1.183	2.685	8.141
	6.362	*6.064*	*6.071*	*5.191*	*4.999*	***5.056***	*8.174*	***7.470***	*7.490*	*6.133*	*6.274*	*6.787*
Travel cost variables												
TC	**-0.054***	**-0.055***	**-0.054***	-0.090	**-0.111****	**-0.109****	**-0.067***	-0.049	-0.052	**-0.121***	**-0.129***	**-0.151***
	0.020	***0.019***	***0.018***	*0.056*	***0.052***	***0.052***	***0.380***	*0.033*	*0.033*	***0.047***	***0.047***	***0.050***
TC SUB	**0.045****	**0.044****	**0.044****	0.083	**0.105****	**0.104****	0.055	0.038	0.041	**0.102****	**0.104****	**0.121****
	0.020	***0.019***	***0.019***	*0.055*	***0.051***	***0.051***	*0.035*	*0.031*	*0.031*	***0.046***	***0.046***	***0.049***
Socioeconomic variables												
AGE	0.279	0.153	0.169	0.251	0.222	0.222	0.439	0.430	0.397	0.083	0.073	-0.046
	0.240	*0.217*	*0.215*	*0.181*	*0.172*	*0.174*	*0.298*	*0.277*	*0.279*	*0.227*	*0.229*	*0.232*
AGESQ	-0.004	-0.003	-0.003	-0.003	-0.002	-0.002	-0.005	-0.005	-0.004	-0.002	-0.001	-0.001
	0.003	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.003*	*0.003*	*0.003*	*0.002*	*0.002*	*0.002*
FEMALE	0.114	0.144	0.062	-0.452	-0.662	-0.643	-0.045	-0.680	-1.179	1.089	0.472	-1.003
	0.766	*0.813*	*0.806*	*0.621*	*0.666*	*0.666*	*0.838*	*0.863*	*0.957*	*0.798*	*0.889*	*1.047*
EDYEARS	0.162	0.195	0.211	0.097	**0.218***	**0.213***	-0.048	0.075	0.042	-0.196	-0.235	-0.279*
	0.184	*0.177*	*0.175*	*0.134*	***0.130***	***0.130***	*0.177*	*0.158*	*0.153*	*0.172*	*3.214*	*0.160*
RETIRED	**4.484****	**4.254***	**4.013***	1.028	1.159	1.062	1.695	-0.168	0.026	**3.079****	**-0.570****	**3.406****
	1.387	***1.301***	***1.298***	*1.022*	*0.946*	*0.991*	*1.542*	*1.490*	*1.506*	***1.506***	***0.987***	***1.443***
HIGHINC	**2.264***	**1.819****	**1.609***	0.445	-0.525	-0.507	0.436	-0.798	-0.925	-0.534	-1.114	-0.584
	0.868	***0.892***	***0.866***	*0.781*	*0.775*	*0.780*	*0.890*	*0.856*	*0.860*	*0.922*	*0.946*	*1.053*
CHILD	**-2.239****	-1.366	-1.444	-0.402	-0.062	-0.029	-0.935	-0.945	-0.848	-1.146	0.959	-1.843
	0.992	*0.940*	*0.924*	*0.726*	*0.725*	*0.726*	*0.945*	*0.914*	*0.899*	*0.954*	*0.842*	*1.158*

Table 2.4. Continued Negative binomial count regression results

	OOB-1	OOB-2	OOB-3	OG-1	OG-2	OG-3	LS-1	LS-2	LS-3	HAMP-1	HAMP-2	HAMP-3
Recreation variables												
FULLDAY		0.899	0.779		**1.252****	**1.281****		0.437	0.067		0.701	0.073
		0.847	*0.837*		***0.602***	***0.616***		*0.749*	*0.785*		*1.256*	*0.894*
ANYSWIM		0.396	0.185		-0.070	-0.135		2.246	1.945		-0.793	0.341
		1.176	*1.159*		*0.740*	*0.765*		*1.422*	*1.399*		*1.146*	*1.297*
CSTSWIM		-0.908	-1.238		**-2.782*****	**-2.836*****		0.418	0.178		0.115	-0.875
		1.212	*1.234*		***0.909***	***0.927***		*1.409*	*1.047*		*0.972*	*1.232*
FISH		0.924	0.963		**1.376***	**1.364***		1.027	1.106		-1.605	0.226
		0.812	*0.803*		***0.740***	***0.745***		*0.803*	*0.797*		*1.327*	*1.061*
SURF		-0.769	-0.778		-1.165	-1.119		0.084	-0.244			**-2.853***
		1.027	*1.060*		*0.963*	*0.972*		*0.961*	*0.960*			***1.462***
Safety information seeking variables												
INFOWQ			0.477			0.218			-0.856			**-1.870***
			0.795			*0.643*			*0.917*			***0.993***
INFOSURF			0.535			0.003			1.046			**3.065*****
			0.784			*0.541*			*0.814*			***1.151***
θ[a]	**9.721**	**6.290**	**5.791**	**11.742**	**6.064**	**5.990**	**13.602**	**6.672**	**5.830**	**12.828**	**9.009**	**6.766**
LL[b]	-93.904	-88.324	-87.795	-129.143	-113.163	-113.106	-79.697	-68.071	-67.003	-98.572	-94.260	-88.077
AIC	209.808	208.648	211.590	280.287	258.327	262.212	181.390	168.143	170.006	219.143	220.520	212.155
N	244	231	231	249	236	236	254	241	241	260	246	246

Stars indicate significance, as follows: * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level
Standard errors are displayed in italics beneath the coefficient values
[a] All overdispersion parameter values are significant at the 5% level
[b] Log likelihood values

We find that the recreation variables (FULLDAY, ANYSWIM, CSTSWIM, FISH, and SURF) are jointly significant in the Ogunquit specifications (OG-2, OG-3) but are not jointly significant in the other site models. In the OG models, fishing and spending a full day at the beach increase the log expected number of trips to Ogunquit. We find that the information seeking variables are jointly significant in the Hampton specification (HAMP-3), but are not jointly significant in the other site models. In the Hampton models, we observe a negative relationship between seeking out water quality and visiting Hampton Beach State Park, and a positive relationship between seeking out surf conditions and visiting Hampton Beach State Park.

2.5. Discussion

Overall we find a statistically significant relationship between some recreation activities and safety information seeking behavior and expected counts of beach trips. These results differ between our study beaches in both sign and significance, suggesting that there is heterogeneity in the factors that impact beach visitation across the four sites. While the recreation variables are jointly significant in most study beaches (Long Sands, the only site where the intercept survey was not conducted, being the exception), Ogunquit Beach is the only study site with more than one individual recreation variable is significant at the 5% level (FULLDAY, CSTSWIM, FISH). The significance on FULLDAY suggests that those who spend a long time at the beach during a typical trip are more likely to visit Ogunquit than those who spend less time on the beach during a typical trip. We might expect these results because Ogunquit is a popular destination beach; it is a beach where people might relax all day at. We observe a negative relationship between CSTSWIM and log of expected counts, suggesting that those who engage in coastal swimming are less likely to visit than those who do not; it would be interesting to follow up on these results to determine whether this relationship holds for broad groups of beachgoers to this site. The positive sign on FISH likely reflects that Ogunquit area is popular for coastal fishing, especially where the Ogunquit River meets the ocean. A possible explanation for the individual recreation variables significance in the Ogunquit models but not the other site models is that this site was the most visited of the four study sites by beachgoers in our dataset, and perhaps the larger user set allowed for us to observed increased variation in Ogunquit beachgoer characteristics; alternatively, it could be that diverse recreation activities are one of the major drivers of visitation decisions for Ogunquit Beach, and this may not be true for the other beaches.

Hampton Beach State Park is the only study site where the safety information seeking behaviors were jointly significant. Perhaps beachgoers who decide to take trips to a State Park weigh safety and environmental conditions information more carefully when making trip decisions than those who go to other types of public beaches. The signs on the two types of information's parameters are opposite: INFOWQ is negatively related to trips to Hampton (though only significant at the 10% level), while INFOSURF is positively related to trips to Hampton. One possible explanation is that there is some quality about Hampton Beach State Park that those who are wary about surf conditions find desirable; it is a highly regulated beach with a prominent lifeguard presence. The negative sign on the water quality information seeking is interesting because it counters our expectations. Hampton State Park has consistently safe water quality conditions, and we might expect that people who value information about water quality, those who seek it out, would be more likely to visit Hampton because of its excellent water quality history.

2.6. Conclusions & Future Research

Recreation and safety information are important components of beachgoers' decision-making processes. By incorporating different recreation and information seeking behaviors into demand models, we begin to better understand the varied ways that that recreation activities and information seeking behaviors impact trip decisions, and how these impacts vary depending on the site. We identify some connections between recreation activities and trip behaviors on some beaches, and these findings are particularly meaningful in the context of trip decision-making;

individuals likely make substitutions in activity and site choice and safety information can help motivate these decisions.

Our results help to inform future models of trip demand, which could build on our generalized single-site analysis to assess recreation behavior on specific beaches or regions. Our study makes connections between general recreation patterns and trip behavior, and this broad approach has limitations. First, in our sample, we asked about visitation across many beaches in Maine and New Hampshire and observed a relatively low number of users who took day trips to individual beaches. We chose a single site approach over aggregating visits to several beaches in a region because we would not have been able to address the recreation behaviors on an aggregated scale, and also because aggregation across sites can produce troublesome effects of its own (Parsons, 2003). Second, asking about recreation patterns broadly masks potential differences in behavior between beach sites. Future work could address this issue by asking about recreation and safety information seeking behaviors on specific beaches. In addition, it would be useful to know whether individuals would take a trip to the beach if they could not engage in their preferred recreation behavior (for example, if they could not swim in the water, would they still take a trip to the beach?). Understanding the sensitivity of trip decision-making to activity preferences may help researchers better isolate the value of a change in water quality to those who recreate on coastal beaches. Finally, the water quality conditions in Maine and New Hampshire are generally good; though some beaches face issues they are largely exceptions to the excellent water quality along the shared coastline. Repeating this study with a sample of beachgoers who visit beaches with more widely varying water quality conditions, and are exposed to more heavily publicized water quality issues, might produce different results.

