

# Great Lakes Beach Hazards:

## Developing a Risk Communication Strategy for Dangerous Waves and Currents

NOAA Coastal Storms Program  
National Weather Service  
Great Lakes Sea Grant Network  
Great Lakes Coastal Zone Management Programs

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### *Final Report*

*Prepared for:*

NOAA Coastal Storms Program  
National Weather Service  
Great Lakes Sea Grant Network  
Great Lakes Coastal Zone Management Programs

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## Introduction

Eastern Research Group, Inc. (ERG), under contract to the National Oceanic and Atmospheric Administration's (NOAA's) Coastal Storms Program (CSP), has developed a risk communication strategy to address the problem of dangerous waves and currents on the Great Lakes, and the loss of life these hazards can cause. The project was designed to:

- Identify how beachgoers perceive the risk of dangerous currents and waves in the Great Lakes.
- Evaluate existing messages and delivery mechanisms (such as National Weather Service [NWS] Beach Hazard Statements).
- Translate complex beach conditions into understandable, actionable messages for specific beachgoer audiences.
- Identify effective delivery mechanisms for specific audiences.

This report presents the findings of ERG's research, including:

- Summaries of interviews conducted in July-October 2013 with experts and practitioners with knowledge about various aspects of the problem and potential solutions. These interviews included a focus group with surfers active in education and rescue activities (Appendix A).
- Results of two surveys conducted in summer 2013: a web-based survey and beach intercept survey (Appendices B and C).
- A summary of a literature search conducted at the beginning of the project (Appendix D).

The report then lays out recommendations for the risk communication strategy, including overall goals, audiences, dissemination mechanisms, and potential objectives to be tracked over time.

## Coastal Storms Program and Beach Hazards in the Great Lakes

CSP initiated scoping of issue-based focus areas in the Great Lakes in 2011. Beach hazards (wave- and current-focused) detection and risk communication were selected as a focus area. Beach hazards were a major issue of concern identified by numerous partners and aligned well with CSP capabilities. Funding for projects started in 2012 for the Great Lakes and will continue until 2017. In 2013, CSP supported a \$1M small grant competition through Ohio Sea Grant. A number of beach hazard research and outreach focused projects were submitted. Projects funded through that competition will support the concepts outlined in this strategy. Additional support for implementation of this strategy will continue until 2017 and will be prioritized collaboratively through the Great Lakes Beach Hazards Community of Practice.

## Selected Survey Results

ERG conducted a pair of surveys with the following objectives:

- To gather information on how people who are likely to visit Great Lakes beaches obtain information about beach conditions and use that information to make decisions about entering the water.
- To gauge the extent of beachgoer awareness and understanding of existing outreach and information about beach hazards.

- To gain feedback from beachgoers on their understanding of several potential outreach messages.

The first survey was implemented as a web-based survey of individuals residing in states likely to visit the Great Lakes (e.g., Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, the western parts of Pennsylvania, and New York). The questions focused on topics such as beach visit behaviors, sources of information for beach conditions, perception of risks associated with water conditions, and awareness and understanding of specific beach hazards (i.e., currents, waves). The web-based survey was fielded for 39 days total; potential respondents received weekly reminders during that time. We received 460 total complete responses, 290 of which were in scope.<sup>1</sup> Most respondents (60 percent) were over the age of 45, have visited or plan to visit Lake Michigan (72 percent), prefer to read in English (96 percent), and are well-educated (68 percent have completed a Bachelor's degree or higher). This demographic is likely older and more highly educated than the average Great Lakes beachgoer, and as a result the findings of this survey may be somewhat skewed.

The findings from the web-based survey supported the development of the second survey, an intercept survey of beachgoers on two Michigan beaches. This survey focused primarily on the respondents' reactions to a sample of potential outreach messages, in addition to their awareness of the risks of certain beach hazards. The survey was fielded during two sunny weekends in late August on two beaches (Grand Haven and Ludington); at each beach a team of two interviewers walked the beach, sampled potential respondents from the beachgoers, and interviewed them, for a total of 97 responses. The respondents to this survey were slightly younger than the web-based survey (37 percent over the age of 45) and slightly less well-educated (49 percent with a Bachelor's degree or higher), and were more likely to be female (64 percent).

The next few sections present the key findings from these surveys regarding information sources, risk perception, awareness of beach hazards, and the potential outreach messages. Detailed results are presented in Appendices B and C.

### Information Sources

The web-based survey asked respondents how often they check sources of weather information before going to the beach; interestingly, 28 percent of respondents "Always" check their mobile weather applications (apps) before going to the beach. Based on open comments from respondents the most popular weather apps include the Weather Channel, the "weather" app for their specific phone, and Weatherbug.

Looking at information sources that were rated "Always" and "Often" by most respondents, we see that a significant number of respondents also rely on websites offering weather forecasts (other than the specific beach website), weather forecasts on TV and radio. Based on the open comments, the most popular sources include the Weather Channel, local television news, and local radio stations. See Appendix B for more detail.

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<sup>1</sup> To be considered in scope the respondent must indicate that they are over 18 years of age and plan to visit the Great Lakes or have visited in the past 2 years.

When asked to rate the reliability of the information sources at predicting beach (weather) conditions, respondents indicated that mobile weather apps (22 percent), websites with weather forecasts (18 percent), radio (17 percent), and Surf Zone Forecasts (16 percent) are “very reliable.” A significant number of respondents indicate that they don’t use the following sources for weather information: social media (Facebook, Twitter) (49 percent), hotel desks or tourism agencies (44 percent), beach websites (40 percent), and Surf Zone (40 percent).

The web-based survey also asked about respondent awareness of a set of common beach conditions outreach sources and messages. While only 8 percent were aware of the NOAA “Break the Grip of the Rip” website, 67 percent had used beach flags indicating wave or current conditions, and over 50 percent were aware of messages about swimming parallel to the shoreline and not to fight the current when caught in a current.

### **Risk Perception**

The series of questions about risk perception on the web-based survey began by asking respondents to rate the dangerousness of a set of swimming related hazards. The respondents rated the following hazards as “extremely dangerous”: a current that pulls you quickly toward rocks/breakwalls/piers (67 percent), lightning/thunderstorm (63 percent), and a current that pulls you quickly away from shore (57 percent). The number of respondents rating hazards as extremely dangerous increased dramatically when asked to rate how dangerous the hazards are to their children; 82 percent of respondents rate a structural current (moving into piers, rocks or other structures) as extremely dangerous to their children. When asked how dangerous the hazards are to a young person aged 13 to 18 swimming without adult supervision, respondents rate the hazards as more dangerous than they did for their own safety but slightly less dangerous than for young children.

Looking at these ratings in more detail we find some differences by age, swimming ability, and distance of home zip code from the beach. Respondents under 34 rate the top two hazards (structural currents, lightning) at a comparable level of danger for respondents over 35, but for other hazards the respondents over 35 are more likely to rate the hazard as very or extremely dangerous compared to the respondents under 34. For example, 62 percent of respondents over 35 rate jumping off a pier as dangerous, while only 34 percent of respondents under 34 agree. A similar pattern emerges when comparing strong swimmers to less strong swimmers, with the strong swimmers less likely to rate swim hazards as dangerous compared to other swimmers. For example, 39 percent of strong swimmers rate swimming alone as dangerous compared to 52 percent of other swimmers. While there appears to be a similar pattern when comparing locals to “tourists,” with tourists more likely to rate some hazards as dangerous, the difference between the two groups is not large enough to draw conclusions about risk perception.

Next, respondents were asked to rate how comfortable they feel entering the water under certain conditions. In general, the results followed the expected patterns, with 87 percent of respondents uncomfortable or very uncomfortable entering the water with high waves and dangerous currents, 90 percent comfortable or very comfortable when lifeguards are on duty, and 95 percent comfortable or very comfortable when flags indicate safe conditions. A smaller cohort of respondents, on the other

hand, indicated a higher level of comfort with riskier activities. For example, 47 percent feel comfortable entering the water after consuming small amounts of alcohol, 46 percent without lifeguards or park personnel on duty, 34 percent after news reports about recent drowning, and 26 percent despite posted warnings about unsafe conditions.

Looking at these ratings in more detail, we find some differences by age, swimming ability, and distance of home zip code from the beach. The differences between groups for this set of questions are less dramatic than those for the questions rating dangerousness. In general, respondents 34 and under, strong swimmers, locals, and respondents without children are more likely to indicate they are comfortable entering the water when consuming small amounts of alcohol, when no lifeguards or park personnel are on duty, when there are frequent high waves, and after a report of recent drowning in the region.

### **Hazard Identification**

The web-based survey also asked respondents about how to identify and respond to information about water conditions. When asked to interpret the meaning of a yellow flag and the appropriate response, the majority of respondents (60 percent) correctly identified the yellow flag to mean a medium hazard with high waves and/or strong currents. Another 30 percent of respondents indicated that they are not sure what it means. In response to yellow flag respondents indicated that they would swim with another person (38 percent), seek out areas of slightly lower waves (29 percent), or only swim where lifeguards are present (27 percent).

Next, respondents were presented with images indicating wind, wave, and current direction and asked to determine the best way to escape from the current and then to identify the type of current.

- **Structural Current.** When shown a photo and description of a structural current along a pier, most respondents (59 percent) indicated that one should swim parallel to shore to escape the current instead of getting the attention of the lifeguard or someone who could assist them (9 percent). Interestingly, strong swimmers were slightly more likely to choose this approach to escaping the current (68 percent, versus 55 percent for less strong swimmers) and locals were slightly more likely to try to get the attention of the lifeguard (10 percent versus 6 percent of tourists). Respondents identified this current as a rip current (42 percent); only 13 percent correctly identified it as a structural current and 34 percent simply didn't know.
- **Longshore Current.** Shown a photo and description of a longshore current running between the shore and a sandbar, up or down the beach parallel to shore, the highest percentage of respondents (42 percent) correctly suggested swimming toward shore to escape, while 25 percent said one should swim parallel to the shore. The highest percentage of respondents (47 percent) could not identify this type of current, but a small group (15 percent) correctly identified it.
- **Rip Current.** Shown a photo and description of a rip current most respondents, 61 percent, chose to swim parallel to the beach to escape the current – only 8 percent chose to “float on my back until the current weakens, then swim to shore.” The highest percentage of respondents, 48 percent, correctly identified this current, while 38 percent didn't know how to identify it.

A significant number of respondents, 37 to 47 percent, were willing to indicate that they did not know the answer when asked to identify the currents above. This is of interest because it is more common in surveys for respondents to try to guess the correct answer than to indicate that they don't know.

Respondents were also shown a photo of short period high waves with white caps and asked to rate how comfortable they would be entering the beach at this point. Most respondents (48 percent) said they would be uncomfortable entering the water and that amount grew to 65 percent when respondents were asked if they would let their children enter the water there. Strong swimmers were more likely to indicate that they are comfortable or very comfortable entering the water (38 versus 20 percent).

During the beach intercept survey, interviewers asked respondents about their approach to handling various hazards (see Appendix C for full verbatim responses). When asked how they determine if it is safe for their party to enter the water, a significant number of people, (54 of 97) said they look at the water, the size of the waves, and other people swimming. The next most popular approach was to check the flag; many respondents looked at the water first, then checked the flag. A small group, 11 people, said they prefer to check the conditions by wading directly into the water.

When asked what they would do if they were walking along a pier and saw someone about to jump off into the water, the largest number of people, 46, said they would do nothing. In fact, a few expressed surprise that this is an issue, noting that jumping from the pier is fun and they do it themselves. About half that many, 25, would advise the jumper not to do it, and another 21 would simply caution them to be careful. For many of these respondents, their action depended on the age of the potential jumper—they would intervene if the jumper was young but not if he or she was an adult.

## Messages

The intercept survey asked respondents to provide feedback on the understandability and persuasiveness of the following potential outreach messages:<sup>2</sup>

- Respect the Power
- Know Before You Go in the Water
- When in Doubt, Don't Go Out
- Stay Dry When the Waves are High
- Mind the Waves! A Surfing Day is Not a Swimming Day
- Knee Deep is Too Deep on Red Flag Days
- When at the Beach, Keep your Kids in Arm's Reach
- Got Kids? Don't Forget Their Lifejackets

When assessing the relative success of these messages, it is important to understand the interview conditions (i.e., the interview interrupts a visit to the beach, in some cases for people with children). Notably, the interviewers stated in the post-survey debrief that in many cases, the interviewees began

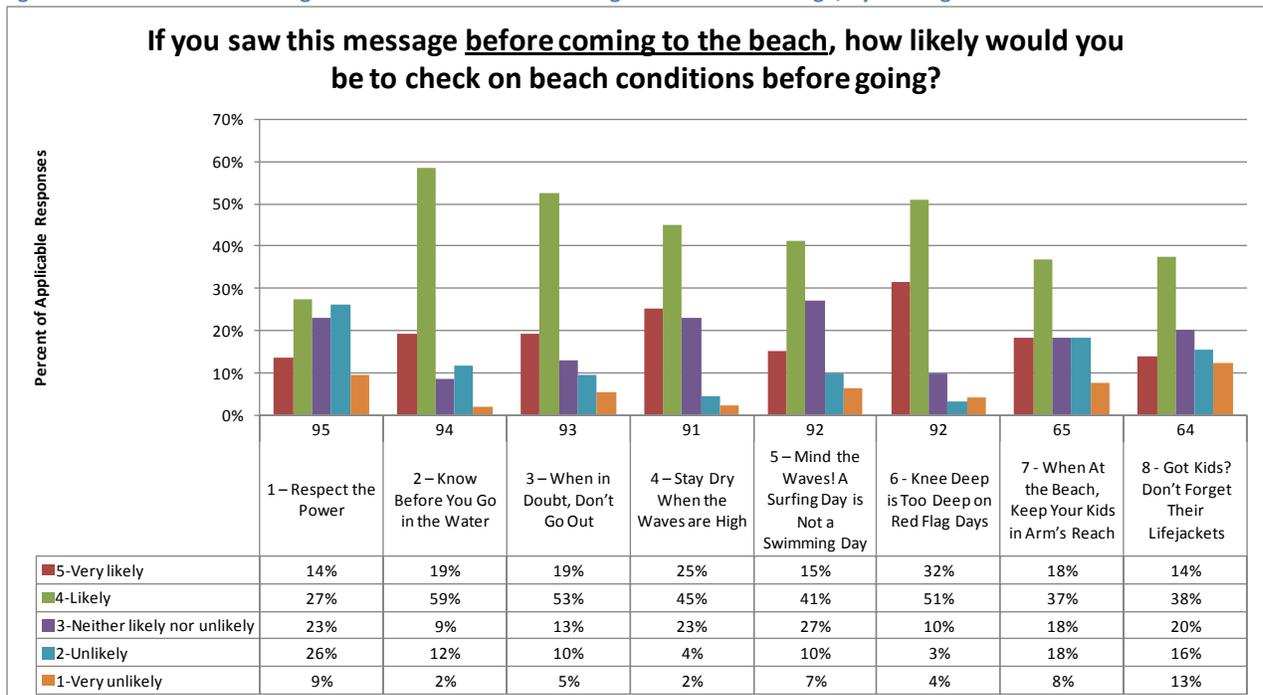
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<sup>2</sup> The last two messages on the list were only presented to interviewees with children.

to lose interest in the messages toward the end of the list and were less likely to provide detailed feedback.

Interviewees were first asked if they would be likely to check on beach conditions before arriving at the beach if they saw the outreach message. Thirty-two percent of interviewees said they were “very likely” to check beach conditions in response to “Knee Deep is too Deep on Red Flag Days” followed by 25 percent of interviewees for “Stay Dry When the Waves are High.” If we combine the responses for “very likely” and “likely” we find that most interviewees, 78 percent, would check beach conditions in response to “Know before You Go in the Water.”

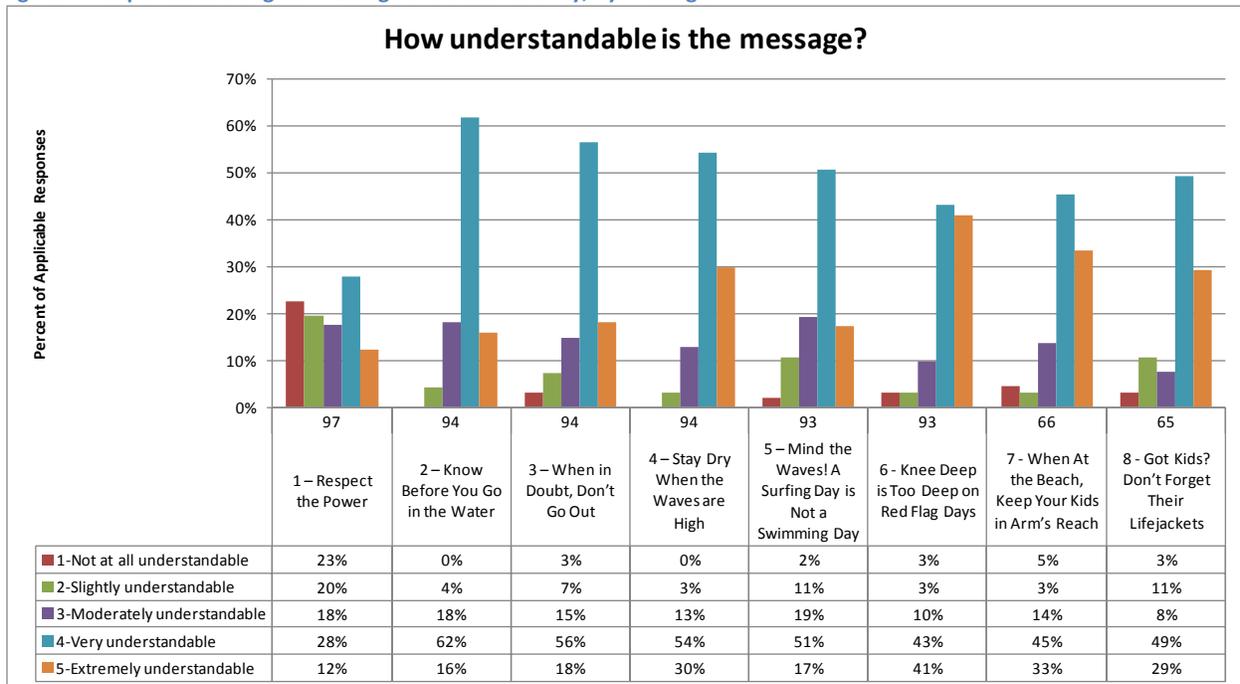
Figure 1. Likelihood of checking beach conditions after viewing an outreach message, by message.



Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

Next, interviewees were asked to rate the understandability of each message. The most understandable message, rated “extremely understandable” by 41 percent of interviewees, is “Knee Deep is too Deep on Red Flag Days” followed by 33 percent of interviewees with kids for “When at the Beach, Keep your Kids in Arm’s Reach” and 30 percent of interviewees for “Stay Dry When the Waves are High.” Accounting for the ratings of “very understandable” the top messages are “Stay Dry When the Waves are High” (84 percent), “Knee Deep is too Deep on Red Flag Days” (84 percent), and “Know before You Go in the Water” and “When at the Beach, Keep your Kids in Arm’s Reach” (78 percent each). Surprisingly, 23 percent of respondents rate “Respect the Power” as “not at all understandable”; this is four times as many respondents who rate any other message as not understandable.

Figure 2. Respondent ratings of message understandability, by message.



When asked how likely the interviewee would be to enter the water or let their children enter the water after seeing the message and information about high waves or dangerous currents at the beach, interviewees generally said they would be unlikely to enter the water, across messages. When asked how well each message prepared their family to stay safe at the beach, interviewees rated three of the messages very highly:

- “Know Before You Go in the Water” (85 percent)
- “Stay Dry When the Waves are High” (85 percent)
- “Knee Deep is too Deep on Red Flag Days” (84 percent)

Interestingly, 22 percent of interviewees rated “Respect the Power” as leaving them unprepared or very unprepared to stay safe; very few respondents provided low ratings to any of the other messages. Additionally, the messages that performed the best incorporate a simple rhyme or repetition in the phrase.

## Key Findings and Guidance for the Strategy From Interviews, Literature Search, and Team Discussions

### Overall strategy

Overall, there is no “silver bullet” for discouraging risky behavior with respect to dangerous currents and waves or improving knowledge about escaping currents, but a wide range of opportunities are available to reach key audiences. The risk communication/social marketing effort will need to:

- Reach multiple audiences, through a segmented outreach strategy for target audiences and partners/communities of practice.
- Address multiple hazards (waves and currents).
- Use a variety of dissemination mechanisms, prioritized with respect to each target audience, potentially as part of a branded campaign with a strong rollout for maximum impact.
- Encompass the three “windows” when people need information: before they get to the beach, when they get to the beach, and when they are in the water.

## Message content

- Existing messaging does not adequately address *waves* and *all types* of currents (tending to lump all hazards under “rip currents” and underestimate or omit wave hazards, as well as hazards from cold water).
- “Avoidance” messages should be the first priority (i.e., don’t get caught in currents or high waves to begin with).
- Messages about escape methods are important as well (note that the “Know Before You Go in the water” message, in a comprehensive campaign, could expand to knowing what to do if you are caught in different types of currents).
  - The “Flip, Float, Follow” message may be inadequate for swimmers caught in a structural current. There is interest in adding a fourth term to clarify that “Follow” means figure out which direction current is pulling, and to swim out of it, rather than against it.
- Existing messaging suffers from a lack of consistency across agencies, groups, Great Lakes states, and provinces (repetition being key to getting a message across).
- NWS Beach Hazard Statements are highly accurate: In 2013 every fatality that occurred in a swimming area covered by NWS Beach Hazards Statements happened with one in effect. Responses to an online survey (2012-2103) from a variety of users (140) indicate that 75 to 80 percent like the Beach Hazards Statement; most of the respondents use it daily or several times a day.
- It is important to think long term—a consistent message, with multiple delivery mechanisms, repeated over time to bring about a culture shift the way culture changed about wearing seatbelts.

## Other issues to consider

- At least one interviewee stressed that it is important to beach managers that messages **not** to discourage people from visiting the beach, even if it’s dangerous to swim (e.g., discuss “swim hazards” rather than “beach hazards”).
- Some interviewees noted that closing beaches on high swim hazard days could have unintended consequences: people will just move down the beach from a relatively safe “closed” area to an unsafe one.
- Some interviewees discussed the pros and cons of involving volunteers to patrol/educate on beaches (e.g., liability issues). However, volunteers can be trained to promote messages from the campaign (similar to the NWS “Weather-Ready Ambassadors”).

- Enhanced wave measurement devices at beaches (e.g., submerged buoys) could improve beach hazard statements and ability to warn about specific conditions in an area. Data gaps exist for long stretches of Great Lakes coast and some locations adjacent to piers, and these gaps could be addressed through data-generating buoys, either on top of the water or submerged. This is an area in which NOAA’s Coastal Storms Program is considering investing, beyond the risk communication strategy itself.
- The risk communication strategy for dangerous waves and currents could be integrated with information dissemination about other hazards, such as algal blooms, bacteria, and ice (e.g., could be integrated in a mobile app or website).
- The phenomenon of meteotsunamis (or “seiches”), in which water rises and then rips back lakeward through channels, is an important threat that requires additional research and awareness on the part of forecasters.

## Recommendations for a Risk Communication/Social Marketing Strategy

Based on the research results, ERG has developed the following recommendations for a risk communication strategy.

### Community of practice

A formalized community of practice, encompassing a wide range of organizations working for beach safety in the Great Lakes, emerged as an important need in the course of ERG’s research and discussions. Initial coordination efforts begun over the course of this project provided a forum for discussion and exchange of ideas among representatives from the Coastal Storms program team including the National Weather Service, Michigan Coastal Zone Management (CZM) and Michigan Sea Grant, Michigan Technological University, and Great Lakes Environmental Research Laboratory. This collaboration has already resulted in a heightened recognition of Great Lakes swim zone hazards in addition to rip currents (other types of currents and high, short-period waves).

Potential tasks and activities for an expanded community of practice could include:

- Prioritizing objectives for a risk communication strategy that can be tracked over time.
- Determining the quality of available baseline and trend data (e.g., does an increase in incidents reflect availability of cell phones for reporting; does a decline represent colder temperatures and less swimming during a particular season?).
- Evaluating tools currently used for measuring effectiveness (e.g., incident database).
- Determining what information to collect over time.
- Promoting consistent messages/language, that addresses all types of current and dangerous waves in the Great Lakes.
- Tapping into other efforts (including nationwide swimming safety efforts, and initiatives addressing other hazards such as algal blooms).
- Sharing best practices and lessons learned, to build on what works and adjust messaging to address varying conditions and demographics.

## Goals and objectives of the strategy

Overall, we recommend a risk communication/social marketing strategy that promotes a culture of *knowledge and awareness* and promotes several *behaviors*:

- Checking local signs, websites, and other information sources for up-to-date conditions reports.
- Ensuring appropriate use of safety equipment—especially life jackets for children.
- Knowing that although they’re called lakes, the Great Lakes are really inland oceans, with all the same dangers and hazards, and some different ones.
- Never jumping off a pier into a swiftly moving current.
- Knowing how to escape certain common currents.

Another key component of the strategy involves research and development to improve technical capacity to *detect* dangerous waves and currents, for the purpose of informing communication to beachgoers in a timely way. While this report does not address this technical “track” in detail, such research and development is crucial to providing people with the information they need to avoid hazardous conditions.

## Objectives/Timeline

Objectives are the steps along the way to achieving the goals; objectives chosen determine what vehicles and tactics are used. The best objectives are “SMART”: specific, measurable, achievable, results-oriented, and time-bound. Objectives can address both process (e.g., number of PSAs placed) and outcomes (e.g., reduced number of incidents in a swim season). Possible examples of objectives include:

- By the 2014 swim season, pilot example signs, PSAs, videos and other materials with new messaging [specify type and number].
- After the 2014 swim season, conduct focus groups/survey to assess response to and understanding of messages.
- By the 2015 swim season, work to apply the products more broadly [specify how, where].
- Within 12 months, key organizations will establish and actively participate in a community of practice (e.g., focus on state park beaches) to enhance coordination among communicators around the region.
- Within 18 months, key organizations (across agencies, states, private groups, etc.) will be disseminating the same messages.
- In two years, xx percent of adult beachgoers will be aware of NWS beach hazard statements and how to access them.
- In three years, xxx adolescent “peer leaders” will be trained to help raise awareness of hazards (e.g., pier jumping).
- In five years, xx percent of young children will be wearing life jackets when swimming.
- In five years, the original risk communication questions from this survey will be re-administered to identify any changes in risk perception and awareness of specific risk messaging.
- By [this date], xx beaches will use an augmented flag system.
- By [x year] the number of incidents per swim season will decrease by xx percent.

We recommend that the formalized community of practice set objectives that are ambitious yet realistic, given resource and policy considerations, and could also be tracked over time.

### Target audiences for the strategy

Table 1 below shows the audiences that the strategy should encompass—both beachgoer audiences to be reached with hazard and educational messages, and partners who disseminate that information.

**Table 1. Target Audiences**

Beachgoer Audiences	Partners/Communities of Practice
<ul style="list-style-type: none"> <li>• Parents of young children (<i>e.g., understanding importance of life jackets</i>)</li> <li>• Teenagers and young adults (<i>understanding consequences of risky behaviors, presenting alternatives. Alcohol an issue as well</i>)</li> <li>• Parents of teenagers</li> <li>• Non-English speaking audiences</li> <li>• Older and low-income audiences (<i>and others less likely to use smartphones and social media</i>)</li> <li>• Tourists (<i>may be less familiar with hazards of Great Lakes</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• Educators</li> <li>• Groups with “peer” influence (<i>community groups, faith-based groups, student groups, etc.</i>)</li> <li>• Park and municipal personnel</li> <li>• First responders and surf rescue groups</li> <li>• Media people (<i>newspaper, radio, TV</i>)</li> <li>• Local meteorologists</li> <li>• Tourist industry</li> </ul>

### Messaging

We want the primary audiences—beachgoers of all ages, genders, races, and swimming abilities—to **“know before [they] go in the water.”** This message was found to be understandable; actionable; able to be effectively disseminated; potentially appropriate for other hazards such as algal blooms and bacteria, and adaptable for specific audiences, conditions, and “windows” (before going to the beach, before entering the water). A risk communication campaign can employ the phrase “in the water” as part of the message to ensure that reluctant swimmers, and beachgoers in general, are not discouraged from visiting the beaches to enjoy other activities besides swimming. Additional message content can be developed to address needs of specific audiences (e.g., parents of young children).

### NWS Beach Hazard Statements

Some specific recommendations to consider for the NWS Beach Hazard Statements include the following:

- Settle on terminology; e.g., “high swim hazard” day may be more precise than “high beach hazard” day.
- All NWS offices issue the product when it is warranted (currently, not all offices in the Great Lakes area use it).
- All start with the same suite of base hazards (large waves, rips, structural, longshore, and channel currents) and then tailor them to the specific area. Some areas do not have channel currents, for example.
- Have product similarities so that the public and consumers of the data start on the same page.

- Pare down the length of the product.
- Format to improve its readability: more distinct headings, bullet points, boxes, bold type, etc. Mixed-case typeface would be better if possible.
- Augment/highlight the precautionary/preparedness information (e.g., avoid pier jumping; knee deep is too deep on high swim hazard days).
- Provide graphics to complement text (e.g., maps, diagrams of currents) for use by broadcast meteorologists, etc.
- Add hyperlinks to information about how to escape dangerous currents.

## **Strategies/tactics and dissemination mechanisms**

The following tables set forth recommended tools, tactics, and dissemination mechanisms recommended for the risk communication strategy:

- Table 2 indicates which desired outcomes and barriers for each audience, and potential dissemination mechanisms to reach those audiences.
- Table 3 shows the “window” for each potential dissemination mechanisms, i.e., whether beachgoers could access it before going to the beach, at the beach, or both, along with additional comments about possibilities for each mechanism.
- Table 4 shows recommended tools and tactics according to their purpose, i.e., whether they provide timely risk information, promote awareness in the longer term, or provide tools and information to partners.
- Table 5 lists each potential tactic/mechanism for the strategy and presents its audience(s), potential effectiveness, ease of implementation, and evaluation steps that could be part of the strategy.

**Table 2. Desired Outcomes, Barriers, and Potential Tactics by Audience**

Target Audience or Partner	Desired Outcomes/Behavior Change	Apparent Barriers	Outreach Tactic/Mechanism
Adolescents	<ul style="list-style-type: none"> <li>▪ Not jumping off piers</li> <li>▪ Not swimming while intoxicated</li> <li>▪ Not seeking rougher waves</li> <li>▪ Knowing your swimming ability</li> </ul>	<ul style="list-style-type: none"> <li>▪ Desire to seek risks/thrills.</li> <li>▪ Peer pressure</li> <li>▪ Sense of invincibility.</li> <li>▪ Not understanding difficulty of escaping structural currents</li> <li>▪ Underestimating the power of Great Lakes waves.</li> </ul>	<ul style="list-style-type: none"> <li>▪ K-12 education (curricula, activities, educator materials)</li> <li>▪ Extracurricular activities and peer leadership development</li> <li>▪ Signage and activities on piers</li> <li>▪ Social media presence</li> <li>▪ Beach “Olympics”</li> <li>▪ Mobile phone application (like Android-only MyBeachCast) and associated publicity</li> <li>▪ Promotional items (Frisbees, t-shirts, etc.)</li> </ul>
Tourist families	<ul style="list-style-type: none"> <li>• Keeping children close</li> <li>• Only attempting rescues with proper equipment</li> <li>• Putting children into life jackets</li> <li>• Not swimming in rough conditions</li> <li>• Checking conditions before going to the beach/entering the water</li> <li>• Understanding that as the presence of white waves increases, so does the threat.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of knowledge about swim hazards in the Great Lakes</li> <li>• Lack of knowledge about proper use of safety equipment.</li> <li>• Beach-goers generally don’t see the need for children to use PFDs to swim.</li> </ul>	<ul style="list-style-type: none"> <li>• “Rack” cards or videos placed at pre-beach business partners</li> <li>• Promotional items (Frisbees, t-shirts, etc.)</li> <li>• Beach and pre-beach signage</li> <li>• Mobile alerts tied into apps (e.g., Google Now). Note “hazard of choice” issue for NWS alerts.</li> <li>• Augmented flag system</li> <li>• Beach safety kits</li> <li>• Activities at the beach</li> </ul>
Local families/parents of young children	<ul style="list-style-type: none"> <li>• Keeping children close</li> <li>• Only attempting rescues with proper equipment</li> <li>• Putting children into life jackets</li> <li>• Not swimming in rough conditions</li> <li>• Checking conditions before going to the beach/entering the water</li> </ul>	<ul style="list-style-type: none"> <li>• Underestimating hazards to children.</li> <li>• Lack of knowledge about proper use of safety equipment.</li> <li>• Culturally, people tend not to think about using PFDs to swim</li> </ul>	<ul style="list-style-type: none"> <li>• Local media coverage</li> <li>• Beach websites</li> <li>• Public service announcements</li> <li>• Whiteboard video</li> <li>• Mobile applications/alerts</li> <li>• Beach and pre-beach signage</li> <li>• Augmented flag system</li> <li>• NWS Hazard Statements</li> <li>• Promotional items</li> <li>• Beach safety kits</li> <li>• Activities at the beach</li> </ul>

Target Audience or Partner	Desired Outcomes/Behavior Change	Apparent Barriers	Outreach Tactic/Mechanism
Local parents of teenagers	<ul style="list-style-type: none"> <li>Reinforcing messaging to teenagers.</li> </ul>	<ul style="list-style-type: none"> <li>Parents' belief that teenagers are safer and more mature than they may actually be.</li> <li>Lack of understanding of hazards (e.g., pier jumping).</li> </ul>	<ul style="list-style-type: none"> <li>Local media coverage</li> <li>Beach websites</li> <li>Public service announcements</li> <li>Whiteboard video</li> <li>Mobile applications</li> <li>Beach and pre-beach signage</li> <li>NWS Hazard Statements</li> </ul>
Non-English speaking audiences	<ul style="list-style-type: none"> <li>Outcomes cross-cut all other groups.</li> </ul>	<ul style="list-style-type: none"> <li>Language barrier exacerbates all other barriers</li> </ul>	<ul style="list-style-type: none"> <li>Fotonovela</li> <li>Other mechanisms cross-cut all other forms, wherever translation is possible.</li> </ul>
Older/low-income beachgoers	<ul style="list-style-type: none"> <li>Outcomes cross-cut all other groups.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of smart-phones and internet access/proficiency</li> </ul>	<ul style="list-style-type: none"> <li>Local media coverage (TV, radio)</li> <li>Beach and pre-beach signage</li> <li>Augmented flag system</li> </ul>
Educators	<ul style="list-style-type: none"> <li>Providing instruction to students about swim hazards in the Great Lakes.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of consistent information/messaging.</li> <li>Lack of resources to easily and properly instruct.</li> <li>Lack of time/space in the curriculum.</li> </ul>	<ul style="list-style-type: none"> <li>Easily implemented K-12 classroom curricula and activities, consistent with standards.</li> <li>Surfer-run training courses.</li> <li>Professional development for teachers.</li> </ul>
Groups with "peer" influence (community groups, faith-based groups, etc.)	<ul style="list-style-type: none"> <li>Helping to disseminate messages to constituents.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of consistent information/messaging.</li> <li>Lack of forum to properly instruct.</li> <li>Potential liability issues</li> </ul>	<ul style="list-style-type: none"> <li>Social media</li> <li>Surfer-run training courses</li> <li>Beach expo and Beach "Olympics"</li> <li>NWS Hazard Statements</li> <li>Promotional materials</li> </ul>
Park/municipal personnel	<ul style="list-style-type: none"> <li>Providing timely and consistent information to beachgoers</li> <li>Focusing areas to swim (away from piers on high wave days)</li> <li>Staging resources and personnel ahead of high wave/dangerous current days.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of consistent information/messaging</li> </ul>	<ul style="list-style-type: none"> <li>NWS Hazard Statements</li> <li>Beach websites</li> <li>Social media</li> <li>Beach and pre-beach signage</li> <li>Promotional items</li> <li>Lifeguard program</li> </ul>

Target Audience or Partner	Desired Outcomes/Behavior Change	Apparent Barriers	Outreach Tactic/Mechanism
First responders/professional surfers	<ul style="list-style-type: none"> <li>• Providing education and training as part of consistent strategy/messaging</li> <li>• Based on knowledge of the day, have responders show up prepared (i.e. not in full police gear)</li> <li>• Coast Guard stage resources for rescues not recoveries.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of consistent information/messaging</li> <li>• Lack of forum to properly instruct</li> </ul>	<ul style="list-style-type: none"> <li>• NWS Hazard Statements</li> <li>• Beach websites</li> <li>• Social media</li> <li>• Surfer-run training courses</li> <li>• Beach and pre-beach signage</li> <li>• Promotional items</li> </ul>
Media	<ul style="list-style-type: none"> <li>• Providing background stories as part of risk communication campaign.</li> <li>• Providing timely, accurate information on swim hazard days.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of consistent information/messaging</li> <li>• Lack of a consistent story to report</li> </ul>	<ul style="list-style-type: none"> <li>• NWS Hazard Statements</li> <li>• Beach websites</li> <li>• Social media</li> <li>• “Tool kit” for reporters.</li> <li>• Press releases.</li> </ul>
Meteorologists	<ul style="list-style-type: none"> <li>• Providing compelling messages and timely information to broadcast audiences</li> <li>• Helping raise awareness among students, community groups, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of consistent information/messaging.</li> </ul>	<ul style="list-style-type: none"> <li>• NWS Hazard Statements</li> <li>• Beach websites</li> <li>• Social media</li> <li>• Partnerships with local media</li> <li>• Promotional items</li> <li>• “Tool kit” for events.</li> </ul>
Tourist groups/industry	<ul style="list-style-type: none"> <li>• Providing timely information and awareness to tourists</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of consistent information/messaging.</li> <li>• Need for suitable tools</li> <li>• Need to ensure that info doesn’t discourage tourism—develop in partnership.</li> </ul>	<ul style="list-style-type: none"> <li>• Tool kit</li> <li>• Timely swim hazard information</li> <li>• Video</li> <li>• Rack cards</li> <li>• Promotional items</li> </ul>

**Table 3. “Windows” for Dissemination Mechanisms**

Before Going to the Beach	At the Beach	Both
<p><b>Enhanced NWS Beach Hazards Statements.</b> <i>(Note that every 2013 fatality occurred in a swimming area covered by NWS beach hazard statements. Make them more readable and succinct)</i></p>	<p><b>Augmented flag system.</b> <i>(While the flags are not everywhere and require person power to stay updated, they are widely understood. Important to standardize language and/or symbols associated with colors. Placement and height issues to consider—people can go onto some beaches without passing “entrances”)</i></p>	<p><b>Mobile apps</b> <i>(partner with Google Now for emergency messaging? myBeachCast App—currently available for Android only)</i></p>
<p><b>Websites</b> <i>(Beach-specific websites—make consistent and easy to access. Add interactive web-based learning activities, videos—e.g., whiteboard video, video contest. Webcams on beach-specific sites mentioned as useful. Consider Great Lakes-wide website)</i></p>	<p><b>Beach signage</b> <i>(could be both “timeless” educational info and condition-specific “flip-up” signs. Consider LED/electronic signage, “audio lighting alert.” Potential (issues mentioned in other geographic areas include readability, technical difficulties, and timely updating)</i></p>	<p><b>Messages/signage for “captive” audiences</b> <i>(e.g., placing signage and information in public places on the beach, such as snack shops, kiosks, and in public restrooms, and near the beach, such as local convenience stores and gas stations)</i></p>
<p><b>Volunteer training (similar to NWS “Weather</b></p>	<p>Messaging accompanying rescue stations, beach safety kits, life jacket loaner programs</p>	<p>Events for target audience segments <i>(e.g., “Beach Olympics” at Grand Haven)</i></p>
<p><b>K-12 curricula and teacher development</b></p>	<p><b>Activities for children/students at the beach</b> <i>(e.g., dye tracking in the water at a pier, “Test what you know” quiz or game at beach entrance)</i></p>	<p><b>Social media</b> <i>(e.g., Facebook, Twitter—near real-time info; campaign messages)</i></p>
<p><b>Local media—coverage of beach conditions as well as more in-depth stories</b> <i>(newspaper, radio, TV, PSAs, press releases, feature stories)</i></p>		<p><b>Fotonovela</b> <i>(popular format in some Latino communities)</i></p>
<p><b>Rack cards, videos</b> for tourist centers and hotel desks</p>		<p><b>Promotional materials</b> <i>(t-shirts, bumper stickers, Frisbees, etc. to promote campaign)</i></p>
<p><b>Electronic billboards</b> on the street</p>		
<p><b>Materials for partners/communities of practice</b> <i>(toolkits, workshops, virtual training, events for reporters, NMW Marine Program Managers, local meteorologists, tourism groups, etc.)</i></p>		

**Table 4. Recommended Tools/Tactics by Purpose**

<b>Timely risk information/tools for beachgoers (“Is it safe to swim?”)</b>	<b>Longer term education/awareness building for beachgoers</b>	<b>Tools for partners/community of practice</b>
Enhanced flag system/alert signs	In-depth media stories	“Toolkits” for reporters, broadcast meteorologists, NWS Marine Program Managers, tourist bureaus
Lifeguards	Educational beach signage	Teacher professional development
Mobile applications	K-12 curricula/activities (for school, museums, etc.)	
Enhanced NWS Beach Hazards Statements	Whiteboard video	
Local media coverage	PSAs (radio, TV, video billboards)	
Beach safety kits	Beach expos	
Beach-specific websites (webcam, timely updates) or Great Lakes-wide website	Volunteer training	
Beach-specific hazard signage	Fotonovela	
Swim hazard info at hotels, welcome centers, etc. for tourists	Promotional items	
	“Rack” cards, video, etc. for tourists (at hotels, welcome centers, etc.)	

**Table 5. Tactics/Mechanisms: Audiences, Effectiveness, Implementation, Assessment (highest recommendations in blue)**

<b>Tactic/Outreach Mechanism</b>	<b>Target Audience(s)</b>	<b>Potential Effectiveness</b>	<b>Costs/Resources/Ease of Implementation</b>	<b>Assessment Steps/Evaluation</b>
Enhanced flag system (with consistent messaging) and/or LED signs/alert towers	All	Very high	Resource intensive	Repeated (annual) e-mail and intercept surveys
Lifeguards	All	Very high	Resource intensive	Number of lifeguard-influenced rescues
Mobile applications	Adolescents, local families	Very high	Partnership with Google or Great Lakes Commission; beach-specific texting service	Internet tracking
Local media coverage	All	Very high	Low cost, with correct media partnerships	Number of news stories/amount of coverage
“Toolkit” for reporters and broadcast meteorologists	Media	High	Low cost	Number of news stories/amount of coverage
Toolkit for NWS offices	NWS Marine Program Managers	High	Low cost	Interviews
K-12 curricula/activities and teacher development	Children, teenagers, educators	High	Partnership opportunities	Classroom-based assessments
Whiteboard video	All	High	Up-front resource investment	Focus group
Beach safety kits	Local and tourist families	High	Up front investment/maintenance	Intercept/observational survey
Beach-specific websites (consider Great Lakes-wide website?)	All	High	High up-front resource investment, regular updating required	Internet tracking
Beach expos	Children, Adolescents	High	Resource intensive	Tracking number of participants; pre- and post-event questionnaires
Volunteer training	Citizen volunteers, youth groups, faith-based groups, etc.	High	Could be resource intensive, though some training is already in place	Tracking number of participants; pre- and post-event questionnaires
Fotonovela	Latino communities	High	Up-front resource investment; potential partnership opportunities	Focus groups
PSAs (radio, TV, video billboards)	All	Medium	Up-front resource investment	Repeated (annual) e-mail and intercept surveys

<b>Tactic/Outreach Mechanism</b>	<b>Target Audience(s)</b>	<b>Potential Effectiveness</b>	<b>Costs/Resources/Ease of Implementation</b>	<b>Assessment Steps/Evaluation</b>
Educational beach signage	All	Medium	Resource intensive	Repeated (annual) e-mail and intercept surveys
Enhanced NWS Hazards statements	All	Medium	Low cost	Repeated (annual) e-mail and intercept surveys
Promotional Items	All	Medium	Resource intensiveness scales with reach of program	Repeated (annual) e-mail and intercept surveys
"Rack" cards, video	Tourists	Medium	Resource intensive; could be reduced by local partnerships	Focus group

## Appendix A: Expert Interview Summaries

### Christine Manninen, Great Lakes Commission

July 15, 2013

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**Expert(s):** Christine Manninen, Director of Communications & Web Programming, Great Lakes Commission

**Project staff:** Jenny Helmick (ERG), Benjamin Miller (ERG)

#### Messages

- “Avoidance” messages should be the first priority (i.e., don’t get caught in currents or high waves to begin with) but messages about escape methods are important as well.
- Consistency of messaging among GL states and provinces is really important (this was a problem with fish consumption advisories—differed from state to state).
- Consistent branding will also be important—so you can identify the message no matter how you get it.
- Very important to beach managers not to discourage people from visiting the beach, even if it’s dangerous to swim. For example, there was pushback from state/local folks on simply issuing a “hazard alert” for a beach, because people can go to the beach safely, just not swim. Don’t deter people unnecessarily. Similarly—say “swim hazard” not “beach hazard.”
- Another issue is private groups (like Surf Rescue) going to classrooms etc. with their own messages (“Flip, Float and Follow”).

#### myBeachCast app

- GLC developed MyBeachCast. 8,000 downloads so far. Most feedback received is “when will you have it for the iPhone?” though there is a mobile web version.
- When NWS added the hazard alert in 2012, people really wanted it—that’s why they added it to the MyBeachCast app.
- She stressed that the app is mostly for *young people with smartphones*.
  - Many low-income, unemployed people don’t have smartphones.
  - The over-50 crowd also tends not to use apps.

- Non-native English speakers may also have difficulty.
- Key is how to get people to actually use the app, before they go to the beach. Requires “repeated marketing.”
- The beach app was funded by EPA, GLRI, but there is no more funding. They are thinking about crowd-sourcing funding for an iPhone version (40 percent of smartphone users).

### **Audiences**

- Young adults are a key demographic group for this effort.
- She thinks the K-12 audience is an important one. She has gone to venues like Water Fairs. **Going into classrooms would be important. Rhyming, easily remembered phrases are best, like “When in doubt, don’t go out.”**
- Tourists are an important audience.

### **Dissemination mechanisms**

- GLC developed an info card to put in tourism welcome centers. They saw a big spike in downloads of the app from that (mentioned on card, with QR code). They also distributed the cards to state parks—great cooperation from beach managers.
- “Push” messages would be important (e.g. winds/waves a certain height, you get a message on your phone) [this is similar to our discussion with NOAA about using GoogleNow]. People could sign up for a text or alert service.
- Regarding flag messaging, tourists are not so familiar; residents are more so, but knowledge of the national beach flag system (green, yellow, red, double-red, purple = low, moderate, severe, swim-prohibited, dangerous marine life) is still universally understood.
- Given that not everyone uses smartphones and social media, local radio and TV are very important. Get local meteorologists on board.
- Some PSA-type videos, potentially disseminated online, could be effective tools for reaching school-aged children, or their parents.
  - Also effective in teaching parents about how to best safeguard children.

**Expert(s):** Dr. Guy Meadows, Great Lakes, Research Commission

**Project staff:** Benjamin Miller (ERG), Sara Matasci (ERG)

### Physical Conditions Affecting Great Lakes Beach Hazards

- There are actually significant differences in conditions in Great Lakes as compared to coasts.
  - Distribution of waves are primarily locally generated (from winds & current), which is not the case on the coasts.
  - In the past, it was thought that long-period swells were responsible for generating rip currents, but locally generated waves can generate them in the Great Lakes as well.
  - Basins are enclosed – when wind stress is relieved, simulates shifting tides, which stimulates rip currents (similar to changing tides on coasts).
- Water levels on Great Lakes can vary by 2 meters; *sediment greatly affected*.
  - Localization of sediment is changing, which is contributing to prevalence of rip currents—sediment is remobilized by lower lake levels.
    - Allows waves to move sediment that was previously compacted into bars or troughs).
    - Or by storm events (in which coastal erosion contributes to sedimentation).
    - Coastal erosion contributes sediment to near-shore region in a way that is not seen on ocean coast.
  - Remobilized sediment is comparatively weaker than compacted sediment.
    - Weaker sediment leads to easier breakthroughs on sandbars, etc.
      - Ultimately more dangerous currents.
      - Additional issue is “meandering” currents, which pop up, disappear, move, etc.
  - Cold water is contributor as well—during summer swimming season (May-July), warm air temperatures but cold water. Warming of lake water lags a couple of months behind warming of atmosphere.
    - Cold water is contributing factor to drowning (physiological shock to body) in early summer.
    - Warm water is contributing factor in late summer/fall, as lake is still swimmable even as the stormy season moves in.
- Great Lakes actually do have large wave conditions in summer season because of locally generated storms (up to 18-foot significant wave heights in summer months)—environment can change very quickly.

- Larger waves are primarily in Lake Michigan (where majority of drownings occur). Erie is limited by shallowness of western basin.

### Communications Issues Affecting Great Lakes Beach Hazards

- All currents equally dangerous:
  - If a wave knocks you off your feet you can fall victim to any of them.
- As a swimmer it can be difficult to remember “this is that kind of current so I should do this” – anything that can simplify the issue?
  - New concept is to get people to float (out of drowning situation) and in that process to assess the situation.
  - Flip/float/follow may not be best message overall, but gives people a chance to think and doesn’t confuse the message.
  - Key message is don’t try to swim against it; messaging to get people out of vertical in the water position is important – figure out what to do in some form from there.
- “When in doubt don’t go out” – effective mechanism? Or regardless of conditions telling people to look for certain conditions might not work well?
  - Message is good – in 2-ft waves or less, very few instances.
  - In higher waves (5+ ft), people do look and see that it’s an issue.
  - So the issue is in the mid-range; for young unmarried who are risk-takers – looks dangerous but fun.
  - Two audiences for the message—those who are familiar but risk-seeking, and those who don’t know what to expect (visitors, esp. inner city youth).
- Adaptive message or alert system? Are there key indicators that can give real time guesses where rip currents are formed?
  - Apps with NWS alerts on beach conditions (surf zone forecasts).
  - Working with NWS, trying to be there on site to determine whether rip currents develop. *Problem: they can develop on one beach and not another under same conditions. There are holes in the science and the ability to take accurate measurements.*
  - Shape of near shore bottom on coast focuses waves in certain areas, but forecasting which beaches will have rip currents is a big problem—they are irregular and difficult to predict. Unlike on coasts, which have consistent rip currents, rip currents in lakes can move.
  - *What we do now: 3-5 ft waves are most dangerous, so when they occur, warning is issued—but often those are false positives so people begin to ignore warnings.*
- Upcoming improvements: yes, buoys can be asked to do more and contribute to alert systems, but there are relatively few currently.
  - At MIT students developed buoy to sense rip currents – normally marks swim zones, but could also serve as warning (Williamston High School)
    - <http://web.mit.edu/inventteams/teams/2012/williamston.html>

**Expert(s):** Ron Kinnunen, Michigan State University

**Project staff:** Benjamin Miller (ERG), Sara Matasci (ERG)

### Area of Focus

- Most dangerous is rip currents, structural currents formed with breakwaters and also channel currents.
  - Marquette has had 16 fatalities in one small area from one particular channel current.

### Current State of Beach Hazard Communication

- *POSTED SIGNS* (channel current signs posted in specific known areas; rip currents elsewhere)
  - Not really working, or working to a certain degree but not highly effective.
  - Many drownings in one particular section; family convened safety evaluation panel and pushed for K-12 education.
  - Certain areas have success but that brings up the issue of people moving into more isolated areas.
  - Swimmers on US-2 corridor (Mackinaw County) are both visitors and families, so education efforts have been run but aren't 100 percent effective.
    - Language barriers—specifically for Spanish-speakers—reduce effectiveness.
  - Density of signage may or may not make difference.
    - *Seen accidents occur where people walk right by signs (situations where educated people are ignoring signs).*
- Great Lakes Observing System grant has a Doppler radar working in the lake and compiling data to find certain wind directions, etc. to begin working on forecasting.
  - As long as they can collect data, they will—not enough now to do a predictive model.

### Suggestions Moving Forward

- Better to try to teach people how to get out of currents once they're in them, or teach them not to enter in the first place?—both: community & youth education, onsite demonstrations (4H).
  - Programs are generally localized where accidents occur/rip currents are more common (school and community programs, working with emergency services).
- *In some places where education has been implemented, local fatalities have been reduced (excluding visitors to the area); evidence that community members do retain information.*

- But unsure of most effective channels of communication for mass messaging (i.e., smartphone apps, social media, traditional media) on the issue—working with risk communications team at MI Sea Grant, now including:
  - Jamie Racklyeft—social scientist at UMich and almost-drowning victim is making some slick PSAs about current safety: <http://youtu.be/vuCQnBTav1s>.
    - Could be a good contact/follow-up interview.
- Very important to ensure that responders are also well-trained; MI Sea Grant has run some first responder workshops.
  - In the process of developing “rescue stations” in problem areas for responders.
  - Some areas are very isolated which can be unsafe for responders as well as swimmers.

## Professional Surfer Focus Group Discussion

August 6, 2013

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**Professional Surfers:** Bob Pratt, Vince Deur, Dave Benjamin, Will Beaton, Ryan Gerard

**Project staff:** Bob Dukesherer (NWS), Jenny Helmick (ERG), Benjamin Miller (ERG), Sara Matasci (ERG)

### Relative Danger of Currents

- Structural currents are probably the most dangerous of hazards.
  - Escape is difficult because longshores relentlessly push you into the structure, and the structural current pushes you out further than most swimmers are capable of swimming. Submerged hazards (i.e. rocks, etc.) add more problems.
  - Essentially, structural currents *require* a rescue.
- Most drowning are a combination of effects:
  - A current and strong waves that knock your off your feet.
  - Cold water putting the body into shock—and a current or waves.
- Need to differentiate dangers for swimmers and for surfers.
  - Surfers already have a flotation device—and often are called upon as the rescuers.
  - Environments where surfing occurs are dangerous for swimmers:
    - *If you can surf, you can't swim.*
    - Need to prevent swimmers from *entering* very rough conditions
      - Consider designating some sections of beach “surfing areas only.”
      - Limit access around piers to prevent jumping in off piers.
    - Appointed experts (surfers?) could be beach “sherpas.”
      - Create lifesaving class?
        - Give certain beachgoers/surfers training and the ability to tell people to stay out of the water when areas are not lifeguarded.
          - Huge liability issues.
      - *Enforcement has serious practical and theoretical limitations for realistic implementation. (See below)*

### What has been effective so far?

- *Overall, there's no “silver bullet.”*
- *There are different issues/threats with different groups and issues rarely occur alone.*
- *Increase common sense when it comes to water safety.*
- *Change the culture—like the way culture changed about wearing seatbelts.*
  - Education videos have limited effectiveness.
    - Especially on:

- “Invincible” teenagers
    - Unsupervised kids
  - Should be paired by enforcement or some kind of “threat.”
    - Again, it’s unrealistic to expect that you will be able to keep people out of the water.
- NWS advisories—especially since the media has picked up and reported.
- Bob Pratt’s S-3 Program ideology: Safer water, safer swimmers, and safer response.
  - Swim lessons for inner city kids to increase knowledge and comfort in water.
  - Improved rescue equipment on beaches.
- Education classes are good but also limited.
  - People who attend them are already aware of dangers (“preaching to the choir”).
  - Community involvement is great, but usually only happens *after* a tragedy.
- Current exhibit being installed with swimming safety info at Shedd Aquarium.
- Need to reach at-risk demographics—bulletproof young adults, unsupervised children.
  - Risk vs. reward concept?
  - Authorize enforcers/preventers?
    - Again, liability and implementation issues.
  - “Know something—say something.”
    - At least train a volunteer corps to spot parents who might not be paying enough attention to their kids and remind them of swimming hazards.
      - Busiest beaches first; isolated beaches don’t have critical mass of people to make this work.
  - **Water safety classes in K-12.**

### Issue of closing beaches

- Closure of beaches has unintended consequences.
  - People will just move down the beach from a relatively safe “closed” area to an unsafe one.
    - Farther away from public areas, lifeguards, EMS, etc.).
    - In the case of Ludington, when the town beach is closed, swimmers move down beyond a dune—literally out of sight—to a beach on the state park.
- Enforcement is an issue: how much effort to spend removing people from the water?
- What resources do you give for people who go out when water is unsafe?
- Who can judge whether a beach is dangerous enough to be closed?
  - “Safety Continuum”: water is always dangerous, but to what extent and to whom?
- **Potential solutions:**
  - Keep beach open to those with proper flotation devices
    - Or those who have taken a Beach Safety Certification course?

## Effective messages

- Group consensus: “respect the power”
  - Balances enjoyment of beaches with understanding of the strength of the waves.
  - Messages can sometimes be condescending or belittling (people want to be treated like adults), but “respect the power” assumes a certain amount of knowledge.
- Many people still think of Great Lakes as lakes, not inland seas, and don’t understand differences/danger.
- Good example is the Florida water safety message, “Don’t Panic.”
  - Simpler is better.
  - Sends the message that struggling saps energy and floating buys time.
- “Flip, Float, Follow” is not perfect, but not actively harmful.
  - Doesn’t work if you don’t understand the underlying message: follow the current to understand where it’s taking you, and, thus, how to escape.
  - Does work in that if you’re floating, at least you’re not sinking: even if you can’t self-rescue, it buys time for others to rescue you.

## Effective mechanisms

- Online is good but should be coupled with physical signage.
  - At parks, visitor lounges, puremichigan.org, TV tents (?)
    - Work with hotel owners and local businesses.
- Broadcast across various media—“all of the above” approach.
- “Beach survival challenge” concept has been successful.
  - Beach Olympics—team events including a “survival obstacle course” (Grand Haven, MI).
  - Event taken seriously but isn’t overwhelming.
  - Well branded and exciting for kids.
    - Concept is maxed out in terms of space at Grand Haven beach.
    - Nice idea: replicate the event in other regions; maybe even have the winners from each region compete in a statewide tournament.
- There is an undue emphasis on beach flags: they are not an acceptable substitute for a physical lifeguard or other warning systems.
  - Weather changes too quickly to keep up.
  - Generally difficult to interpret.
  - However, a flag on a lifeguard stand (where lifeguard is monitoring in real time) can be effective.
- Unsure of demand for text alerts, etc.
  - Those who would use them probably are already aware of issues.

**Expert(s):** Jim Gallie, Manager, Ludington State Park

**Project staff:** Benjamin Miller (ERG)

### Background on Ludington Beaches

- *City of Ludington's town beach* is built on the North side of a big pier and structural currents abound.
- Beach patrol—law enforcement officers—patrol beach parking lot, picnic area, and beach.
  - Along with certain city officials, have the power to shut the beach down.
  - And administer the flag system.
- *Ludington State Park* has no structures—one designated beach with flags.
  - Entrance to park has signs explaining currents, etc.
  - Biggest issues are longshore currents
  - Some rip currents
  - Outflow from rivers can be an issue.
  - Some patrol on hazardous days (defined by NWS).
    - DO NOT HAVE THE AUTHORITY TO CLOSE THE BEACH.
- *When City of Ludington shuts beach down, the State Park gets crowded/overwhelmed with more people.*

### Ongoing Risk Communication Efforts

- Mason Oceana Water Safety Coalition—public safety officials, etc., from local counties—meets twice a year, figuring out what to do to improve education in the area.
  - Haven't yet had any community outreach.
- Gallie is aware of/coordinating with MI Sea Grant on education efforts (hotel rooms, brochures, rack cards, daily updates, newspaper banners, etc.).
- Also, the Ludington State Park 'Interpreter' does naturalist training, community outreach, etc., and could certainly add water safety training component.

### Target Audiences and Mechanisms/ Suggestions Moving Forward

- 850,000 beachgoers annually—mainly from *inland* (~an hour away or more).
  - Consistently the rescues and drowning victims are *not* from adjacent communities.

- Less emphasis on local community education.
- POOR INTERNET/PHONE SERVICE
  - Improvement in cell service could be a huge boon.
    - WiFi access at the beach, beach house, and visitor center w/weather.
  - More, larger flags.
    - Current flag system does not address color-blind.
    - Symbols to go along with words/colors?
- Print media for Ludington is a great channel to reach a lot of people.
  - Leads to press attention, etc.
- Need to educate populace that there is no shame in wearing a life jacket.
  - Better to prevent folks from entering hazardous conditions rather than giving them escape methods!
- Fairly significant population of ESL-folks—fruit farms, etc., bring Latin American workers.
  - Bilingual (Spanish/English) message highly important.

## Matt Warner, Michigan Department of Environmental Quality

August 6, 2013

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**Expert(s):** Matt Warner, MI-DEQ

**Project staff:** Benjamin Miller (ERG)

### Primary Target of Messaging

- Drownings rarely occur from just one hazard—it’s always a combination of things.
  - Primarily waves events and current events.
  - Often misunderstood is the variety of currents.
    - Not just rip currents but also structural currents, etc.
  - Variation in bathymetry can cause issues.

### Existing CZM/DNR Program

- Two elements to Matt Warner’s program:
  - K-12 education
  - Improving safety in State Park system.
- Program is informed on three distinct levels:
  - DNR Beach policy and guidance for 2014 (via Section 309).
  - Social science performed by Michigan Sea Grant.
  - UMich & MTU (GUY MEADOWS’ WORK) collect physical data
    - Collecting data from various instruments, including radar, autonomous underwater vehicles, and GPS tracers to collect “perishable data” on dangerous currents.
    - Hope is to show relationship among bathymetry, conditions, and current formation.
    - Goal is to capture a significant event, not monitor normal activity
      - End-game is about RAPID RESPONSE: what signs and signals can we pick up on pre-storm, during storm, post-storm?

### Additional Programs

- Already have a DNR Park Naturalist Program.
  - For schools, campers—evenings and weekends.
  - Thinking of adding one that would cover beach issues.
- Educational material at rest areas on highways (run by DOT).
  - Also with visitors’ bureaus
    - In Marquette, for example, they’ve placed “rack cards” with maps, safety information, etc. in hotels.
      - Require buy-in and support from local hotels
    - Would like to work with business associations.

- Chambers of commerce

### **Message Content and Delivery**

- CHECK ALL AVAILABLE RESOURCES BEFORE GOING IN.
  - Prevention is key, not improving the odds of a successful (self) rescue.
  - Secondary is the response actions (Flip, Float, Follow).
    - On Flip, Float, Follow, there is potential to add another component that helps swimmers get out once they stop panicking and identify the current.
- KNOWLEDGE ABOUT WHICH BEACHES HAVE LIFEGUARDS AND FLAGS.
- With respect to media outlets: ALL OF THE ABOVE.

**Expert(s):** Jesse Schomberg, Minnesota Sea Grant

**Project staff:** Benjamin Miller (ERG), Sara Matasci (ERG)

### Area of Focus

- Not convinced that too many events/drownings have been over-attributed to rip currents.
  - One doesn't see lots of **non**-rip current related incidents in the area (**Lake Superior**).
- Rip currents most dangerous swimming hazard in region, alongside hypothermia/cold water (waters can be in the 40s and 50s even in the summer).
- Not a lot of big structures on the beaches, but there are a couple of key structures that are used very heavily.
  - Main swimming beach is one 7-mile stretch of beach; rest of shore is rocky and steep; people wade in but don't swim.
  - Along that beach there are two sets of structures, one on either end of the channel.

### Current State of Beach Hazard Communication on Eastern Minnesota coast (on Lake Superior)

- One beach with amenities that is staffed by lifeguards during the summer.
- There are warnings posted all along the beach about rip currents – city warnings about general dangers, tells people “swim where the lifeguards are,” but aren't very effective.
- At every beach access point there's a rip currents sign, and at three largest access points there are rip current flags (green/red/yellow) that fly that are changed every day based on weather reports.
- At first access point there is an electronic sign that reiterates beach conditions for the day (alongside flags).
  - If conditions change during the day the flags get changed, although there can be a lag.
  - Electronic signs can be updated during the day from the fire station.
- Started a website this year that includes real-time conditions on the beach: water temperature, wave height, bacteria monitoring, rip current hazards, etc. – updated all day and has a feature where if you sign up for Twitter or Facebook feed it will notify you if conditions worsen during the day.
  - [Parkpointbeach.org](http://Parkpointbeach.org)
  - Found that 31 percent of people on the beach have already used the website.

## Beach Intercept Surveys

- Beach intercept survey results
  - In 2011, 60 percent of beach users were able to correctly identify how to escape a rip current; in 2013, 92 percent can explain.
  - Flags started in 2010, in 2011 only 18 percent had seen them; 2013 is up to 72 percent.
  - 85 percent of users heard of beach currents in 2013 (increase from 2011).
  - In 2011 13 percent could explain at least one sign of how to spot a rip current; in 2013, 77 percent.
  - In 2013, 37 percent of beach users have decided not to go to the beach because of rip currents.
- Sense of most compelling mechanisms?
  - Found that TV was #1 place where people have heard about rip currents; second-biggest was friends and family.
- Major problem is trying to figure out how better to target audience, which is the reason they do so many different things.
  - Know everyone goes to the beach, and to get to beach there's one road—so they can reach a lot of people that way.
  - Surveys show that younger people and visitors tend to know less, so targeted radio spots and brochures/stands near the beaches (although nobody indicated they had seen a brochure, and hardly anybody surveyed remembers seeing rip current warning signs either).
- This year, talked to hotels and tourism industry people who were very willing to print out and provide a beach forecast for visitors.

## Suggestions Moving Forward

- More important to teach people to avoid or teach rescue strategies?
  - Have not yet put rescue equipment out, but volunteer surf rescue group has started to patrol beach where there were many rip current incidents in the past.
  - They combine both issues – if the only thing you do is tell people to avoid them, you'll fail (people will always go out).
  - Escape is also very important—tourism is a big deal, so message can't be only “water is dangerous, stay away.”
  - Survey data have shown that people are avoiding hazardous conditions because of rip currents, but there are a lot of reports of bystanders going out and rescuing people.
- How to approach giving simultaneous advice/education/warnings about issues that are not rip currents (in this case, cold temperatures)?
  - Rip currents are focus, so other issues are addressed in conjunction with those.
  - Because it's cold, getting trapped in a rip current can be more dangerous.
- Grandhavenbeach.org is great resource to replicate.

- Surveys showed that people were interested in different data points—only a small percentage interested in rip currents, or wave height, etc.—but when you combine them all, interest goes up to almost 80 percent. So, they put together a website that had all that information, to reach as many people as possible.

## Appendix B: “Staying Safe at the Beach”—Great Lakes Beach Hazards Web-based Survey—Results Summary

Survey Period: June 28, 2013 – August 5, 2013 (39 days)

Complete Responses: 460

In-scope responses: 290

\*\*In this document, verbatim comments from respondents have been modified slightly to correct obvious typographical errors.

### Q1. What is your age? [REQUIRED QUESTION]

Age	Count All	Percent of Total (460)	Count In-scope	Percent of In-scope
<b>Under 18 [SCREEN OUT]</b>	4	1%	NA	NA
<b>18-24</b>	22	5%	13	4%
<b>25-34</b>	76	17%	51	18%
<b>35-44</b>	79	17%	52	18%
<b>45-55</b>	110	24%	69	24%
<b>Over 55</b>	169	37%	105	36%
<b>Total</b>	<b>460</b>	<b>100%</b>	<b>290</b>	<b>100%</b>

### Q2. Have you visited any of the Great Lakes in the past 2 years, or do you intend to visit one of the lakes this summer? [REQUIRED QUESTION]

Response	Count	Percent of Total (460)
<b>No [SCREEN OUT]</b>	166	30%
<b>Yes</b>	290	69%
<b>Not Applicable (Under 18)</b>	4	1%
<b>Total</b>	<b>460</b>	<b>100%</b>

### Q3. Which of the Great Lakes did you visit or do you plan to visit? (Check all that apply)

Lake	Count	Percent of Total (290)
<b>Lake Superior</b>	97	33%
<b>Lake Michigan</b>	209	72%
<b>Lake Erie</b>	55	19%
<b>Lake Huron</b>	43	15%
<b>Lake Ontario</b>	23	8%
<b>I’m not sure</b>	1	0%
<b>Left Blank</b>	5	2%

**Q4. On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?**

Strength of Swimmer	Count	Percent of Total (290)
0-I don't swim	11	4%
1-Not very strong	52	18%
2	31	11%
3-Somewhat strong	98	34%
4	52	18%
5-Very strong	42	14%
<i>Left Blank</i>	4	1%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q5. When you go swimming, where do you usually swim? (Please check all that apply) [NOT ASKED IF 'I DON'T SWIM' IN QUESTION 4]**

Swimming Location	Count	Percent of Total (279)
Private pool	158	57%
Gym pool	68	24%
Public pool	91	33%
Stream or river	39	14%
Beach (pond or lake)	112	40%
Beach (Great Lake)	142	51%
Beach (ocean)	84	30%
<i>Left Blank</i>	2	1%

**Q6. When you visit a Great Lakes beach, how often do you go into the water?**

Response	Count	Percent of Total (290)
Never	22	8%
Rarely	54	19%
Sometimes	92	32%
Often	75	26%
Always	44	15%
I have not visited the GL yet	1	0%
<i>Left Blank</i>	2	1%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q7. When you visit Great Lakes beaches, how often do you visit the beach with your children?**

Frequency	Count	Percent of Total (290)
I don't have children	106	37%
Not sure	3	1%
Never	15	5%
Rarely	25	9%
Sometimes	65	22%
Often	41	14%
Always	28	10%
<i>Left Blank</i>	7	2%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q8. Under which of the following conditions do you allow your children to go into the water at the beach (choose all that apply) [ONLY ASKED IF 'SOMETIMES,' 'OFTEN,' OR 'ALWAYS' IN QUESTION 7]**

Conditions	Count	Percent of Total (134)
A lifeguard is present.	55	41%
The waves appear small.	74	55%
Flags on the beach indicate conditions are safe.	73	54%
An adult accompanies them into the water.	75	56%
They wear a life jacket or other type of personal flotation device (PFD).	31	23%
A beach safety station with life ring or flotation device is nearby.	22	16%
I do not allow my children in the water under any circumstances.	0	0%
Other (please describe)	21	16%
<i>Left Blank</i>	2	1%

**Other Text:**

- Adult present watching on the beach, who can swim and limit distance out into the water. life jacket on any boating
- An adult is at least nearby. My youngest is 13. [TEXT PROVIDED BUT DIDN'T CHECK OTHER]
- children are over 21
- conditions are within their abilities
- if conditions appear safe
- I'm really only concerned about waves and rip tide.
- just feet
- Kids are 17 & 20 and strong swimmers. We live on Lake Erie in the summer and there is no lifeguard present. They are in the water all the time.
- My children are 13 and 16. I keep an eye on them.
- My children are over 30 yrs old.
- my children have been raised on the beach and know the conditions they can be in the water. They use common sense.
- No allowed to go in above their knees

- none of the above
- Only when clean and only to his knees
- The children are in the presence of a capable swimmer and are required to stick together.
- They are both lifeguards now
- they can go out a certain distance
- They go by themselves if they want, but I have trained them for any situation and they are aware of the dangers.
- They must be within my sight & weather/water is suitable for swimming
- They only walk in the water. It's too cold!
- Up to their arm pits [TEXT PROVIDED BUT DIDN'T CHECK OTHER]
- Water quality is safe
- when they learned to swim

**Q9. Which of the following things do you do to be sure you are safe in the water? (Please check all that apply) [ONLY ASKED IF 'SOMETIMES,' 'OFTEN,' OR 'ALWAYS' IN QUESTION 6]**

Conditions	Count	Percent of Total (211)
<b>Only swim when lifeguards are present.</b>	28	13%
<b>Always swim with another person.</b>	128	61%
<b>Seek out and pay attention to beach condition warnings.</b>	134	64%
<b>Wear a life jacket or other personal flotation device.</b>	13	6%
<b>Only swim when conditions appear safe and/or calm.</b>	144	68%
<b>I do not swim at all or I swim very rarely.</b>	11	5%
<b>Other (please describe)</b>	8	4%
<b>Left Blank</b>	3	1%

**Other Text:**

- I don't swim in water over my head.
- I don't swim where the water is above my shoulders
- I swim regardless of lifeguards and company.
- if conditions appear safe [TEXT PROVIDED BUT DIDN'T CHECK OTHER]
- I'm a surfer, body boarder. water man.
- Know the water and area well. Swim around for awhile to discover any new or potential dangers (PARTIALY SUBMERGED LOGS etc...)
- none of the above
- Stay alert of boaters and as visible to them as possible.
- Stay close to shore

**Q10. How often do you check these sources of weather information before going to the beach?**

Source	Not sure/not applicable	Never	Rarely	Sometimes	Often	Always	[Left Blank]	Total (290)
<b>Newspaper weather forecast</b>	4%	36%	16%	16%	10%	8%	10%	100%
<b>TV weather forecast</b>	2%	12%	12%	24%	27%	17%	7%	100%
<b>Radio weather forecast</b>	3%	16%	16%	26%	22%	6%	12%	100%
<b>Surf Zone Forecast from the NWS</b>	10%	47%	10%	12%	4%	4%	12%	100%
<b>Other weather forecast website</b>	5%	16%	6%	20%	28%	18%	7%	100%
<b>Beach website</b>	11%	44%	13%	11%	5%	4%	11%	100%
<b>Mobile weather app</b>	4%	23%	3%	13%	22%	28%	7%	100%
<b>Facebook, Twitter, or other social media</b>	7%	61%	8%	8%	3%	2%	11%	100%
<b>Hotel desks or tourism agencies</b>	8%	51%	11%	12%	4%	2%	11%	100%
<b>Other?</b>	33%	32%	4%	4%	4%	2%	19%	100%

**Q11. Please give specific examples of weather information sources you indicated that you use either "Often" or "Always" (e.g. a specific newspaper, website, or radio station, etc.). [ASKED ONLY IF 'OFTEN' OR ALWAYS' TO A SOURCE IN QUESTION 10]  
[CATEGORIZED BY INFORMATION SOURCE]**

Information Source	Specific Examples of Information Sources
<b>Newspaper weather forecast</b>	<ul style="list-style-type: none"> <li>• Newspaper (3)</li> <li>• Local newspaper (3)</li> <li>• Wisconsin State Journal (2)</li> <li>• Chicago Tribune (3)</li> <li>• Manitowoc city and county websites</li> <li>• Star Tribune</li> <li>• Toronto star; Globe and Mail</li> <li>• Traverse City Record Eagle</li> <li>• Miami Herald</li> </ul>
<b>TV weather forecast</b>	<ul style="list-style-type: none"> <li>• The Weather Channel (16)</li> <li>• TV news (11)</li> <li>• Local television news (11)</li> <li>• Tom Schilling WGNTV, WGN (local news affiliate) (3)</li> <li>• WMTV</li> <li>• CBS channel WOIO</li> <li>• channel 7/10 in Gaylord mi</li> <li>• Daily news in local channels in Chicago</li> <li>• Erie TV weather stations &amp; local news forecast of future weather</li> <li>• Always listen to weather reports in the A.M. on the tv new stations</li> <li>• Always listen to weather station, for Lake Erie information.</li> <li>• local news station when on vacation</li> <li>• I always check w/the hotel, and listen to the TV weather</li> <li>• I always check with the local TV stations and the NWS before going to the beach.</li> <li>• I usually watch the TV the night before for the weather.</li> <li>• I'll watch the weather forecast on a local network</li> </ul>

Information Source	Specific Examples of Information Sources
	<ul style="list-style-type: none"> <li>• Listen to local weather forecasts and heed their warnings.</li> <li>• Listen to TV the day before going to the beach.</li> </ul>
<b>Radio weather forecast</b>	<ul style="list-style-type: none"> <li>• Radio (7)</li> <li>• NOAA weather radio (5)</li> <li>• Local news radio (5)</li> <li>• Weather radio (3)</li> <li>• Environment Canada Marine Weather Broadcast (2)</li> <li>• NOAA Weather Marine Radio Broadcast</li> <li>• NOAA weather channel from our boat</li> <li>• Specific radio station: 680 news, Silver Bay, MN, MPR; Wood Radio 1300am 106.9FM, TWC 620, WBBM 105.9 fm, WBBM radio, WCPO, WGN, WGN radio 720 AM, WJBL Radio, WFAW Radio, WMJI, WMTV, WKAR, WUOM, WKQX, WMIC, WNDU, WSBT, 960Radio, WTHR Indianapolis</li> <li>• Sirius/XM radio</li> </ul>
<b>Surf Zone Forecast from the NWS</b>	<ul style="list-style-type: none"> <li>• I search for sites that have conditions on beach I'm going to. Surfing sites, testing info sites, etc,</li> <li>• I use the Surf Forecast.</li> <li>• Santa Barbara Surf Report</li> <li>• Boat &amp; Beach Conditions by The Weather Channel</li> <li>• SwellInfo News</li> <li>• wunderground.com</li> <li>• iWindsurf.com</li> <li>• NOAA weather radio</li> </ul>
<b>Other weather forecast website</b>	<ul style="list-style-type: none"> <li>• Area individuals that know the local weather.</li> <li>• Generally google for the area</li> <li>• hourlyweather.com</li> <li>• Online weather forecasts have more current changes. I also just look outside.</li> <li>• So I can know what the weather will be before I go outside.</li> <li>• google "lake superior beach conditions"</li> <li>• whatever is available to me</li> </ul>
<b>Beach website</b>	<ul style="list-style-type: none"> <li>• Weather.com (5)</li> <li>• Accuweather.com (3)</li> </ul>

Information Source	Specific Examples of Information Sources
	<ul style="list-style-type: none"> <li>• Noaa.gov (2)</li> <li>• Manitowoc city and county websites</li> <li>• TWC on my laptop</li> <li>• wunderground.com</li> <li>• iWindsurf.com</li> <li>• I search for sites that have conditions on beach I'm going to. Surfing sites, testing info sites, etc,</li> <li>• I use the Silver Beach Cam in addition to the surf report to gauge what conditions really look like.</li> <li>• I'll check for any beach closings or advisories at the beach website</li> <li>• Computer site for jet stream, as we need wind, to make waves here, in Michigan</li> </ul>
<b>Mobile weather app</b>	<ul style="list-style-type: none"> <li>• Weather channel app (37)</li> <li>• Cell phone weather application (14)</li> <li>• Weatherbug mobile app (9)</li> <li>• Yahoo mobile app (3)</li> <li>• MyRadarPro mobile app (2)</li> <li>• Mobile accuweather (2)</li> <li>• weather underground (2)</li> <li>• Fox Weather app.</li> <li>• Marine Plus Web Site APP</li> <li>• Mobile weather app (MyCast),</li> <li>• SprintWEB Weather.</li> <li>• Double check weather conditions on my kindle</li> <li>• Apps on my phone such as Google or Tornado give weather alerts when conditions are bad. Otherwise, I just check my weather.com app.</li> </ul>
<b>Facebook, Twitter, or other social media</b>	<ul style="list-style-type: none"> <li>• Facebook</li> </ul>
<b>Hotel desks or tourism agencies</b>	<ul style="list-style-type: none"> <li>• I always check w/the hotel, and listen to the TV weather</li> </ul>

**Q 11. [VERBATIM]**

- - NOAA Marine Point Forecast: Hourly Graph; - NOAA Weather Marine Radio Broadcast; - Environment Canada Marine Weather Broadcast
- Accu Weather
- accuweather, miami herald, Weather channel TV
- Accuweather.com
- always listen to weather reports in the A.M. on the tv new stations..and double-check weather conditions on my kindle
- Always listen to weather station, for Lake Erie information.
- App
- Apps on my phone such as Google or Tornado give weather alerts when conditions are bad. Otherwise, I just check my weather.com app.
- Area individuals that know the local weather.
- Broadcast info is random.....but
- CBS channel WOIO; NOA weather channel from our boat
- Cell phone weather application.
- channel 7/10 in gaylord mi
- Chicago Tribune and Smartphone weather app
- Chicago Tribune weather page; my swimming friends who check various websites.
- Chicago tribune, weatherbug app, local news station when on vacation
- depends on the area I'm in
- Detroit news. Oakland press
- DTN weather (online service); weather.com; TV weather channel
- Environment Canada; Weather.gc.ca; Marine forecast; 680 news; The Weather Network
- Erie TV weather stations & local news forecast of future weather
- Generally google for the area
- Google weather
- Herald Times Online
- hourlyweather.com
- I always check w/the hotel, and listen to the TV weather
- I always check With the local TV stations and the NWS before going to the beach. At the ocean, I'll check with the Coast Guard. I use common sense when deciding to go into the water.
- I feel the weather channel is always up to date and changing just like the weather.
- I go to the coast guard website for warnings and water temps, and i have an iphone weather app.
- I listen to local weather conditions and the weather channel
- I might check NOAA or local internet for conditions, but rarely am I visiting a Great Lakes beach. Once or twice each year and often alone, not with family.
- I pay attention to the weather apps
- I search for sites that have conditions on beach I'm going to. Surfing sites, testing info sites, etc,

- I use my smart phone to check weather channel or accuweather.
- I use the iphone weather app, the Yahoo weather app, and the weather.com app. I also occasionally visit weather.com for information.
- I use the Surf Forecast. It's updated frequently and accurate. Please keep providing previous versions of the report alongside the current version. However, the report is not friendly to read on any screen. Text and layout is very primitive and outdated. I use the Silver Beach Cam in addition to the surf report to gauge what conditions really look like.
- I usually watch the TV the night before for the weather.
- I'll watch the weather forecast on a local network, check for any beach closings or advisories at the beach website, or listen to a weather radio station.
- I'm always on my phone so usually I get my info from my device
- iPhone weather app
- Listen to local weather forecasts and heed their warnings.
- Listen to TV the day before going to the beach.
- Local news paper, Daily news in local channels in Chicago. Weather channel and Mobile app.
- Local news radio, Local TV weather, The Weather Channel TV station, I-Phone weather and radar apps.
- local newspaper, weather channel mobile app
- local newspapers/TV/radio wherever I happen to be, and weather apps
- local radio station
- Local radio station.
- local radio stations -- Silver Bay, MN, MPR. ; Fox Weather app. ;
- Local Television.
- Local TV and news, where we are visiting
- Local TV stations, weather channel tv and website, NOAA website
- Local TV website, Weather Bug mobile app.
- Local weather forecasts if near home.; Have checked beach reports when on vacation near ocean.
- Local weather stations, and apps on my phone
- Manitowoc city and county websites;
- Marine Plus Web Site APP; The Weather Channel APP
- Marine Radio
- mlive
- Mobile accuweather
- mobile phone app
- Mobile weather app (MyCast), weather.com, wunderground
- Nearshore Marine Forecasts
- News if it is on tv. Radio station if it on while changing channels and mobile app.
- Newsites - Kare 11, WCCO, Weather.com
- Newspaper

- Newspaper; ;
- Newspaper, TV news, radio station when driving in car,
- NOAA
- NOAA and links
- noaa site
- NOAA weather radio
- NOAA web site, WGN (local news affiliate)
- Noaa website
- NOAA, The Weather Chanel, Weather Underground (e-net)
- NOAA, weather underground, nbdc
- Noaa, wonderground
- noaa.gov
- Noaa.gov ; Accuweather.com
- NOAA.org Yahoo mobile app and MyRadar mobile app
- nws.noaa.gov web site
- online weather forecasts have more current changes. I also just look outside.
- Paper
- PBS radio
- Phone App or website via computer or phone, weatherbug, weather underground, MyRadarPro
- Radio
- Radio station on weather conditions
- Radio station, news websites
- Radio, environment Canada website and mobile phone app.
- Santa Barbara Surf Report; Boat & Beach Conditions by The Weather Channel; SwellInfo News;
- So I can know what the weather will be before I go outside.
- SprintWEB Weather.
- Star Tribune, weather.com
- storm and wind warnings
- the weather channel
- television, radio, weather websites.
- Temp and wind
- The Plain Dealer, Weather Underground, WTAM 1100
- The Weather Channel (website and mobile apps), Wood Radio 1300am 106.9FM
- The Weather Channel (website) & Weather Underground
- The weather channel app
- The weather Channel web site or TV station.
- The weather channel, NOAA ipad/iphone app., the weather bug app.
- The Weather Channel, NOAA website and mobile app for the Weather Channel
- theweathernetnetwork.com
- Tom Schilling WGNTV

- toronto star; globe and mail
- Traverse City Record Eagle, cable Weather Channel,
- Tv 8 news app or WZZM 13 news app weather channel app
- tv channel;; radio,
- tv news
- Tv news . Weather station on tv
- TV news and meteorologists
- Tv news and weather telling conditions ; Flay system posted at the beach
- TV WEATHER REPORTS
- tv weather, computer site for jet stream.; as we need wind to make waves here in Michigan. yes s/w Michigan!!
- TV, weather channel, Iphone
- TWC
- TWC 620
- Typically local weather through a weather site like Weather Underground
- Usually I check the weather on TV. If questionable I check other sources. Sometimes the marine forecast by phone.
- wbbm 105.9 fm
- wbbm radio, weather.com
- WCPO
- Weather apps and websites (weather.com)
- weather bug
- Weather Chanel
- weather channel
- Weather channel and twc app. Various sources as available.
- Weather channel app
- Weather channel app & noaa radio ( fall for duck hunting).
- Weather Channel App on iPhone
- Weather Channel App on iphone, along with WeatherBug App on iphone
- Weather Channel app, or NWS website
- Weather channel has been my favorite website that I used to visit while I only get to use newspaper and radio station when I need to go downtown.
- weather channel iphone app
- weather channel mobile app and weatherbug mobile app
- weather channel or weather.com, NOAA website, local newspaper(s),local TV news channel(s) or local radio news channel(s) of where I'm vacationing.
- Weather channel website
- weather channel website and mobile app
- Weather Channel; NWS
- weather channel,

- Weather Channel, Sirius/XM radio, Yahoo, NOAA, Facebook
- Weather feed on home page
- Weather radio
- Weather Underground
- Weather Underground site and iPhone app
- weather underground; local TV stations and their websites
- weather underground; npr; forecast.weather.gov
- Weather Underground, forecast.io
- weather.com
- weather.com accuweather
- weather.com and other weather apps on my android phone. TV local weather often.
- weather.com and the weather channel mobile app
- Weather.com and weather.com app
- weather.com app
- Weather.com app on phone
- weather.com on my phone
- weather.com or cell
- Weather.com;
- weather.com; accuweather; wunderground; Local News Channel (YNN)
- weather.com; cleveland.com; Plain Dealer; WMJI
- -weather.com; -local news website - Kare 11 or WCCO;
- weather.com; mobile weather apps
- Weather.com; The weather channel;
- weather.com; Weatherbug App for Android OS
- weather.com; wunderground.com; noaa.com; accuweather.com
- weather.com, accuweather
- Weather.com, android app
- Weather.com, local radio & TV station
- weather.com, local tv station, weather channel
- weather.com, weather underground
- weather.com, wunderground.com wilx.com Lansing state journal Detroit free press
- weather.com,wgn radio 720 AM
- Weatherbug iphone app, weather.com iphone app
- WeatherBug iPhone app; TWC on my laptop
- Weatherbug mobile app
- weatherunderground.com, google "lake superior beach conditions"
- weatherunderground or weather.com
- Weatherunderground.com
- web site on i phone
- WGN, NOAA, Weatherchannel

- whatever is available to me
- Wisconsin State Journal, Weather radio, WJBL Radio, WFAW Radio, WMTV,
- Wisconsin State Journal, Weather Underground, weather.com
- WKAR, WUOM, www.wunderground.com
- WKQX; Weather Underground
- WMIC; NOAA
- WNDU WSBT weather.com South Bend Tribune 960Radio
- WTHR Indianapolis
- Wunderground; Intellicast; Weather Channel;
- wunderground.com, google
- Wunderground.com, NOAA, Hotel info
- wunderground.com; iWindsurf.com; NOAA weather radio
- www.weather.com
- www.woodtv.com; www.intellicast.com
- yahoo phone app ; tv weather report;

**Q12. You indicated that you frequently use other weather information sources before going to the beach. Please describe what you use. [ASKED ONLY IF 'OFTEN' OR ALWAYS' TO AN OTHER SOURCE IN QUESTION 10]**

- actual forecasts posted at beach locations
- Current weather conditions where I am, which would be visiting someone on the beach.
- Facebook, Twitter
- I engage people about what the conditions are and usually ask to get a consensus from various authority locations and figures.
- I may read the newspaper or go online on my computer at home. Weathernug.com or weatherchannel are my favorite to go sites for weather updates
- I use the top three weather service apps listed in iTunes store to keep me up to date.
- iPhone app.
- Marine Radio
- Neighbors or friends who live nearby, local merchants
- Noaa radar, phone apps
- NOAA weather radio
- Noaa website
- not very, not go but maybe once every year or so
- Personal Intuition and years of experience around the Great Lakes.
- TV weather news used to indicate me.
- weather websites like weather underground
- Wunderground Android App

**Q13. In your opinion, how reliable are the following sources of weather information in correctly predicting beach conditions?**

Source	Not sure	I don't use this	Unreliable	Somewhat reliable	Very reliable	[Left Blank]	Total (290)
Newspaper weather forecast	7%	29%	14%	39%	4%	7%	100%
TV weather forecast	6%	8%	9%	59%	14%	6%	100%
Radio weather forecast	6%	11%	3%	56%	17%	7%	100%
Surf Zone Forecast from the NWS	20%	40%	1%	15%	16%	8%	100%
Other weather forecast website	12%	14%	3%	43%	18%	9%	100%
Beach website	19%	40%	2%	18%	9%	12%	100%
Mobile weather app	11%	19%	4%	37%	22%	7%	100%
Facebook, Twitter, or other social media	17%	49%	10%	12%	2%	11%	100%
Hotel desks or tourism agencies	18%	44%	6%	18%	5%	9%	100%
Other?	29%	39%	1%	8%	5%	18%	100%

**Q14. Have you ever seen or used any of the following?**

Item	Yes	No	Not sure	[Left Blank]	Total (290)
The NOAA "Break the Grip of the Rip" website	8%	83%	6%	3%	100%
Beach flags that indicate wave or current conditions	67%	26%	5%	3%	100%
Surf Zone Forecast from the National Weather Service	17%	70%	9%	4%	100%
The MyBeachCast mobile app	2%	87%	5%	6%	100%
"Break the Grip of the Rip" beach signs	17%	70%	8%	5%	100%
"Break the Grip of the Rip" brochures	8%	79%	8%	6%	100%
Information advising you to swim parallel to the shoreline	58%	30%	9%	3%	100%
Information advising you to swim out of the current	46%	38%	12%	4%	100%
Information advising you to not fight the current	52%	34%	11%	3%	100%

Q15. If you arrived at the beach and saw a yellow flag, that would mean:

Responses	Count	Percent of Total (290)
Water closed to the public	4	1%
High hazard: high waves and/or strong currents	17	6%
Medium hazard: moderate waves and/or currents	175	60%
Low hazard: Calm conditions, exercise caution	14	5%
Dangerous marine life	1	0%
Not sure	78	27%
<i>Left Blank</i>	1	0%
<b>Total</b>	<b>290</b>	<b>100%</b>

Q16. If you arrived at the beach and you saw a yellow flag, which of the following actions would you take?

Responses	Count	Percent of Total (290)
Make no change in my plans to swim that day.	36	12%
Seek out areas of slightly lower waves.	85	29%
Seek out areas of slightly higher waves.	1	0%
Only swim where lifeguards are present.	78	27%
Swim with another person.	110	38%
Wear a lifejacket or other personal flotation device.	24	8%
Choose not to go in the water.	56	19%
I do not swim at all or I swim very rarely, regardless of posted warnings.	23	8%
Not sure	53	18%
Other (please describe)	24	8%
<i>Left Blank</i>	2	1%

Other Text:

- ask someone what it meant
- Ask someone what the yellow flag means before entering the water
- away from breakwater and piers
- Check for meaning
- Check local information
- clarify flag warning
- Find out meaning of yellow flag
- Find someone who knew what the yellow flag meant.
- going out. I'm a surfer.
- I check online to see what the flags mean before I go into the water.
- I have never seen or heard of yellow flags at the beach. If I found the weather to be acceptable and decided to go to the beach, I don't think a yellow flag would alter my plans to swim. However, I don't swim out far.

- I would assess whether to swim depending on what other swimmers were doing and whether a lifeguard was present
- I would find someone to ask what the flag meant.
- I would seek out a staff person and ask what the flag meant
- I would swim just as I normally do but pay closer attention to Rips and wave patterns
- I'd try to find out what the yellow flag meant before choosing to go into the water!
- If a well known beach I would likely still swim. An unknown beach I would be likely to stay close to shore.
- Ignore it.
- Judge visually based on experience
- Look for signs explaining conditions in more detail
- Look on my smartphone to find what a yellow flag means.
- NOTE: I usually swim on a private beach and there aren't any flags. either not go in, check for details on the flag or stay very close to the shore in water not over my waist, children not in water
- only go into the water to my knees
- perhaps only wade and not up to my knees
- Request more information from lifeguard.
- Stay by immediate shoreline
- stay in shallow water
- Swim with caution. Pay attention
- Wade but not swim past waist or chest height
- Would depend on the weather reports

**Q17. How dangerous are the following swimming-related activities or hazards to you...?**

<b>Hazard</b>	<b>Not at all dangerous</b>	<b>Slightly dangerous</b>	<b>Moderately dangerous</b>	<b>Very dangerous</b>	<b>Extremely dangerous</b>	<b>Not sure</b>	<b>[Left Blank]</b>	<b>Total (290)</b>
<b>High waves</b>	3%	16%	30%	30%	18%	1%	3%	100%
<b>A current that pulls you quickly away from shore</b>	1%	3%	6%	30%	57%	1%	2%	100%
<b>A current that pulls you quickly toward rocks/breakwalls/piers</b>	0%	2%	4%	23%	67%	1%	2%	100%
<b>Lightning/thunderstorms</b>	0%	1%	7%	26%	63%	1%	2%	100%
<b>Bacterial contamination</b>	0%	4%	13%	24%	55%	1%	2%	100%
<b>Swimming alone</b>	3%	17%	31%	23%	24%	1%	2%	100%
<b>Sunburns</b>	4%	21%	39%	21%	12%	1%	1%	100%
<b>Jumping off a pier</b>	2%	13%	27%	26%	27%	2%	3%	100%
<b>Motorized water vehicles (jet skis, powerboats, etc.)</b>	5%	24%	37%	18%	14%	1%	1%	100%
<b>Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)</b>	1%	14%	30%	27%	26%	1%	1%	100%

**Q18. How dangerous are the following swimming-related activities or hazards to your children...?  
[ONLY ASKED IF 'SOMETIMES,' 'OFTEN,' OR 'ALWAYS' IN QUESTION 7]**

Source	Not at all dangerous	Slightly dangerous	Moderately dangerous	Very dangerous	Extremely dangerous	Not sure	[Left Blank]	Total (134)
High waves	0%	4%	13%	22%	54%	0%	7%	100%
A current that pulls you quickly away from shore	0%	1%	1%	16%	76%	0%	6%	100%
A current that pulls you quickly toward rocks/breakwalls/piers	0%	1%	1%	8%	82%	1%	6%	100%
Lightning/thunderstorms	0%	2%	3%	15%	73%	1%	6%	100%
Bacterial contamination	0%	2%	7%	17%	66%	1%	6%	100%
Swimming alone	1%	3%	8%	12%	68%	1%	7%	100%
Sunburns	0%	16%	23%	21%	33%	0%	7%	100%
Jumping off a pier	1%	2%	15%	26%	49%	1%	6%	100%
Motorized water vehicles (jet skis, powerboats, etc.)	2%	6%	22%	24%	39%	0%	7%	100%
Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)	1%	6%	15%	21%	50%	1%	6%	100%

**Q19. Are any of your children between 13 to 18 years old? [ONLY ASKED IF 'SOMETIMES,' 'OFTEN,' OR 'ALWAYS' IN QUESTION 7]**

Response	Count	Percent of Total (134)
Yes	45	34%
No [SKIP TO Q21]	85	63%
Left Blank	4	3%
<b>Total</b>	<b>134</b>	<b>100%</b>

**Q20. How dangerous would you say are the following activities or hazards for a young person aged 13 to 18 when they go to the beach by themselves or with friends (without you or another adult)? [ONLY ASKED IF 'YES' TO QUESTION 19]**

Source	Not at all dangerous	Slightly dangerous	Moderately dangerous	Very dangerous	Extremely dangerous	Not sure	[Left Blank]	Total (45)
<b>High waves</b>	0%	7%	20%	29%	42%	2%	0%	100%
<b>A current that pulls you quickly away from shore</b>	0%	0%	0%	24%	73%	2%	0%	100%
<b>A current that pulls you quickly toward rocks/breakwalls/piers</b>	0%	0%	0%	22%	76%	2%	0%	100%
<b>Lightning/thunderstorms</b>	0%	0%	9%	16%	71%	2%	2%	100%
<b>Bacterial contamination</b>	0%	2%	9%	24%	58%	2%	4%	100%
<b>Swimming alone</b>	0%	2%	13%	22%	58%	2%	2%	100%
<b>Sunburns</b>	0%	20%	33%	22%	20%	2%	2%	100%
<b>Jumping off a pier</b>	0%	4%	24%	29%	38%	2%	2%	100%
<b>Motorized water vehicles (jet skis, powerboats, etc.)</b>	4%	7%	31%	24%	29%	2%	2%	100%
<b>Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)</b>	0%	9%	22%	29%	36%	2%	2%	100%

**Q21. How comfortable are you entering the water at the beach for the following conditions?**

<b>Conditions</b>	<b>Not sure/not applicable</b>	<b>Very uncomfortable</b>	<b>Uncomfortable</b>	<b>Comfortable</b>	<b>Very comfortable</b>	<b>[Left Blank]</b>	<b>Total (290)</b>
<b>High waves with dangerous currents</b>	1	60	27	9	1	1	100%
<b>Low waves with weak currents</b>	1	2	5	42	48	2	100
<b>Frequent high waves</b>	1	20	43	30	3	3	100
<b>Lifeguards on duty</b>	6	1	1	50	40	2	100
<b>Safety equipment available nearby</b>	4	1	2	58	33	2	100
<b>No lifeguards or park personnel on duty</b>	4	12	35	41	5	2	100
<b>Flags indicating safe beach conditions</b>	6	3	4	50	35	2	100
<b>Posted warnings about unsafe beach conditions</b>	4	38	30	18	8	2	100
<b>Consuming small amounts of alcohol</b>	6	23	21	43	4	2	100
<b>Consuming large amounts of alcohol</b>	9	64	17	5	3	2	100
<b>News report about recent drownings in the Great Lakes region</b>	12	17	36	27	7	1	100

**Q22. You are swimming near a pier and experience a current that pulls you swiftly away from shore (parallel to the pier), towards open water. Which of the following describes the best way to escape this current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**



Responses	Count	Percent of Total (279)
Swim toward shore	8	3%
Swim away from shore	5	2%
Swim up or down the beach, parallel to shore	166	59%
*Get the attention of a lifeguard or someone on the pier or shore	24	9%
Ask someone on the pier or shore to throw a life-ring	13	5%
Float on my back until the current weakens, then swim to shore	28	10%
I don't know	31	11%
<i>Left Blank</i>	4	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q23. Which of the following best describes this type of wave or current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**

Responses	Count	Percent of Total (279)
Rip current	116	42%
Channel current	24	9%
High wave conditions	1	0%
*Structural current	37	13%
Seiche	0	0%
Longshore current	1	0%
Normal wave action	3	1%
I don't know	94	34%
<i>Left Blank</i>	3	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q24. You are swimming and experience a current that pulls you swiftly between the shore and a sand bar up or down the beach, parallel to shore. Which of the following describes the best way to escape this current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**



Responses	Count	Percent of Total (279)
<b>*Swim toward shore</b>	117	42%
Swim away from shore	11	4%
Swim up or down the beach, parallel to shore	69	25%
Get the attention of a lifeguard or someone on the pier or shore	11	4%
Ask someone on the pier or shore to throw a life-ring	2	1%
Float on my back until the current weakens, then swim to shore	22	8%
I don't know	43	15%
<i>Left Blank</i>	4	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q25. Which of the following best describes this type of wave or current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**

Responses	Count	Percent of Total (279)
Rip current	29	10%
Channel current	61	22%
High wave conditions	1	0%
Structural current	6	2%
Seiche	1	0%
<b>*Longshore current</b>	42	15%
Normal wave action	5	2%
I don't know	132	47%
<i>Left Blank</i>	2	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q26. You are swimming and experience a current that pulls you swiftly away from shore, towards open water. Which of the following describes the best way to escape this current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**



Responses	Count	Percent of Total (279)
Swim toward shore	19	7%
Swim away from shore	7	3%
<b>*Swim up or down the beach, parallel to shore</b>	170	61%
Get the attention of a lifeguard or someone on the pier or shore	17	6%
Ask someone on the pier or shore to throw a life-ring	4	1%
Float on my back until the current weakens, then swim to shore	22	8%
I don't know	37	13%
<i>Left Blank</i>	3	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q27. Which of the following best describes this type of wave or current? [NOT ASKED IF 'I DON'T SWIM' TO QUESTION 4]**

Responses	Count	Percent of Total (279)
<b>*Rip current</b>	133	48%
Channel current	12	4%
High wave conditions	6	2%
Structural current	6	2%
Seiche	1	0%
Longshore current	7	3%
Normal wave action	5	2%
I don't know	105	38%
<i>Left Blank</i>	4	1%
<b>Total</b>	<b>279</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Q28. Looking at the photo of water conditions, how comfortable would you feel entering the water at this point on the beach?**



<b>Responses</b>	<b>Count</b>	<b>Percent of Total (290)</b>
<b>Not sure</b>	5	2%
<b>Very uncomfortable</b>	69	24%
<b>Uncomfortable</b>	139	48%
<b>Comfortable</b>	58	20%
<b>Very comfortable</b>	16	6%
<b>Left Blank</b>	3	1%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q29. How comfortable would you feel letting your children enter the water here? [ONLY ASKED IF 'SOMETIMES,' 'OFTEN,' OR 'ALWAYS' IN QUESTION 7]**

Responses	Count	Percent of Total (134)
Not sure	0	0%
Very uncomfortable	87	65%
Uncomfortable	20	15%
Comfortable	19	14%
Very comfortable	5	4%
<i>Left Blank</i>	3	2%
<b>Total</b>	<b>134</b>	<b>100%</b>

**Q30. What is your gender?**

Responses	Count	Percent of Total (290)
Male	141	49%
Female	146	50%
Prefer not to answer/Left Blank	3	1%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q31. What is your zipcode?**

State	Count	Percent of Total (290)
MI	61	21%
WI	47	16%
MN	47	16%
IL	39	13%
OH	32	11%
IN	25	9%
NY	13	4%
PA	5	2%
Other (FL,VA,GA,WV,WA,NC,MD,KY,KS,CT,CO,CA)	12	5%
Prefer not to answer/Left Blank	5	2%
<b>Total</b>	<b>290</b>	<b>100%</b>

Note: Percent of total may not sum to 100% due to rounding.

Zip code categorizations	Count	Percent of Total (290)
Less than 10 miles from a major body of water	92	32%
10 to 20 miles from a major body of water	42	14%
20 to 40 miles from a major body of water	38	13%
Greater than 40 miles from a major body of water	113	39%
Prefer not to answer/Left Blank	5	2%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q32. What language do you prefer to read in?**

Responses	Count	Percent of Total ( )
English	278	96%
Spanish	1	0%
Portuguese	0	0%
Mandarin	0	0%
Arabic	0	0%
Vietnamese	0	0%
Polish	0	0%
French	0	0%
Other (please describe)	1	0%
<i>Left Blank</i>	10	3%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Other Text:**

- Finnish (Finland).

**Q33. What is the highest level of education that you have completed?**

Responses	Count	Percent of Total (290)
Less than high school	1	0%
High school or GED	20	7%
Associate degree	32	11%
Trade, technical or vocational education	22	8%
Bachelor's degree	118	41%
Master's degree	60	21%
Ph.D.	16	6%
Prefer not to answer	13	4%
<i>Left Blank</i>	8	3%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q34. Are you, yourself, of Hispanic or Latino origin or descent?**

Responses	Count	Percent of Total (290)
Yes, I am of Hispanic or Latino origin or descent	6	2%
No, I am not of Hispanic or Latino origin or descent	259	89%
Prefer not to answer	16	6%
<i>Left Blank</i>	9	3%
<b>Total</b>	<b>290</b>	<b>100%</b>

**Q35. What is your race? (please select one or more)**

<b>Responses</b>	<b>Count</b>	<b>Percent of Total (290)</b>
<b>American Indian or Alaska Native</b>	4	1%
<b>Asian</b>	6	2%
<b>Black or African American</b>	8	3%
<b>Native Hawaiian or Other Pacific Islander</b>	1	0%
<b>White</b>	237	82%
<b>Prefer not to answer</b>	21	7%
<b>Other (please describe)</b>	5	2%
<i>Left Blank</i>	11	4%

**Other Text:**

- Caucasian
- euro-american
- hispanic a mix
- mixed
- other
- American [TEXT PROVIDED BUT DIDN'T CHECK OTHER]
- Venezuelan/Italian [TEXT PROVIDED BUT DIDN'T CHECK OTHER]
- You forgot JD in the education. [TEXT PROVIDED BUT DIDN'T CHECK OTHER]

## Great Lakes Beach Hazards Web-based Survey—Selected Cross-tabulations

Question 17: How dangerous are the following swimming-related activities or hazards to you...?

Percentage of respondents rating beach hazards as “very” or “extremely dangerous” (Q17), by age category (Q1)

Beach Hazards in Question 17	N	N <=34/>=35	%	
			<=34 years	>=35 years
A current that pulls you quickly toward rocks/breakwalls/piers	280	62/218	90%	94%
Lightning/thunderstorms	282	61/221	82%	94%
A current that pulls you quickly away from shore	282	61/221	79%	92%
Bacterial contamination	281	62/219	68%	85%
Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)	283	62/221	39%	59%
Jumping off a pier	277	58/219	34%	62%
High waves	278	61/217	33%	55%
Swimming alone	283	62/221	32%	52%
Sunburns	284	62/222	18%	39%
Motorized water vehicles (jet skis, powerboats, etc.)	283	61/222	16%	37%

Note: “Not sure” and non-responses to Q17 are excluded.

Percentage of respondents rating beach hazards in as “very” or “extremely dangerous” (Q17), by swimming ability (Q4)

Beach Hazards in Question 17	N	N Strong/Not	%	
			Strong Swimmers	Not Strong Swimmers
A current that pulls you quickly toward rocks/breakwalls/piers	276	92/184	90%	95%
Lightning/thunderstorms	278	90/188	90%	92%
A current that pulls you quickly away from shore	279	93/186	83%	92%
Bacterial contamination	277	92/185	76%	83%
Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)	280	93/187	52%	56%
Jumping off a pier	273	88/185	51%	57%
Swimming alone	279	93/186	39%	52%
High waves	274	90/184	38%	55%
Motorized water vehicles (jet skis, powerboats, etc.)	279	93/186	25%	37%
Sunburns	280	92/188	23%	39%

Note: Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is “very strong,” how strong a swimmer are you?). “Not sure” and non-responses to Q4 (swimming ability) and Q17 (beach hazards) are excluded.

**Percentage of respondents rating beach hazards as “very” or “extremely dangerous” (Q17), by home zip code (Q31)**

<b>Beach Hazards in Question 17</b>	<b>N</b>	<b>N</b>	<b>%</b>	<b>%</b>
		<b>Local/Tourist</b>	<b>“Local”</b>	<b>“Tourist”</b>
<b>A current that pulls you quickly toward rocks/breakwalls/piers</b>	<b>276</b>	<b>167/109</b>	<b>92%</b>	<b>95%</b>
<b>Lightning/thunderstorms</b>	<b>278</b>	<b>168/110</b>	<b>90%</b>	<b>93%</b>
<b>A current that pulls you quickly away from shore</b>	<b>278</b>	<b>166/112</b>	<b>89%</b>	<b>89%</b>
<b>Bacterial contamination</b>	<b>277</b>	<b>167/110</b>	<b>83%</b>	<b>79%</b>
<b>Lake bed hazards (sharp rocks, fishing hooks, broken glass, etc.)</b>	<b>279</b>	<b>168/111</b>	<b>55%</b>	<b>54%</b>
<b>Jumping off a pier</b>	<b>273</b>	<b>165/108</b>	<b>55%</b>	<b>57%</b>
<b>Swimming alone</b>	<b>279</b>	<b>170/109</b>	<b>44%</b>	<b>54%</b>
<b>High waves</b>	<b>274</b>	<b>164/110</b>	<b>44%</b>	<b>60%</b>
<b>Motorized water vehicles (jet skis, powerboats, etc.)</b>	<b>279</b>	<b>169/110</b>	<b>36%</b>	<b>29%</b>
<b>Sunburns</b>	<b>280</b>	<b>169/111</b>	<b>36%</b>	<b>34%</b>

Note: Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water. “Not sure” and non-responses to Q17 (beach hazards) are excluded.

**Question 21: How comfortable are you entering the water at the beach for the following conditions?**

**Percentage of respondents rating their comfort level with beach conditions as “comfortable” or “very comfortable” (Q21), by age category (Q1)**

Beach Conditions in Question 21	N	N	%	
		<=34/>=35	<=34 years	>=35 years
Lifeguards on duty	267	60/200	97%	98%
Safety equipment available nearby	274	61/213	94%	93%
Low waves with weak currents	282	62/220	94%	92%
Flags indicating safe beach conditions	267	59/208	93%	92%
Consuming small amounts of alcohol	267	57/210	61%	50%
No lifeguards or park personnel on duty	271	62/209	58%	47%
Frequent high waves	278	60/218	52%	30%
News report about recent drownings in the Great Lakes region	251	56/195	50%	35%
Posted warnings about unsafe beach conditions	272	60/212	25%	29%
High waves with dangerous currents	284	62/222	15%	9%
Consuming large amounts of alcohol	258	56/202	14%	7%

Note: “Not sure/not applicable” and non-responses to Q21 are excluded.

**Percentage of respondents rating their comfort level with beach conditions as “comfortable” or “very comfortable” (Q21), by swimming ability (Q4)**

Beach Conditions in Question 21	N	N	%	
		Strong/Not Strong	Strong Swimmers	Not Strong Swimmers
Lifeguards on duty	264	89/175	99%	97%
Safety equipment available nearby	271	90/181	99%	96%
Flags indicating safe beach conditions	263	89/174	98%	90%
Low waves with weak currents	278	92/186	91%	93%
Consuming small amounts of alcohol	264	85/179	64%	46%
No lifeguards or park personnel on duty	268	90/178	63%	42%
News report about recent drownings in the Great Lakes region	248	77/171	52%	32%
Frequent high waves	274	90/184	51%	27%
Posted warnings about unsafe beach conditions	268	87/181	31%	27%
High waves with dangerous currents	280	92/188	20%	6%
Consuming large amounts of alcohol	255	83/172	13%	7%

Note: Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). “Not sure/not applicable” and non-responses to Q4 (swimming ability) and Q21 (beach conditions) are excluded.

**Percentage of respondents rating their comfort level with beach conditions as “comfortable” or “very comfortable” (Q21), by home zip code (Q31)**

Beach Conditions in Question 21	N	N	%	%
		Local/Tourist	Local	Tourist
Safety equipment available nearby	270	163/107	97%	97%
Lifeguards on duty	263	153/110	97%	98%
Low waves with weak currents	278	169/109	92%	94%
Flags indicating safe beach conditions	263	153/107	92%	93%
No lifeguards or park personnel on duty	268	158/110	55%	42%
Consuming small amounts of alcohol	264	159/105	50%	55%
Frequent high waves	274	167/107	38%	29%
News report about recent drownings in the Great Lakes region	247	155/92	36%	41%
Posted warnings about unsafe beach conditions	268	159/109	31%	25%
High waves with dangerous currents	280	172/108	13%	7%
Consuming large amounts of alcohol	255	154/101	8%	9%

Note: Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water. “Not sure” and non-responses to Q21 (beach hazards) are excluded.

**Percentage of respondents rating their comfort level with conditions as “comfortable” or “very comfortable” (Q21), by whether or not they have children (Q7)**

Beach Conditions in Question 21	N	N	%	%
		Children/No Children	Children	NO Children
Safety equipment available nearby	265	167/98	98%	97%
Lifeguards on duty	260	163/97	97%	99%
Low waves with weak currents	273	170/103	91%	96%
Flags indicating safe beach conditions	259	162/97	91%	96%
Consuming small amounts of alcohol	258	167/91	50%	57%
No lifeguards or park personnel on duty	262	163/99	48%	54%
Frequent high waves	269	170/99	35%	36%
News report about recent drownings in the Great Lakes region	243	154/89	35%	44%
Posted warnings about unsafe beach conditions	264	163/101	29%	28%
High waves with dangerous currents	275	172/103	10%	12%
Consuming large amounts of alcohol	249	159/90	8%	11%

Note: Those that do not have children were identified by their response (“I don’t have children”) in Question 7. Those that left Q7 blank are excluded. “Not sure/not applicable” and non-responses to Q21 (beach conditions) are excluded.

**Question 22: You are swimming near a pier and experience a current that pulls you swiftly away from shore (parallel to the pier), towards open water. Which of the following describes the best way to escape this current?**



**Responses to Question 22, by age category (Q1)**

Q22 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
Swim toward shore	8	3%	1	7	2%	3%
Swim away from shore	5	2%	0	5	0%	2%
Swim up or down the beach, parallel to shore	166	59%	40	126	63%	58%
*Get the attention of a lifeguard or someone on the pier or shore	24	9%	8	16	13%	7%
Ask someone on the pier or shore to throw a life-ring	13	5%	4	9	6%	4%
Float on my back until the current weakens, then swim to shore	28	10%	5	23	8%	11%
I don't know	31	11%	3	28	5%	13%
<i>Left Blank</i>	4	1%	2	2	3%	1%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

### Responses to Question 22, by swimming ability (Q4)

Q22 Responses	N	% of Total (275)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
Swim toward shore	8	3%	3	5	3%	3%
Swim away from shore	5	2%	3	2	3%	1%
Swim up or down the beach, parallel to shore	164	60%	64	100	68%	55%
*Get the attention of a lifeguard or someone on the pier or shore	24	9%	7	17	7%	9%
Ask someone on the pier or shore to throw a life-ring	12	4%	2	10	2%	6%
Float on my back until the current weakens, then swim to shore	27	10%	7	20	7%	11%
I don't know	31	11%	6	25	6%	14%
<i>Left Blank</i>	4	1%	2	2	2%	1%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

### Responses to Question 22, by home zip code (Q31)

Q22 Responses	N	% of Total (285)	N Locals	N Tourists	% of Locals	% of Tourists
Swim toward shore	8	3%	5	3	3%	3%
Swim away from shore	5	2%	5	0	3%	0%
Swim up or down the beach, parallel to shore	162	57%	94	68	55%	60%
*Get the attention of a lifeguard or someone on the pier or shore	24	8%	17	7	10%	6%
Ask someone on the pier or shore to throw a life-ring	13	5%	11	2	6%	2%
Float on my back until the current weakens, then swim to shore	28	10%	15	13	9%	12%
I don't know	31	11%	17	14	10%	12%
<i>Left Blank</i>	14	5%	8	6	5%	5%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 23: Which of the following best describes this type of wave or current?**

**Responses to Question 23, by age category (Q1)**

Q23 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
Rip current	116	42%	21	95	33%	44%
Channel current	24	9%	5	19	8%	9%
High wave conditions	1	0%	0	1	0%	0.5%
*Structural current	37	13%	8	29	13%	13%
Seiche	0	0%	0	0	0%	0%
Longshore current	1	0%	0	1	0%	0.5%
Normal wave action	3	1%	1	2	2%	1%
I don't know	94	34%	26	68	41%	31%
<i>Left Blank</i>	3	1%	2	1	3%	0.5%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Responses to Question 23, by swimming ability (Q4)**

Q23 Responses	N	% of Total (275)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
Rip current	115	42%	42	73	45%	40%
Channel current	24	9%	7	17	7%	9%
High wave conditions	1	0%	1	0	1%	0%
*Structural current	35	13%	15	20	16%	11%
Seiche	0	0%	0	0	0%	0%
Longshore current	1	0%	1	0	1%	0%
Normal wave action	2	1%	0	2	0%	1%
I don't know	94	34%	27	67	29%	37%
<i>Left Blank</i>	3	1%	1	2	1%	1%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

**Responses to Question 23, by home zip code (Q31)**

<b>Q23 Responses</b>	<b>N</b>	<b>% of Total (285)</b>	<b>N Locals</b>	<b>N Tourists</b>	<b>% of Locals</b>	<b>% of Tourists</b>
<b>Rip current</b>	<b>112</b>	<b>39%</b>	<b>66</b>	<b>46</b>	<b>38%</b>	<b>41%</b>
<b>Channel current</b>	<b>24</b>	<b>8%</b>	<b>18</b>	<b>6</b>	<b>10%</b>	<b>5%</b>
<b>High wave conditions</b>	<b>1</b>	<b>0%</b>	<b>1</b>	<b>0</b>	<b>1%</b>	<b>0%</b>
<b>*Structural current</b>	<b>37</b>	<b>13%</b>	<b>22</b>	<b>15</b>	<b>13%</b>	<b>13%</b>
<b>Seiche</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0</b>	<b>0%</b>	<b>0%</b>
<b>Longshore current</b>	<b>1</b>	<b>0%</b>	<b>1</b>	<b>0</b>	<b>1%</b>	<b>0%</b>
<b>Normal wave action</b>	<b>3</b>	<b>1%</b>	<b>2</b>	<b>1</b>	<b>1%</b>	<b>1%</b>
<b>I don't know</b>	<b>94</b>	<b>33%</b>	<b>54</b>	<b>40</b>	<b>31%</b>	<b>35%</b>
<b><i>Left Blank</i></b>	<b>13</b>	<b>5%</b>	<b>8</b>	<b>5</b>	<b>5%</b>	<b>4%</b>
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 24: You are swimming and experience a current that pulls you swiftly between the shore and a sand bar up or down the beach, parallel to shore. Which of the following describes the best way to escape this current?**



**Responses to Question 24, by age category (Q1)**

Q24 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
<b>*Swim toward shore</b>	117	42%	35	82	56%	38%
Swim away from shore	11	4%	3	8	5%	4%
Swim up or down the beach, parallel to shore	69	25%	12	57	19%	26%
Get the attention of a lifeguard or someone on the pier or shore	11	4%	1	10	2%	5%
Ask someone on the pier or shore to throw a life-ring	2	1%	0	2	0%	1%
Float on my back until the current weakens, then swim to shore	22	8%	3	19	5%	9%
I don't know	43	15%	8	35	13%	16%
<i>Left Blank</i>	4	1%	1	3	2%	1%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

### Responses to Question 24, by swimming ability (Q4)

Q24 Responses	N	% of Total (275)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
<b>*Swim toward shore</b>	115	42%	49	66	52%	36%
Swim away from shore	11	4%	6	5	6%	3%
Swim up or down the beach, parallel to shore	68	25%	23	45	24%	25%
Get the attention of a lifeguard or someone on the pier or shore	11	4%	2	9	2%	5%
Ask someone on the pier or shore to throw a life-ring	1	0%	0	1	0%	0.5%
Float on my back until the current weakens, then swim to shore	22	8%	5	17	5%	9%
I don't know	43	16%	7	36	7%	20%
<i>Left Blank</i>	4	1%	2	2	2%	1%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

### Responses to Question 24, by home zip code (Q31)

Q24 Responses	N	% of Total (285)	N Locals	N Tourists	% of Locals	% of Tourists
<b>*Swim toward shore</b>	115	40%	75	40	44%	35%
Swim away from shore	11	4%	7	4	4%	4%
Swim up or down the beach, parallel to shore	69	24%	42	27	24%	24%
Get the attention of a lifeguard or someone on the pier or shore	11	4%	4	7	2%	6%
Ask someone on the pier or shore to throw a life-ring	2	1%	1	1	1%	1%
Float on my back until the current weakens, then swim to shore	21	7%	13	8	8%	7%
I don't know	42	15%	21	21	12%	19%
<i>Left Blank</i>	14	5%	9	5	5%	4%
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 25: Which of the following best describes this type of wave or current?**

**Responses to Question 25, by age category (Q1)**

Q25 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
Rip current	29	10%	4	25	6%	12%
Channel current	61	22%	15	46	24%	21%
High wave conditions	1	0%	0	1	0%	0.5%
Structural current	6	2%	0	6	0%	3%
Seiche	1	0%	0	1	0%	0.5%
* Longshore current	42	15%	10	32	16%	15%
Normal wave action	5	2%	1	4	2%	2%
I don't know	132	47%	32	100	51%	46%
<i>Left Blank</i>	2	1%	1	1	2%	0.5%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Responses to Question 25, by swimming ability (Q4)**

Q25 Responses	N	% of Total (275)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
Rip current	29	11%	9	20	10%	11%
Channel current	59	21%	25	34	27%	19%
High wave conditions	1	0%	1	0	1%	0%
Structural current	6	2%	5	1	5%	0.5%
Seiche	1	0%	1	0	1%	0%
* Longshore current	41	15%	13	28	14%	15%
Normal wave action	5	2%	1	4	1%	2%
I don't know	131	48%	38	93	40%	51%
<i>Left Blank</i>	2	1%	1	1	1%	0.5%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

**Responses to Question 25, by home zip code (Q31)**

Q25 Responses	N	% of Total (285)	N Locals	N Tourists	% of Locals	% of Tourists
Rip current	29	10%	21	8	12%	7%
Channel current	59	21%	37	22	22%	19%
High wave conditions	1	0%	1	0	1%	0%
Structural current	6	2%	3	3	2%	3%
Seiche	1	0%	0	1	0%	1%
*Longshore current	42	15%	30	12	17%	11%
Normal wave action	5	2%	3	2	2%	2%
I don't know	130	46%	70	60	41%	53%
<i>Left Blank</i>	12	4%	7	5	4%	4%
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 26: You are swimming and experience a current that pulls you swiftly away from shore, towards open water. Which of the following describes the best way to escape this current?**



**Responses to Question 26, by age category (Q1)**

Q26 Responses	N	% of Total (279)	N ≤34	N ≥35	% of ≤34	% of ≥35
Swim toward shore	19	7%	7	12	11%	6%
Swim away from shore	7	3%	2	5	3%	2%
*Swim up or down the beach, parallel to shore	170	61%	38	132	60%	61%
Get the attention of a lifeguard or someone on the pier or shore	17	6%	3	14	5%	6%
Ask someone on the pier or shore to throw a life-ring	4	1%	2	2	3%	1%
Float on my back until the current weakens, then swim to shore	22	8%	3	19	5%	9%
I don't know	37	13%	6	31	10%	14%
<i>Left Blank</i>	3	1%	2	1	3%	0.5%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

### Responses to Question 26, by swimming ability (Q4)

Q26 Responses	N	% of Total (275)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
Swim toward shore	19	7%	8	11	9%	6%
Swim away from shore	7	3%	2	5	2%	3%
<b>*Swim up or down the beach, parallel to shore</b>	<b>166</b>	<b>60%</b>	<b>65</b>	<b>101</b>	<b>69%</b>	<b>56%</b>
Get the attention of a lifeguard or someone on the pier or shore	17	6%	3	14	3%	8%
Ask someone on the pier or shore to throw a life-ring	4	1%	1	3	1%	2%
Float on my back until the current weakens, then swim to shore	22	8%	6	16	6%	9%
I don't know	37	13%	7	30	7%	17%
<i>Left Blank</i>	3	1%	2	1	2%	0.5%
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

**Responses to Question 26, by home zip code (Q31)**

<b>Q26 Responses</b>	<b>N</b>	<b>% of Total (285)</b>	<b>N Locals</b>	<b>N Tourists</b>	<b>% of Locals</b>	<b>% of Tourists</b>
<b>Swim toward shore</b>	<b>19</b>	<b>7%</b>	<b>11</b>	<b>8</b>	<b>6%</b>	<b>7%</b>
<b>Swim away from shore</b>	<b>7</b>	<b>2%</b>	<b>4</b>	<b>3</b>	<b>2%</b>	<b>3%</b>
<b>*Swim up or down the beach, parallel to shore</b>	<b>167</b>	<b>59%</b>	<b>106</b>	<b>61</b>	<b>62%</b>	<b>54%</b>
<b>Get the attention of a lifeguard or someone on the pier or shore</b>	<b>17</b>	<b>6%</b>	<b>10</b>	<b>7</b>	<b>6%</b>	<b>6%</b>
<b>Ask someone on the pier or shore to throw a life-ring</b>	<b>4</b>	<b>1%</b>	<b>1</b>	<b>3</b>	<b>1%</b>	<b>3%</b>
<b>Float on my back until the current weakens, then swim to shore</b>	<b>22</b>	<b>8%</b>	<b>13</b>	<b>9</b>	<b>8%</b>	<b>8%</b>
<b>I don't know</b>	<b>36</b>	<b>13%</b>	<b>19</b>	<b>17</b>	<b>11%</b>	<b>15%</b>
<b>Left Blank</b>	<b>13</b>	<b>5%</b>	<b>8</b>	<b>5</b>	<b>5%</b>	<b>4%</b>
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 27: Which of the following best describes this type of wave or current?**

**Responses to Question 27, by age category (Q1)**

Q27 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
<b>*Rip current</b>	133	48%	30	103	48%	48%
Channel current	12	4%	4	8	6%	4%
High wave conditions	6	2%	1	5	1.5%	2%
Structural current	6	2%	1	5	1.5%	2%
Seiche	1	0%	1	0	1.5%	0%
Longshore current	7	3%	1	6	1.5%	3%
Normal wave action	5	2%	2	3	3%	1%
I don't know	105	38%	22	83	35%	38%
<i>Left Blank</i>	4	1%	1	3	2%	1%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>63</b>	<b>216</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response.

**Responses to Question 27, by swimming ability (Q4)**

Q27 Responses	N	% of Total (279)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
<b>*Rip current</b>	133	48%	45	84	48%	46%
Channel current	12	4%	6	6	6%	3%
High wave conditions	6	2%	3	3	3%	2%
Structural current	6	2%	3	3	3%	2%
Seiche	1	0%	0	1	0%	0.5%
Longshore current	7	3%	2	5	2%	3%
Normal wave action	5	2%	2	3	2%	2%
I don't know	105	38%	31	74	33%	41%
<i>Left Blank</i>	4	1%	2	2	2%	1%
<b>Total</b>	<b>279</b>	<b>100%</b>	<b>94</b>	<b>181</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

**Responses to Question 27, by home zip code (Q31)**

Q27 Responses	N	% of Total (285)	N Locals	N Tourists	% of Locals	% of Tourists
<b>*Rip current</b>	<b>131</b>	<b>46%</b>	<b>84</b>	<b>47</b>	<b>49%</b>	<b>42%</b>
<b>Channel current</b>	<b>12</b>	<b>4%</b>	<b>8</b>	<b>4</b>	<b>5%</b>	<b>4%</b>
<b>High wave conditions</b>	<b>6</b>	<b>2%</b>	<b>5</b>	<b>1</b>	<b>3%</b>	<b>1%</b>
<b>Structural current</b>	<b>6</b>	<b>2%</b>	<b>2</b>	<b>4</b>	<b>1%</b>	<b>4%</b>
<b>Seiche</b>	<b>1</b>	<b>0%</b>	<b>1</b>	<b>0</b>	<b>1%</b>	<b>0%</b>
<b>Longshore current</b>	<b>7</b>	<b>2%</b>	<b>5</b>	<b>2</b>	<b>3%</b>	<b>2%</b>
<b>Normal wave action</b>	<b>5</b>	<b>2%</b>	<b>2</b>	<b>3</b>	<b>1%</b>	<b>3%</b>
<b>I don't know</b>	<b>103</b>	<b>36%</b>	<b>57</b>	<b>46</b>	<b>33%</b>	<b>41%</b>
<b><i>Left Blank</i></b>	<b>14</b>	<b>5%</b>	<b>8</b>	<b>6</b>	<b>5%</b>	<b>5%</b>
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Asterisk denotes preferred response. Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

**Question 28: Looking at the photo of water conditions, how comfortable would you feel entering the water at this point on the beach?**



**Responses to Question 28, by age category (Q1)**

Q28 Responses	N	% of Total (279)	N <=34	N >=35	% of <=34	% of >=35
Not sure	5	2%	0	5	0%	2%
Very uncomfortable	69	24%	7	62	11%	27%
Uncomfortable	139	48%	38	101	59%	45%
Comfortable	58	20%	15	43	23%	19%
Very comfortable	16	6%	3	13	5%	6%
<i>Left Blank</i>	3	1%	1	2	2%	1%
<b>Total</b>	<b>290</b>	<b>100%</b>	<b>64</b>	<b>226</b>	<b>100%</b>	<b>100%</b>

**Responses to Question 28, by swimming ability (Q4)**

Q28 Responses	N	% of Total (279)	N Strong Swimmers	N Not Strong Swimmers	% of Strong Swimmers	% of Not Strong Swimmers
Not sure	5	2%	0	5	0%	3%
Very uncomfortable	69	24%	13	56	14%	29%
Uncomfortable	136	48%	45	91	48%	47%
Comfortable	58	20%	25	33	27%	17%
Very comfortable	15	5%	10	5	11%	3%
<i>Left Blank</i>	3	1%	1	2	1%	1%
<b>Total</b>	<b>286</b>	<b>100%</b>	<b>94</b>	<b>192</b>	<b>100%</b>	<b>100%</b>

Note: Strong swimmers are those who rated themselves a 4 or a 5 in Question 4 (On a scale from 0 - 5, where 5 is "very strong," how strong a swimmer are you?). Non-responses to Q4 (swimming ability) are excluded.

**Responses to Question 28, by home zip code (Q31)**

Q28 Responses	N	% of Total (285)	N Locals	N Tourists	% of Locals	% of Tourists
<b>Not sure</b>	5	2%	1	4	1%	4%
<b>Very uncomfortable</b>	69	24%	37	32	22%	28%
<b>Uncomfortable</b>	135	47%	83	52	48%	46%
<b>Comfortable</b>	58	20%	42	16	24%	14%
<b>Very comfortable</b>	16	6%	9	7	5%	6%
<b>Left Blank</b>	2	1%	0	2	0%	2%
<b>Total</b>	<b>285</b>	<b>100%</b>	<b>172</b>	<b>113</b>	<b>100%</b>	<b>100%</b>

Note: Locals are those whose home zip code is located within 40 miles of a major body of water. Tourists are those whose home zip code is greater than 40 miles from a major body of water.

## Appendix C. Great Lakes Beach Risk Messaging Intercept Survey—Results Summary

Complete Responses: 97

\*\*In this document, verbatim comments from respondents have been modified slightly to correct obvious typographical errors.

### What is your age?

Age	Count	Percent
18-24	21	22%
25-34	15	15%
35-44	25	26%
45-55	20	21%
Over 55	16	16%
<b>Total</b>	<b>97</b>	<b>100%</b>

### Who are you visiting the beach with?

	Count	Percent
I'm here by myself.	3	3%
I'm here with my friends.	26	27%
I'm here with my spouse/partner.	37	38%
I'm here with my spouse/partner and kids.	22	23%
I'm here with my kids.	8	8%
Refused or not recorded.	1	1%
<b>Total</b>	<b>97</b>	<b>100%</b>

### When you visit a Lake Michigan beach, how much time do you spend in the water?

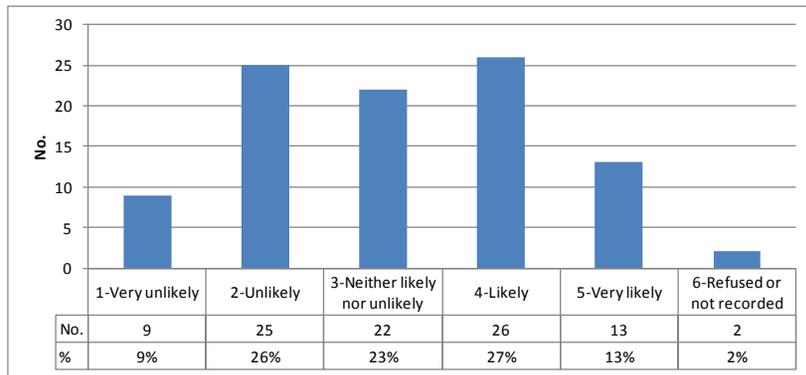
	Count	Percent
I don't go in the water.	6	6%
Small amount of time.	44	45%
Moderate amount of time.	41	42%
Significant amount of time.	5	5%
Refused or not recorded.	1	1%
<b>Total</b>	<b>97</b>	<b>100%</b>

### On a scale from 0-5, where 5 is "very strong," how strong a swimmer are you?

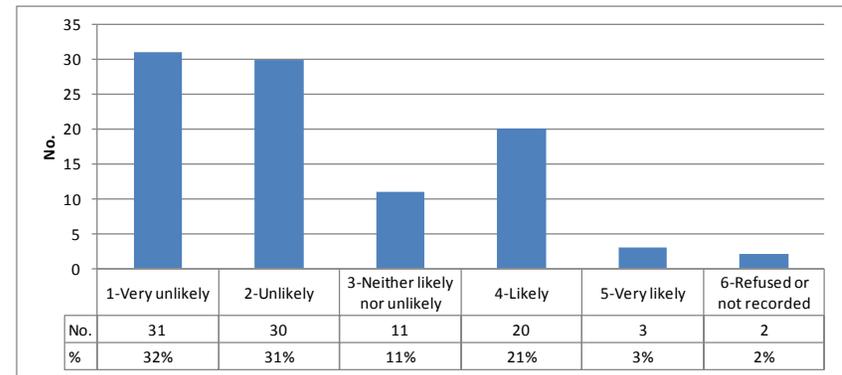
	Count	Percent
0 – I don't swim	2	2%
1 – Not very strong swimmer	11	11%
2 -	8	8%
3 – Somewhat strong swimmer	36	37%
4 -	22	23%
5 – Very strong swimmer	18	19%
Refused or not recorded	0	0%
<b>Total</b>	<b>97</b>	<b>100%</b>

**Respect the Power**

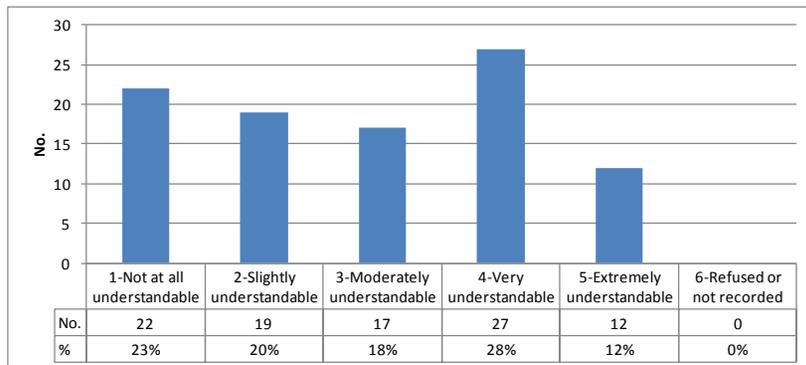
**If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?**



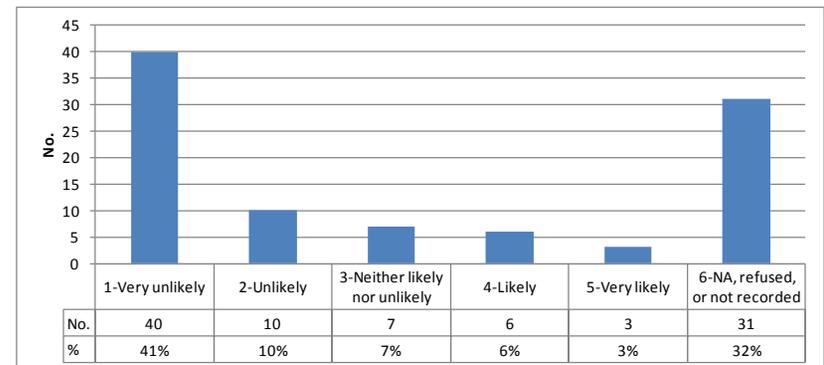
**If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?**



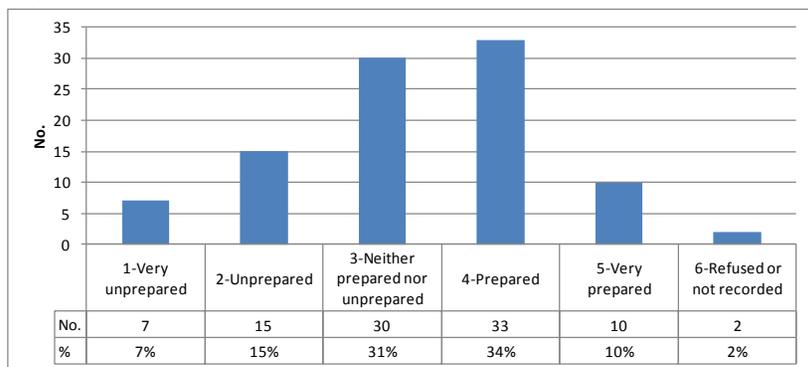
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

Theme of Comment	Count
What Power or the power of what?	22
Lack of context, meaning is vague	21
Other	9
Respect what?	8
<b>Total</b>	<b>60</b>

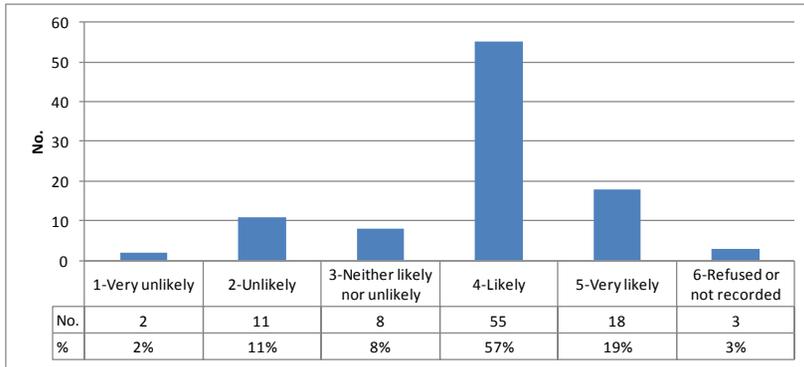
Note: Verbatim comments with more than one theme are counted separately.

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

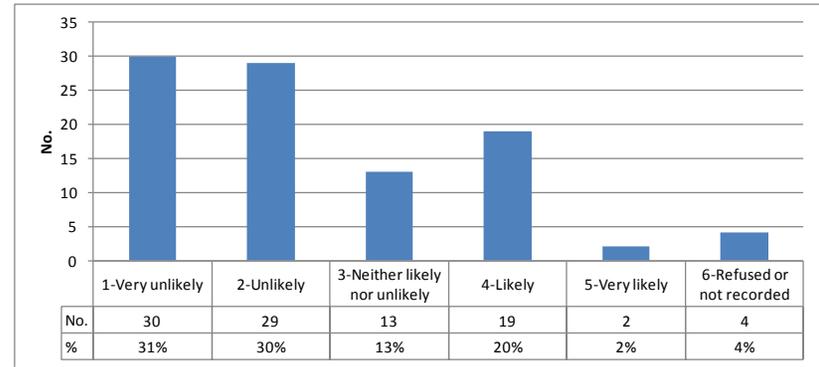
- or something like
- word
- Doesn't have subject
- No definition of the power, vague
- Power
- Power don't make sense
- Respect to what?
- Respect to what? Is it water?
- That you need to check the water safety conditions because it is important to
- Doesn't say anything
- Don't know what the power is, sub-tag is needed
- Power is not clear
- Power need adjective
- Too ambiguous, you don't know what power it is
- Dose not identify what is power
- Feel like advertising something
- Power of water
- Too arbitrary, need association with subject
- I don't really look at sign
- I don't think that that is anything doing with weather
- Power of what
- Too vague
- I don't understand what is saying
- I don't think that that is anything doing with weather
- Power of what and how
- Vague
- I don't understand what is saying
- I don't think that that is anything doing with weather
- Power of what?
- What is content. Respect what?
- In what context
- It doesn't sound like a rule to follow
- Power of what? Not specific
- What is the specific danger?
- It doesn't tell you about power
- It doesn't sound like a rule to follow
- Power of what? Not specific
- What the power is referring?
- It looks like religion say, not talking about beach
- Refer to what? water?
- Who is the power
- N.A
- It doesn't tell you about power
- Respect is wrong word
- Whole things I don't get it. Not enough content
- NA
- It looks like religion say, not talking about beach
- Respect the power of what?
- Words mean many things. Waves
- Nothing
- Respect to what
- What is that meaning? Not sure whether it is dangerous
- NA
- It doesn't tell you about power
- Respect to what (weather?)
- word power

**Know Before You Go in the Water**

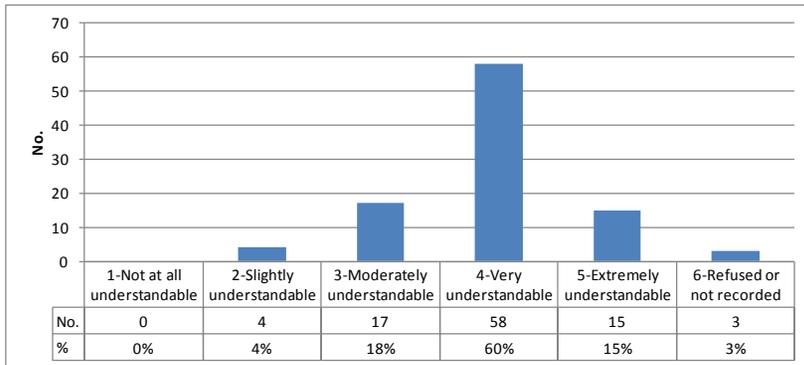
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



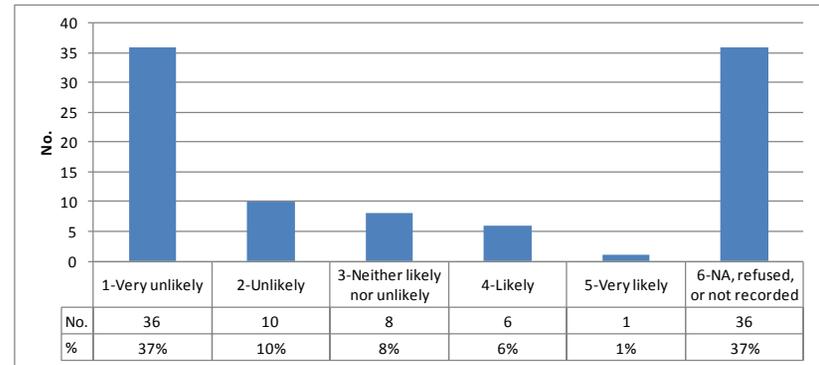
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



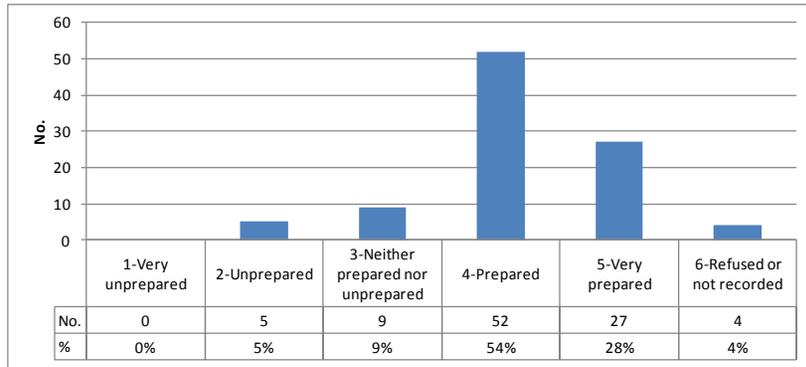
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

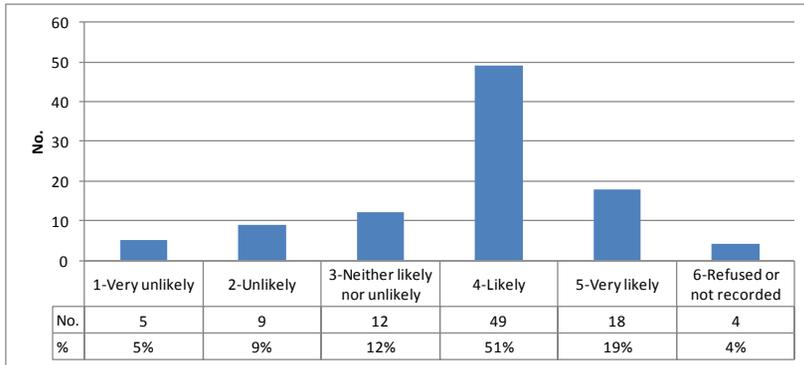
Theme of Comment	Count
Meaning is vague	9
Doubt what?	7
Other	6
Go out where?	4
<b>Total</b>	<b>26</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

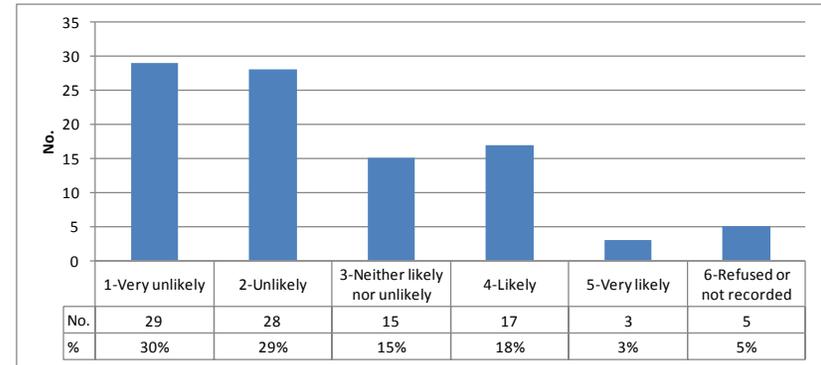
- About what
- Because it is important to check water conditions before entering
- Boring message
- Context is not clear
- Doesn't tell you what you should know
- I don't think that a lot of people will check and listen that
- It seems that warning for swimmer or boater. Need warning for different activities.
- Know what exactly?
- Know what?
- Knowing what?--conditions
- NA
- No
- No children
- Not applicable because I don't swim at all
- Not specific enough
- Not tell what to know
- Nothing
- Sounds vague
- Vague
- Very clear
- What is the risk involved

**When in Doubt, Don't Go Out**

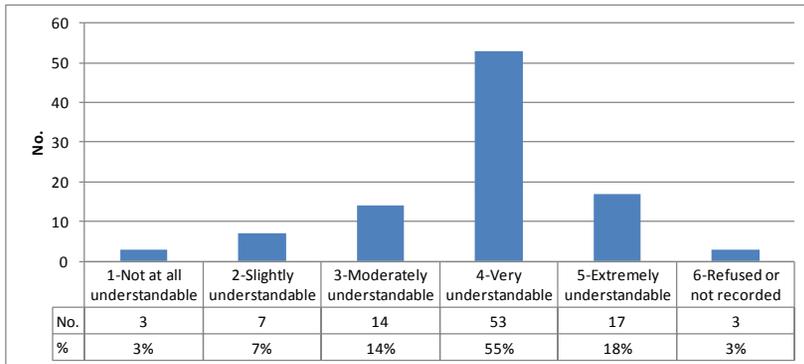
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



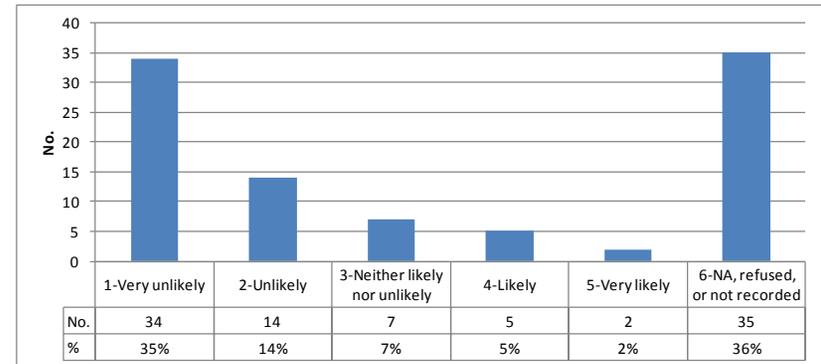
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



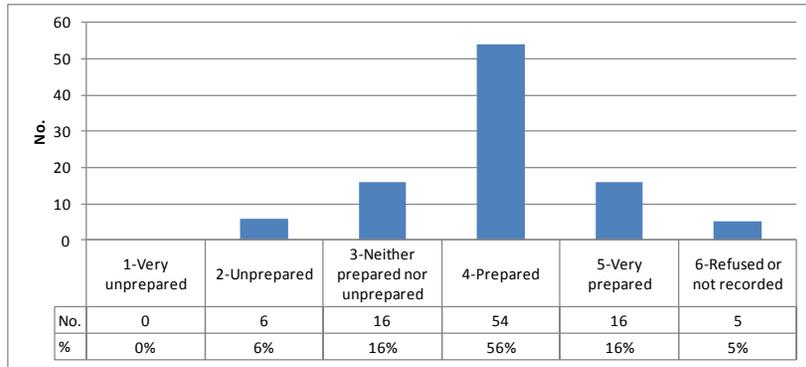
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

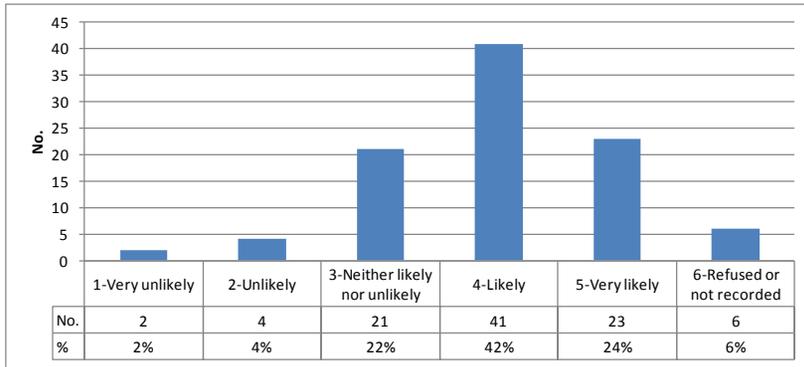
Theme of Comment	Count
Waves are fun	5
Meaning is vague	5
Other	4
Does not apply to other users (boats)	2
<b>Total</b>	<b>16</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

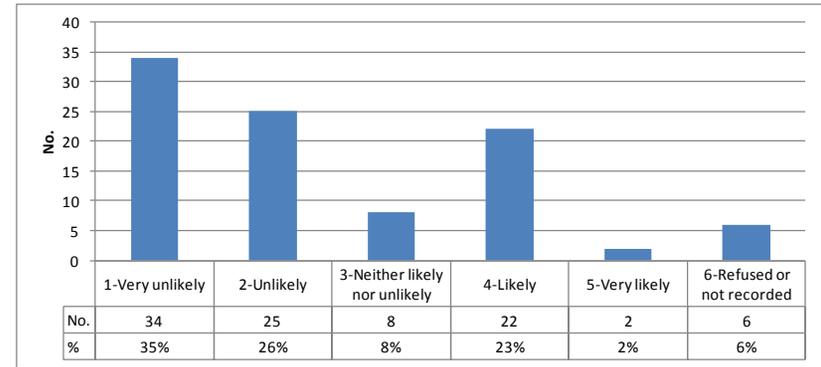
- helps with understanding the graveness of the message
- , doesn't mean in.. confusing
- Clean, decide where at beach
- Does not identify what you are doubt about
- Does not refer water dangerous
- Doesn't explain what to doubt
- Doesn't mean that the weather is bad that day
- Don't go of what
- Doubt, it's like doubtful
- In what context
- It is important to check water conditions
- It seems like related with voting
- Just like previous one (Don't understand word)
- Just, feeling
- NA
- No
- No meaning
- Not clear
- Not specific enough
- Should specify where I am seeing this message
- Too vague and over used
- When in doubt of what?
- When in doubt of what? Not make me go to see weather. Stay out may be better
- When in doubt of what? sand? sun?
- When people doubt, people usually just go

**Stay Dry When the Waves are High**

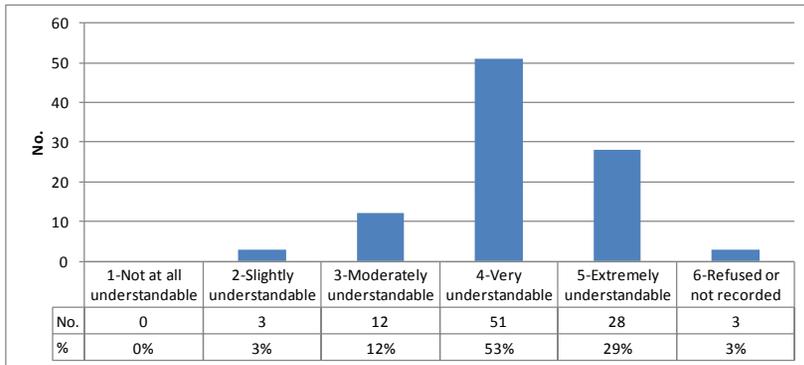
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



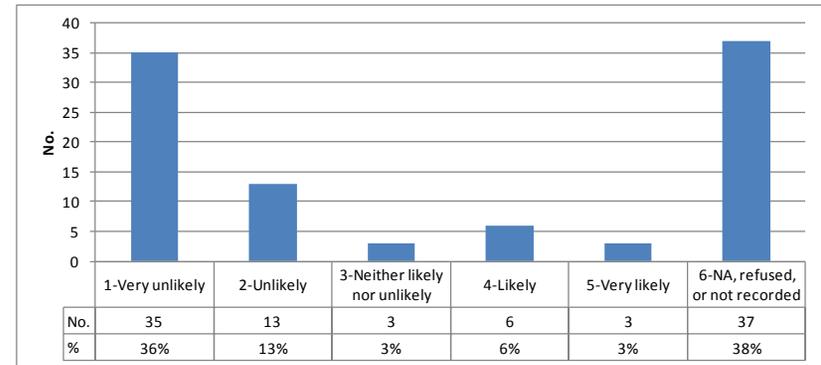
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



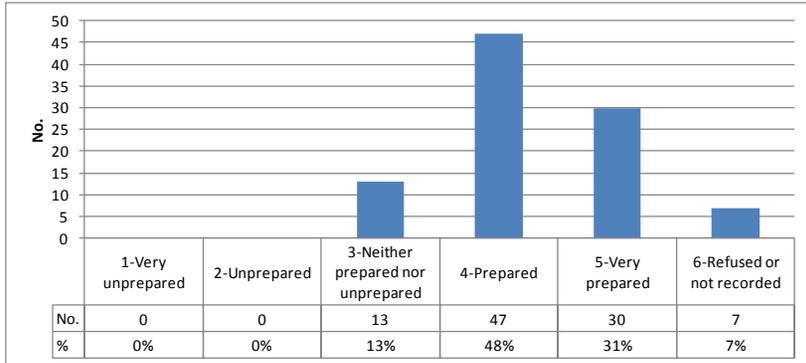
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

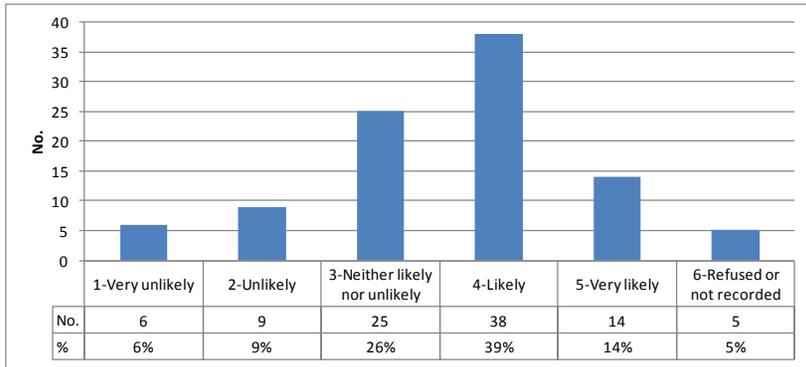
Theme of Comment	Count
Waves are fun	5
Meaning is vague	5
Other	4
Does not apply to other users (boats)	2
<b>Total</b>	<b>16</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

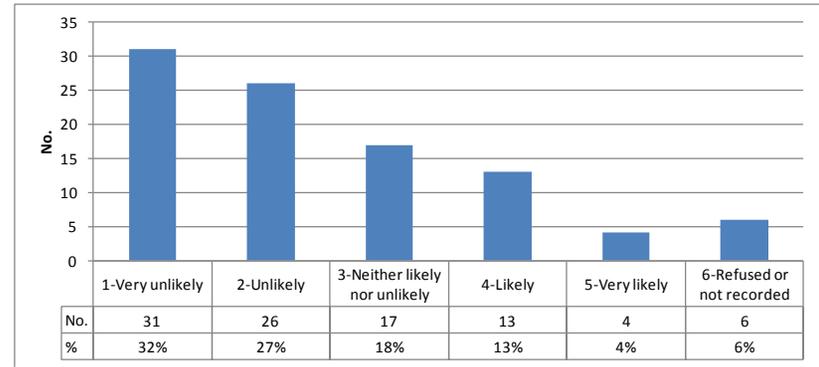
- Because it is important to check water conditions
- Boat on float device.
- High waves are enticing! What's the rip current?
- I like high wave
- I like high waves
- It's general statement
- It's look only for swimmer, not targeting other users, such as jet skier
- L like high waves
- No
- Not clear to kids
- Not convincing
- On conditions
- Stay dry of what
- Vague! Little bit unclear to some people.; Waves are not directly related to swim
- Waves are high- I am from New Jersey and usually have high wave. So, hard to compare.

**Mind the Waves! A Surfing Day is Not a Swimming Day**

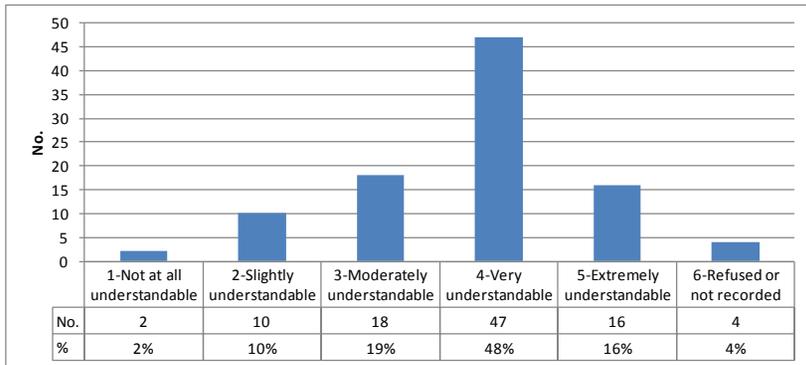
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



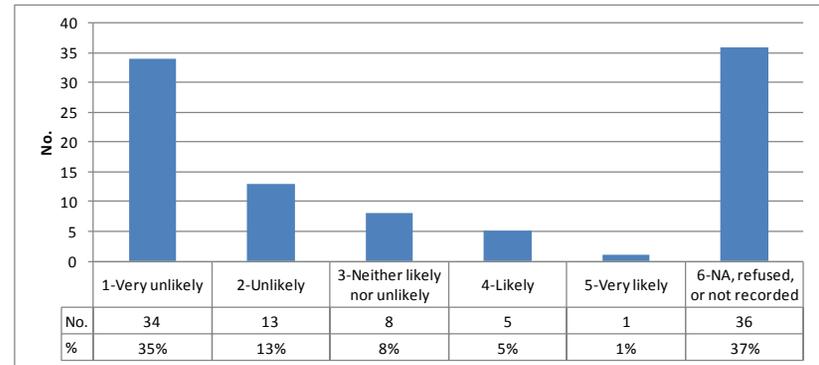
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



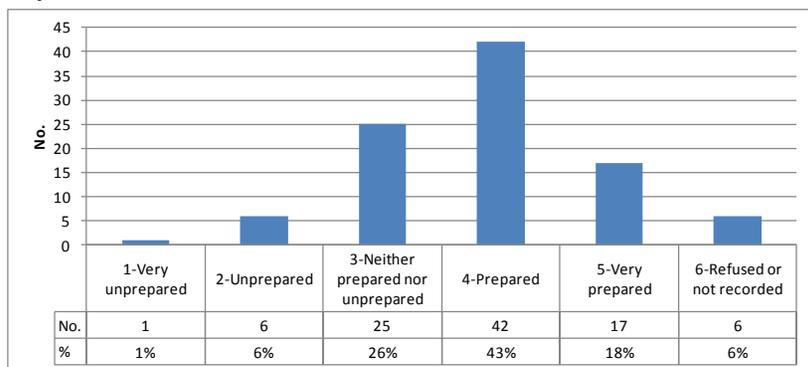
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

Theme of Comment	Count
Confusion about why this is true	10
Not clear on what action to take	7
Meaning is not clear	9
Other	4
<b>Total</b>	<b>30</b>

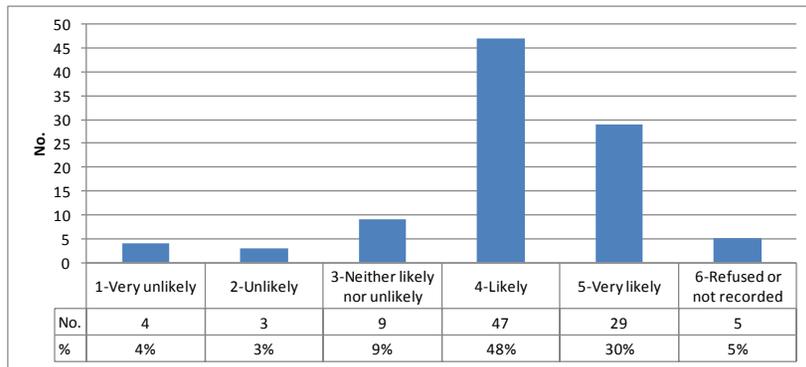
Note: Verbatim comments with more than one theme are counted separately.

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

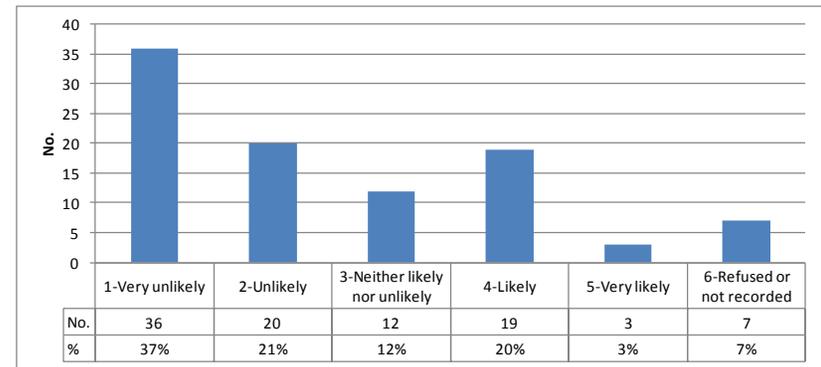
- are not clear
- is not clear
- British phrase-U.S not understand
- Didn't say anything dangerous
- Doesn't say stay out, someday it is good
- Doesn't stress the importance
- Don't know
- I can't compare the wave of surfing with swimming
- I didn't know that surfing day is not good for swim
- Important to check water conditions
- It looks mixed message, you can't surf without swimming
- N.A
- NA
- No
- Not as caution as others
- Not concise. Surfing not on Lake Michigan. In CA, yes
- Not really tell me it's dangerous. Not sure the strength of waves. Need a picture of the waves.
- Same with previous, and no surfing in Grand Haven
- Some people may not understand what surfing day means
- Surfers swim too
- Surfing and swimming seems both good day
- Surfing on Lake Michigan?! No!
- This message doesn't tell you much
- Too long
- What is difference between surfing and swimming
- Why is a surfing day ok and not a swimming day?
- too wordy

**Knee Deep is Too Deep on Red Flag Days**

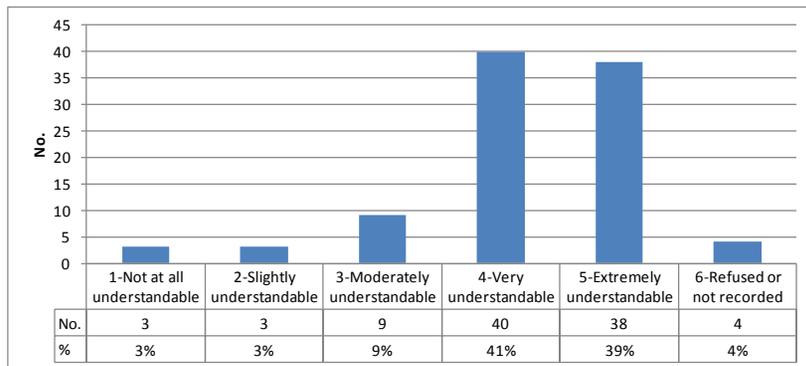
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



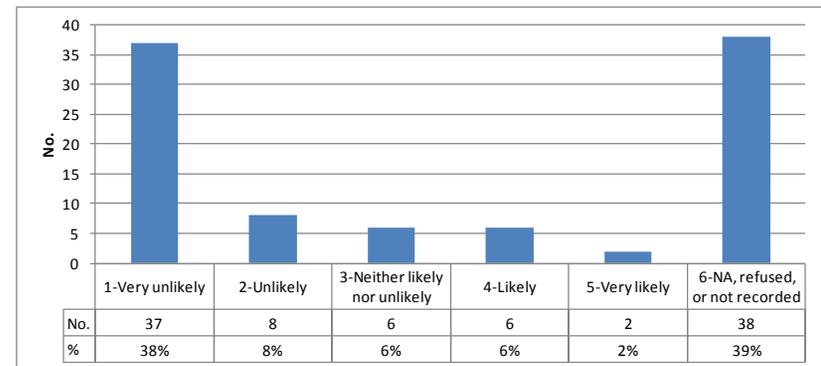
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



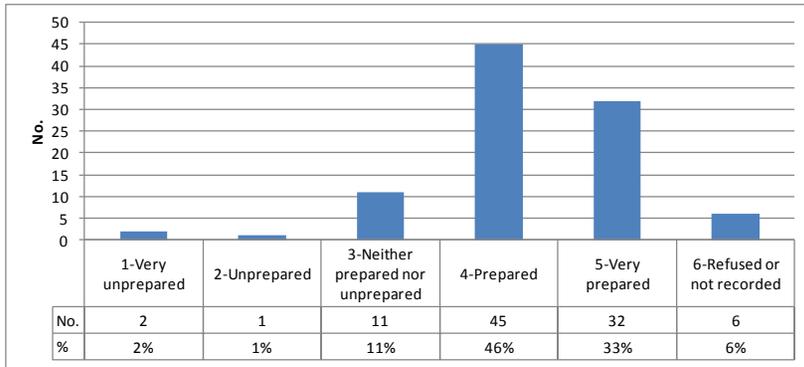
How understandable is the message?



(If with kids) How likely would you be to let kids 12 and under go in the water?



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

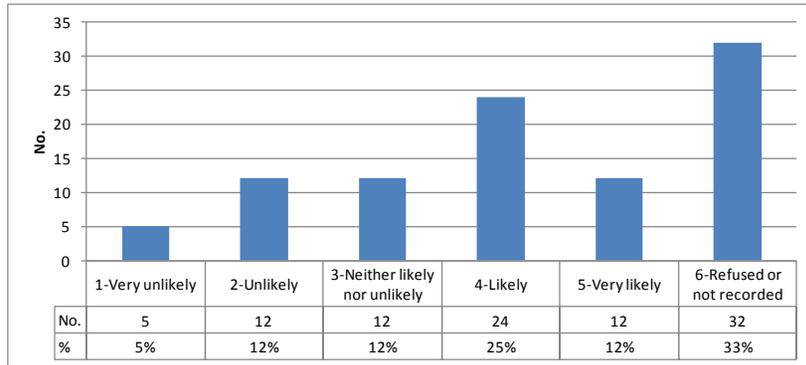
Theme of Comment	Count
Not believable	6
Meaning is vague, confusing	6
Other	1
<b>Total</b>	<b>13</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

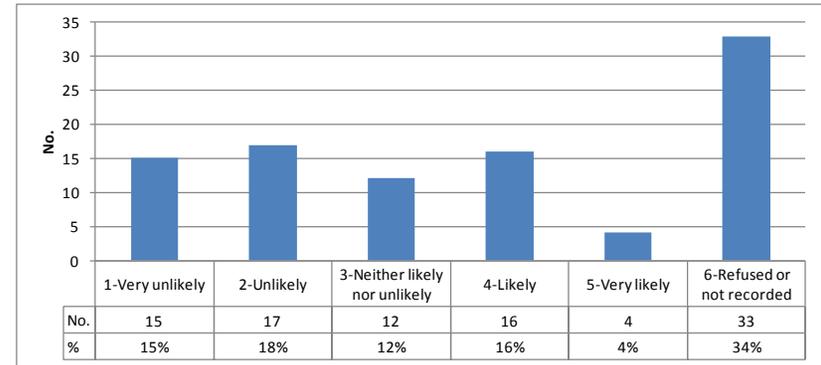
- Check water conditions
- Doesn't really make sense
- I don't believe that
- I don't understand at all
- I still go knee level. Knee level is not too deep.
- Is red flag present
- Knee deep is vague
- Mixed message, better to say, stay out on red flag day, Knee deep for me and for kids are different things.
- Nothing
- Red flags not always at beach
- We can still go in up to knees?
- What is the red flag for?
- Worded weird, knee deep?

**When At the Beach, Keep Your Kids in Arm’s Reach**

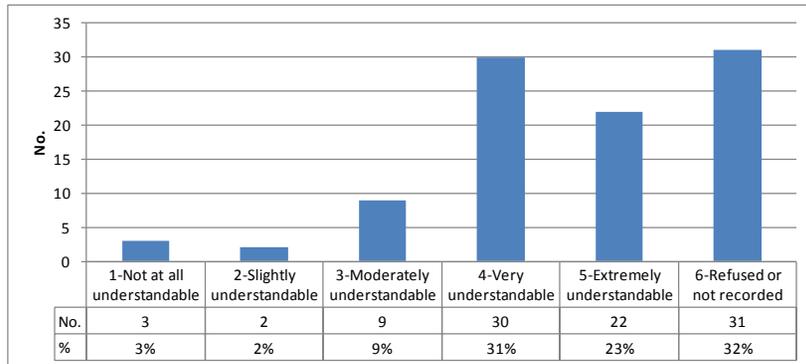
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



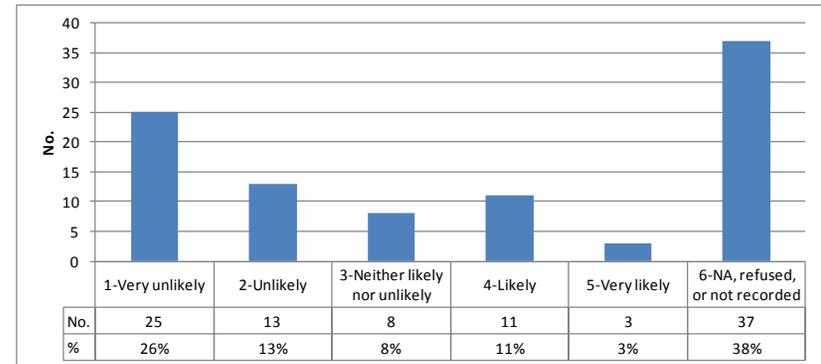
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



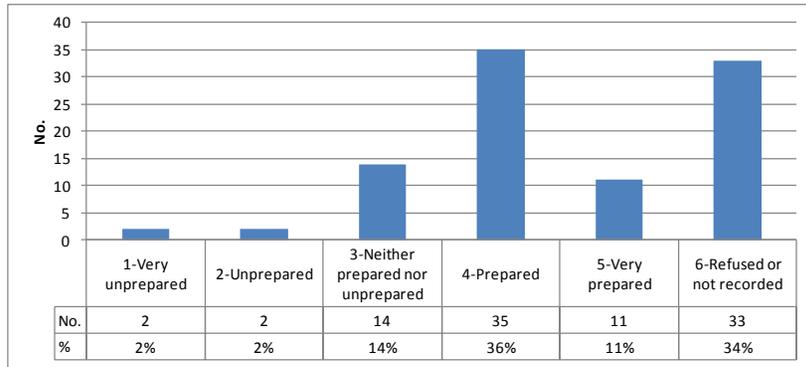
**How understandable is the message?**



**(If with kids) How likely would you be to let kids 12 and under go in the water?**



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

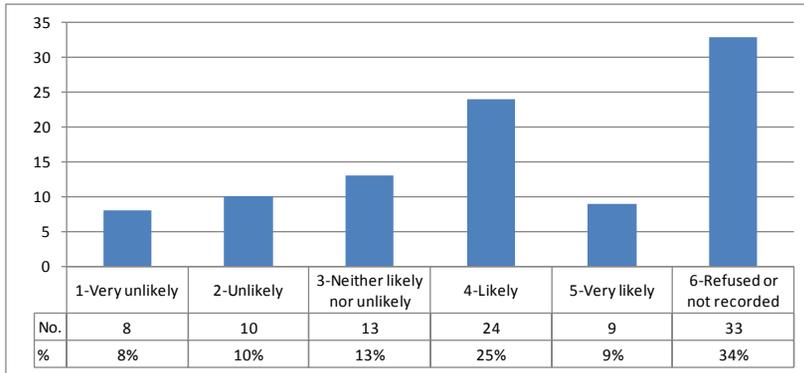
Theme of Comment	Count
Not water or beach related	11
Common sense	5
Other	3
<b>Total</b>	<b>19</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

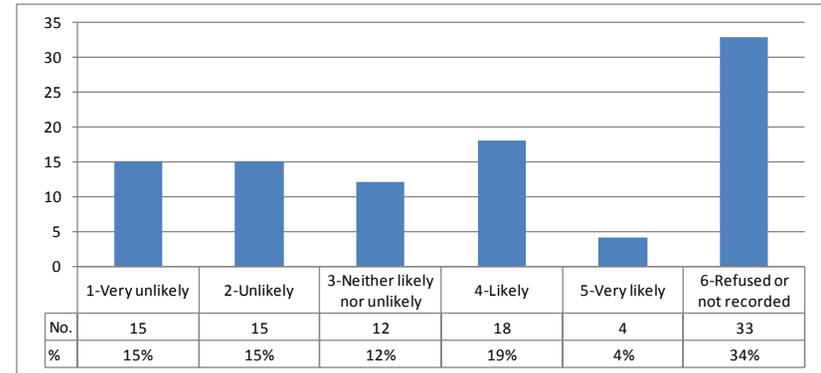
- Check water conditions
- Children are over 14, so...
- Do anyway-not related to water
- Doesn't make me think about the weather
- Doesn't pertain to water
- Doesn't refer to water
- Doesn't tell me how conditions are. It's parents' responsibility.
- Feel like kids get lost
- Feel like, just watch your kids
- It's about kids
- No
- Not connected with weather
- Not necessarily related to water
- Not related to beach
- Not related to water
- Nothing about water conditions
- Obvious-anywhere! on dry land or not
- Why keep them close?

**Got Kids? Don't Forget Their Lifejackets**

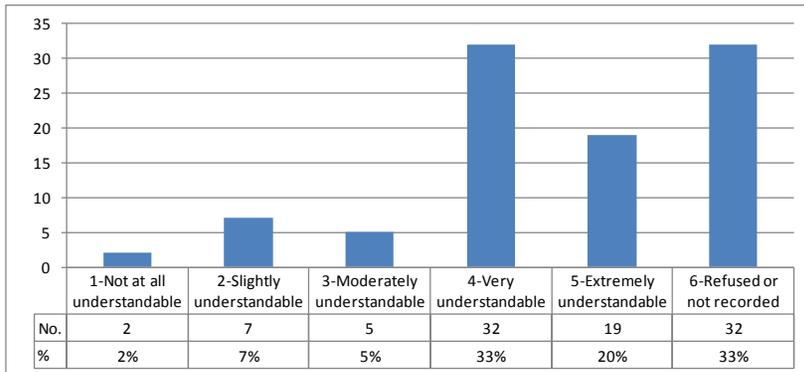
If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?



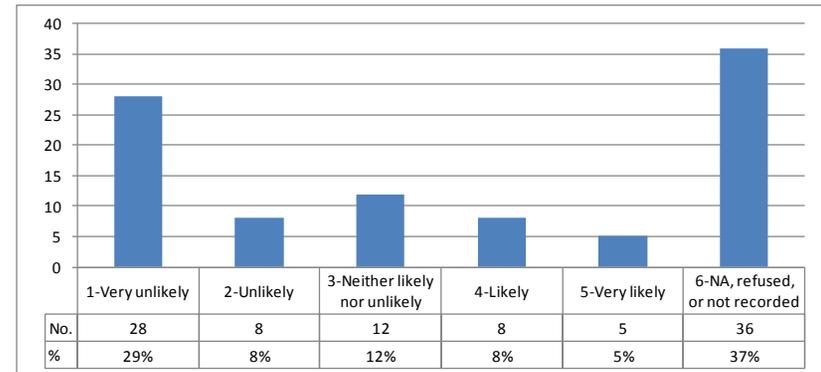
If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?



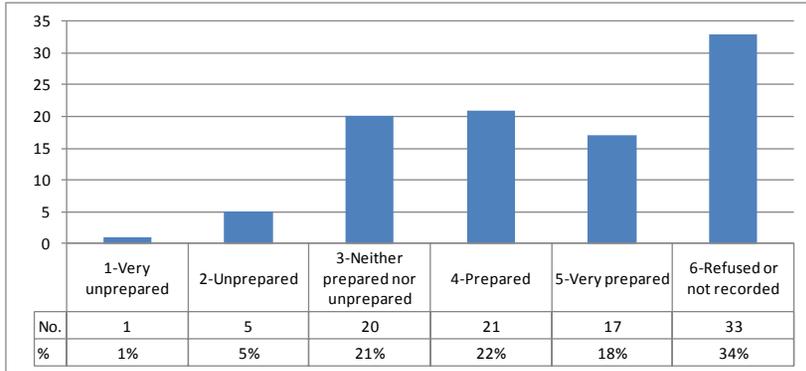
How understandable is the message?



(If with kids) How likely would you be to let kids 12 and under go in the water?



**Overall, how well has this message prepared you (and your family) to stay safe at the beach?**



**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [CATEGORIZED]**

Theme of Comment	Count
Not beach weather or water related	10
Lifejackets good	5
Other	7
Common sense	2
<b>Total</b>	<b>24</b>
Note: Verbatim comments with more than one theme are counted separately.	

**Which parts of the message are the least understandable? Are there any words or phrases that are not clear? [VERBATIM]**

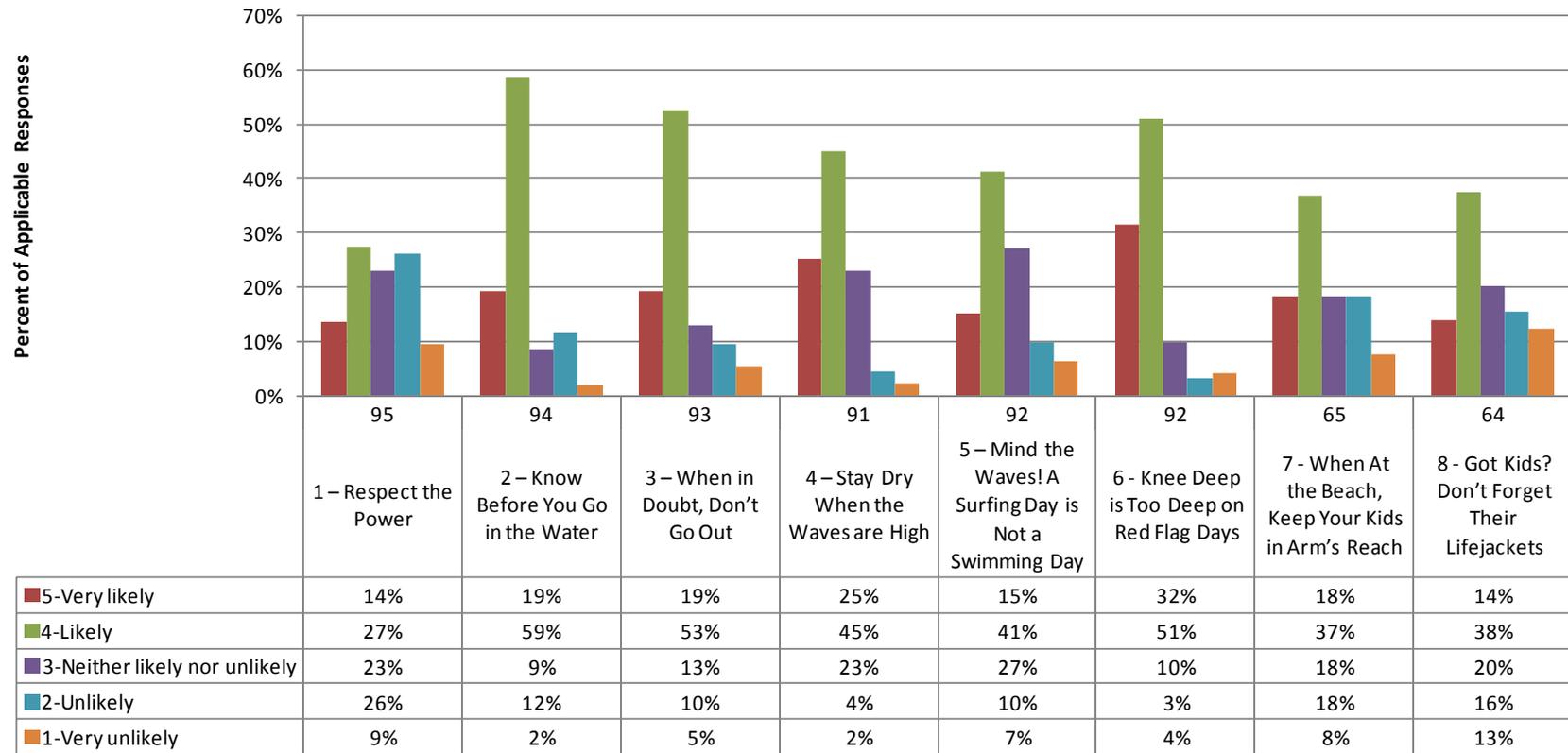
- Age(young) of kids?
- Boring message
- Check water conditions
- Common sense
- Doesn't associate conditions with need for gear. I bring life vests every time!
- Doesn't imply beach weather
- Don't know
- I like it, my kids wear life jackets.
- Just about kids
- Just don't check
- Life jackets aren't necessarily tied to bad conditions
- Life jackets on boat or swimming
- NA
- NO
- Not related to weather
- Not telling me water is dangerous
- Not water related. For boat
- Nothing
- Slogan is not strong enough
- Tells-Nothing about water condition
- Watch your kids, not about waves
- not related with weather

**Results by Question, Across Slogans**

If you saw this message before coming to the beach [show respondent test message] how likely would you be to check on beach conditions before going?

Message	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely	Refused or not recorded	Total
1 – Respect the Power	9	25	22	26	13	2	97
2 – Know Before You Go in the Water	2	11	8	55	18	3	97
3 – When in Doubt, Don’t Go Out	5	9	12	49	18	4	97
4 – Stay Dry When the Waves are High	2	4	21	41	23	6	97
5 – Mind the Waves! A Surfing Day is Not a Swimming Day	6	9	25	38	14	5	97
6 - Knee Deep is Too Deep on Red Flag Days	4	3	9	47	29	5	97
7 - When At the Beach, Keep Your Kids in Arm’s Reach	5	12	12	24	12	32	97
8 - Got Kids? Don’t Forget Their Lifejackets	8	10	13	24	9	33	97

**If you saw this message before coming to the beach, how likely would you be to check on beach conditions before going?**

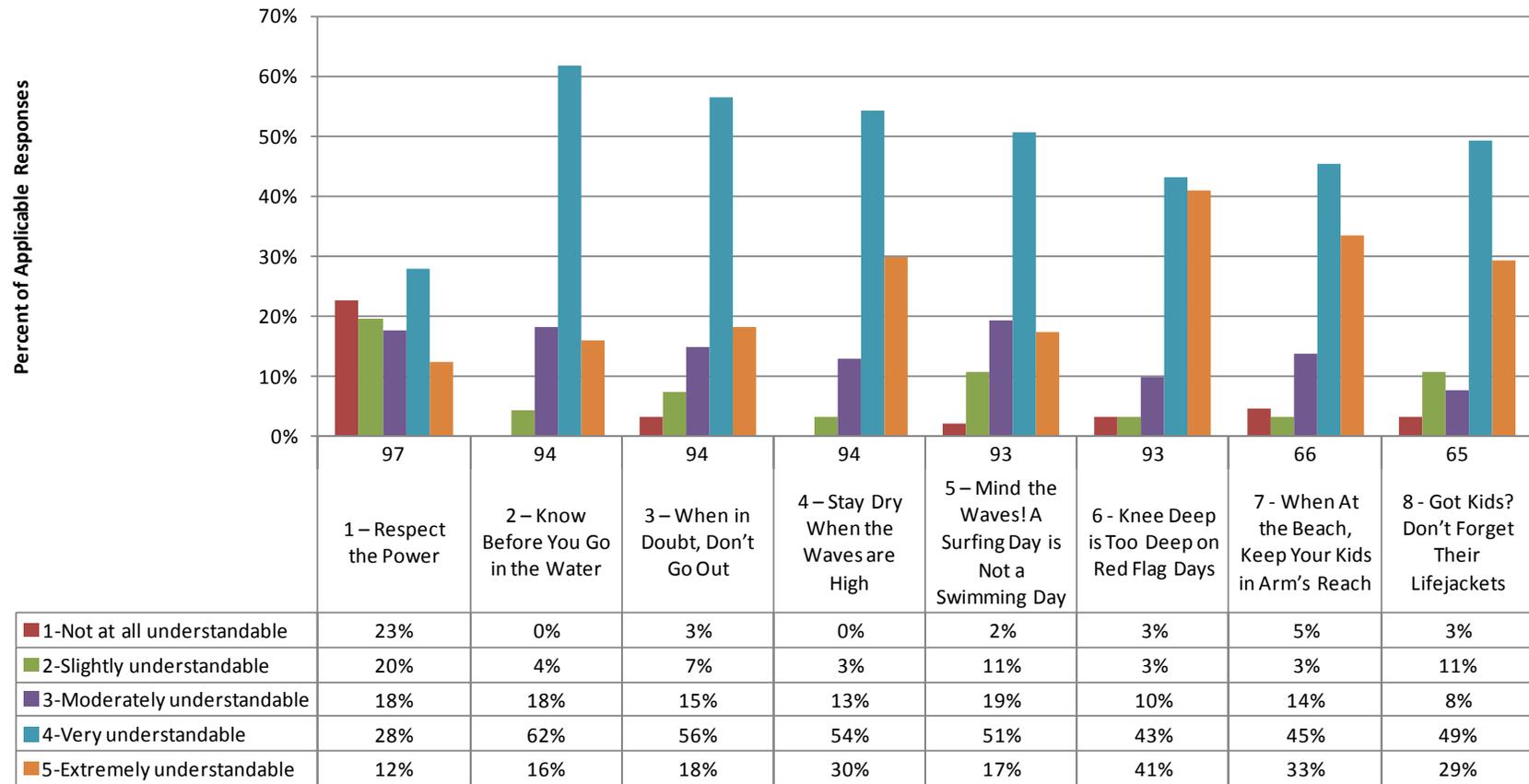


Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

**How understandable is the message?**

Message	Not at all understandable	Slightly understandable	Moderately understandable	Very understandable	Extremely understandable	Refused or not recorded	Total
<b>1 – Respect the Power</b>	22	19	17	27	12	0	97
<b>2 – Know Before You Go in the Water</b>	0	4	17	58	15	3	97
<b>3 – When in Doubt, Don’t Go Out</b>	3	7	14	53	17	3	97
<b>4 – Stay Dry When the Waves are High</b>	0	3	12	51	28	3	97
<b>5 – Mind the Waves! A Surfing Day is Not a Swimming Day</b>	2	10	18	47	16	4	97
<b>6 - Knee Deep is Too Deep on Red Flag Days</b>	3	3	9	40	38	4	97
<b>7 - When At the Beach, Keep Your Kids in Arm’s Reach</b>	3	2	9	30	22	31	97
<b>8 - Got Kids? Don’t Forget Their Lifejackets</b>	2	7	5	32	19	32	97

## How understandable is the message?

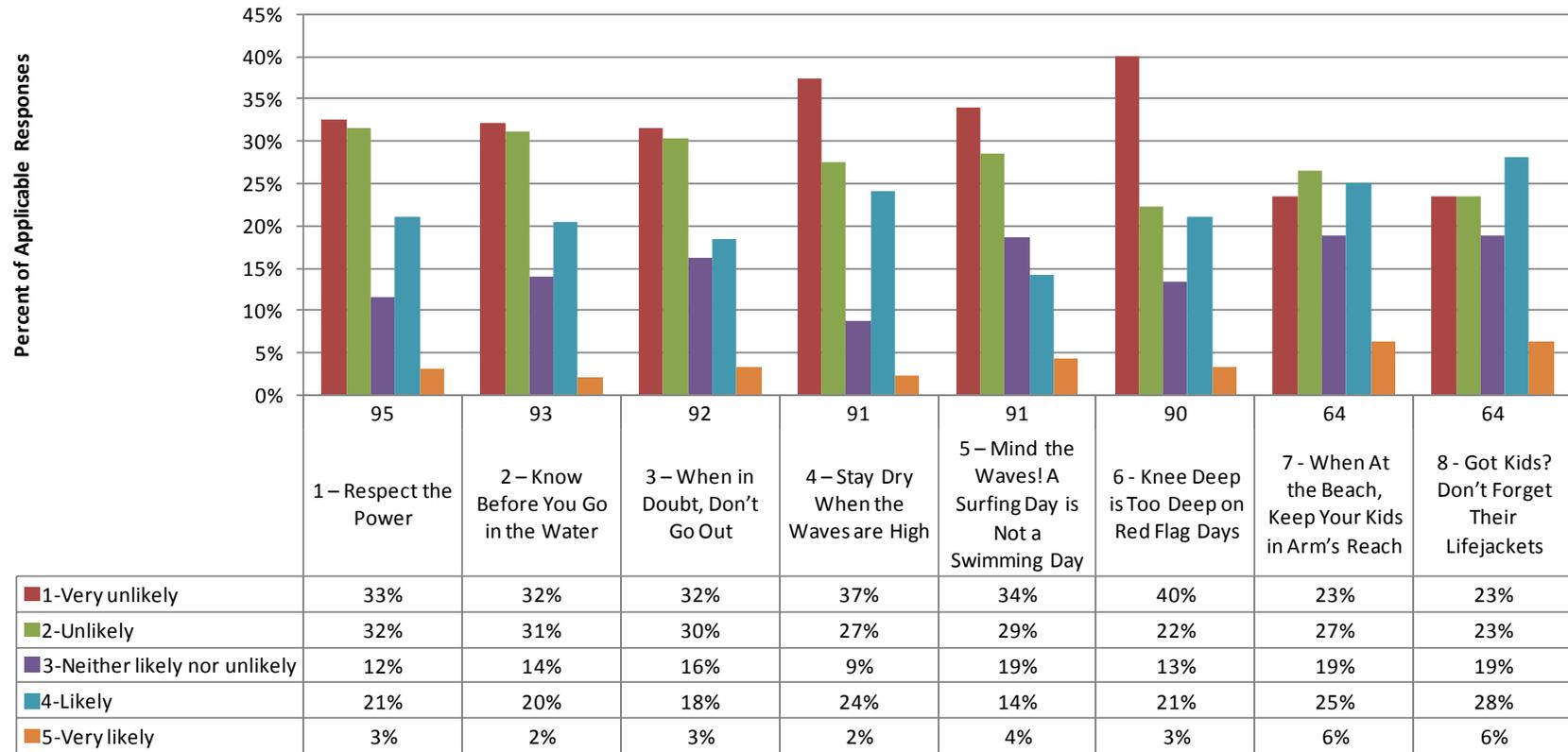


Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?

Message	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely	Refused or not recorded	Total
1 – Respect the Power	31	30	11	20	3	2	97
2 – Know Before You Go in the Water	30	29	13	19	2	4	97
3 – When in Doubt, Don't Go Out	29	28	15	17	3	5	97
4 – Stay Dry When the Waves are High	34	25	8	22	2	6	97
5 – Mind the Waves! A Surfing Day is Not a Swimming Day	31	26	17	13	4	6	97
6 - Knee Deep is Too Deep on Red Flag Days	36	20	12	19	3	7	97
7 - When At the Beach, Keep Your Kids in Arm's Reach	15	17	12	16	4	33	97
8 - Got Kids? Don't Forget Their Lifejackets	15	15	12	18	4	33	97

## If you knew there were high waves or dangerous currents that day and saw this message, how likely would you be to go in the water?

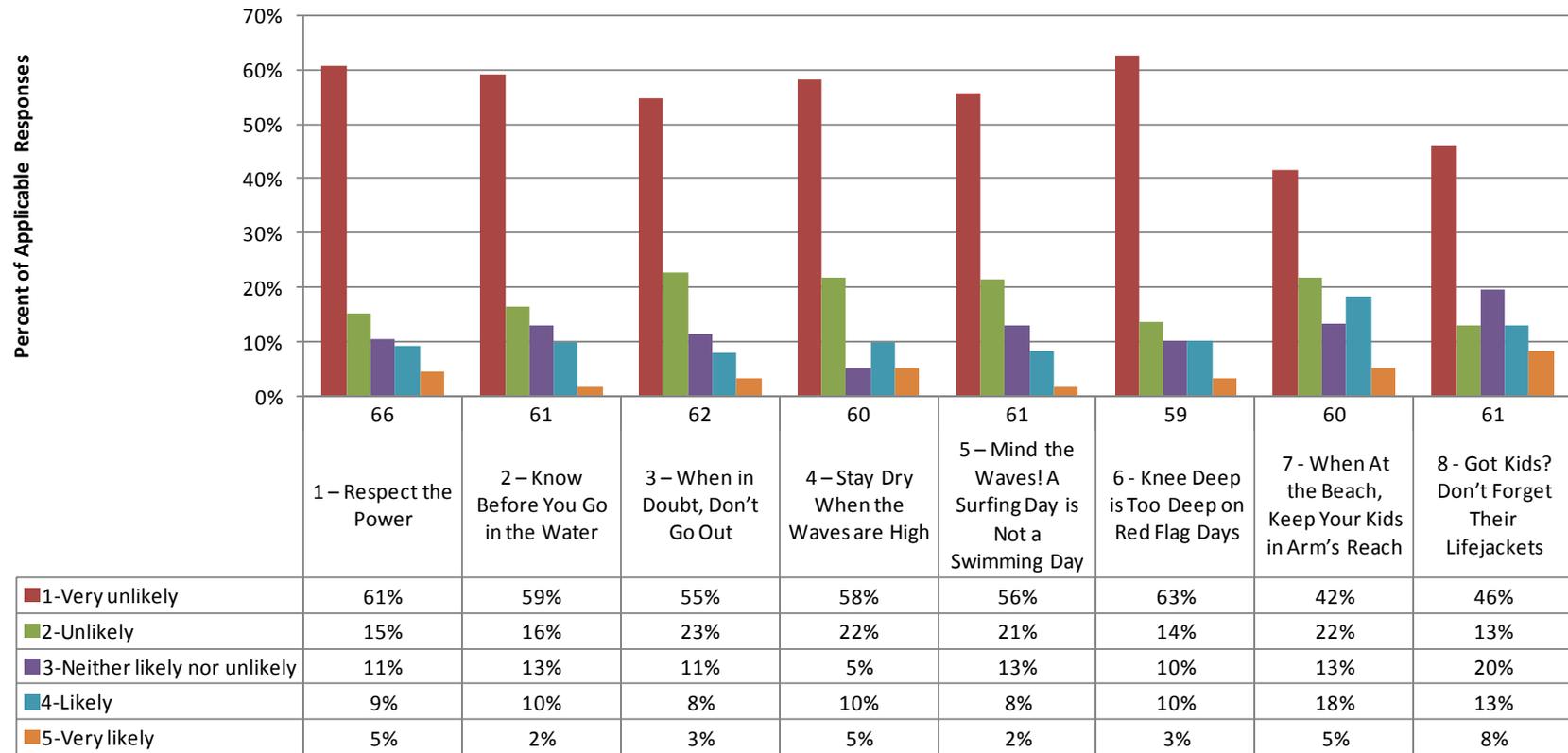


Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

(If with kids) How likely would you be to let kids 12 and under go in the water?

Message	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely	NA, refused, or not recorded	Total
1 – Respect the Power	40	10	7	6	3	31	97
2 – Know Before You Go in the Water	36	10	8	6	1	36	97
3 – When in Doubt, Don't Go Out	34	14	7	5	2	35	97
4 – Stay Dry When the Waves are High	35	13	3	6	3	37	97
5 – Mind the Waves! A Surfing Day is Not a Swimming Day	34	13	8	5	1	36	97
6 - Knee Deep is Too Deep on Red Flag Days	37	8	6	6	2	38	97
7 - When At the Beach, Keep Your Kids in Arm's Reach	25	13	8	11	3	37	97
8 - Got Kids? Don't Forget Their Lifejackets	28	8	12	8	5	36	97

## (If with kids) How likely would you be to let kids 12 and under go in the water?

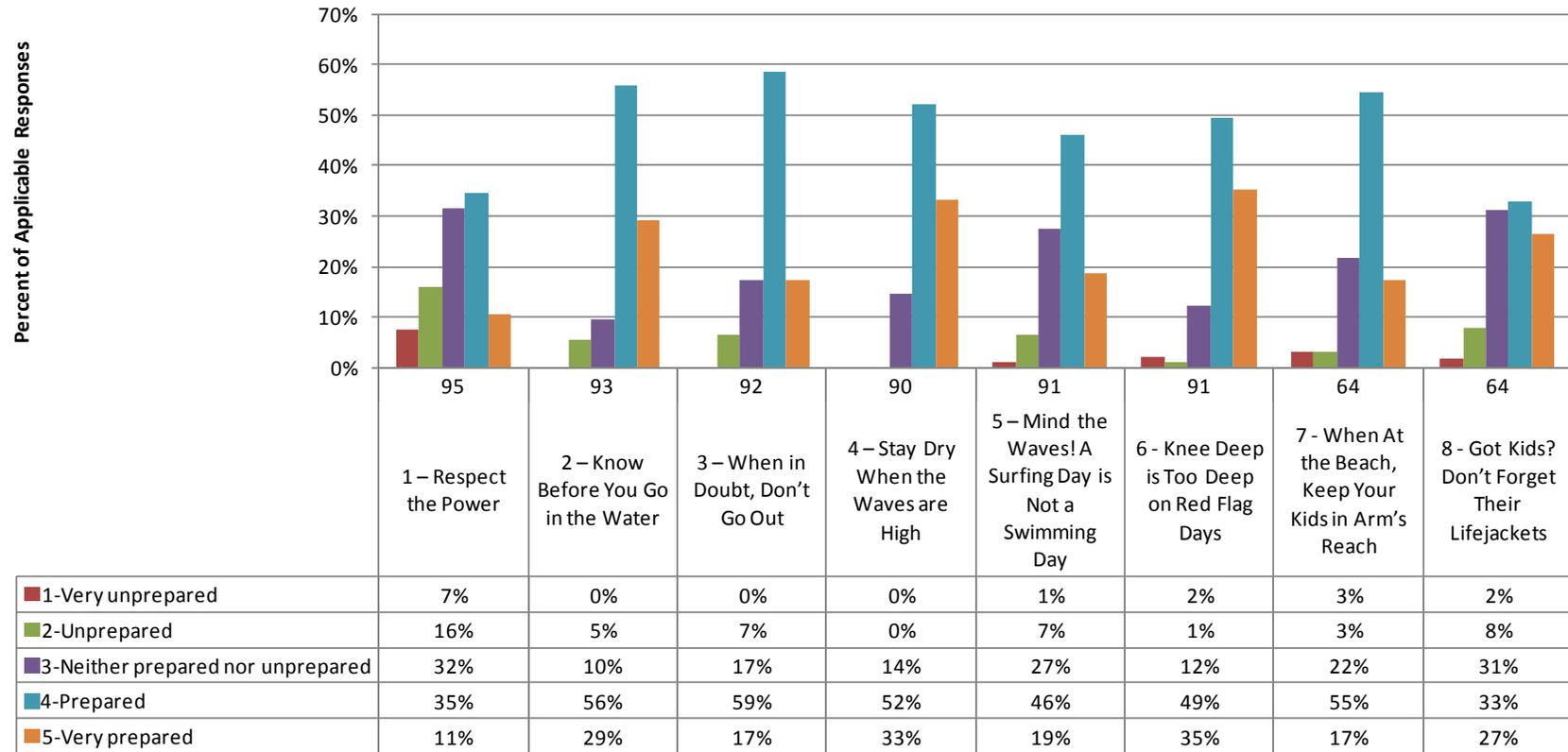


Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

Overall, how well has this message prepared you (and your family) to stay safe at the beach?

Message	Very unprepared	Unprepared	Neither prepared nor unprepared	Prepared	Very prepared	Refused or not recorded	Total
1 – Respect the Power	7	15	30	33	10	2	97
2 – Know Before You Go in the Water	0	5	9	52	27	4	97
3 – When in Doubt, Don't Go Out	0	6	16	54	16	5	97
4 – Stay Dry When the Waves are High	0	0	13	47	30	7	97
5 – Mind the Waves! A Surfing Day is Not a Swimming Day	1	6	25	42	17	6	97
6 - Knee Deep is Too Deep on Red Flag Days	2	1	11	45	32	6	97
7 - When At the Beach, Keep Your Kids in Arm's Reach	2	2	14	35	11	33	97
8 - Got Kids? Don't Forget Their Lifejackets	1	5	20	21	17	33	97

## Overall, how well has this message prepared you (and your family) to stay safe at the beach?



Note: The numbers in the horizontal axis labels represent the number of responses to the question out of a total of 97 survey responses. Those who skipped the question or never saw the question are not included here.

**How to assess conditions and escape a current**

**When you arrive at the beach, how do you decide if it is safe for you (and any children or young adults with you) to enter the water? [CATEGORIZED]**

Theme of Comment	Count
Look at the water, waves, people	54
Check flag on beach	51
Wade into water	11
Check weather before leaving	3
Stay out of water	1
Blank	3
<b>Total</b>	<b>123</b>
Note: Verbatim comments with more than one theme are counted separately.	

- Always check conditions. Check the flag
- Based on experience, flag
- By looking at waves
- By wading into the water
- By walk in my self and feel under toe or by flag
- Check condition of water
- Check flag
- Check flag, listen to water
- Check flag, waves
- Check flags
- Check flags/look at waves
- Check red flag, wind
- Check sign and color of flag
- Check the waves and keep the kids in shallow water
- Check water condition; Check flag, wind; People in water
- Check water, look at flag
- Check waves, drop-off
- Check weather conditions before going. Check wave conditions-look for signs regarding currents
- Check winds/high waves
- Don't go water at all
- Flag
- Flag and check H2O
- Flag condition, wave height
- Flag system, remind children rip current day
- Flag, looking size of the waves
- Flag, water conditions
- Flag/waves
- Flags, check news conditions
- Get into water see how feel
- Green flag on pole should have more
- Height of surface, whether storm is approaching, Don't check flag
- Height of wave, speed of wind, feel of under toe (strength)
- I check the flag and water temperature
- If there is whitecaps on Lake Michigan or not-usually tough waves
- If there were people in the water
- It it is nice day and no sign of flag
- Look at conditions, waves, and flag
- Look at flag
- Look at flag, size of waves
- Look at flags

**When you arrive at the beach, how do you decide if it is safe for you (and any children or young adults with you) to enter the water? Continued...**

- Look at sign and flag when coming in
- Look at the flag
- Look at the water
- Look at water
- Look at water, how calm
- Look at water, wind
- Look at water
- Look at waves and flag
- Look at waves, winds
- Look at waves/flag
- Look at weather conditions-check water
- Look flag
- Look flag and waves
- Look flag. Visual conditions (do I see lots of people?)
- Look for signs
- Look see it is calm, see people, flag
- Looking at flag and water
- Looking at the condition
- Looking at the water, check weather.com before coming
- Red flag
- Red flag, see how big the waves are
- See flag
- See the waves
- See waves
- See wind, use common sense
- See, tide and current
- Size of waves & current- see how strong it is
- Temperature of water
- Test water, go in and check currents
- Test water, look at water
- Tested it first
- Watch waves and weather
- Water conditions
- Wave
- Wave height, other people are in the water
- Wave size
- Waves
- Waves, flag
- What lifeguard says/weather/look waves
- When its yellow flag
- how the waves are (white caps)
- see how high the waves are
- size of winds and waves
- the look of the water

**If you were walking along the pier and saw someone about to jump off into the water, what would you tell them?**

Theme of Comment	Count
Nothing	46
Don't do it	25
Be careful	21
Check water, obstacles first	13
Blank	4
<b>Total</b>	<b>109</b>
Note: Verbatim comments with more than one theme are counted separately.	

- If young- ask where their parents are
- If don't know say nothing.
- Are you sure that in safe?
- Ask how deep enough
- Be careful
- Be careful!
- Be careful, very unsafe
- Be careful-kid; Nothing-adult
- Be safe
- Call 911, talk them down
- Did you check there is rock?
- Do it! It really depends on how well of a swimmer they are
- Don't do it
- Don't do it! You need some help
- Don't do that
- Don't jump
- Don't say anything
- Don't!
- Don't! Not sure
- Go go!
- Honestly, I'd probably do the same thing!
- I would ask them whether it is safe
- I wouldn't say anything, it's their choice
- Idiot
- If situation is dangerous, we will say something
- (If under 12) do you know what you get into? Respect strength of the lake
- If water condition is bad, tell them not to do
- It's dangerous
- It's not a good idea
- It's not safe
- Keep eye out. Not say anything. Is it safe?
- Look for big rock
- Make sure you know how deep it is, not a good idea
- No
- Not do it
- Not good idea
- Not safe
- Not safe to do
- Not safe to jump
- Not safe! There might be high current
- Not to do it, or nothing
- Not to jump
- Not to jump-kid; Nothing-adult
- Nothing
- Nothing, because water seems calm & safe
- Nothing.
- Please don't do that
- Please don't you could hit head
- Say nothing

**If you were walking along the pier and saw someone about to jump off into the water, what would you tell them? Continued...**

- Say nothing if I don't know
- Say nothing, unless is very bad weather
- Say, nothing
- Stop!
- Tell nothing, I heard that it's really not safe, though.
- That's dangerous
- To stop because it is not safe
- Try to discourage them not to jump
- Watch out for rocks
- Watch water conditions
- You want a life jacket? Be careful, Don't swim alone
- nothing
- nothing, I do it too
- say nothing
- you're stupid

**If you were on the beach and saw someone caught in a current pulling them away from shore, what would you tell them to do?**

Theme of Comment	Count
Swim parallel to shore	40
Relax, stay calm, don't panic	18
Get help, lifeguard, call 911	15
Don't know	11
Swim toward shore	10
Go rescue the person	7
Swim with current	6
Swim at angle	4
Blank	4
<b>Total</b>	<b>115</b>
Note: Verbatim comments with more than one theme are counted separately.	

- Ask for help
- Call lifeguard
- Call, 911
- Come in?
- D.K.
- Don't do anything
- Don't fight, swim parallel to the shore
- Don't fight. Go in to help.
- Don't know
- Don't know. Go with waves
- Don't panic
- Don't panic, just tread water, to with it
- Don't swim against them, swim parallel
- Get a lifeguard
- Get people to help pull in
- Go different side of current
- Go get help
- Go in to help. Tell them to swim parallel
- Go with current then swim parallel to shore
- I am not sure
- I don't know
- I don't know, I am not prepared for that situation
- I'd jump in and save them
- If I can help, I would help. If not, ask for help.
- If they have life jacket, I will not doing anything, if not, just say don't panic and swim parallel to the beach
- Just flow with that current. Drift back to the south. Don't fight against it.
- Not educated on currents. Would seek help for shore
- Not fight, and wait until they flow to sand bar
- Not sure
- Not to fight current
- Not to panic, swim parallel to the shore.
- Not to struggle, be calm
- Relax

**If you were on the beach and saw someone caught in a current pulling them away from shore, what would you tell them to do? Continued...**

- Relax, Don't swim against it
- Relax, get life guard
- Ride it out and not struggle
- Run out to help. Come toward shore
- Say nothing
- Say, come back
- Say, get out the water and get help
- Scream, come back!
- Stay calm, don't panic
- Stay calm, not sure
- Swim against current
- Swim along shore
- Swim back to the shallow area
- Swim cross-ways
- Swim horizontal
- Swim in
- Swim out to current
- Swim parallel
- Swim parallel to beach
- Swim parallel to dock and shore
- Swim parallel to shore
- Swim parallel to shore, not panic
- Swim parallel to the beach
- Swim parallel to the shore
- Swim parallel to water, check phone
- Swim parallel. Don't panic
- Swim side way
- Swim side way, parallel to the shore
- Swim side ways
- Swim side ways to shore
- Swim side-way
- Swim side-way to beach
- Swim side-ways
- Swim side-ways along the beach
- Swim side-ways, Throw float
- Swim sideways, don't panic
- Swim to shore
- Swim with current
- Swim with current then back
- Swim with current. Don't fight it. It will exhaust you
- Swim with the current don't fight it-I will get help
- Swim with the current! I'll get help
- Swim wrong side of beach, call to help
- Swim, call for help
- Swimming toward shore
- Swimming with the beach
- To swim parallel
- Try to roll out of it
- swim parallel to water
- to swim on an angle to the beach, I would also try and go save them

If you were on the beach and saw someone caught in a current pulling them up or down the beach, what would you tell them to do?

Theme of Comment	Count
Relax, stay calm, don't panic	20
Don't know	18
Get help, lifeguard, 911	17
Swim parallel to shore	15
Swim toward shore	11
Go rescue the person	10
Swim with current	5
Nothing	3
Swim against current	2
Swim at angle	1
Blank	5
<b>Total</b>	<b>107</b>
Note: Verbatim comments with more than one theme are counted separately.	

- Be calm and get help
- Be calm, swim along shore
- Call, 911
- