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Lake Superior Beach Monitoring and Notification Program: An Evaluation

A Thesis
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Dedication

This thesis is dedicated to my grandmother, Marie C. Gentz. She was a self-described “backwoodsman” and my first environmental educator.

Abstract

The Minnesota Lake Superior Beach Monitoring and Notification Program is a collaborative effort supported by state and local health officials and citizens to address health risks to users of recreational waters on Lake Superior's coast. The Beach Program strives to influence attitudes regarding the importance of recreating safely in water, and give people knowledge and skills regarding beach recreation and stewardship. The purpose of this study was to assess to what degree the Beach Program has fulfilled its responsibility to notify the public of the services it provides and to make water recreation information available for the protection of human health. Results show that frequency of beach use and ZIP code were related to the levels of knowledge and awareness that beachgoers had about Lake Superior beach monitoring and notification. Less than half of beachgoers surveyed (45.9%) had heard of beach advisories. Beachgoers were aware of some best practices to keep themselves safe and the water clean, but unaware of others that are important. The results will be used by the Beach Program coordinator and the Beach Team to improve programming.

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Chapter One

Introduction

Background

Minnesota's Lake Superior Beach Monitoring and Notification Program (hereafter Beach Program) exists to monitor public recreational waters for potentially hazardous bacteria levels and notify the public of these conditions. The Beach Program is administered by the Minnesota Department of Health (MDH) whose mission is "Protecting, maintaining and improving the health of all Minnesotans." The Beach Program operates under the authority of the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. The key emphasis of the BEACH Act is to significantly reduce exposure and risk of disease for users of coastal recreational waters through monitoring the waters for indicators of potential health hazards, and notifying the public when these potential hazards are detected. All states with ocean or Great Lakes shoreline implement beach programs through this act with funding from the Environmental Protection Agency (EPA). Minnesota's program supports these objectives through improvements in public notification practices, management policies, and continuous scientific and technical advancements. Four major categories of work tasks or responsibilities exist for this program: (1) water quality monitoring, (2) public notification and posting, (3) data analysis and management, and (4) reporting. In addition, periodic evaluation of notification efforts is required by the EPA (EPA, 2002, p. 5-13). Public health is the main focus of the Beach Program, however, public health can

be protected, maintained and improved in a variety of ways including through the use of environmental education and environmental outreach.

Minnesota's Lake Superior shoreline is lined with almost 80 public beaches, 40 of which are monitored by the Beach Program. These beaches are visited by thousands of people each year. A significant part of the State's coastal recreational waters are subject to contamination from sources such as urban runoff, overflows from wastewater collection and treatment facilities, failing on-site wastewater treatment systems, human offal discharge from boats, swimmers and anglers, pet wastes, and natural animal sources such as wildlife. This contaminated water is a potential cause of gastrointestinal illness and other diseases. The Minnesota Lake Superior Beach Monitoring and Notification Program is a collaborative effort supported by state and local health officials and citizens, to address health risks to users of recreational waters on Lake Superior's coast. While water quality monitoring is a major component of the Beach Program, this project focuses solely on the notification and outreach efforts of the program.

By using multiple methods of outreach (see Table 1, Chapter 2) to address the public's knowledge, attitudes, and behavior, we utilize the Health Belief Model to create an intention of the public to act in ways that will maintain their own health and the health of the environment. The Beach Program strives to influence attitudes regarding the importance of recreating safely in water, and give people knowledge and skills regarding beach recreation and stewardship.

Congress created this program to "improve the quality of coastal recreation waters, and for other purposes" (BEACH Act, 2000). The other purposes, specified by

EPA, are to reduce the risk and incidence of disease and improve water quality at public recreation beaches (EPA OW, 2002, p. 1-1). Steps toward this effort include communication, notification and outreach. The EPA's National Beach Guidance and Required Performance Criteria for Grants, which governs the implementation of all beach programs across the country that receive funding from EPA, states that evaluation of notification, outreach and risk communication efforts is a requirement of the program (MDH, 2011; EPA OW, 2002). The requirements include conducting a survey of beachgoers as well as a literature review of other Beach Grant recipients' notification and outreach efforts (QAPP; EPA OW, 2002). The program staff are to use this information "to determine the effectiveness of current beach warning and posting procedures and obtain suggestions of improving risk notification to beach users (QAPP; EPA OW, 2002)."

The Beach Program aims to keep the beachgoing public safe by monitoring recreational waters for fecal indicator bacteria, specifically *E. coli*. When levels of *E. coli* are found to be above acceptable thresholds, a variety of tools are utilized to notify the public of this potential hazard (personal knowledge, QAPP and MDH workplan). The EPA requires states to develop notification plans that describe the "efforts and measures to inform the public of the potential risks associated with water contact activities in the coastal recreation waters that do not meet applicable water quality standards (EPA OW, 2002, p. 5-1)." Notification tools are reactive and advisory in nature: beaches are not closed to the public in Minnesota; rather, information is given about possible risks to beachgoers so that they may make their own decisions. The

difference between closing a beach (preventing public access to the beach) and an advisory (recommendations to avoid contact with the beach water) has implications for the notification methodology used (EPA, 2002, p. 5-5; EPA OP, 2011, p. 17). In this case, notification methodology refers to issuing an advisory or a closure of a beach. A distinction is drawn by the EPA between *informing* and *influencing* the public (2011). The goal of *influencing* beachgoer behavior should result in convincing beachgoers to stay out of the water through beach closings (EPA, 2011, p. 17). *Informing* the public, in contrast, results in recommendations to stay out of the water, or water contact advisories (EPA, 2011, p. 17). The EPA recommends that beach managers be as clear as possible about what they are telling the public – are notification tools forbidding access to the beach or recommending that beachgoers stay out? The notification wording should coincide with the type of notification (closure vs. advisory) made (EPA, 2011, p. 20).

Beach conditions are posted to the Beach Program telephone hot line (218/725-7724) immediately after results are obtained from the laboratory and at least twice weekly on the <http://www.MNBeaches.org/> website. This twice weekly (more if there are advisories) update is designed to accommodate changes in water quality conditions at tier one and tier two beach sites.

Like many agency and non-profit programs, the Beach Program outreach efforts have evolved over time and with staff changes from a notification of advisory effort to something that is closer to outreach. The Beach Program originally was housed in the Minnesota Pollution Control Agency where the focus was on water quality monitoring for pollution problems. Since 2011, the program has been run by the Minnesota

Department of Health which places an emphasis on human health, while recognizing that the environment plays a role in health outcomes.

The EPA's National Beach Guidance and Required Performance Criteria for Grants (2002, p. 5-13) states that evaluation of notification efforts should be a routine part of an agency's beach program. The EPA suggests that evaluations can be process or summative in nature, depending on the degree of completion that the program has achieved. Some of the questions the EPA suggests asking in an evaluation are:

- Did people receive enough information to make an informed decision?
- Were people protected from bacterial contamination?
- Did the public respond positively to the advisory and closing program?

In addition, concepts regarding the public's knowledge about and behavior in reaction to beach notification programming, as well as their "reaction to advisories and closings...willingness to adhere to advisory and closing recommendations...suggestions for better communication methods (EPA OW, 2002, p. 5-15) could also be assessed.

Purpose Statement

The purpose of this study was to evaluate to what degree the Beach Program has fulfilled its responsibility to notify the public of the services it provides and to make water recreation information available for the protection of human health. The results were provided to the Beach Team for their input on ways to improve programming. Moreover, the results of this evaluation provided recommendations regarding environmental outreach efforts that have been conducted to date. The results provided

insight into whether the program should continue to be implemented as originally designed and if not, how it should be adapted to improve effectiveness.

Evaluation Questions

This evaluation addressed the following research questions in order to better understand and improve the Beach Program.

1. Are North Shore beachgoers aware of the Beach Program? Are they aware of the notification resources the Beach Program provides?
2. Do beachgoers know what the water safety recommendations are and how to help keep the water clean?
3. What perceptions of risk to disease do beachgoers hold regarding beach water contact?
4. Has the Beach Program been successful in changing behaviors related to safe swimming?
5. How can the Beach Program improve the effectiveness of its outreach and communication/notification tools?

Definition of Terms

The following section defines how key terms were used in this study. The terms are defined using the process for specification of concepts outlined in Babbie (2011) and Creswell (2009). A nominal definition for each term is provided, and when relevant, an operational definition that specifies how the concept was measured is also provided.

The beach program literature refers to agency interaction with the public in many ways. The terms notification, education, outreach, risk communication, and communication are all used at various times in the literature. For the purposes of this study, the following terms were used.

Environmental Education

Environmental education is a process that aims to develop a world population that is aware of and concerned about the total environment and its associated problems. Further, environmental education aims to develop a world population that has the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (UNESCO-UNEP, 1978).

More specifically, the Environmental Protection Agency Office of Environmental Education defines Environmental Education in its grant program request for proposals as: “educational activities and training activities involving elementary, secondary and postsecondary students, as such terms are defined in the State in which they reside, and environmental education personnel, but does not include technical training activities directed toward environmental management professionals or activities primarily directed toward the support of non-educational research and development (EPA OEE, 2014).” As the Beach Program is an EPA program, the definitions regarding Environmental Education and Environmental Outreach that the EPA sets were used for this project.

Environmental Outreach

The Environmental Protection Agency states that Environmental Outreach “disseminates information and sometimes asks audiences to take specific action, but doesn’t necessarily teach people how to analyze an issue. Outreach often presents a particular point of view, and often in pursuit of a particular goal (2014).” Examples may include a community meeting to inform residents about a toxic site in their area and where they can go for help, or a campaign to get volunteer participants for a beach or stream cleanup event.

Beachgoer

This term is used in the literature, but not defined in the literature or by the EPA (H. Wirick, personal communication, April 3, 2014). This project defined the term as commonly used by the EPA Beach Program and public health communities. Beachgoer refers to people who have “primary contact use” of recreation waters. Primary contact recreation refers to activities that have the most potential for ingestion of or immersion in water (Clean Water Act, Water Quality Standards Handbook). Examples include swimming, water-skiing, surfing, and other activities likely to result in immersion. Secondary contact recreation examples are boating, wading, and rowing.

Beach

The term “beach” was used in this project to denote public shoreline areas along Lake Superior that are used for recreation. The EPA uses and defines the term ‘coastal recreation waters’ and does not define the term “beach”— “(i) the Great Lakes; and “(ii) marine coastal waters (including coastal estuaries) that are designated under section

303(c) by a State for use for swimming, bathing, surfing, or similar water contact activities (BEACH Act, 2000).”

Limitations, Delimitations, and Assumptions

Because beaches in the Duluth area have a higher rate of use than beaches farther northeast along Lake Superior, data collection was delimited to the following Park Point beaches: Park Point Beach House Beach, Lakewalk Beach and the Franklin Street/Tot Lot Beach.

This study was delimited to adults who have primary contact with water, or are responsible for supervising children who have primary contact with water. In Duluth, these groups would be swimmers and surfers. By design, this study did not include people who routinely don't go in the water, or types of beach use other than those listed above.

Significance

The Beach Program has an important role in keeping beachgoers informed about recreational water quality and the role they play in protecting their own health and the health of the beaches. Knowing whether these messages are having their desired effect is crucial to an effective Beach Program. The EPA (2002) states, “The public notification and risk communication program should be evaluated at various times throughout the risk communication process. This step is an important element that helps to ensure that a notification program has been designed to meet the needs of the public and the objectives of the agency (p. 5-13).” The results of this study, and indeed the preparation to conduct

the study itself, provided valuable insight into Beach Program notification and outreach practices that will inform work going forward.

Chapter Two

Review of the Literature

The goal of Beach Program notification and outreach is to “provide audience members information and tools to facilitate healthy water recreation decisions (MPCA, year unknown).” Efforts include “advisory notification mechanisms” (reactive) & “education mechanisms” (proactive) (MPCA, year unknown). The advisory mechanisms include: Beach Program webpage, mnbeaches.org, advisory signage at the beach, occasional press releases to local and statewide media, telephone (priority contacts), hotline (recorded message), and the email list-serv. The education mechanisms include: Beach Program webpage, mnbeaches.org, with links to partners’ web sites, presentations to local clubs and presence at outreach events, educational press releases to local media for public notification and distribution (twice a year), and brochures (MPCA, year unknown). These goals and protocols were established early in the Beach Program’s history, and may no longer be entirely accurate, for example, it does not list personal contact when encountering beachgoers during sampling times.

If an analysis of water quality data warrants posting a beach advisory, MDH will take action to physically place signs at the affected beach or beaches, to resample the beach and to replicate the information on the program telephone hotline and website. MDH has established arrangements with local partner Cook County Soil and Water Conservation District (SWCD) for posting of beaches in that county. Notification of

beach advisories includes both internal and external audiences. MDH has assumed the public role of responding to interview requests and media inquiries. MDH also responds to inquiries from citizens or groups (MDH workplan, 2014).

Proactive outreach efforts are also undertaken by the Beach Program. These efforts aim to inform beachgoers of the role they have to play in keeping themselves and the waters they recreate in clean and healthy. Outreach efforts include “Stay Healthy While You Swim” flyers, the mnbeaches.org website, staff speaking at community gatherings such as the Park Point Community Club, personal interaction with beachgoers at the beach and staffing community fairs such as the Park Point Water Safety Expo.

Suggestions for maintaining personal health include

- stay away from storm drains, trash and other pollutants such as oil slicks.
- Wait 24 hours before swimming after a heavy rain
- Shower after swimming or playing at the beach.
- Keep your face and head out of the water or wear ear plugs and goggles.
- Avoid swallowing beach water.
- Don't swim if you are sick (MDH, 2012).

Suggestions for maintaining the health of the beach and beach water include

- Dispose of diapers and animal waste properly by putting them in trash receptacles or sealing them in a plastic bag to carry out with you.
- Don't feed ducks, geese, seagulls, or other birds.
- Take your children for frequent bathroom breaks and wash your hands.
- Carry out all trash or dispose of it securely in trash receptacles.

- Don't swim if you're sick (diarrhea or vomiting) (MDH, 2012).

Table 1		
MDH Outreach		
Outreach method	Intended Audience	Purpose
Hotline	People who may not have internet, before arriving at beach	To alert potential beach goers to bacteria conditions
Website	People who have not yet arrived at beach, generally want to know more about the program	To alert potential beach goers to bacteria conditions; to provide background information and context to Beach Program; to give more in-depth information about water quality, illness risks and symptoms, etc.; to provide information on how to stay healthy while at the beach and how to keep the beaches healthy.
Flyers	People at the beach; people who want more information about the Beach Program	To provide background information and context to Beach Program; to give more in-depth information about water quality, illness risks and symptoms, etc.; to provide information on how to stay healthy while at the beach and how to keep the beaches healthy.
Booths/community outreach events	People at outreach events who may recreate on beaches in the future	To provide background information and context to Beach Program; to give more in-depth information about water quality, illness risks and symptoms, etc.; to provide information on how to stay healthy while at the beach and how to keep the beaches healthy.
Advisory signs	People at the beach	To provide notification that the beach is unsafe for water contact at the present time; to provide information (hotline, website) on

		how to learn more.
In person discussion	People at the beach	to provide background information and context to Beach Program; to give more in-depth information about water quality, illness risks and symptoms, etc.; to provide information on how to stay healthy while at the beach and how to keep the beaches healthy; answer questions.

Table 2		
Partner Outreach		
Outreach method	Intended Audience	Purpose
Parkpointbeach.org	People who have not yet arrived at beach, & want to know if it is a good day to go to the beach	To alert potential beachgoers to bacteria conditions, rip current warnings, UV index, water temperature, etc.
Beachcast http://www.great-lakes.net/beachcast/	People who have not yet arrived at the beach, & want to know if it is a good day to go to the beach	To provide information about beach advisories in the Great Lakes region and related human health information. Also provides current weather, water and wind conditions. In addition, it comes in app form.

Theory

While learning and behavior change models differ in their assumptions and interactions, most behavioral researchers agree that action is a result of the interaction of emotions, cognition, and values, along with the possession of the necessary skills and

opportunities for taking action (Heimlich & Ardoin, 2008). Because the Lake Superior Beach Monitoring and Notification Program exists in the worlds of public health, natural resource management, microbiology and outreach and education, there are numerous schools of thought from which to frame an evaluation of the outreach efforts of this program. For the purposes of this study, changes in beachgoer perceptions of risk, awareness, knowledge, skills and behavior are all of interest, as well as finding the most effective methods of providing information to beachgoers. The most relevant theories to these questions are described in the following paragraphs.

The Beach Program operates under federal (EPA) as well as state (MDH) guidelines. As with many state programs that are funded by federal dollars, the Beach Program has the ability to go beyond the federal minimum requirements in order to meet state-specific needs. While the agencies have a goal of protecting public health at public beaches the MDH goals of the program go beyond notification by aiming to protect water quality and empower people with information to keep themselves, their community and their beaches safe and clean. Thus, the EPA guidelines for beach programs are grounded in the field of risk communication, while Minnesota's Beach Program aligns with the Health Belief Model.

The simplest definition of risk is $\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Probability}$, however there are more variables than are described in the equation (Morrow, 2009). A more detailed definition is the “interactive process of exchange of information and opinions among individuals, groups, and institutions concerning a risk or potential risk to human health or the environment (National Research Council, 1989).” Corvello (1998)

states that the overall goal of risk communication should not be to diffuse public concerns but rather to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative. Information to be communicated must be chosen with care so as not to overwhelm the target audience (Morrow, 2009). The EPA (2011, p. 17) reports that there are four basic steps to risk communication: 1) creating a risk communication strategy; 2) establishing public trust; 3) crafting specific risk communications; and 4) evaluating outcomes (adapted from Bennett, n.d.) p. 17 EPA 2011.” Morrow (2009) states that understanding risk perception is key to knowing what it takes to reach a threshold where the public will take mitigating action.

Within the field of risk communication, Lundgren and McMakin (2013) identify three types: care, consensus and crises risk communication. Care communication is regards “risks for which the danger and the way to manage it have already been well determined through scientific research that is accepted by most of the audience (Lundgren & McMakin, 2013, p. 4).” Consensus communication is used in situations where groups need to “work together to reach a decision about how the risk will be managed (Lundgren & McMakin, 2013, p. 4).” Crisis communication is “risk communication in the face of extreme, sudden danger (Lundgren & McMakin, 2013, p. 4).” While the EPA does not specify which type of risk communication it uses, care communication fits the goals of EPA’s beach program. Within this type, the EPA guidance takes an approach that fits Lundgren and McMakin’s description of the Three-Challenge Approach (2013, p. 15). The three challenges are:

1. Knowledge challenge: the audience needs to understand the technical information surrounding the risk assessment.
2. Process challenge: the audience needs to feel involved in the risk management process.
3. Communications skills challenge: the audience and those who are communicating the risk need to communicate effectively.

The EPA organizes the beach program notification efforts around these challenges, emphasizing to states that giving the intended audience information to increase their knowledge, make their own decisions about the risk (advisory vs. closure, depending on the state) and performing periodic evaluations of notification efforts are all important components of a successful beach program.

The Minnesota Beach Program utilizes the tenets of risk communication listed above, and in addition operates under the Health Belief Model (HBM). The Health Belief Model attempts to explain what situations prompt individuals to maintain good health behaviors. The goal of the HBM is greater quality of life for an individual (Burke, n.d.) and the mission of MDH is “Protecting, maintaining and improving the health of all Minnesotans”.

Both health behaviors and pro-environmental behaviors share some characteristics such as: adoption of the behavior is voluntary, it requires the audience to consider the positive or negative consequences of an action and it may require a personal sacrifice of adopting an inconvenience or financial outlay (Lindsay & Strathman, 1997). According to the HBM, behaviors will be performed if the person feels that the “performance of the behavior will prevent or affect the negative consequences... the belief that there are costs or barriers associated with the behavior, and self-efficacy (Vining & Ebreo, 2002).” The

Health Belief Model is concerned with the concepts of perceived susceptibility and severity, perceived threat, perceived barriers and benefits, cues to action, and self-efficacy (Rosenstock, Strecher, & Becker, 1988; Burke, n.d.). Perceived threat is a combination of two beliefs, the likelihood “that negative consequences will occur and the judgement of the severity of these consequences (Vining & Ebreo, 2002).” The Health Belief Model also accounts for barriers to adoption of an action (Lindsay & Strathman, 1997). Barriers to action such as difficulty, inconvenience or expense “may mean that the behavior will not be performed, particularly when it is related to the environment rather than health. Health-related actions generally have more immediate personal outcomes, while environmental actions may have longer-term, more diffuse, and less individualistic benefits and outcomes (M. Monroe, personal communication, September 20, 2007, quoted in Ardoin, 2009).” A limitation of this model is that it may not “appropriately consider environmental or economic factors, nor does it give adequate weight to social norms (Denison, 1996).” The Health Belief Model is similar to Bandura’s social learning theory – both are “applications of value-expectancy theories (Rosenstock et al., 1988, p. 182).”

The theories explained here frame the Beach Program evaluation by providing a framework for understanding the many ways that beachgoers make use of information regarding notification and outreach efforts. The Health Belief Model gives us insight into the ways perception, knowledge and beliefs will influence behavior.

Program Evaluation

The purpose of evaluation research is to determine the impact of some social intervention (Babbie, 2008). More specifically, program evaluation is the determination of whether a social intervention is producing the intended result (Babbie, 2008). Patton (1997) states that program evaluation systematically collects information about the “activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and /or inform decisions about future programming.” This is different from a research study, as the results are not generalizable, but are for use by a specific audience and for a specific purpose (Patton, 1997). In addition, Ernst (2014) states that the reasons for evaluating include program improvement, decision making and program fate, program justification, obtaining funding, and guiding program development.

A variety of evaluation approaches exist and include objectives-oriented, management-oriented, consumer-oriented, expertise-oriented, participant-oriented and concerns-based adoption model/innovation configuration evaluation. A management-oriented approach is appropriate for this study because this type of approach is geared towards the decision makers, in this case Beach Program staff and the Beach Team, who will use the results (Fitzpatrick, Sanders & Worthen, 2010). Management-oriented evaluation is a systems approach that collects information to guide decision by providing balanced information for all management options (Fitzpatrick et al., 2010).

The EPA’s National Beach Guidance and Required Performance Criteria for Grants, which governs the implementation of all beach programs across the country that receive funding from EPA, states that evaluation of notification, outreach and risk

communication efforts is a requirement of the program (MDH, 2011; EPA OW, 2002).

The requirements include conducting a random survey of beachgoers as well as a literature review of other Beach Grant recipients' notification and outreach efforts (MDH, 2011; EPA OW, 2002). The program staff are to use this information "to determine the effectiveness of current beach warning and posting procedures and obtain suggestions of improving risk notification to beach users (MDH, 2011; EPA OW, 2002)."

While the Beach Program has been operating since 2003, no formal evaluation of its effectiveness at alerting the public to high bacteria levels has been conducted. Thus, to date, it is unclear if the Beach Program is fulfilling its goal of notifying the public and providing them with information that ultimately leads to safe water recreation behavior and environmental stewardship in a beach water quality context. This research will provide a description of the outcomes of the outreach and notification goals of the Beach Program.

Findings of other beach programs

Despite the guidance from EPA calling for periodic evaluation of notification and outreach efforts of beach programs, evaluations of this nature seem to be scarce, even when they are sought across the country (EPA, 2011). In addition, published evaluations are even scarcer. The only peer-reviewed, published article evaluating beach program notification that the researcher found comes from the Chicago Park District. This study found awareness of all facets of the beach program was generally low, "only 6% (5/86) of beachgoers interviewed at beaches with a swim ban/advisory had sought information

prior to coming to the beach that day and none of 288 interviewees at open beaches mentioned looking for any information (Pratap, Redman, Fagen & Dorevitch, 2013)."

This methodology, however, did not take into account the number of people, if any, who did seek information at home, and based upon that information, chose to stay home.

The authors also gave a number of "best practices" for improving notification efforts. In focus groups, specific requests were made by participants about the types of notification messaging they would like to see from the authorities. The authors recommended that these requests be granted by beach managers, however, some requests may clash with the guidelines of risk communication as the focus group participants asked for a large amount of detail. As Morrow (2009, p. 5) stated, too much information "can cause overload, increase anxiety, and make it harder to reach decisions." For example, "participants in nine of 13 focus groups wanted to know 'who tests the waters' and felt that having information about 'the type of illness or consequence, 'what am I exposed to today', and 'the odds of the consequences' were important factors in adhering to a sign/flag (Pratap et al., 2013)." In addition, ideal message content, according to the focus group, would state the following: when the sampling and analysis was performed, the agency or laboratory that performed the testing, the potential health outcomes, populations at higher risk for illness, and the reason for the notification (bacteria level relative to the EPA standard) (Pratap et al., 2013). Some of these best practices are already utilized by Minnesota's Beach Program; others may need to be adopted if the evaluation results warrant. Other improvements recommended by the authors include the use of the internet, smart phones, and social media. Minnesota's Beach Program

currently uses the internet to communicate, but not smart phone apps or social media. The mnbeaches.org website has been updated to be smartphone compatible. However, there are organizations that use the Minnesota Beach Program's data in their media. Examples include the Great Lakes Commission app for Android "myBeachCast" and the collaborative effort parkpointbeach.org. Parkpointbeach.org, in addition to notifying beachgoers of beach conditions via its website, also generates notices via Facebook and Twitter.

In 2011 the Environmental Protection Agency compiled a report titled "Assessing the Effectiveness of the Beaches Environmental Assessment and Coastal Health (BEACH) Act notification program: Final Report." It was based on interviews with beach program managers across the country as well as several beach programs' own evaluations of their notification efforts. While Minnesota was not interviewed for this study, the findings reported still have implications for Minnesota's Beach Program. As noted earlier, few of the nation's beach programs have evaluated their notification and outreach efforts. Therefore, it is not surprising that there is also little information on how beach notifications influence public awareness of water quality risks, or behavior (EPA, 2011)." Localized surveys in California, Texas and Indiana show that beachgoer knowledge of advisories, and other beach program knowledge, is generally low, with a few exceptions (EPA, 2011). More knowledgeable beachgoers usually have been exposed to a targeted outreach campaign conducted after a beach manager found knowledge to be low and therefore took steps to improve communication, or where media (esp. TV) coverage has been extensive (EPA, 2011 p. 48, 55-57). With such varied results reported and such a

variety of audiences and types of notification, MN's beach program will need to conduct its own evaluation as published results are not generalizable. An important stratification among beachgoers is apparent; EPA (2011) reports that local residents, regardless of state of residence, often are more aware of beach program and information than tourists.

As with the Chicago Park District, beach programs across the country were found to use a variety of notification and outreach tools and “the methods reinforce each other (EPA, 2011)”. Methods included websites, notification signs, email and press releases, with a few early adopters using social media (EPA, 2011). While social media was less widely used by beach programs in this study, it is thought to expand the reach of traditional notification methods and its popularity with beach managers may be growing (EPA, 2011). “In addition to notifying the public about discrete advisories, several states and local beach managers conduct general outreach and education efforts to raise public awareness of water quality issues at beaches and enhance the reach of notifications (EPA, 2011).” It is important to note that the focus of notification and outreach methods can vary depending on the target audience, some are “targeted to beachgoers at the beach (e.g., signs), and others (e.g., websites) are targeted to potential visitors before they travel to the beach (EPA, 2011).” Education and outreach play an important role in building “a common understanding of beach water quality issues, risks of (contact with) contaminated water, and steps that beachgoers can take to stay safe while still enjoying the beach (EPA, 2011).” “Educated members of the public are more likely to be aware of, seek out, and abide by beach water quality notification messages.” It is unclear what “educated” means in this context.

The most common ways that beachgoers obtain beach water quality information are beach signs, the internet, and television (EPA 2011). This is slightly different from the methods popular with beach managers – websites, signs, and email. The EPA (2011) cautions that the target audience for notifications can be large and diverse and therefore it is a challenge to reach the majority of beachgoers, necessitating a variety of notification and outreach methods. Best management practices for signs include: large size, simple and large text, as well as placement in a highly visible area. Use of symbols, not solely words, is also important (EPA, 2011, p. 32). Familiar color-coding such as green, yellow and red are also a good practice. The text should also briefly include the consequences of water contact, how to stay safe, who the responsible agency is, and a source for more information (EPA, 2011, p. 32). Websites are also a key and common way that agency's notify the public of advisories as well as being a source for more detailed information than can be provided on a sign. Best management practices include showing the status of each beach clearly and up-front with all the other information in a less prominent location (EPA, 2011, p. 42). In addition, social media tools are becoming more popular with beach programs as a means to reach additional beachgoers (EPA, 2011, p. 49-50). An advantage of social media is that it can provide mobile access to advisory information, expand the reach of notification efforts and also reach the younger demographic that is most likely to have contact with the water (EPA, 2011, p. 51).

While the EPA (2011) and Pratap et al. (2013) found generally low beachgoer awareness and knowledge of beach programs and their advisories and outreach, a survey by Minnesota Sea Grant (Schomberg, 2014) found that 87% of beachgoers (total survey

sample size was 63) had heard of health advisories at Minnesota/Lake Superior beaches. This was up from 40% (total survey sample size was 67) in 2011 (Schomberg, 2014). The most popular methods for learning of a health advisory were television, radio and the internet.

In addition to these results, many authors (EPA, 2011; Morrow, 2009; Pratap et al., 2013) emphasized trust as a crucial element of effective risk communication and outreach with the public. The EPA (2011, p. 51) also reported that overall, state agencies felt that “general outreach in some form is necessary to raise the awareness of beachgoers on water quality issues and about the existence of signs at the beach or of websites; and the various notification methods play a complementary role with one method reinforcing- or raising awareness of another.”

In Los Angeles County, a study measured beachgoer perceptions and beach use, but did not evaluate outreach efforts directly. Over half of respondents had personally seen a “no swimming” sign at the beach. In addition, 68% had heard of a beach closure in the last year and 73% had heard a story about water quality on the news, primarily on television. The authors’ concluded that media exposure played a larger role in providing beach goers with information about beach pollution than personal experience did. This conclusion echoes the findings of Schomberg (2014) and EPA (2011) that found television to be a significant source of information for beachgoers to obtain information regarding beach advisories. Also, it reinforces the warning of Heimlich & Falk (2009) - that media coverage can be difficult for the educator to control. The media play an important role in defining what topics are of significance to the viewer, they set the

agenda for information consumption (Kline & Tichenor, 1972). “How and what is reported by the media can shape specific groups’ opinions of issues (Badri, 1991).” This “agenda-setting” tendency of the media may also have implications for risk perception. It is reasonable, therefore, to expect user groups such as surfers to behave differently in terms of risk perception than parents of young children.

The importance of quality outreach is underscored by the finding of Pendleton and Martin (2001), whose study demonstrates what can happen to public perception when news media dominate the information on water quality instead of agencies and organizations with expertise on the topic. “Despite documented successes in the battle to clean up the coastal waters of Southern California, especially through sewage and industrial treatment, Southern Californians continue to view the ocean more as a reservoir for pollution than a vibrant and natural place for bathing and swimming. Nearly half of all Angelenos interviewed in this study cite water pollution as the major reason for not going to the beach (Pendleton & Martin, 2001).”

Pendleton & Martin also noted that water quality is not an important issue for most people, consistently ranking behind crime, education and air pollution as issues of concern. Also, people believe industrial pollution and trash to be the primary contaminants of ocean waters, not stormwater, sewage or biological contaminants. The authors conclude “Clearly public education campaigns and the media have yet to fully succeed in properly informing the public about coastal water quality issues in Southern California. Coastal waters are generally perceived to be far more polluted than they are known to be (Pendleton & Martin, 2001).” They state that these perceptions of poor water

quality keep people from enjoying the beaches unnecessarily (Pendleton & Martin, 2001). In addition to this nuisance, the lack of knowledge could also pose a health risk to beachgoers because they cannot distinguish between clean and contaminated beaches. “Efforts to improve the public’s understanding of coastal water quality could result in both economic and health benefits to beachgoers (Pendleton & Martin, 2001).”

Water stewardship knowledge and attitudes

The literature reviewed in this section shows a wide diversity of knowledge of water quality issues across topics and geography. In contrast to the Angelenos, residents of the Como Lake neighborhood in St. Paul mostly understood that yard care practices and stormwater influence lake water quality (Eckman & Consoer, 2012). They also mostly understood that stormwater flows directly into Como Lake (Eckman & Consoer, 2012). In addition, residents surveyed demonstrated a high concern for water quality and high motivations to practice good water quality stewardship by implementing best yard care practices (Eckman & Consoer, 2012). The high numbers of respondents with knowledge about stormwater and reporting “correct” behaviors may have to do with a self-selection bias, with less knowledgeable and stewardship-practices residents refusing to participate. The authors conclude that more nuanced messaging, with a positive focus, would be useful in helping neighborhood residents to understand nutrient issues that are a particular problem for Como Lake. In addition, barriers to stormwater stewardship were identified and the authors made recommendation to reduce barriers such as implementing community-wide leaf-bag pick up (Eckman & Consoer, 2012).

A study that took place in Lakeside, a neighborhood in Duluth, Minnesota examined residents' Knowledge, Attitudes and Practices (KAP) regarding stormwater and stormwater best practices in their neighborhood and yards. This study was conducted as a baseline study before the implementation of a project that would work with landowners to install stormwater retention features on their property. Residents had the potential to access the website lakesuperiorstreams.org, which is dedicated to information on stormwater and stream pollution, prior to this baseline study, and may have been the recipients of outreach efforts on the part of the Regional Stormwater Protection Team. However, no intensive, neighborhood-specific outreach was conducted prior to this study. This neighborhood is approximately seven miles from the Park Point beaches where data was collected for this project. Like the residents of the Como Lake neighborhood, Lakeside residents understood that stormwater from their property enters storm drains and eventually reaches Lake Superior (Eckman & Walker, 2008). As in other studies, respondents said they learned about stormwater issues from television news or weather (62%), 21% were not aware of information on how to manage stormwater and 25% said they weren't sure how to manage stormwater in their yard (Eckman & Walker, 2008). While residents knew where stormwater ends up in their neighborhood (Lake Superior), less than half (38%) thought that "stormwater might cause problems in Lake Superior (Eckman and Walker, 2008)." The majority (79%) of respondents indicated that they would like to learn more about the study and about the Lakeside Stormwater Reduction Project, of which the study was a part. In addition, a majority of respondents (64%) said they would adopt a stormwater management best practice on their property if cost and

effort were mostly covered. These results have implications for Beach Program outreach and pollution mitigation efforts going forward. MDH staff can reasonably expect there to be some public interest in beach water quality as well as there to be some potential support for beach stewardship efforts. Efforts to improve knowledge of stormwater issues and best practices may need to adopt a tiered approach in order to respond to the knowledge that some Duluth residents already have. Eckman and Consoer (2012) recommended this approach for the Como Lake neighborhood.

Outreach Evaluation

In an evaluation of agency outreach programs regarding fire and fuel management in the Western United States, Toman, Shindler and Brunson (2006) discussed uni-directional and interactive outreach programs. Examples of uni-directional programs are brochures or television ads; examples of interactive program are visitor centers or guided field trips (Toman et al., 2006). The authors found that respondents (citizens in fire and fuel management areas) reported that four of the five most helpful outreach methods were interactive – interpretive centers, guided field trips, elementary schools programs and conversations with agency employees. However, results indicated that exposure levels to outreach are higher for uni-directional activities. Therefore, a combination of outreach efforts is likely necessary in order to provide the public with both breadth and depth of outreach programming. The authors also reported that citizens have little trust for the Internet and for public meetings. Overall, the authors suggest that “interactive methods

may facilitate greater connection to real-world problems and better incorporate participant experiences (Toman et al., 2006).”

Project’s Relationship to Environmental Education

There are a variety of ways that people learn about the environment. Environmental Education (EE) encompasses these types of learning, especially where the goal is to provide the learner with “the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (UNESCO-UNEP, 1978).” EE can be delivered in both formal and nonformal settings. Some of the most popular nonformal delivery methods include family and friends, the media – including television, movies and the internet, travel and museums, zoos and other free-choice learning environments (Heimlich & Falk 2009).

The Beach Program uses several nonformal methods of delivering environmental outreach (Table 1). The Beach Program’s notification and outreach efforts seek to provide awareness and knowledge as well as to change behavior and teach skills to beachgoers. Labeling the Beach Program as environmental outreach is appropriate rather than a label of environmental education because the Beach Program “disseminates information and sometimes asks audiences to take specific action, but doesn’t necessarily teach people how to analyze an issue. Outreach often presents a particular point of view, and often in pursuit of a particular goal (EPA OEE, 2014).” Beach Program outreach messages advocate specific actions and behaviors that are in pursuit of a particular goal –

the protection of human health and water quality. This is accomplished through several of the previously mentioned means such as television and the internet as well as through personal communication.

As was stated earlier, the Beach Program straddles a number of different disciplines and it is therefore helpful to think of its notification and outreach goals in the following terms:

“With growing awareness of the complexity of current environmental crises, we find that the boundaries between education and communication are blurred and strategies from multiple fields are called on to improve public involvement and solve complex problems (Monroe, Andrews, & Biedenweg 2007).”

Increasing public involvement and solving human and environmental health problems are important parts of the Beach Program. Outreach documents/brochures list specific actions and behaviors people can take to protect the environment. It is assumed that these simple, concrete steps would be behaviors easily adopted by the beachgoing public since barriers to all but frequent hand washing are low. In addition, it is assumed that these steps could increase the perception of self-efficacy that beachgoers experience. These assumptions will be explored further in the evaluation.

Chapter Three

Methods

The purpose of this formative evaluation was to evaluate to what degree the Minnesota Lake Superior Beach Monitoring and Notification Program (hereafter Beach Program) has fulfilled its goal to notify the public of the services it provides and to make water recreation information available for the protection of human and environmental health. Specifically, this evaluation asked the following questions:

1. Are North Shore beachgoers aware of the Beach Program? Are they aware of the notification resources the Beach Program provides?
2. Do beachgoers know what the water safety recommendations are and how to help keep the water clean?
3. What perceptions of risk to disease do beachgoers hold regarding beach water contact?
4. Has the Beach Program been successful in changing behaviors related to safe swimming?
5. How can the Beach Program improve the effectiveness of its outreach and communication/notification tools?

Design

The project used a management-oriented context evaluation (Fitzpatrick et al., 2010) and a survey instrument. Survey research is used when a researcher needs to

generalize about the “trends, attitudes or opinions of a population by studying a sample of that population (Creswell, 2009, p. 145).” According to Babbie (2008), “surveys may be used for descriptive, explanatory, and exploratory purposes (p. 270).” Survey research was used in this program evaluation to gather information regarding beachgoers’ awareness, knowledge and behavior in the context of the Beach Program’s outreach and notification efforts. The number of beaches in the Duluth and North Shore region and the number of visitors to Minnesota’s Lake Superior beaches are far too numerous to contact each individual directly, therefore three beaches were purposefully selected for this study.

Data were collected on six days (two per beach) in August when the weather conditions were conducive to large populations of beachgoers. Two collection days were spent at each of the three beaches. Two collection days were Fridays, one was a Saturday, and the rest were a Monday, Wednesday and Thursday. Data collection was in the form of in-person survey interviews. Babbie (2008) identifies several advantages to this approach including typically higher response rates than mail surveys, decreasing the number of blank answers, reducing confusion about the questions asked, and the ability to make observations about the respondent.

See Appendix A for the evaluation matrix that guided interview questions.

Population and Sample

There are eighteen beaches in Duluth monitored by the Beach Program. Three beaches, Lakewalk beach, Tot Lot/13th Street beach and Beach House beach, were purposefully selected due to their consistent popularity. Beach attendance varies so

greatly, depending upon weather, water temperature and day of the week that an accurate estimation of beachgoer attendance was impossible to achieve. Therefore, this study aimed to collect information from all eligible people present at each of the three beaches during August. The population size available to survey on the six collection days depended upon a number of environmental factors including the weather and water temperature.

The selection process involved approaching all adult beachgoers on the beach on each data collection day. Only adults who indicated that they or children they supervise engaged in swimming or surfing were asked to complete the survey. This was done to ensure that the survey respondents were people who would have water contact most likely to result in waterborne illness. To differentiate results between beachgoers who are locals and tourists, participants were asked for their Zone Improvement Plan (ZIP) code. ZIP code did not determine eligibility for participation. Both groups were used in the analysis.

Instrumentation

A survey instrument was developed specifically for this study. Items generally used a close-ended format to allow for efficient aggregation of data.

The instrument was reviewed by researchers with experience in survey design. Dr. Julie Ernst and Dr. Bruce Munson reviewed it for face validity and Jesse Schomberg and Trisha Robinson reviewed it for content validity. The instrument was pilot tested with nine beachgoers to assess clarity and time needed for completion. To encourage

participation the survey was devised to require less than ten minutes, but required approximately 12. The final instrument is found in Appendix B.

Data Collection Procedures

During six sunny, approximately 70-80 degree days in August interviewers went to three Park Point beaches (two days per beach) to conduct interviews with the beachgoers there. Data collection occurred on days without a health advisory, as people who heeded the advisory would not be at the beach that day. One additional field researcher was used. The research assistant received Collaborative Institutional Training Initiative (CITI) training as well as field training to ensure the protection of human subjects and consistent instrument delivery between interviewers. Interviews were conducted during the day, beginning at approximately 11:00am when people started arriving and continued until approximately 5:00pm when most people left.

Interviewers entered through the main access point and attempted to interview each adult that met the survey parameters on the beach over the course of the day. Subjects were invited to participate with a brief explanation of the purpose of the study and the time involved. Before the interview began, interviewers read a consent statement to the participant and obtained verbal consent. Upon completion of the interview, respondents were given a promotional beach bucket to thank them for their participation.

Participants

Surveys were administered to 70 respondents across six days, while 14 declined to participate. Although reasons for declining were not recorded, people who declined were primarily parents of small children who understandably wanted to keep close watch over their child near the water. Of the 70 respondents that accepted the terms of the survey, only 61 met the beach use requirements of this project which were either participating in swimming or surfing in Lake Superior. The majority of respondents were female (Table 3). Ages of participants ranged from teens (over 18) to 70s, but the majority were in the range of 20-50 years of age (Table 3). The number of respondents with children was 34 (56.0%) and the number without was 24 (44.0%). The number of visitors to the beach varied from day to day.

Chapter Four

Results

The 70 survey participants were asked how often they had visited the beach on Park Point in the last five years. Categories were collapsed from four groups into three by combining the categories 1-2 times and 2-5 times into a 1-5 group. Of 61 respondents to this question, 13 respondents (21.3%) indicated they were visiting Park Point for the first time, 13 respondents (21.3%) indicated they had visited Park Point between one and five times in the last five years (occasional visitors), and 35 respondents (57.4%) were at Park Point for the fifth time or more in five years (frequent visitors). In addition, participants were asked for their ZIP code in order to ascertain if they were local or a tourist. Of 70 respondents to this question, 37 respondents (52.9%) were from the Twin Ports.

Table 3
Participants Demographic Information

Variable	n	%
Gender		
Male	27	38.6
Female	43	61.4
Age		
Teens	4	5.7
20s	24	34.3
30s	17	24.3
40s	12	17.1
50s	6	8.6
60s	5	7.1
70s	1	1.4
No Response	1	1.4

Note . N=70

Only 61 of the 70 participants met the beach use requirements of the survey which was to engage in swimming or surfing on the Lake Superior beach. If respondents indicated that they did not engage in the activities of swimming or surfing, they were then asked for a reason they refrained from these activities. Four options were given: too cold, worried about rip currents, worried about bacteria in the water, or other (open-ended). Respondents could choose more than one answer. Out of the 9 participants who did not swim or surf, 6 indicated that the reason for not engaging in these activities was “too cold” (whether the water or air was not specified). Two respondents indicated they were worried about rip currents and none said they were worried about bacteria in the water. Responses to the open-ended “other” option included “other places to go,” “not really a swimming day,” not interested,” “not great at swimming,” “scary,” and “worried”.

When comparing responses to questions regarding visit frequency and ZIP code, results show that frequent visitors were also likely to be locals (77%). Only 13% of first time visitors were locals and 26.7% of occasional visitors were locals (Table 4).

Table 4
Visit Frequency and ZIP Code

Variable	Local	Tourist	Total	% Local
Visit Frequency				
First time	2	13	15	13.3
Occasional	4	11	15	26.7
Frequent	31	9	40	77.5

Note: N=70

For several age groups, there were less than 10 representatives for each of the original categories. Therefore, the age categories were collapsed from the original groups of teens, 20s, 30s, 40s, 50s, 60s, 70s, etc., into teens or twenties, 30s, 40s, and 50 or more. As the Twin Ports area of Lake Superior see the same news broadcasts and interact mostly as one community, it was determined that the Twin Ports would be given the designation of “local” and all other visitors would be “tourists”. The “Twin Ports” is a user-created term without an official government or market designation; therefore the Wikipedia-listed ZIP codes of the Twin Ports were used to make this distinction. Some ZIP codes overlap: Duluth (55801, 55802, 55803, 55804, 55805, 55806, 55807, 55808, 55810, 55811, 55812), Superior (54880), Cloquet (55720), Carlton (55718), Hermantown (55810, 55811), Proctor (55810), Scanlon (55720).

The remainder of the findings will be discussed in the context of the study’s overarching research questions.

1. Are North Shore beachgoers aware of the Beach Program? Are they aware of the notification resources the Beach Program provides?

Survey participants were asked if they were aware that the state has a water quality monitoring program that determines how safe it is to be in the water in Lake Superior. While 36 respondents (59.0%) indicated they had, 25 respondents (41.0%) indicated they had not. More specifically, participants were also asked if they had heard of the Minnesota Lake Superior Beach Monitoring Program by name. Only 5 respondents (8.2%) indicated they had heard of this program specifically, while the majority (91.8%) had not. While most participants were unaware of the program by name, 28 (45.9%) were

aware of ‘Water Contact Not Recommended’ postings (as worded by the Minnesota Department of Health) or, ... ‘beach advisories for bacteria’ postings (as worded by local media) on Lake Superior.

Awareness of any state water quality monitoring program was related to frequency of visit, specifically, those who visit occasionally (69.2%) and frequently (68.6%) were aware of a water quality monitoring program significantly more than first time visitors (23.1%) (Chi-square = 8.82, $p < .01$) (Table 5). Also, the frequent visitors (71.4%) were aware of “the Beach Advisory for Bacteria” significantly more than those visiting for the first time (7.7%) and occasional visitors (15.4%) (Chi-square = 21.70, $p < .01$). The categories of age and having kids did not have an effect on awareness of the programs.

Table 5
Proportion of Awareness of the Beach Programs by Frequency of Visit, Age, and Having Kids

Variable	n	Water Quality Monitoring Program			Minnesota Lake Superior Beach Program			Beach Advisories for Bacteria		
		Yes (n)	Yes (%)	Chi-square	Yes (n)	Yes (%)	Chi-square	Yes (n)	Yes (%)	Chi-square
Activities:Swimming a/o Surfing ^A	61	36	59.0		5	8.2		28	45.9	
Frequency of Visit				8.82**			1.65			21.70**
First Time	13	3	23.1		1	7.7		1	7.7	
1-5	13	9	69.2		0	0.0		2	15.4	
5+	35	24	68.6		4	11.4		25	71.4	
Age Category				6.36			1.47			6.30
20s or less	27	14	51.9		1	3.7		12	44.4	
30s	15	8	53.3		2	13.3		6	40.0	
40s	10	9	90.0		1	10.0		8	80.0	
50+	8	6	75.0		1	12.5		2	25.0	
No Response	1									
Have Kids under 18				1.03			1.30			3.08
No	27	14	51.9		1	3.7		9	33.3	
Yes	34	22	64.7		4	11.8		19	55.9	

Note . ^AThe sample size of this analysis was n=61, who reported swimming and/or surfing activities; ** $p < .01$

If respondents had heard of beach advisories for bacteria, they were then asked a follow up question about how they had learned of the advisory and were asked to volunteer a single response. This was used to ascertain whether respondents were aware of the Beach Program's notification resources. Out of the 45 respondents who answered positively the question regarding whether they had heard of "beach advisories for bacteria," the majority had learned of advisories from either TV/news (16, 35.6%) or from signs at the beach (10, 22.2%) (Table 6). Learning about beach advisories through TV/news was associated with the number of visits to the beach, specifically those who were frequent visitors (50%) were significantly more likely to have heard about advisories from TV than first time (0%) or occasional visitors (14%) (Chi-Square = 8.53, $p < .01$). Other significant associations with learning about advisories from TV/news were having kids (Chi-square= 6.64, $p < .01$) and ZIP code (Chi-Square = 5.61, $p < .01$) (Table 6). Among those respondents who learned of advisories from signs, the number of visits to the beach was significant (Chi-Square = 6.43, $p = .04$). In addition, there was a relationship between learning of advisories from signs and ZIP code (Chi-Square = 5.47, $p = .02$, respectively) (Table 6).

Table 6

Source of Learning about Beach Advisories^A and Source by Demographic Variables

Source	Yes (n)	Yes (%)	Source	Yes (n)	Yes (%)
TV/News	16	35.6	parkpointbeach.org	3	6.7
Signs at the beach	10	22.2	mmbeaches.org	1	2.2
Other	6	13.3	Phone hotline	0	0
Newspaper	3	6.7	Email listserv	0	0
Radio	3	6.7			

Demographic	Chi-square	p-value	Percent of Learning from the Source by Sub-Group
<u>Learn from "TV/News"</u>			
by no. of visit	8.53	0.01**	First (0%), 2-5 visits (14%), 5+ visits (50%)
by having kids	6.64	0.01**	No kids (15%), Having kids (52%)
by ZIP code	5.61	0.01**	Twin Ports (50%), Other (16%)
by age group ^B	4.89	0.18	
by gender	0.23	0.63	
<u>Learn from "Signs at the beach"</u>			
by no. of visit	6.43	0.04*	First (0%), 2-5 visits (0%), 5+ visits (33%)
by ZIP code	5.47	0.02*	Twin Ports (35%), Other (5%)
by age group	2.62	0.45	
by gender	0.32	0.57	
by having kids	0.16	0.69	

Note . ^AThe sample size of this analysis was n=45, who were aware of at least one program; ^B 4 Age groups (20s or less, 30s, 40s, 50s+); ** $p < .01$; * $p < .05$

2. Do beachgoers know what the water safety recommendations are and how to help keep the water clean?

Respondents were asked to rate the importance of specific recommendations made for staying healthy when swimming by the Beach Program. The recommendation “stay away from storm drains, trash and other pollutants such as oil slicks” was recognized as important or very important by 100% of respondents. The majority of respondents (90.2%) recognized “avoid swallowing beach water” as important or very important. The majority of respondents (83.6%) recognized “take your children for

frequent bathroom breaks and wash your hands” was important or very important. A recommendation that helps beachgoers to avoid pollution is “wait 24 hours before swimming after a heavy rain”. However, that was the recommendation that received the second highest portion of “not relevant” and “unimportant” responses (55.7%) (Table 7). Regarding knowledge of how to keep the water clean, the majority of participants listed the items that would keep water clean as important such as proper disposal of trash, not feeding shorebirds, and not swimming if ill with diarrhea or vomiting. An item that MDH does not promote is “keep your face and head out of the water or wear ear plugs or goggles.” The majority of participants (65.5%) recognized this statement as not relevant or unimportant. All survey items regarding these questions were close-ended.

Table 7

Knowledge on Recommendations for Water Safety and Keeping the Water Clean^A

Question	Proportion of Response (%)			
	Not relevant	Un-important	Important	Very important
Recommendations for water safety (healthy swimming)				
Stay away from storm drains, trash and other pollutants such as oil slicks	0.0	0.0	21.3	78.7
Wait 24 hours before swimming after a heavy rain	29.5	26.2	31.1	13.1
Take your children for frequent bathroom breaks and wash your hands	8.2	8.2	39.3	44.3
Shower after swimming or playing at the beach	4.9	13.1	47.5	34.4
Keep your face and head out of the water or wear ear plugs and goggles	14.7	50.8	24.6	9.8
Avoid swallowing beach water	1.6	8.2	49.2	41.0

Note .^AThe sample size of this analysis was n=61, who reported swimming and/or surfing activities

3. What perceptions of risk to disease do beachgoers hold regarding Lake Superior beach water contact?

Respondents were asked to rate their perceived level of risk of getting sick from swimming in Lake Superior on a scale of one to five. One corresponded to “not at all risky,” two corresponded to “a little risky,” three to “somewhat risky,” four to “risky,”

and five to “very risky”. There were no blank or in between options. Most participants perceived Lake Superior beach water contact as not at all risky or a little risky. Other participants (14.8%) perceived it to be somewhat risky. No respondents thought that the level was risky or very risky.

4. Has the Beach Program been successful in changing behaviors related to safe swimming?

Participants were asked if they had ever not gone to Park Point beaches because (they) learned there was a warning that the water was unsafe for swimming due to unusually high levels of bacteria, 13 out of 61 (21.3%) responded with “Yes”.

Participants were also asked if they had ever gone to the beach but avoided the water because they learned there was a warning that the water was unsafe for swimming due to potentially harmful levels of bacteria. Eleven out of 61 (18.0%) indicated they had.

5. How can the Beach program improve the effectiveness of its outreach and communication/notification tools?

Participants were given a list of items and asked what types of resources they would be most likely to use in the future to learn about beach advisories in Lake Superior. They could choose all that applied to them. The majority of respondents (80.3%) said they would use signs at the beach. Other popular resources included the websites mnbeaches.org (65.6%) and parkpointbeach.org (63.9%), and TV/news (57.4%) (Table 8). Social media (Facebook or Twitter) and text message alerts were each likely to be used by 47.5% of respondents.

Results were tested against all demographic categories, however Table 8 only shows those results where significance was found. Although not one of the top choices for future advisory notifications (Table 8), use of the radio to learn about beach advisories was associated with ZIP code; specifically, those in the Twin Ports (50%) were significantly more likely than tourists to use the radio in the future (Chi-square = 5.61, $p < .01$). In addition, there was an association between participants that would use the radio to learn about advisories and age (Chi-square = 8.21, $p = .04$), number of visits (Chi-square = 6.75, $p = .03$) and by having kids (Chi-square = 4.03, $p = .05$) (Table 8).

Table 8

Resource to Use in the Future to Learn about Beach Advisories in Lake Superior^A

Resource	Yes (n)	Yes (%)	Resource	Yes (n)	Yes (%)
Signs at the beach	49	80.3	Radio	27	44.3
mnbeaches.org	40	65.6	Phone hotline	23	37.7
parkpointbeach.org	39	63.9	Email listserv	21	34.4
TV/news	35	57.4	Newspaper	19	31.1
Social media (Facebook/Twitter)	29	47.5	Other (app, billboard, electronic signs, google, text, weather report, word of mouth)	15	24.6
Text message alerts	29	47.5			

Demographic	Chi-square	p-value	Percent of Use in the Future by Sub-Group
<u>Would use "Radio"</u>			
by Age group	8.21	0.04*	20s-(59%), 30s (20%), 40s (60%), 50s+(25%)
by No. of visit	6.75	0.03*	First (42%), 2-5 visits (15%), 5+ visits (57%)
by Having kids	4.03	0.05*	No kids (59%), Having kids (33%)
by Zip code	5.61	0.01**	Twin Ports (50%), Other (16%)
<u>Would use "Phone hotline"</u>			
by No. of visit	6.67	0.04*	First (50%), 2-5 visits (8%), 5+ visits (46%)
<u>Would use "mnbeaches.org"</u>			
by Zip code	6.56	0.01**	Twin Ports (81%), Other (50%)
<u>Would use "Social media (Facebook/Twitter)"</u>			
by Age group	9.11	0.03*	20s-(67%), 30s (47%), 40s (30%), 50s+(13%)
by Gender	5.88	0.02*	Male (29%), Female (61%)

Note. ^AThe sample size of this analysis was n=61; ** $p < .01$; * $p < .05$

Participants were given a list of choices and asked to respond to what types of information they would like to see provided by the Beach Program. They could choose more than one response. For age-group specific information, results were significant for demographic variables having children and ZIP code. For example, outside the Twin Ports, they would be significantly more likely to use age-group specific information (Table 9). Results were tested against all demographic categories, however Table 9 only shows those results where significance was found.

Table 9

Types of Information Participants would use^A

Resource	Yes (n)	Yes (%)	Information on	Yes (n)	Yes (%)
Types of illness associated with bacteria	57	93.4	How to keep the water clean	15	24.6
Sources of bacteria	38	62.3	Other (actual risk/frequency, alerts, causes of pollution, pets, etc.)	9	14.8
Age-group specific information	32	52.5			

Demographic	Chi-square	p-value	Percent of Use in the Future by Sub-Group
<u>Would use "Age-group specific information"</u>			
by Having kids	6.16	0.05*	No kids (52%), Having kids (82%)
by Zip code	4.63	0.03*	Twin Ports (56%), Other (82%)

Note . ^AThe sample size of this analysis was n=61; ; ** p<.01; * p<.05

Respondents were also asked about ways they would like to receive outreach information about how to keep themselves safe and the water clean (distinct from advisory notifications) and the type of information they would like to have (Table 10). They were presented with the items listed in Table 10 under “resource” and they could choose more than one response. Results were significant for a number of demographic variables including gender, ZIP code, age group, number of visits, and having children. For example, age group was significant for those who would use workshops to learn about ways to keep themselves safe and the water clean (Chi-square = 13.89, p<.01)

(Table 10). Results were tested against all demographic categories, however Table 10 only shows those results where significance was found.

Table 10

Types of Outreach Resources to Use for the Beach Program^A

Resource	Yes (n)	Yes (%)	Resource	Yes (n)	Yes (%)
Booths with staff and information at the beach	48	78.7	Facebook	32	52.5
TV/radio commercials	48	78.7	After school programs for kids	28	45.9
Information at hotels/visitor centers	40	65.6	Twitter	15	24.6
Booths at festivals/events	38	62.3	Workshops	7	11.5
MN Tourism website	33	54.1			

Demographic	Chi-square	p-value	Percent of Use in the Future by Sub-Group
<u>Would use "Booths at festivals/events"</u>			
by No. of visit	6.10	0.05*	First (33%), 2-5 visits (77%), 5+ visits (69%)
<u>Would use "Twitter"</u>			
by No. of visit	5.94	0.05*	First (25%), 2-5 visits (0%), 5+ visits (34%)
by Zip code	5.71	0.02*	Twin Ports (38%), Other (11%)
<u>Would use "Facebook"</u>			
by Age group	9.64	0.02*	20s-(67%), 30s (60%), 40s (30%), 50s+(13%)
by Gender	5.38	0.02*	Male (33%), Female (64%)
<u>Would use "Workshops"</u>			
by Age group	13.89	0.01**	20s-(7%), 30s (0%), 40s (10%), 50s+(50%)
<u>Would use "Afterschool programs"</u>			
by Gender	4.92	0.03*	Male (29%), Female (58%)
by Having kids	8.49	0.01**	No kids (26%), Having kids (64%)
<u>Would use "Booths with staff and information"</u>			
by No. of visit	9.85	0.01**	First (50%), 2-5 visits (69%), 5+ visits (91%)
<u>Would use "Booths with staff and information"</u>			
by Zip code	5.02	0.03*	Twin Ports (55%), Other (82%)

Note . ^AThe sample size of this analysis was n=61; ; ** p<.01; * p<.05

Chapter Five

Discussion

The purpose of this formative evaluation was to assess to what degree the Minnesota Lake Superior Beach Monitoring and Notification Program has fulfilled its goal to notify the public of the services it provides and to make water recreation information available for the protection of human and environmental health. The Beach Program aims to influence beachgoer behavior in terms of staying away from the beach when conditions are unsafe and in adopting those behaviors which will keep the water clean. Most behavioral researchers agree that action is a result of the interaction of emotions, cognition, and values, along with the possession of the necessary skills and opportunities for taking action (Heimlich & Ardoin, 2008). In the case of the Beach Program, the Health Belief Model is the relevant theory that attempts to explain what situations prompt individuals to maintain good health behaviors.

As this was a management-oriented evaluation, it is appropriate to point out that Beach Program staff will need structure in documentation to move forward with improvements. In conducting the literature review for this thesis, it was difficult to find MDH documentation that articulated specific goals and reasoning for conducting Beach Program outreach. The EPA does have documentation providing structure to outreach efforts. However, the Minnesota Beach Program is attempting to go beyond the requirements of the EPA. Therefore, outreach efforts and goals specific to the Minnesota Beach Program should be formalized in program documents such as the annual workplan

and the Quality Assurance Project Plan (QAPP). These documents will also be reviewed by the Beach Team. There are established norms within the program that provide the reasoning behind certain outreach efforts, but effectiveness has not been documented. These new documents should start with the premise: “By using multiple methods of outreach to address the public’s knowledge, attitudes, and behavior, we utilize the Health Belief Model to create an intention of the public to act in ways that will maintain their own health and the health of the environment. The Beach Program strives to influence attitudes regarding the importance of recreating safely in water, and give people knowledge and skills regarding beach recreation and stewardship.”

Overall awareness of the Beach Program and its resources is low. There is a need to raise awareness to give people access to this resource. Awareness likely also plays a role in risk perception, although the nature of that relationship is unclear. The literature cautions that information to be communicated must be chosen with care so as not to overwhelm the audience (Morrow, 2009). Morrow (2009) also states that understanding risk perception is key to knowing what it takes to reach a threshold where people will take mitigating action. All respondents but one perceived the level of risk of getting sick from swimming Lake Superior to be low and none perceived it was high. In support of this finding, of the nine participants who did not swim or surf, none indicated that bacteria were a reason they did not have full body contact with the water. From these results, it is unlikely that risk perception would be a reason that people would take mitigating action such as staying out of the water after a rain event or adopting water stewardship actions.

The EPA guidance aligns with the Three-Challenge Approach (Chapter 2). The three challenges are knowledge, process, and communications skills. The results of this study show that knowledge is somewhat lacking on the part of beachgoers. In addition, the audience was given some process involvement in this study, but more could be needed. Finally, this study highlights areas where communication between MDH and beachgoers could improve. The risk communication model that the EPA advances may not be as effective in capturing people's attention when the risk is perceived to be low. The effects of climate change, however, could alter this low disease incidence trend if extreme weather events and warmer water temperatures become the norm. (Patz, Vavrus, Uejio, & McLellan, 2008).

While it is not imperative that beachgoers know the name of the program that tests their beach water, it is important that they know this service does exist for them and that they have an idea of where to start looking for information. Since only 8.2% of respondents said they had heard of the Lake Superior Beach Monitoring Program, 45.9% indicated they had heard of beach advisories, and 59.0% said they knew there was a program for beach water testing, it seems that a number of people in the population are missing out on a resource they may benefit from using. Levels of awareness of beach programs vary widely. Minnesota Sea Grant (Schomberg, 2014) found that 87% of beachgoers had heard of health advisories at Minnesota's Lake Superior beaches, up from 40% in 2011. These findings are from the two of the same beaches as this study with similar numbers of participants. It is unclear why the Schomberg (2014) awareness results were so much higher than those reported in this study. In Schomberg (2012) a

greater proportion of respondents were frequent visitors, so it is even more surprising that results were low. Wording between all three surveys was similar for this question.

Perhaps the 2012 Duluth flood created more awareness of water quality issues temporarily. The EPA (2011) and Pratap et al. (2013) found generally low beachgoer awareness and knowledge of beach programs and their advisories and outreach. It is possible that variations in awareness of beach programs are due to different sampling times. If researchers are on the beaches when there are high numbers of tourists (weekends, holiday weekends, Fridays or Mondays) then the awareness levels might be lower.

The demographic categories of ZIP Code, age, having kids, and number of visits were significant for many questions. Frequent visitors to Lake Superior beaches were significantly more aware of a state water quality monitoring program as well as beach advisories than first time visitors (Table 5). There are a number of possible explanations for this. Frequent visitors could interact with other beachgoers more, who may pass on knowledge to them. Also, frequent visitors are more likely to encounter beach advisory signs. As shown in Table 4, frequent visitors are likely to be Twin Ports residents and therefore are in the community to hear about advisories through various media channels. They may also be at the beach when sampling occurs and therefore have interacted or at least observed staff testing the water. Another possible explanation is that they are more invested or interested in beach conditions and so they pay more attention than other visitors. Thus, raising awareness is not as imperative, perhaps, amongst frequent visitors or local users but there is a need to reach more tourists and infrequent users. As shown in

Tables 8 and 10, potential ways to reach these audiences include radio, a phone hotline, a website, booths at beaches and festivals or events and Twitter.

Of participants who had heard of beach advisories for bacteria, the majority had learned of advisories from either TV/news or from signs at the beach (Table 6). A study from Los Angeles County (Pendleton, Martin, & Webster, 2000) found similar results regarding TV as did Schomberg (2014) and EPA (2011). As discussed in the literature review, media coverage can be hard for the agency to control. There is an “agenda setting” tendency of the media that can shape consumers’ opinions of an issue (Badri, 1991). The Beach Program will need to examine how its use of news releases can contribute to increased knowledge of its resources through TV/news and radio. The MDH communications office is concerned with creating “fatigue” with the media and audiences if news releases are sent out too frequently. However, it is clear from the survey results that beachgoers rely on TV and the news to get information about beach advisories. The practice that the Beach Program has of including media contacts on advisory alert listservs will continue to be useful. Future research should explore the difference between what MDH news releases and outreach literature say and how public perceptions differ from agency messaging. In addition to relying on news releases, the Beach Program could take a more involved role and create Public Service Announcements (PSAs) to reach the television and radio audiences (Table 10).

It is clear that physical signs at the beach will continue to be an important part of the Beach Program’s notification strategy. It wasn’t clear in the survey language whether signs would be temporary or permanent. Schomberg (2014) found that Park Point

Beachgoers were not aware of the permanent signs that are already in place at the beaches. The researcher feels that the novelty of the MDH temporary advisory signs makes them noticeable and therefore of use to beachgoers. Currently, one temporary sign is placed at the main entrance to the beach that is under advisory. Park Point beaches Tot Lot and Beach House have parking lots that lead to main pathways and users are likely to see the signs. Lakewalk has more entries and therefore the sign may not be seen. On larger beaches, given the importance that beachgoers place on signs, two or more temporary signs should probably be used for greater visibility. Given the ambiguity of sign type in this study and Schomberg's findings, it seems that the best strategy is to continue the use of temporary signs and not try to implement permanent ones.

Desire for information on how to keep water clean was low (Table 9). Perhaps this due to a perception that the water is clean and always will be clean. It could also be that respondents thought they already knew how to keep the water clean. Or, it could be due to a low perception of the impacts of cumulative effects on water quality. Finally, it could just be that this information was not important to respondents.

While not as popular as signs at the beach or websites, newer types of notification strategies did have support from beachgoers (Table 8). Options such as social media and text messages should be explored for implementation. These options were most popular with younger people who would be the adults most likely to be the parents of small children – a vulnerable population.

Like many programs, the Beach Program has grown and evolved from its original framework. In reviewing program documentation for this evaluation, it is clear that newer

facets of the program, such as increased outreach, are a good start, but need to be codified better in program documentation. In addition, outreach should involve the topics of types of illness associated with bacteria and the sources of bacteria that survey respondents said they would want. A specific issue that needs to be addressed is the recommendation that beachgoers avoid the water for 24 hours after a heavy rain event. This is an important water safety tip as stormwater runoff leads to higher bacteria and other pollutant loads to beaches immediately following a rain event. However, this was the recommendation that most respondents (55.7%) identified as either “not relevant” or “unimportant” for healthy swimming. This is potentially a recommendation that should be addressed in-person, where there can be a discussion between staff and beachgoers about the reasons for this recommendation. Supporting this recommendation, booths at the beach and at events or festivals were a popular option with beachgoers (Table 10). Toman et al. (2006) stated “interactive methods may facilitate greater connection to real-world problems and better incorporate participant experiences.”

Beach Program flyers will need to be updated with better recommendations for keeping people and beaches healthy. These new flyers can also list new ways of getting information about the Beach Program. Over 90% of beachgoers asked for specific information on the “types of illness associated with bacteria” (Table 9). Other popular areas of information desired were the “sources of bacteria” and “age-group specific information” (Table 9). While each of these topics are touched on in the general flyer, perhaps they could be broken out for more detail on each topic if a beachgoer expressed an interest. In addition, upon review, several recommendations in the current flyer are not

in line with CDC guidelines and should be revised. Finally, the flyers need to better emphasize the importance of avoiding the water after a rainfall event.

Like many urban areas, Duluth has problems with stormwater. Beaches are routinely under advisory after a rain event presumably due to the polluted runoff from yards, streets, driveways and occasionally sanitary sewer infiltration. Anecdotally, beachgoers seem to be more interested in the issue of stormwater and why it matters when polluted runoff is connected to the waters they recreate in. This potential “hook” should be explored more and used by the Beach Program and other Duluth organizations to foster a sense of responsibility with residents toward stormwater stewardship. Improved stormwater stewardship would reduce advisory days and improve water quality and better protect public and environmental health. The Beach Program must continue to educate the public of the role they play in keeping themselves and their beaches safe and healthy. Caution must be used when doing outreach that has a risk component. While respondents sometimes say they want a large amount of information about a topic (Pratap et al., 2013), the risk communication literature overwhelmingly advises that messages be brief and specific (Morrow, 2009 p. 5).

These results and recommendations will be shared with the Beach Team and MDH decision makers who may have additional recommendations of their own. The current guidance for implementing notification and outreach has not been updated since 2006 and does not take into account social media or the results of any survey done on Park Point beaches since 2006. These findings and recommendations will be incorporated

into a new Standard Operating Procedure (SOP) and Quality Assurance Project Plan (QAPP).

Limitations

One of the biggest limitations of this study is that the results are not generalizable to other beach programs or other communities. It is an evaluation and the survey did not have an experimental design.

The month of August is a narrow window of the beach season and may not be representative of the season as a whole, although it is generally when water is warmest and people are most likely to swim.

Respondents were asked how many times they had visited the beaches on Park Point in the last five years. Categories for this response were not exclusive (first time, one to two times, two to five times and five or more times).

More days of data collection would have been desirable, especially on weekends, however, the weekend weather in August of 2014 was predominantly rainy. In addition, potential data collection days were limited by the unusually high number of beach health advisories at the chosen beaches. Three advisories were issued for the beaches chosen for sampling in this project in 2014. Between 2011 and 2013, only 2 advisories were issued on any of the beaches in all three years (MDH, 2015).

Future Research

There are many more facets of beachgoers' perceptions regarding Beach Program outreach to explore. In future surveys, beachgoers should be asked if they sought

information regarding beach water quality prior to coming to the beach that day. In addition, beachgoers' attitudes towards specific outreach and notification mechanisms should be explored in more depth by using a scaled response system. Change in levels of attitudes, knowledge, and behavior should be measured in future evaluations to determine if changes in outreach strategies are having an effect on beachgoers. In particular, levels of knowledge regarding stormwater runoff (best management practices, potential ways it can harm them or the lake, etc.) should be measured as good stormwater management is a way to improve beach health. Barriers to taking action should also be explored.

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Appendix A

Beach Program evaluation matrix

Evaluation Question	Instrument Question
<p>Are North Shore beachgoers aware of the Beach Program? Are they aware of the notification resources the Beach Program provides?</p>	<p>1. How often have you visited the beach on Park Point in the past 5 years? <input type="checkbox"/> first time <input type="checkbox"/> 1-2 <input type="checkbox"/> 2-5 <input type="checkbox"/> 5 or more</p> <p>2. Which activities do you or children you are responsible for supervising engage in at the beaches on Park Point? (read list to participant) <input type="checkbox"/> Swimming <input type="checkbox"/> rowing <input type="checkbox"/> surfing <input type="checkbox"/> rock picking <input type="checkbox"/> sailing <input type="checkbox"/> beach walking <input type="checkbox"/> kayaking <input type="checkbox"/> fishing <input type="checkbox"/> canoeing <input type="checkbox"/> other _____</p> <p>2a. If you don't go in the water to do activities like swimming or surfing, what are some of the reasons you don't? <input type="checkbox"/> Too cold <input type="checkbox"/> worried about rip currents <input type="checkbox"/> worried about bacteria in the water <input type="checkbox"/> other _____</p> <p><i>*If answer does not include surfing or swimming, thank them and drop to demographic questions.</i></p> <p>3. Are you aware the state has a water quality monitoring program that determines how safe it is to be in the water in Lake Superior? <input type="checkbox"/> Y <input type="checkbox"/> N</p> <p>4. The program is called the Minnesota Lake Superior Beach Program. Have you heard of that? <input type="checkbox"/> Y <input type="checkbox"/> N</p> <p>5. Have you ever heard or read about "Water Contact Not Recommended" advisories or, as the media often refer to them, "Beach advisories for bacteria" for the Lake Superior Beaches? <input type="checkbox"/> Y <input type="checkbox"/> N</p>

	<p>6. If yes, how did you learn about them? (Let them volunteer response)</p> <p> <input type="checkbox"/> TV/News <input type="checkbox"/> Radio <input type="checkbox"/> Newspaper <input type="checkbox"/> phone hotline <input type="checkbox"/> email listserv </p> <p> <input type="checkbox"/> mnbeaches.org <input type="checkbox"/> signs at the beach <input type="checkbox"/> parkpointbeach.org <input type="checkbox"/> other _____ </p>
<p>Do beachgoers know what the water safety recommendations are and how to help keep the water clean?</p>	<p>11. This next part talks about healthy swimming recommendations. I am going to read six possible options to staying healthy while you swim and you tell me whether you think they are very important, important, unimportant or not relevant.</p> <p>a. stay away from storm drains, trash and other pollutants such as oil slicks.</p> <p>Not relevant Unimportant Important Very important</p> <p>b. Wait 24 hours before swimming after a heavy rain</p> <p>Not relevant Unimportant Important Very important</p> <p>c. Take your children for frequent bathroom breaks and wash your hands</p> <p>Not relevant Unimportant Important Very important</p> <p>___ d. Shower after swimming or playing at the beach.</p> <p>Not relevant Unimportant Important Very important</p> <p>___ e. Keep your face and head out of the water or wear ear plugs and goggles.</p> <p>Not relevant Unimportant Important Very important</p> <p>___ f. Avoid swallowing beach water.</p> <p>Not relevant Unimportant Important Very important</p> <p>12. Now I'm going to read you some possible recommendations for keeping beach water clean. Please tell me as I read them if you think they are very important, important, unimportant or not relevant.</p> <p>a. Dispose of diapers and animal waste by putting them in trash receptacles or sealing them in a plastic bag to carry out with you.</p> <p>Not relevant Unimportant Important Very important</p>

	<p>b. Don't feed ducks, geese, seagulls, or other birds.</p> <p>Not relevant Unimportant Important Very important</p> <p>c. Carry out all trash or dispose of it securely in trash receptacles.</p> <p>Not relevant Unimportant Important Very important</p> <p>d. Don't swim if you're sick with diarrhea or vomiting.</p> <p>Not relevant Unimportant Important Very important</p>																				
<p>Has the Beach Program been successful in changing behaviors related to safe swimming?</p>	<p>8. Have you ever not gone to Park Point beaches because you learned there was a warning that the water was unsafe for swimming due to unusually high levels of bacteria?</p> <p style="text-align: center;"><input type="checkbox"/> Y <input type="checkbox"/> N</p> <p>9. Have you ever gone to the beach but avoided the water because you learned there was a warning that the water was unsafe for swimming due to potentially harmful levels of bacteria?</p> <p style="text-align: center;"><input type="checkbox"/> Y <input type="checkbox"/> N</p>																				
<p>How can the Beach Program improve the effectiveness of its outreach and communication/notification tools?</p>	<p>10. What resources would you be most likely to use in the future to learn about beach advisories in Lake Superior? (read to them)</p> <table border="0" style="width: 100%;"> <tr> <td><input type="checkbox"/> TV/News</td> <td><input type="checkbox"/> mnbeaches.org</td> </tr> <tr> <td><input type="checkbox"/> Radio</td> <td><input type="checkbox"/> signs at the beach</td> </tr> <tr> <td><input type="checkbox"/> Newspaper</td> <td><input type="checkbox"/> parkpointbeach.org</td> </tr> <tr> <td><input type="checkbox"/> phone hotline</td> <td><input type="checkbox"/> social media (Facebook/Twitter, etc.)</td> </tr> <tr> <td><input type="checkbox"/> email listserv</td> <td><input type="checkbox"/> other _____</td> </tr> </table> <p>13. I am going to read a short list of ways the Beach Program can get its information out to people who use the beach. Please tell me which of the following you would use:</p> <table border="0" style="width: 100%;"> <tr> <td><input type="checkbox"/> booths at festivals and public events</td> <td><input type="checkbox"/> after school programs for kids</td> </tr> <tr> <td><input type="checkbox"/> Twitter</td> <td><input type="checkbox"/> MN Tourism website</td> </tr> <tr> <td><input type="checkbox"/> Facebook</td> <td><input type="checkbox"/> booths with staff and information at the beach</td> </tr> <tr> <td><input type="checkbox"/> workshops</td> <td><input type="checkbox"/> information at hotels and visitor centers</td> </tr> <tr> <td><input type="checkbox"/> TV/radio commercials</td> <td></td> </tr> </table> <p>14. Which of the following types of information would you use?</p> <p><input type="checkbox"/> information on sources of bacteria <input type="checkbox"/> age-group specific information</p>	<input type="checkbox"/> TV/News	<input type="checkbox"/> mnbeaches.org	<input type="checkbox"/> Radio	<input type="checkbox"/> signs at the beach	<input type="checkbox"/> Newspaper	<input type="checkbox"/> parkpointbeach.org	<input type="checkbox"/> phone hotline	<input type="checkbox"/> social media (Facebook/Twitter, etc.)	<input type="checkbox"/> email listserv	<input type="checkbox"/> other _____	<input type="checkbox"/> booths at festivals and public events	<input type="checkbox"/> after school programs for kids	<input type="checkbox"/> Twitter	<input type="checkbox"/> MN Tourism website	<input type="checkbox"/> Facebook	<input type="checkbox"/> booths with staff and information at the beach	<input type="checkbox"/> workshops	<input type="checkbox"/> information at hotels and visitor centers	<input type="checkbox"/> TV/radio commercials	
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<input type="checkbox"/> Facebook	<input type="checkbox"/> booths with staff and information at the beach																				
<input type="checkbox"/> workshops	<input type="checkbox"/> information at hotels and visitor centers																				
<input type="checkbox"/> TV/radio commercials																					

	<input type="checkbox"/> information on how to manage polluted runoff <input type="checkbox"/> information on types of illnesses associated with beach water contact <input type="checkbox"/> other										
What perceptions of risk to disease do beachgoers hold regarding beach water contact?	<p>15. Do you have any recommendations not listed above?</p> <hr/> <p>7. On a scale of 1 to 5, with 1 being not at all risky and 5 being very risky, what do you think the level of risk of getting sick from swimming in Lake Superior is?</p> <table border="1" data-bbox="535 508 1722 612"> <tr> <td data-bbox="535 508 766 560">Not at all risky</td> <td data-bbox="766 508 997 560">A little risky</td> <td data-bbox="997 508 1228 560">Somewhat risky</td> <td data-bbox="1228 508 1459 560">Risky</td> <td data-bbox="1459 508 1722 560">Very risky</td> </tr> <tr> <td data-bbox="535 560 766 612">1</td> <td data-bbox="766 560 997 612">2</td> <td data-bbox="997 560 1228 612">3</td> <td data-bbox="1228 560 1459 612">4</td> <td data-bbox="1459 560 1722 612">5</td> </tr> </table>	Not at all risky	A little risky	Somewhat risky	Risky	Very risky	1	2	3	4	5
Not at all risky	A little risky	Somewhat risky	Risky	Very risky							
1	2	3	4	5							

Appendix B

Lake Superior Beach Monitoring and Notification Program: An Evaluation

Hello, my name is _____, and I'm from the Minnesota Department of Health. We are conducting an evaluation to find out if the Minnesota Lake Superior Beach Program is doing outreach effectively and ways it can be improved. The questions will take about 7 minutes. There are no direct benefits or risks from participating in this study, but your answers will help us create outreach materials that could help keep the water cleaner and keep people from getting sick.

Participation in this study is voluntary and you may choose not to participate. At any time, you may refuse to answer any of the questions or end participation in the study. This will not have any negative impact on your relationship with the Minnesota Department of Health. All of the information we are collecting is private. No one except the study investigators would have access to any of this information without your permission. The final report will not include your name or other information that could identify you. Would you be willing to participate in this study by answering some questions?

If you have any questions about the study, you can ask me today or you can reach Cindy Hakala at 218-302-6150. If you have questions about your rights as a research participant in the study, please contact Peter Rode, Administrator of the Minnesota Department of Health Institutional Review Board, at 651-201-5942.

Beach testing is when water samples are collected from the beach and then tested to see if there are any harmful germs or bacteria in the water.

1. How often have you visited the beach on Park Point in the past 5 years?

- first time 1-2 2-5 5 or more

2. Which activities do you or children you are responsible for supervising engage in at the beaches on Park Point? (read list to participant)

- | | |
|-----------------------------------|--|
| <input type="checkbox"/> Swimming | <input type="checkbox"/> rowing |
| <input type="checkbox"/> surfing | <input type="checkbox"/> rock picking |
| <input type="checkbox"/> sailing | <input type="checkbox"/> beach walking |
| <input type="checkbox"/> kayaking | <input type="checkbox"/> fishing |

- canoeing other _____

Only ask if they don't swim or surf.

2a. If you don't go in the water to do activities like swimming or surfing, what are some of the reasons you don't?

- Too cold
 worried about rip currents
 worried about bacteria in the water
 other _____

**If answer does not include surfing or swimming, thank them and drop to demographic questions.*

3. Are you aware the state has a water quality monitoring program that determines how safe it is to be in the water in Lake Superior?

- Y N

4. The program is called the Minnesota Lake Superior Beach Program. Have you heard of that?

- Y N

5. Have you ever heard or read about "Water Contact Not Recommended" advisories or, as the media often refer to them, "Beach advisories for bacteria" for the Lake Superior Beaches?

- Y N

6. If yes, how did you learn about them? (Let them volunteer response)

- | | |
|---|---|
| <input type="checkbox"/> TV/News | <input type="checkbox"/> mnbeaches.org |
| <input type="checkbox"/> Radio | <input type="checkbox"/> signs at the beach |
| <input type="checkbox"/> Newspaper | <input type="checkbox"/> parkpointbeach.org |
| <input type="checkbox"/> phone hotline | <input type="checkbox"/> other _____ |
| <input type="checkbox"/> email listserv | |

7. One a scale of 1 to 5, with 1 being not at all risky and 5 being very risky, what do you think the level of risk of getting sick from swimming in Lake Superior is?

Not at all risky	A little risky	Somewhat risky	Risky	Very risky
1	2	3	4	5

8. Have you ever not gone to Park Point beaches because you learned there was a warning that the water was unsafe for swimming due to unusually high levels of bacteria?

Y N

9. Have you ever gone to the beach but avoided the water because you learned there was a warning that the water was unsafe for swimming due to potentially harmful levels of bacteria?

Y N

10. What resources would you be most likely to use in the future to learn about beach advisories in Lake Superior? (read to them)

- | | |
|--|--|
| <input type="checkbox"/> TV/News | <input type="checkbox"/> mnbeaches.org |
| <input type="checkbox"/> Radio | <input type="checkbox"/> signs at the beach |
| <input type="checkbox"/> Newspaper | <input type="checkbox"/> parkpointbeach.org |
| <input type="checkbox"/> phone hotline | <input type="checkbox"/> social media (Facebook/Twitter, etc.) |
| <input type="checkbox"/> email listserv | <input type="checkbox"/> other _____ |
| <input type="checkbox"/> text message alerts | |

11. This next part talks about healthy swimming recommendations. I am going to read six possible options to staying healthy while you swim and you tell me whether you think they are very important, important, unimportant or not relevant.

a. stay away from storm drains, trash and other pollutants such as oil slicks.

Not relevant Unimportant Important Very important

b. Wait 24 hours before swimming after a heavy rain

Not relevant Unimportant Important Very important

c. Take your children for frequent bathroom breaks and wash your hands

Not relevant Unimportant Important Very important

____ d. Shower after swimming or playing at the beach.

Not relevant Unimportant Important Very important

____ e. Keep your face and head out of the water or wear ear plugs and goggles.

Not relevant Unimportant Important Very important

____ f. Avoid swallowing beach water.

Not relevant Unimportant Important Very important

12. Now I'm going to read you some possible recommendations for keeping beach water clean. Please tell me as I read them if you think they are very important, important, unimportant or not relevant.

a. Dispose of diapers and animal waste by putting them in trash receptacles or sealing them in a plastic bag to carry out with you.

Not relevant Unimportant Important Very important

b. Don't feed ducks, geese, seagulls, or other birds.

Not relevant Unimportant Important Very important

c. Carry out all trash or dispose of it securely in trash receptacles.

Not relevant Unimportant Important Very important

d. Don't swim if you're sick with diarrhea or vomiting.

Not relevant Unimportant Important Very important

Your responses to this survey will help us improve the Beach Program. The Beach Program currently takes water samples at least twice a week on Park Point in the summer and notifies the public when the bacteria levels become unsafe. In addition, the Beach Program provides information and outreach on actions people can take as individuals to help keep themselves safe and the water clean. I have just a few more questions. This next section asks questions about what you think the Beach Program could do to improve these efforts.

13. I am going to read a short list of ways the Beach Program can get its information out to people who use the beach. Please tell me which of the following you would use:

- | | |
|--|---|
| <input type="checkbox"/> booths at festivals and public events | <input type="checkbox"/> after school programs for kids |
| <input type="checkbox"/> Twitter | <input type="checkbox"/> MN Tourism website |
| <input type="checkbox"/> Facebook | <input type="checkbox"/> booths with staff and information at the beach |
| <input type="checkbox"/> workshops | <input type="checkbox"/> information at hotels and visitor centers |
| <input type="checkbox"/> TV/radio commercials | |

14. Which of the following types of information would you use?

- | | |
|---|--|
| <input type="checkbox"/> information on sources of bacteria | <input type="checkbox"/> age-group specific information |
| <input type="checkbox"/> information on how to keep the water clean | <input type="checkbox"/> information on types of illnesses associated with beach water contact |
| <input type="checkbox"/> other | |

15. Do you have any recommendations not listed above?

My last few questions will help the Beach Program understand who is using our beaches.

16. What ZIP code do you live in?

17. Children tend to be more susceptible to waterborne disease, so I was wondering if you would be willing to tell me how many people less than 18 years old live in your household or that are you responsible for and bring to the beach?

18. (If yes to #18) How many of those children are:

Less than 5 years old? _____

5 through 12 years old?

13 through 17 years old?

19. I'd like to know your approximate age. Are you in your teens, 20s, 30s, or ?

20. What is your sex (observe)?

Male Female