Research that explores decisions made by beachgoers between and on beaches is important to those who monitor the safety of coastal waters and the coastal communities whose economies are reliant on tourism and recreation. Knowledge of how beachgoers make decisions about trips can help on-the-ground decision-makers prioritize various beach renovation and protection projects to ensure that beaches remain economically and environmentally sustainable destinations. Work like this will become more important if issues such as erosion, storm surges, and various water quality issues increase in magnitude over the coming years.

BIBLIOGRAPHY

Adamowicz, W., Swait, J., Boxall, P., Louviere, J., & Williams, M. (1997). Perceptions versus objective measures of environmental quality in combined revealed and stated preference models of environmental valuation. *Journal of Environmental Economics and Management, 32*(1), 65-84.

Alberini, A., Leiter, A. M., Rheinberger, C. M., McCormick, C., & Mizrahi, A. (2009). AVALUATION: Estimating the economic value of the avalanche bulletin. *Age, 1171*(40.5), 12.0.

Anderson, D. M. (2010). Estimating the economic value of ice climbing in hyalite canyon: An application of travel cost count data models that account for excess zeros. *Journal of Environmental Management, 91*(4), 1012-1020.

Arcury, T. (1990). Environmental attitude and environmental knowledge. *Human Organization, 49*(4), 300-304.

Baker-Austin, C., Trinanes, J. A., Taylor, N. G., Hartnell, R., Siitonen, A., & Martinez-Urtaza, J. (2013). Emerging vibrio risk at high latitudes in response to ocean warming. *Nature Climate Change, 3*(1), 73-77.

Beharry-Borg, N., & Scarpa, R. (2010). Valuing quality changes in Caribbean coastal waters for heterogeneous beach visitors. *Ecological Economics, 69*(5), 1124-1139.

Bell, F. W., & Leeworthy, V. R. (1990). Recreational demand by tourists for saltwater beach days. *Journal of Environmental Economics and Management, 18*(3), 189-205.

Bin, O., Landry, C. E., Ellis, C. L., & Vogelsong, H. (2005). Some consumer surplus estimates for North Carolina beaches. *Marine Resource Economics*, 145-161.

Blackwell, B. (2007). The value of a recreational beach visit: An application to mooloolaba beach and comparisons with other outdoor recreation sites. *Economic Analysis and Policy, 37*(1), 77-98.

Bockstael, N. E., McConnell, K. E., & Strand, I. E. (1989). A random utility model for sportfishing: Some preliminary results for Florida. *Marine Resource Economics*, 245-260.

Bockstael, N. E., McConnell, K. E., & Strand, I. E. (1991). Recreation. *Measuring the Demand for Environmental Quality, 8*.

Brannstrom, C., Brown, H. L., Houser, C., Trimble, S., & Santos, A. (2015). "You can't see them from sitting here": Evaluating beach user understanding of a rip current warning sign. *Applied Geography, 56*, 61-70.

Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125*(3), 367.

Cameron, A. C., & Trivedi, P. K. (2001). Essentials of count data regression. *A Companion to Theoretical Econometrics, 331*.

Case, D. O., Andrews, J. E., Johnson, J. D., & Allard, S. L. (2005). Avoiding versus seeking: The relationship of information seeking to avoidance, blunting, coping, dissonance, and related concepts. *Journal of the Medical Library Association: JMLA, 93*(3), 353-362.

Chakraborty, K., & Keith, J. E. (2000). Estimating the recreation demand and economic value of mountain biking in Moab, Utah: An application of count data models. *Journal of Environmental Planning and Management, 43*(4), 461-469.

Charron, D. F., Thomas, M. K., Waltner-Toews, D., Aramini, J. J., Edge, T., Kent, R. A., et al. (2004). Vulnerability of waterborne diseases to climate change in Canada: A review. *Journal of Toxicology and Environmental Health, Part A, 67*(20-22), 1667-1677.

Collier, S. A., Wade, T. J., Sams, E. A., Hlavsa, M. C., Dufour, A. P., & Beach, M. J. (2015). Swimming in the USA: Beachgoer characteristics and health outcomes at US marine and freshwater beaches. *Journal of Water and Health, 13*(2), 531-543.

Cordell, H. K. (2012). Outdoor recreation trends and futures: A technical document supporting the forest service 2010 RPA assessment.

Cutter, W. B., Pendleton, L., & DeShazo, J. (2007). Activities in models of recreational demand. *Land Economics, 83*(3), 370-381.

Diaz, J. H. (2006). Global climate changes, natural disasters, and travel health risks. *Journal of Travel Medicine, 13*(6), 361-372.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.) John Wiley & Sons.

Doney, S. C., Ruckelshaus, M., Duffy, J. E., Barry, J. P., Chan, F., English, C. A., et al. (2012). Climate change impacts on marine ecosystems. *Marine Science, 4*.

Dorevitch, S., Pratap, P., WrobIewski, M., Hryhorczuk, D. O., Li, H., Liu, L. C., et al. (2012). Health risks of limited-contact water recreation. *Environmental Health Perspectives, 120*(2), 192.

Drozdzewski, D., Roberts, A., Dominey-Howes, D., & Brander, R. (2015). The experiences of weak and non-swimmers caught in rip currents at Australian beaches. *Australian Geographer, 46*(1), 15-32.

Egan, K., & Herriges, J. (2006). Multivariate count data regression models with individual panel data from an on-site sample. *Journal of Environmental Economics and Management, 52*(2), 567-581.

Fein, S. B., Lando, A. M., Levy, A. S., Teisl, M. F., & Noblet, C. (2011). Trends in US consumers' safe handling and consumption of food and their risk perceptions, 1988 through 2010. *Journal of Food Protection®, 74*(9), 1513-1523.

Fischhoff, B. (1993). Risk perception and communication. *Risk Analysis and Human Behavior,* 3-32.

Freeman III, A. M., Herriges, J. A., & Kling, C. L. (2014). Recreation demand. *The measurement of environmental and resource values: Theory and methods* (pp. 269-309) Routledge.

Gensini, V. A., & Ashley, W. S. (2010). An examination of rip current fatalities in the United States. *Natural Hazards, 54*(1), 159-175.

Gomez, J. M., Fajardo, R., Patino, J. F., & Arias, C. A. (2003). Necrotizing fasciitis due to vibrio alginolyticus in an immunocompetent patient. *Journal of Clinical Microbiology, 41*(7), 3427-3429.

Greene, W. H. (2003). *Econometric analysis* Pearson Education India.

Haab, T. C., & McConnell, K. E. (2002). *Valuing environmental and natural resources: The econometrics of non-market valuation* Edward Elgar Publishing.

Hanley, N., Koop, G., Álvarez-Farizo, B., Wright, R. E., & Nevin, C. (2001). Go climb a mountain: An application of recreation demand modelling to rock climbing in Scotland. *Journal of Agricultural Economics, 52*(1), 36-52.

Harding, A. K., Stone, D. L., Cardenas, A., & Lesser, V. (2015). Risk behaviors and self-reported illnesses among Pacific Northwest surfers. *Journal of Water and Health, 13*(1), 230-242.

Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgment and Decision Making, 1*(1), 48.

Hilger, J., & Hanemann, M. (2006). Heterogeneous preferences for water quality: A finite mixture model of beach recreation in southern California. *California Sea Grant College Program,*

Houston, J. R. (2008). The economic value of beaches: A 2008 update. *Shore and Beach, 76*(3), 22-26.

Howel, D., Moffatt, S., Bush, J., Dunn, C. E., & Prince, H. (2003). Public views on the links between air pollution and health in northeast England. *Environmental Research, 91*(3), 163-171.

Huang, J., Poor, P. J., & Zhao, M. Q. (2007). Economic valuation of beach erosion control. *Marine Resource Economics*, 221-238.

Jakus, P. M., & Shaw, W. D. (2003). Perceived hazard and product choice: An application to recreational site choice. *Journal of Risk and Uncertainty*, *26*(1), 77-92.

Jeon, Y., Herriges, J. A., Kling, C. L., & Downing, J. (2005). The role of water quality perceptions in modeling lake recreation demand. *The international handbook on non-market environmental valuation*. Edward Elgar Publishing Cheltenham, UK.

Kahle, D., & Wickham, H. (2013). Ggmap: Spatial visualization with ggplot2. *The R Journal, 5*(1), 144-161.

Kline, J. D., & Swallow, S. K. (1998). The demand for local access to coastal recreation in southern New England. *Coastal Management*, *26*(3), 177-190.

Kuo, Y., Shieh, S., Chiu, H., & Lee, J. (2007). Necrotizing fasciitis caused by vibrio vulnificus: Epidemiology, clinical findings, treatment and prevention. *European Journal of Clinical Microbiology & Infectious Diseases*, *26*(11), 785-792.

Leatherman, S. P., & Leatherman, S. B. (2011). Rip currents: A major coastal hazard and public safety challenge. *Solutions to coastal disasters 2011* (pp. 131-136) ASCE Publications.

Lew, D. K., & Larson, D. M. (2008). Valuing a beach day with a repeated nested logit model of participation, site choice, and stochastic time value. *Marine Resource Economics*, 233-252.

Lipset, S. M. (1991). *Continental divide: The values and institutions of the United States and Canada* Psychology Press.

Loomis, J., & Santiago, L. (2013). Economic valuation of beach quality improvements: Comparing incremental attribute values estimated from two stated preference valuation methods. *Coastal Management, 41*(1), 75-86.

Mallin, M. A., Williams, K. E., Esham, E. C., & Lowe, R. P. (2000). Effect of human development on bacteriological water quality in coastal watersheds. *Ecological Applications, 10*(4), 1047-1056.

Mangel, M., & Clark, C. W. (1983). Uncertainty, search, and information in fisheries. *Journal Du Conseil*, *41*(1), 93-103.

Matthews, B., Andronaco, R., & Adams, A. (2014). Warning signs at beaches: Do they work? *Safety Science, 62*, 312-318.

McComas, K. A. (2006). Defining moments in risk communication research: 1996–2005. *Journal of Health Communication, 11*(1), 75-91.

McConnell, K. E. (1986). *The damages to recreational activities from PCBs in New Bedford harbor* National Oceanic and Atmospheric Administration.

Murray, C., Sohngen, B., & Pendleton, L. (2001). Valuing water quality advisories and beach amenities in the great lakes. *Water Resources Research, 37*(10), 2583-2590.

National Oceanic and Atmospheric Administration (NOAA), Office for Coastal Management. (2015). NOAA Report on the U.S. Ocean and Great Lakes Economy. Charleston, SC: NOAA Office for Coastal Management. Accessed at <http://coast.noaa.gov/digitalcoast/publications/econreport>

National Survey on Recreation and the Environment (NSRE) (2000) American's Participation in Outdoor Recreation: Results from NSRE 2000 (unweighted data) Round 1-4. Accessed at: <http://www.srs.fs.usda.gov/trends/Nsre/Round1t4rptuw.pdf>

Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research, 8*(2), 157-176.

O’neil, J., Davis, T. W., Burford, M. A., & Gobler, C. (2012). The rise of harmful cyanobacteria blooms: The potential roles of eutrophication and climate change. *Harmful Algae, 14,* 313-334.

Osimani, B. (2012). Risk information processing and rational ignoring in the health context. *The Journal of Socio-Economics*, *41*(2), 169-179.

Parsons, G. R. (2003). The travel cost model. *A primer on nonmarket valuation* (pp. 269-329) Springer.

Parsons, G. R., Kang, A. K., Leggett, C. G., & Boyle, K. J. (2009). Valuing beach closures on the Padre Island national seashore. *Marine Resource Economics*, 213-235.

Parsons, G. R., Massey, D. M., & Tomasi, T. (1999). Familiar and favorite sites in a random utility model of beach recreation. *Marine Resource Economics,* 299-315.

Parsons, G. R., & Stefanova, S. (2010). Gauging the value of short-term site closures in a travel-cost RUM model of recreation demand with a little help from stated preference data.

Parsons, G. R., & Stefanova, S. (2011). Gauging the value of short-term site closures in a travel-cost rum model of recreation demand with a little help from stated preference data. *Chapter to Appear in Preference Data for Environmental Valuation: Combing Revealed and Stated Preference Approaches (Edited by John Whitehead, Tim Haab, and Ju-Chin Huang), Routledge, Tayor & Frances Group.,*

Patz, J. A., Vavrus, S. J., Uejio, C. K., & McLellan, S. L. (2008). Climate change and waterborne disease risk in the great lakes region of the US. *American Journal of Preventive Medicine, 35*(5), 451-458.

Pelletier, L. G., & Sharp, E. (2008). Persuasive communication and proenvironmental behaviors: How message tailoring and message framing can improve the integration of behaviors through self-determined motivation. *Canadian Psychology, 3,*210–217.

Pendleton, L. (2001). Exploring the gap between measured and perceived quality. *Los Angeles, Southern California Coastal Ocean Observing System, 29.*

Pendleton, L., Martin, N., & Webster, D. (2001). Public perceptions of environmental quality: A survey study of beach use and perceptions in Los Angeles County. *Marine Pollution Bulletin, 42*(11), 1155-1160.

Penn, J., Hu, W., Cox, L., & Kozloff, L. (2016). Values for recreational beach quality in Oahu, Hawaii. *Marine Resource Economics, 31*(1).

Pratap, P. L., Sarah, R., & Samuel, D. (2013). Improving water quality communications at beaches: Input from stakeholders.

Scott, S. (2016). Knowledge in action: Water quality risk, local ecological knowledge, and decision-making in Maine and New Hampshire's surfing population. (Unpublished thesis). Plymouth State University, Plymouth, NH.

Scott, S., Rogers, S. (forthcoming). Surf Science in the Gulf of Maine: Understanding perceptions of risk related to water quality in the surfing community. Plymouth, NH: Plymouth State University, Center for the Environment.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis, 24*(2), 311-322.

Song, F., Lupi, F., & Kaplowitz, M. (2010). Valuing great lakes beaches. *Agricultural & Applied Economics Association,* 25-27.

Stigler, G. J. (1961). The economics of information. *The Journal of Political Economy,* 213-225.

Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. *Quarterly Journal of Economics,* 1441-1478.

Stranger, M. (1999). The aesthetics of risk. *International Review for the Sociology of Sport, 34*(3), 265-276.

Sunstein, C. R., & Zeckhauser, R. (2011). Overreaction to fearsome risks. *Environmental and Resource Economics, 48*(3), 435-449.

Tseng, L. Y., & Jiang, S. C. (2012). Comparison of recreational health risks associated with surfing and swimming in dry weather and post-storm conditions at southern California beaches using quantitative microbial risk assessment (QMRA). *Marine Pollution Bulletin, 64*(5), 912-918.

Turbow, D., Lin, T. H., & Jiang, S. (2004). Impacts of beach closures on perceptions of swimming-related health risk in orange county, California. *Marine Pollution Bulletin, 48*(1), 132-136.

Viscusi, W. K. (1991). Age variations in risk perceptions and smoking decisions. *The Review of Economics and Statistics,* 577-588.

Wade, T. J., Calderon, R. L., Brenner, K. P., Sams, E., Beach, M., Haugland, R., et al. (2008). High sensitivity of children to swimming-associated gastrointestinal illness: Results using a rapid assay of recreational water quality. *Epidemiology (Cambridge, Mass.), 19*(3), 375-383.

Wade, T. J., Sams, E., Brenner, K. P., Haugland, R., Chern, E., Beach, M., et al. (2010). Rapidly measured indicators of recreational water quality and swimming-associated illness at marine beaches: A prospective cohort study. *Environmental Health: A Global Access Science Source, 9*, 66-069X-9-66.

Whitehead, J. C., Dumas, C. F., Herstine, J., Hill, J., & Buerger, B. (2008). Valuing beach access and width with revealed and stated preference data. *Marine Resource Economics,* 119-135.

Yeh, C., Haab, T. C., & Sohngen, B. L. (2006). Modeling multiple-objective recreation trips with choices over trip duration and alternative sites. *Environmental and Resource Economics, 34*(2), 189-209.

APPENDIX A: SURVEY INSTRUMENT

MAINE AND NEW HAMPSHIRE
BEACHGOER SURVEY
QUESTIONNAIRE

Abigail Kaminski, Kathleen P. Bell, Caroline Noblet, Tagwongo Obomsawin,
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Section 1: General beach questions

In this first section please answer questions about the frequency of your visits to coastal areas and ocean beaches, how you plan such visits, and your typical visitor experiences to help us learn more about visitation to coastal areas and ocean beaches. We use the term visit broadly and inclusively, recognizing short trips taken by local residents and numerous longer trips by tourists. When we use the term coastal area, we are referring to the numerous communities and regions that are near the ocean and serve as destinations near the ocean for individuals to vacation, and relax.

Q1 In a typical year, how often do you visit coastal areas to vacation, recreate or relax?

- ❍ More than once a week
- ❍ About once a week
- ❍ 2-3 times a month
- ❍ About once a month
- ❍ A few times during the year
- ❍ Not at all

If Not at all Is Selected, Then Skip To End of Block

Q2 What resources do you rely on when planning visits to coastal areas? (Please choose all that apply)

- ❑ Tourist guide books/websites
- ❑ Brochures made available at hotels, motels, inns, campsite, etc.
- ❑ Recommendations of friends and family
- ❑ Recommendations found on-line from social media sites (Facebook, Yelp, Twitter, etc)
- ❑ State or provincial information/tourism office
- ❑ Municipal information/tourism office
- ❑ Regional Chamber of Commerce websites
- ❑ Beach safety information websites
- ❑ Knowledge from previous visits
- ❑ Recommendations from local residents of coastal areas
- ❑ Other (please specify below): ____________________

Q3 How important are the following to you when visiting a coastal area?

	1	2	3	4	5	6	7
	Not Important		Moderately Important			Very Important	
Beautiful scenery	❍	❍	❍	❍	❍	❍	❍
Pleasant weather	❍	❍	❍	❍	❍	❍	❍
Land-based recreation opportunities (walking, hiking)	❍	❍	❍	❍	❍	❍	❍
Water-based recreational opportunities (swimming, boating, kayaking)	❍	❍	❍	❍	❍	❍	❍
Clean ocean, estuary, and river waters	❍	❍	❍	❍	❍	❍	❍
Public access to coastal resources	❍	❍	❍	❍	❍	❍	❍
Sandy beaches	❍	❍	❍	❍	❍	❍	❍
Working waterfronts	❍	❍	❍	❍	❍	❍	❍
Dining amenities	❍	❍	❍	❍	❍	❍	❍
Shopping amenities	❍	❍	❍	❍	❍	❍	❍
Cultural/arts amenities (museums, galleries, theater, music, etc)	❍	❍	❍	❍	❍	❍	❍
Amusements and theme parks/water parks	❍	❍	❍	❍	❍	❍	❍
Casinos	❍	❍	❍	❍	❍	❍	❍

Q4 What activities do you like to do in or near coastal waters?

Open-ended response

Q5 In a typical year, how often do you visit an ocean beach to vacation, recreate or relax?

❍ More than once a week
❍ About once a week
❍ Two to three times a month
❍ About once a month
❍ A few times during the year
❍ Not at all

If Not at all Is Selected, Then Skip To End of Block

Q6 In a typical year, during which seasons do you visit ocean beaches?

❑ Winter
❑ Spring
❑ Summer
❑ Fall

Q7 How important are the following characteristics to you when visiting ocean beaches?

	1	2	3	4	5	6	7
	Not Important		Moderately Important			Very Important	
Hours of operation	❍	❍	❍	❍	❍	❍	❍
Entrance fees	❍	❍	❍	❍	❍	❍	❍
Level of crowding	❍	❍	❍	❍	❍	❍	❍
Toilet/shower facilities	❍	❍	❍	❍	❍	❍	❍
Food and concessions	❍	❍	❍	❍	❍	❍	❍
Access roads and parking	❍	❍	❍	❍	❍	❍	❍
Swimming areas	❍	❍	❍	❍	❍	❍	❍
Sunbathing areas	❍	❍	❍	❍	❍	❍	❍
Fishing opportunities	❍	❍	❍	❍	❍	❍	❍
Boat launches and moorings	❍	❍	❍	❍	❍	❍	❍
Walking/hiking areas	❍	❍	❍	❍	❍	❍	❍
Shellfishing opportunities	❍	❍	❍	❍	❍	❍	❍
Wide, sandy beach areas	❍	❍	❍	❍	❍	❍	❍
Close to year-round home	❍	❍	❍	❍	❍	❍	❍
Close to seasonal home	❍	❍	❍	❍	❍	❍	❍
Close to preferred temporary lodging	❍	❍	❍	❍	❍	❍	❍
Scenic views	❍	❍	❍	❍	❍	❍	❍

Q8 Your answer to this question is very important for understanding what brings people to ocean beaches to vacation, recreate, or relax. Why do you choose to visit ocean beaches to vacation, recreate, or relax?

Q9 During a typical summer ocean beach visit, how long do you spend on the beach?

❍ Less than 1 hour
❍ Between 1 and 3 hours
❍ Between 3 and 5 hours
❍ More than 5 hours

Q10 Do you spend more, about the same, or less time on a typical summer ocean beach visit now compared with a typical summer visit 10 years ago?

❍ Spend more time now
❍ Spend about the same time
❍ Spend less time now

Q11 During a typical summer ocean beach visit for you, do you go swimming or engage in any other activities in the water beyond wading (surfing, kayaking, stand up paddle boarding)?

- ❍ Yes (1)
- ❍ No (2)

Q12 Do you swim or engage in any other activities in the water beyond wading, more, about the same amount, or less on a typical summer ocean beach visit now compared with a typical visit 10 years ago?

- ❍ More
- ❍ The same amount
- ❍ Less

Answer If During a typical ocean beach visit for you, do you go swimming? No Is Selected

Q13 Your answer to this question is important for understanding why visitors do not swim or engage in water activities. Why don't you swim or engage in other activities beyond wading during a typical ocean beach visit?

Open-ended response

Q14 During a typical summer ocean beach visit, do you eat seafood?

- ❍ Yes
- ❍ No

Answer If During a typical ocean beach visit for you, do you eat local seafood? Yes Is Selected

Q15 What are your favorite types of seafood to enjoy on an ocean beach visit? (Please choose all that apply)

- ❑ Fish
- ❑ Lobster
- ❑ Clams
- ❑ Crabs
- ❑ Scallops
- ❑ Oysters
- ❑ Mussels
- ❑ Shrimp
- ❑ Other ____________________

Q16 Do you eat more, about the same or less seafood on a typical summer ocean beach visit now compared with a typical summer ocean beach visit 10 years ago?

- ❍ Eat more local seafood now
- ❍ Eat about the same amount of local seafood
- ❍ Eat less local seafood now
- ❍ I have never eaten local seafood

Answer If During a typical ocean beach visit, do you eat local seafood? No Is Selected

Q17 Your answer to this question is important for understanding why visitors do not eat seafood. Why do you not eat seafood on typical visits to ocean beaches?

Q18 During the last 10 years, in which of these U.S. States or Canadian provinces have you visited ocean beaches? (Please choose all that apply)

- ❑ Maine
- ❑ New Hampshire
- ❑ Massachusetts
- ❑ Rhode Island
- ❑ Connecticut
- ❑ New York
- ❑ New Jersey
- ❑ Delaware
- ❑ Maryland
- ❑ North Carolina
- ❑ South Carolina
- ❑ Florida
- ❑ New Brunswick
- ❑ Nova Scotia
- ❑ Prince Edward Island

Answer If During the last 10 years, in which of these U.S. States or Canadian provinces have you visited ocean beaches? (choose all that apply) Maine Is Selected

Q19 For how many years have you been visiting beaches in Maine?

- ❍ Less than 2 years
- ❍ 2 years
- ❍ 3-5 years
- ❍ 6-8 years
- ❍ 9-15 years
- ❍ More than 15 years

Answer If During the last 10 years, in which of these U.S. States or Canadian provinces have you visited oc... New Hampshire Is Selected

Q20 For how many years have you been visiting beaches in New Hampshire?

- ❍ Less than 2 years
- ❍ 2 years
- ❍ 3-5 years
- ❍ 6-8 years
- ❍ 9-15 years
- ❍ More than 15 years

Beach Management, Cleanliness, and Safety

In this section please answer questions to share your opinions about beach cleanliness and safety and coastal management issues to help us learn about visitor attitudes, behaviors, and preferences.

Q21 Please express your opinion by choosing the answer that matches the extent to which you agree or disagree with each statement.

	1	2	3	4	5	6	7
	Strongly Disagree						Strongly Agree
New Hampshire beaches are cleaner and safer to swim at than beaches in other places (1)	❍	❍	❍	❍	❍	❍	❍
Maine beaches are cleaner and safer to swim at than beaches in other places (2)	❍	❍	❍	❍	❍	❍	❍

Q22 Do you ever seek out information about beach safety?

❑ Yes, I seek information on surf conditions and riptides.
❑ Yes, I seek information on water quality.
❑ No, I do not seek out information about beach safety.

Answer If Do you ever seek out information about beach safety? No, I do not seek out information about beach safety. Is Not Selected

Q23 Where do you get information about beach safety? (Please check all that apply)

❑ State, Provincial, or Municipal Tourism Bureau staff and resources
❑ Lifeguard on beach
❑ Signs, flags, or other information on beach
❑ Water quality website
❑ Surf conditions website
❑ News/media
❑ Family/friends
❑ Local beach manager
❑ Other: ____________________

Q24 Have you ever visited an ocean beach and seen a sign advising you to limit your contact with ocean water?

❍ Yes
❍ No

Q25 If you arrived at an ocean beach and saw signs and flags advising you to limit your contact with the ocean water because of poor ocean water quality, would it affect your behavior at that beach or opinions of the beach?

- ❍ Yes
- ❍ No

Answer If If you arrived at an ocean beach and saw signs and flags advising you to limit your contact with... Yes Is Selected

Q26 Briefly, how would it affect your behavior at that beach or opinions of the beach?

Q27 If you arrived at an ocean beach and saw signs and flags encouraging you to have contact with the ocean water because of excellent ocean water quality, would it affect your behavior at that beach or opinions of the beach?

- ❍ Yes
- ❍ No

Answer If If you arrived at an ocean beach and saw signs and flags encouraging you to have contact with the ocean water because of excellent ocean water quality, would it affect your behavior at that beach o... Yes Is Selected

Q28 Briefly, how would it affect your behavior at that beach or opinions of the beach?

Q29 Your answer to this question is important for understanding what visitors want to know before and during their visits to ocean beaches. When visiting ocean beaches in Maine or New Hampshire, what information do you seek to improve your experience, and how would you prefer to get that information?
Open-ended question response

Q30 In your opinion, what level of priority should coastal managers in Maine and New Hampshire assign to each of the following issues? Please tell us if you think coastal managers should address each issue as a priority or as something that should not be done.

	1	2	3	4	5	6	7
	Low Priority		Moderate Priority			High Priority	
Protection, restoration, or enhancement of coastal wetlands	❍	❍	❍	❍	❍	❍	❍
Preventing threats to life and destruction of property from coastal hazards such as flooding, sea level rise, and storm surge	❍	❍	❍	❍	❍	❍	❍
Attaining increased opportunities for public access to coastal areas	❍	❍	❍	❍	❍	❍	❍
Reducing pollution entering coastal and ocean environments	❍	❍	❍	❍	❍	❍	❍
Reducing the impacts of coastal growth and development	❍	❍	❍	❍	❍	❍	❍
Facilitating the siting of wind energy facilities in coastal areas	❍	❍	❍	❍	❍	❍	❍
Facilitating the siting of tidal energy facilities in coastal areas	❍	❍	❍	❍	❍	❍	❍
Facilitating the siting of oil and gas facilities in coastal areas	❍	❍	❍	❍	❍	❍	❍
Facilitating the siting of aquaculture facilities in coastal areas	❍	❍	❍	❍	❍	❍	❍
Reducing the spread of invasive plants and animals (for example, green crabs)	❍	❍	❍	❍	❍	❍	❍
Reducing erosion at sandy beaches	❍	❍	❍	❍	❍	❍	❍
Protection, restoration, or enhancement of shellfish growing areas	❍	❍	❍	❍	❍	❍	❍
Protection, restoration or enhancement of working waterfronts	❍	❍	❍	❍	❍	❍	❍

Q31 Your answer to this question is very important for understanding what will continue to bring individuals to coastal areas and ocean beaches in Maine and New Hampshire. Coastal management priorities affect the look, feel, and function of coastal areas (e.g., infrastructure, natural resources, economies, communities, tourist attractions, views). What will continue to bring you to coastal Maine and New Hampshire to vacation, recreate, or relax?
Open-ended question responses

Most recent beach visit

In this section please answer questions about your recent personal experiences visiting ocean beaches in Maine and New Hampshire to help us learn more about ocean beach visits in these two states.
Open-ended question response

Q32 Have you visited a beach in Maine or New Hampshire since January 1, 2014?

❍ Yes

❍ No

If No Is Selected, Then Skip To End of Block

Q33 Please think about your most recent visit to a Maine or New Hampshire ocean beach. In what month was that visit?

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November

Q34 Please think about your most recent visit to a Maine or New Hampshire ocean beach. Was that visit to an ocean beach in Maine or New Hampshire?

- Maine
- New Hampshire

Answer If **Which did you most recently visit a beach? Maine Is Selected

Q35 Which beach did you visit in Maine?

- ❍ Sand Beach, Acadia National Park
- ❍ Seal Harbor Beach, Mount Desert Island
- ❍ Lincolnville Beach, Lincolnville
- ❍ Pemaquid Beach, New Harbor
- ❍ Popham Beach, Phippsburg
- ❍ Reid State Park, Georgetown
- ❍ East End Beach, Portland
- ❍ Willard Beach, South Portland
- ❍ Kettle Cove, Cape Elizabeth
- ❍ Crescent Beach State Park, Cape Elizabeth
- ❍ Higgins Beach, Scarborough
- ❍ Pine Point Beach, Scarborough
- ❍ Old Orchard Beach
- ❍ Ocean Park, Old Orchard Beach
- ❍ Bayview & Kinney Shores, Saco
- ❍ Ferry Beach State Park, Saco
- ❍ Camp Ellis Beach, Saco
- ❍ Rotary Park, Biddeford
- ❍ Hills Beach, Biddeford
- ❍ Biddeford Pool, Biddeford
- ❍ Fortunes Rocks Beach, Biddeford
- ❍ Goose Rocks Beach, Kennebunkport
- ❍ The Colony Beach, Kennebunkport
- ❍ Gooch's Beach, Kennebunk
- ❍ Middle Beach, Kennebunkport
- ❍ Kennebunk Beach, Kennebunk
- ❍ Mother's Beach, Kennebunk
- ❍ Laudholm Beach, Wells
- ❍ Drakes Island Beach, Wells
- ❍ Wells Beach, Wells
- ❍ North Beach, Ogunquit
- ❍ Footridge Beach, Ogunquit
- ❍ Ogunquit Beach, Ogunquit
- ❍ Short Sands Beach, York
- ❍ Long Sands Beach, York
- ❍ Cape Neddick Beach, York
- ❍ Harbor Beach, York
- ❍ Fort Foster, Kittery
- ❍ I visited a beach in Maine, but it's not listed here.

Answer If Which beach did you visit? I visited a beach in Maine, but it's not listed here. Is Selected

36 Please tell us the name of the most recent beach you visited in Maine, and where it is located. (e.g. Beach Name, Town Name)

Answer If **Which did you most recently visit a beach? New Hampshire Is Selected

37 Which beach did you visit in New Hampshire?

- New Castle Beach, New Castle
- Sandy Beach, New Castle
- New Castle Town Beach, New Castle
- Wallis Sands State Park, Rye
- Foss Beach, Rye
- Jenness Beach, Rye
- Sawyer Beach, Rye
- Bass Beach, North Hampton
- North Hampton State Beach, North Hampton
- Northside Beach, Hampton
- North Beach, Hampton
- Hampton Beach State Park, Hampton
- Hampton Beach, Hampton
- Sun Valley Beach, Hampton
- Seabrook Harbor Beach, Seabrook
- Seabrook Town Beach, Seabrook
- I visited a beach in New Hampshire, but it's not listed here

Answer If Which beach did you visit in New Hampshire? I visited a beach in New Hampshire, but it's not listed here Is Selected

Q38 Please tell us the name of the most recent beach you visited in New Hampshire, and where it is located. (e.g. Beach Name, Town Name)

Q39 What type of trip was this most recent beach visit a part of?

- DAY-TRIP (left your residence and returned on the same day; primary purpose of trip is recreation or pleasure at the beach)
- SHORT OVERNIGHT-TRIP (spent 1-3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach)
- LONG OVERNIGHT-TRIP (spent more than 3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach)
- SIDE TRIP (part of trip unrelated to beach recreation)

Answer If What type of trip was this most recent beach visit a part of? SHORT OVERNIGHT-TRIP (spent 1-3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected Or What type of trip was this most recent beach visit a part of? LONG OVERNIGHT-TRIP (spent more than 3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected

Q40 On this most recent beach visit, where did you stay overnight?

- Rented a house/cottage
- Stayed in a hotel, motel, or bed & breakfast
- Stayed at a campground or RV Park
- Stayed at own vacation/seasonal property
- Stayed at home (principal residence)
- Stayed at a friend or relative's house

Answer If What type of trip was this most recent beach visit a part of? SHORT OVERNIGHT-TRIP (spent 1-3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected Or What type of trip was this most recent beach visit a part of? LONG OVERNIGHT-TRIP (spent more than 3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected

Q41 How many nights did you stay overnight? (Please enter the number of nights you stayed on your most recent beach visit to ${q://QID19/ChoiceGroup/SelectedChoices})

Number response

Answer If What type of trip was this most recent beach visit a part of? SHORT OVERNIGHT-TRIP (spent 1-3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected Or What type of trip was this most recent beach visit a part of? LONG OVERNIGHT-TRIP (spent more than 3 nights away from your residence; primary purpose of trip is recreation or pleasure at the beach) Is Selected

Q42 During this most recent beach trip, how far away from the beach was your lodging?

- Less than 1/2 mile
- 1/2 - 1 mile
- 2-5 miles
- 6-10 miles
- More than 10 miles

Q43 Including yourself, how many adults went on this most recent beach visit? (Please enter the number below)

Number response

Q44 How many children went on this most recent beach visit? (Please enter the number below)

Number response

Q45 What activities did you do during this most recent beach visit? (Choose all that apply)

- ❑ Sunbathing
- ❑ Swimming
- ❑ Surfing
- ❑ Beach games/sports
- ❑ Photography
- ❑ Clamming
- ❑ Reading/relaxing
- ❑ Sight-seeing
- ❑ Boating
- ❑ Shopping
- ❑ Fishing
- ❑ Sea Kayaking
- ❑ Glass & Shell Collecting
- ❑ Walking
- ❑ Eating at local restaurants
- ❑ Other ____________________

Q46 What beach characteristics were important to your most recent visit? (Choose all that apply)

- ❑ Clean sand
- ❑ Good surf
- ❑ Ample parking
- ❑ Lifeguard available
- ❑ Food/picnic areas
- ❑ Restrooms available
- ❑ Clean water
- ❑ Wide, sandy beach
- ❑ Good, safe swimming
- ❑ Boating nearby
- ❑ Shopping nearby
- ❑ Fishing nearby
- ❑ Sea kayaking nearby
- ❑ Clamming nearby
- ❑ Scenic views
- ❑ Many people
- ❑ Few people
- ❑ Closest beach to where I stay
- ❑ Good for families
- ❑ Good water quality
- ❑ Family tradition
- ❑ Other ____________________

Q47 Please think about water quality in terms of risks to people's health, including the safety of swimming in the water, and the health of the marine environment, including the health of plants and animals. How would you rate the ocean water quality at this beach?

- Poor
- Fair
- Good
- Very good
- Excellent

Q48 For how many years have you been visiting this particular beach?

- Less than 2 years
- 3-5 years
- 6-8 years
- 9-15 years
- More than 15 years

Overall Visitation Questions

Q49 We are interested in knowing more about the trips you have taken to ocean beaches in Maine and New Hampshire since January 1, 2014. Since January, have you taken any long overnight trips (trips where you stayed overnight four or more nights) to the coast of Maine or New Hampshire?

- Yes
- No

Answer If We are interested in knowing more about the trips you have taken to ocean beaches in ME and NH si... Yes Is Selected

Q50 How many long overnight (four or more nights) trips to the coast of Maine or New Hampshire did you take? (Please enter the number of trips below)

Number response

Answer If We are interested in knowing more about the trips you have taken to ocean beaches in ME and NH si... Yes Is Selected

Q51 On your overnight trip(s) to coastal Maine or New Hampshire, about what percent of your time did you spend on the beach?

- 0-10%
- 11-25%
- 26-50%
- 51-75%
- 76+%

Answer If We are interested in knowing more about the trips you have taken to ocean beaches in ME and NH si... Yes Is Selected

Q52 Please click once on EACH of the regions in which you took a **long overnight trip** in Maine or New Hampshire.

	Yes	No
Downeast Maine		
Midcoast Maine		
Greater Portland Maine		
Southern Maine Coast		
New Hampshire Coast		

Answer If Please click on the regions in which you took a long overnight trip in Maine or New Hampshire. Downeast Maine - On Is Selected

Q53 Using the list below, please select the beaches that you have visited in a long overnight trip in Downeast Maine since January 1, 2014.

- ❑ Sand Beach
- ❑ Seal Harbor
- ❑ Lincolnville Beach
- ❑ Hull's Cove
- ❑ Hadley's Point
- ❑ Other: ____________________

Answer If Please click on the regions in which you took a long overnight trip in Maine or New Hampshire. Midcoast Maine - On Is Selected

Q54 Using the list below, please select the beaches that you have visited in a long overnight trip in Midcoast Maine since January 1, 2014.

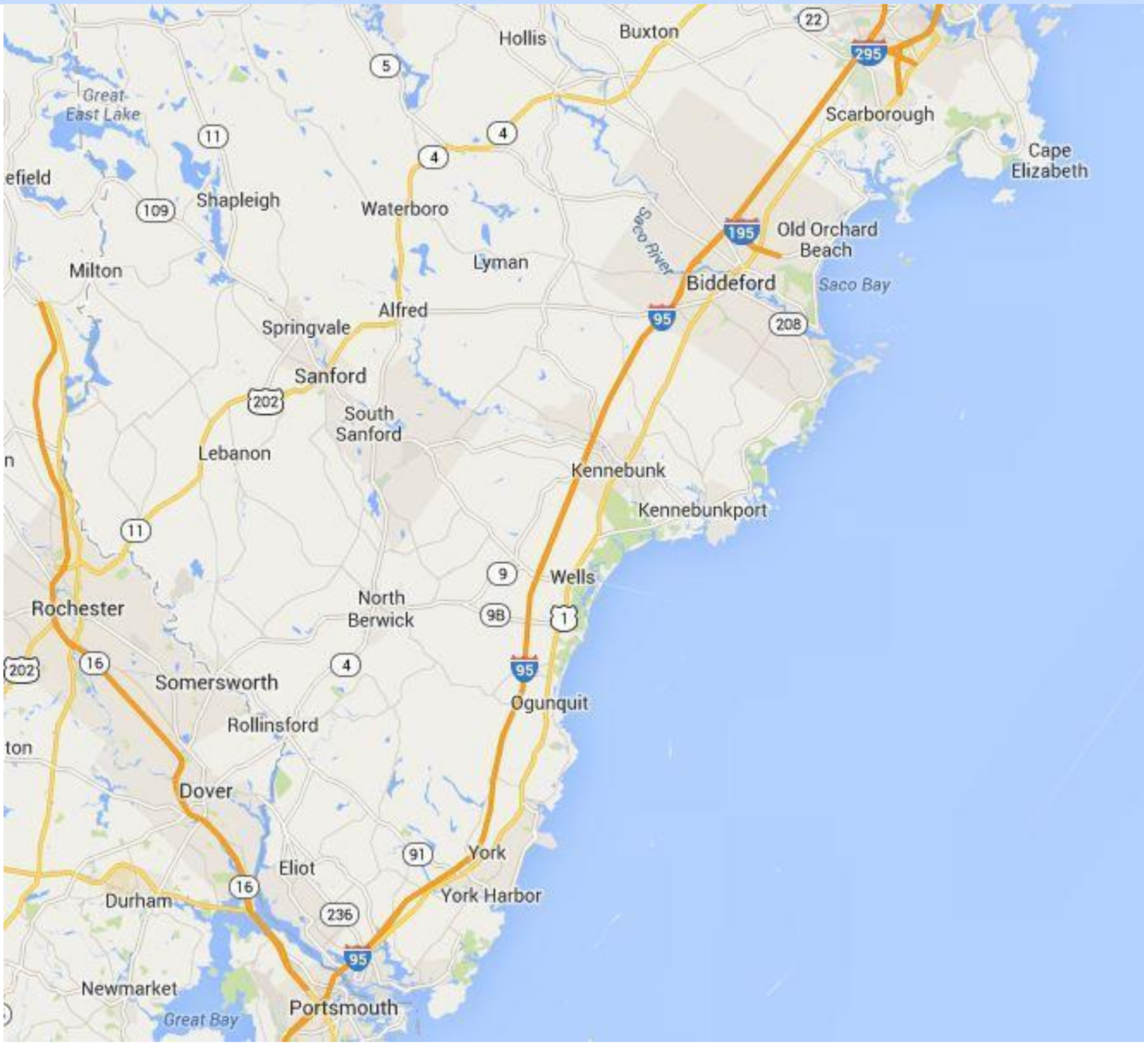
- ❑ Pemaquid Beach
- ❑ Popham Beach State Park
- ❑ Reid State Park
- ❑ Head Beach
- ❑ Other: ____________________

Answer If Please click on the regions in which you took a long overnight trip in Maine or New Hampshire. Greater Portland Maine - On Is Selected

Q55 Using the list below, please select the beaches that you have visited in a long overnight trip in Greater Portland since January 1, 2014.

- ❑ East End Beach
- ❑ Willard Beach
- ❑ Kettle Cove
- ❑ Crescent Beach State Park
- ❑ Other ____________________

Answer If Please click on the regions in which you took a long overnight trip in Maine or New Hampshire. Southern Maine Coast - On Is Selected



Q56 Please click once on the regions in which you took a **long overnight trip** in Southern Maine.

	Yes	No
Scarborough-Old Orchard Beach-Saco		
Kennebunk-Wells		
Ogunquit-Greater York		

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Scarborough-Old Orchard Beach-Saco - On Is Selected

Q57 Using the list below, please select the beaches you have visited in the Saco Bay area (including beaches in the towns of Scarborough, Old Orchard Beach and Saco) during a long overnight trip since January 1, 2014.

- ❑ Higgins Beach
- ❑ Pine Point Beach
- ❑ Old Orchard Beach
- ❑ Ocean Park Beach
- ❑ Ferry Beach State Park
- ❑ Camp Ellis Beach
- ❑ Biddeford Pool
- ❑ Bayview & Kinney Shores
- ❑ Fortunes Rocks Beach
- ❑ Other: ____________________

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Kennebunk-Wells - On Is Selected

Q58 Using the list below, please select the beaches you have visited in the Kennebunk-Wells area during a long overnight trip since January 1, 2014.

- ❑ Goose Rocks Beach
- ❑ The Colony Beach
- ❑ Gooch's Beach
- ❑ Middle Beach
- ❑ Kennebunk Beach
- ❑ Mothers Beach
- ❑ Laudholm Beach
- ❑ Drakes Island Beach
- ❑ Wells Beach
- ❑ Other ____________________

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Ogunquit-Greater York - On Is Selected

Q59 Using the list below, please select the beaches you have visited in the Ogunquit-Greater York Area during a long overnight trip since January 1, 2014.

- ❑ North Beach
- ❑ Footridge Beach
- ❑ Ogunquit Beach
- ❑ Short Sands Beach
- ❑ Cape Neddick Beach
- ❑ Long Sands Beach
- ❑ Short Sands Beach
- ❑ Harbor Beach
- ❑ Fort Foster
- ❑ Other: ____________________

Answer If Please click on the regions in which you took a long overnight trip in Maine or New Hampshire. New Hampshire Coast - On Is Selected

Q60 Using the list below, please select the beaches you have visited in New Hampshire during a long overnight trip since January 1, 2014.

- ❑ Sandy Beach, New Castle
- ❑ New Castle Town Beach, New Castle
- ❑ Wallis Sands State Park, Rye
- ❑ Foss Beach, Rye
- ❑ Jenness Beach, Rye
- ❑ Bass Beach, Rye
- ❑ North Hampton State Beach, North Hampton
- ❑ Northside Beach, North Hampton
- ❑ Hampton Beach State Park, Hampton
- ❑ Hampton Harbor Beach, Hampton
- ❑ Sunvalley Beach, Hampton
- ❑ Seabrook Harbor Beach, Seabrook
- ❑ Seabrook Town Beach, Seabrook
- ❑ Other: ____________________

Q61 Since January 1 2014, have you taken any short overnight (three nights or less) or day trips to the coast of Maine or New Hampshire?

- ❍ Yes
- ❍ No

Q62 Click once on EACH of the regions to which you have taken **a day trip or a short** overnight trip (three nights or less) to an ocean beach since January 1,2014.

	Yes	No
Downeast Maine		
Midcoast Maine		
Greater Portland Maine		
Southern Maine Coast		
New Hampshire Coast		

Answer If Click once on the regions to which you have taken a day trip or a short overnight trip (3 nights... Downeast Maine - On Is Selected

Q63 The following questions will ask you about beaches you've visited in Downeast Maine since January 1, 2014.

	Have you visited since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
Sand Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Seal Harbor	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Lincolnville Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Hull's Cove	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Hadley Point	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Answer If Click once on the regions to which you have taken a day trip or a short overnight trip (3 nights... Midcoast Maine - On Is Selected

Q64 The questions in the table below will ask you about beaches in Midcoast Maine since January 1, 2014.

	Have you visited this beach since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
Pemaquid Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Popham Beach State Park	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Reid State Park	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Head Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

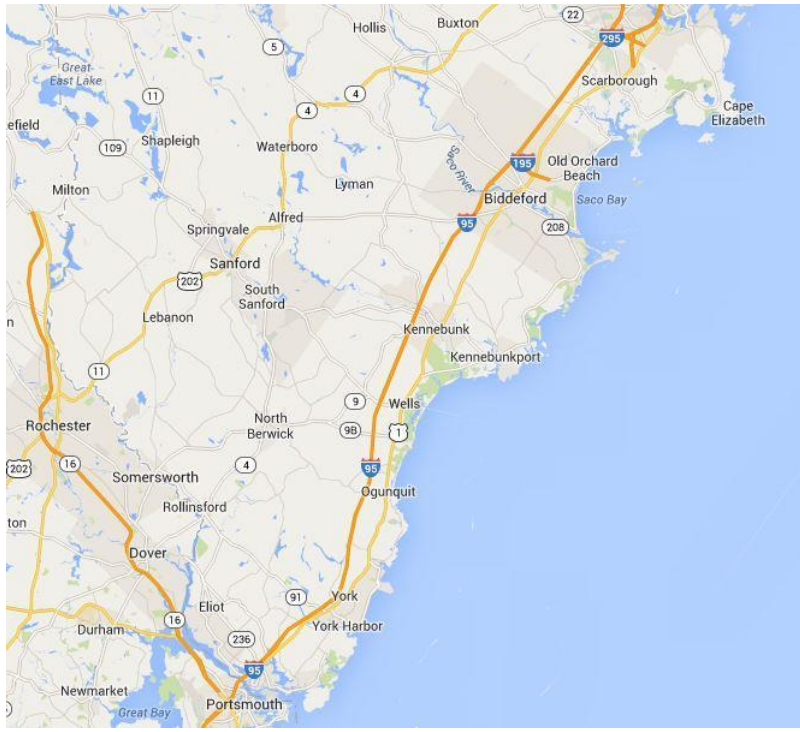
Answer If Click once on the regions to which you have taken a day trip or a short overnight trip (3 nights... Greater Portland Maine - On Is Selected

Q65 The questions in the table below will ask you about beaches in Greater Portland since January 1, 2014.

	Have you visited this beach since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
East End Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Willard Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Kettle Cove	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Crescent Beach State Park	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Answer If Click once on the regions to which you have taken a day trip or a short overnight trip (3 nights... Southern Maine Coast - On Is Selected

Q66 Click once on the regions in southern Maine where you have spent time on a beach since January 1, 2014.



	Yes	No
Scarborough-Old Orchard Beach-Saco		
Kennebunk-Wells		
Ogunquit-Greater York		

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Scarborough-Old Orchard Beach-Saco - On Is Selected

Q67 The following questions will ask you about beaches you've visited in the Saco Bay area (including beaches in the towns of Scarborough, Old Orchard Beach, and Saco) since January 1, 2014.

	Have you visited this beach since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
Higgins Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Pine Point Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Old Orchard Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ocean Park Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ferry Beach State Park	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Camp Ellis Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Biddeford Pool	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Bayview & Kinney Shores	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Fortunes Rocks Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Kennebunk-Wells - On Is Selected

Q68 The following questions will ask you about beaches you've visited in the Kennebunk-Wells area since January 1, 2014.

	Have you visited this beach since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
Goose Rocks Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
The Colony Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Gooch's Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Middle Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Kennebunk Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Mothers Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Laudholm Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Drakes Island Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Wells Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Answer If Click once on the regions in southern Maine where you have spent time on a beach since January 1,... Ogunquit-Greater York - On Is Selected

Q69 The following questions will ask you about beaches you've visited in the Ogunquit-Greater York Area since January 1, 2014.

	Have you visited this beach since January 1, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	Yes	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
North Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Footridge Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Ogunquit Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Short Sands Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Long Sands Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Cape Neddick Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Harbor Beach	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Fort Foster	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Other:	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Answer If Click once on the regions to which you have taken a day trip or a short overnight trip (3 nights... New Hampshire Coast - On Is Selected

Q70 The following questions will ask you about beaches you've visited in New Hampshire since January 1, 2014.

	Have you visited this beach since January, 2014?	If you took any DAY TRIPS to this beach, about how many did you take?									If you took any SHORT OVERNIGHT TRIPS to this beach, about how many did you take?								
	YES	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15 or more
Sandy Beach, New Castle	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
New Castle Town Beach, New Castle	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Wallis Sands State Park, Rye	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Foss Beach, Rye	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Jenness Beach, Rye	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Bass Beach, Rye	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
North Hampton State Beach, North Hampton	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Northside Beach, North Hampton	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Hampton Beach SP, Hampton	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Hampton Harbor Beach, Hampton	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Sunvalley Beach, Hampton	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Seabrook Harbor Beach, Seabrook	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Seabrook Town Beach, Seabrook	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Preferences for Visiting Ocean Beaches

In this section, please help us learn more about your preferences for visiting ocean beaches by answering questions about current conditions and future possible conditions at Maine and New Hampshire ocean beaches.

Q71 In general, how would you rate the current parking situation at Maine and New Hampshire beaches?

- Poor
- Fair
- Good
- Very Good
- Excellent

Q72 Suppose that parking facilities at Maine and New Hampshire beaches were improved so that you would not have to spend time searching for a parking space or access area, the parking and access would be located within a reasonable walking distance of the ocean beaches, and the parking would be free or reasonably priced. How would this change in the parking situation affect the number of trips you take to Maine and New Hampshire beaches, compared to the number of trips you take now?

- I would take more trips
- I would take the same number of trips
- I would take few trips

Q73 Think about water quality in terms of risks to people's health, including the safety of swimming, and to marine ecosystems, including the health of plants and animals. In general, how would you rate the water quality at Maine and New Hampshire beaches?

- Poor
- Fair
- Good
- Very Good
- Excellent

Q74 Suppose that Maine and New Hampshire improved their monitoring of water quality and communication of the results of this monitoring so that you would know the water quality and get detailed information about the safety of swimming at all beaches. Compared to the number of trips you take now, how would this change in monitoring and reporting of water quality conditions affect the number of trips you take to Maine and New Hampshire beaches?

- I would take more trips
- I would take the same number of trips
- I would take fewer trips

Q75 Suppose the water quality at all Maine and New Hampshire ocean beaches was improved and certified as excellent.   Compared to the number of trips you take now, how would this change in water quality affect the number of trips you take to Maine and New Hampshire ocean beaches?

- I would take more trips
- I would take the same number of trips
- I would take fewer trips

Q76 Your answer to this question is important for understanding what brings individuals to beaches to vacation, relax or recreate. What changes would most increase the number of trips you take to ocean beaches in Maine and New Hampshire?
Open-ended question responses

Beach Conjoint

The upcoming questions will ask you to compare two hypothetical beaches and to choose the beach that you prefer. Your answers to these questions are very important for understanding how visitors select which beaches to visit.

The tables below will describe beaches using a subset of characteristics, including parking availability, restroom facilities, safe swimming reporting, the travel distance of the beach from your home, and the beach entrance fee.
PARKING: This describes parking facilities associated with each beach.
RESTROOMS: This describes different types of restroom facilities available at each beach.
SAFE SWIMMING REPORTING: This denotes the percentage of days in a beach swimming season that are considered safe for swimming by scientists and public health officials. These individuals use water quality monitoring results to assess the safety of coastal waters for swimming and to prevent visitors from getting sick.
TRAVEL DISTANCE: This describes the travel distance to the beach using the time of car travel from your home.
ENTRANCE FEE: This describes any fees for entrance to the beach in terms of dollars per car.

When making your choices, assume that all other beach characteristics are the same for both beaches.

Q77 Consider the two hypothetical beaches below. Assume that all beach characteristics are the same for both, except the items listed below. Which beach would you be more likely to visit?

	Beach A	**Beach B**
PARKING	${e://Field/Parking}	${e://Field/Parking2}
RESTROOMS	${e://Field/Restrooms}	${e://Field/Restrooms2}
SAFE SWIMMING	${e://Field/SafeSwim} of days in a season are reported as safe for swimming	${e://Field/SafeSwim2} of days in a season are reported as safe for swimming
TRAVEL DISTANCE	The drive to the beach takes ${e://Field/Distance}	The drive to the beach takes ${e://Field/Distance2}
ENTRANCE FEE	${e://Field/Fee} per car entrance fee to access the beach	${e://Field/Fee2} per car entrance fee to access the beach

- ❍ I would be more likely to choose Beach A
- ❍ I would be more likely to choose Beach B

Q78 Consider the two hypothetical beaches below. Assume that all beach characteristics are the same for both, except the items listed below. Which beach would you be more likely to visit?

	Beach A	**Beach B**
PARKING	${e://Field/Parking}	${e://Field/Parking2}
RESTROOMS	${e://Field/Restrooms}	${e://Field/Restrooms2}
SAFE SWIMMING	${e://Field/SafeSwim} of days in a season are reported as safe for swimming	${e://Field/SafeSwim2} of days in a season are reported as safe for swimming
TRAVEL DISTANCE	The drive to the beach takes ${e://Field/Distance}	The drive to the beach takes ${e://Field/Distance2}
ENTRANCE FEE	${e://Field/Fee} per car entrance fee to access the beach	${e://Field/Fee2} per car entrance fee to access the beach

- ❍ I would be more likely to choose Beach C
- ❍ I would be more likely to choose Beach D

Demographics

This final section includes questions about your background, which will help us compare your answers to those of other people. We stress that all your answers are strictly confidential.

Q79 What is your gender?

- ❍ Male
- ❍ Female

Q80 How old are you? (Please enter your age in years below)
Number response

Q81 How many people, including yourself, live in your household in each of the following age groups? (Please list the number of people that fit into each age category next to each option. Leave the space blank or enter '0' if no one in the household is in the age group).

______ 0-6 years old
______ 7-12 years old
______ 13-18 years old
______ 19-44 years old
______ 45-64 years old
______ 65-84 years old
______ 85 or older

Q82 Which of the following best represents your educational background?

- ❍ 0-11 years of schooling
- ❍ 12 years (High school graduate or GED)
- ❍ 1-3 years College (Some college or Associates degree)
- ❍ College Graduate (Bachelor degree or equivalent)
- ❍ Postgraduate (Master's, Doctorate, Law or other degree)

Q83 Which of the following best describes your current employment status?

- ❍ Student
- ❍ Employed full-time
- ❍ Employed part-time
- ❍ Retired (not working)
- ❍ Employed at home
- ❍ Homemaker
- ❍ Unemployed

Q84 Are you a member of any conservation or environmental organizations?

- ❍ Yes
- ❍ No

Q85 Are you a member of religious-based community organizations?

- ❍ Yes
- ❍ No

Q86 In the past year, did you engage in any of the following outdoor recreation activities? (Please choose all that apply)

- ❑ Hiking
- ❑ Nature photography
- ❑ Wildlife watching
- ❑ Camping
- ❑ ATV/dirt biking
- ❑ Snowmobiling
- ❑ Hunting
- ❑ Biking/mountain biking
- ❑ Surfing
- ❑ Freshwater sail/canoe/kayak
- ❑ Freshwater boating
- ❑ Freshwater fishing
- ❑ Freshwater swimming
- ❑ Coastal sail/canoe/kayak
- ❑ Coastal boating
- ❑ Coastal fishing
- ❑ Coastal swimming
- ❑ Other ____________________

Q87 Which of the following categories represents your total household income (before taxes)?

- ❍ Less than $10,000
- ❍ $10,000-$14,999
- ❍ $15,000-$24,999
- ❍ $25,000-$34,999
- ❍ $35,000-$49,999
- ❍ $50,000-$74,999
- ❍ $75,000-$99,999
- ❍ $100,000-$149,999
- ❍ $150,000-$199,999
- ❍ $200,000 or more

Q88 What type of water and waste system does your household use? (please choose all that apply)

- ❑ Town/city water and sewer
- ❑ Private well and septic system
- ❑ Other ____________________

Q89 How often you engage in the following activities?

	1	2	3	4	5	6	7
	Never		Sometimes			Often	
Eat expired food that still looks okay	❍	❍	❍	❍	❍	❍	❍
Expose yourself to the sun without sunscreen	❍	❍	❍	❍	❍	❍	❍
Wash hands before eating	❍	❍	❍	❍	❍	❍	❍
Eat raw shellfish or other raw meats	❍	❍	❍	❍	❍	❍	❍

Q90 Thank you for taking the time to tell us about your visits, opinions and preferences. In the space below, please feel free to share any additional comments you might have.
Open-ended question responses

You will be automatically redirected to a survey to enter a raffle to win $75 upon completion.

APPENDIX B. SURVEY RESEARCH METHODS & RESPONDENTS

Survey research methods

The 2014 Maine and New Hampshire Beachgoer Follow-Up Survey was a means of follow-up data collection from beachgoers who participated in a short intercept survey in the summer of 2014 led by our NEST colleague Charlie Colgan. Colgan's team surveyed beachgoers onsite over the summer of 2014 on three beach systems: the Saco Bay area, Wells-Ogunquit, and the New Hampshire Seacoast. In our web-survey, we asked these beachgoers more detailed questions about their opinions, perceptions, and visitation. Throughout this technical report, we focus on the added value from our follow-up research. Incomplete knowledge about who uses public coastal beaches and how they use beaches represents a major information gap for tourism, business, and coastal resource managers. Our survey helps to shrink this gap by providing detailed information about Maine and New Hampshire beachgoers.

Survey questionnaire design

We designed the survey questionnaire following scientific, tailored survey design principles,[10] and we refined the content iteratively with input from key stakeholders and NEST colleagues across multiple disciplines and institutions. Before distributing the survey to our sample, we piloted the questionnaire on select beaches in Maine and New Hampshire and made modifications to reflect the feedback of pilot respondents. The final survey instrument included open-ended and categorical question formats that collected information on: (1) general visitation to coastal areas and beaches, (2) beach-user opinions and attitudes about coastal water quality, coastal management and beach safety, (3) detailed information on beach visits to Maine and New Hampshire, and (4) respondent demographic and household characteristics.

Sampling design & survey administration

Our sample of respondents is a subset of Colgan's team's sample. Their intercept survey represents a sample of Maine and New Hampshire beachgoers, intercepted on select beaches during particular days and times, and our follow-up survey represents a sub-sample of this intercepted group. As a part of their intercept questionnaire, respondents were asked if they would be interested in sharing their email addresses to participate in a follow-up survey about beach visitation. 1,259 intercept respondent provided valid email addresses.

We administered our follow up survey to these respondents in fall of 2014 using Qualtrics, a web-based survey software tool. We contacted respondents through email and asked them to follow a link to complete the follow-up survey. Our survey administration followed established tailored design and communication methods, and a scientifically supported timeline.[3] We received responses from 437 respondents, 366 of which completed the survey in full; this yields a response rate of 36% and 29%, respectively.

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[10] Dillman, D., Smyth, J., & Christian, L. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th ed.). New Jersey: John Wiley & Sons.

Our follow-up survey respondents have comparable ages and gender proportions to the intercept group that we sampled from. Comparing our follow-up beachgoer group with that of the general population of Maine and New Hampshire, our respondents are more likely to be older and female, and are more likely to be college graduates with household incomes over $100,000 than the general state populations (Table 1).

Table B.1. Comparing demographics across beachgoer samples and the general state populations

	Follow-up Beachgoer Survey (n=366)	Intercept Beachgoer Survey (n=3183)	Maine Population[a]	New Hampshire Population[a]
Median age	**51***	48**	43.2	41.5
Male	**36%**	38%	48.9%	49.4%
Employed full time	**61%**	NA	--	--
Retired	**16%**	NA	--	--
College graduate	**68%**	NA	27.9%	33.7%
Household income >$100,000	**54%**	NA	16.8%	28.5%

[a] – Statistics sources from the American Community Survey, 2013

*Mean age

**Intercept respondents were not asked a precise age; mean age is calculated as the midpoint of 6 age ranges

While our sample respondents reported home town zip codes from as far west as Washington and as far south as Florida, most respondents were from zip codes in New England and southeastern Canada. These areas were closest to the beaches were Colgan's team performed their intercept survey.

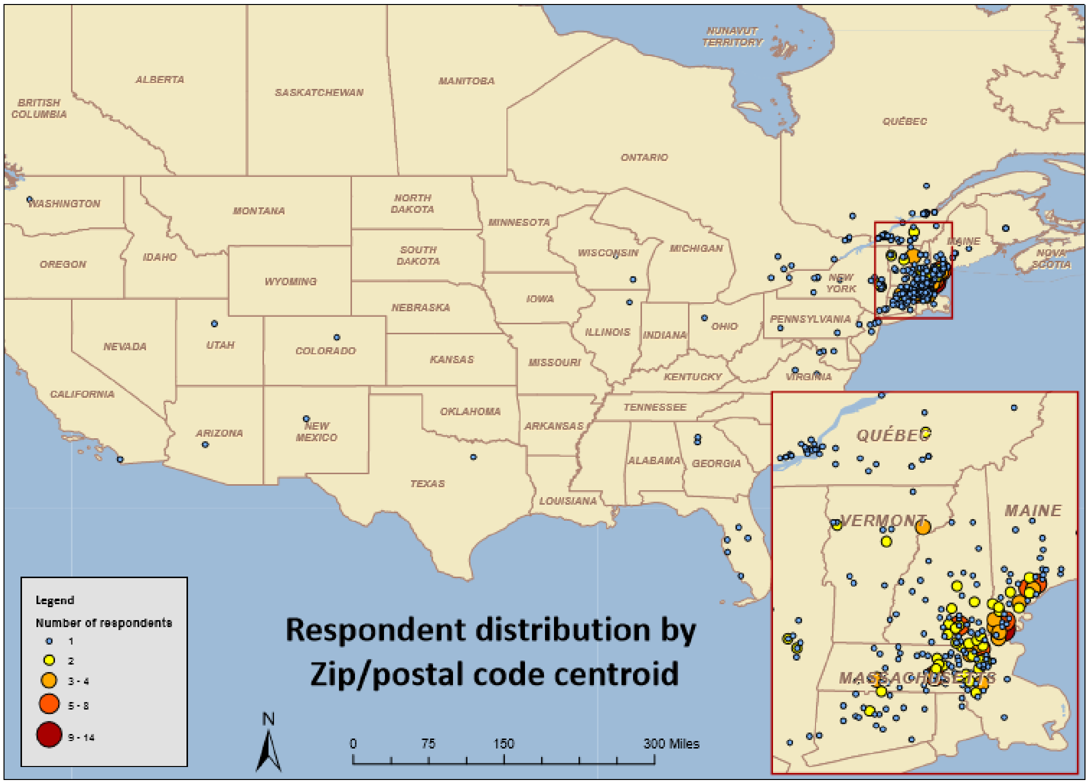

Figure B.1. Respondent distribution by zip/postal code centroid

BIOGRAPHY OF THE AUTHOR

Abigail Kaminski was born in Reading, Pennsylvania and graduated from Antietam High School in Mt. Penn, PA. She graduated from Clark University in May 2011 with a Bachelor of Arts in Economics and Geography. She taught middle school mathematics at Allapattah Middle School in Miami, FL as a member of Teach for America. She is a candidate for the Master of Science degree in Resource and Economics and Policy from the University of Maine in August 2016. GMAIL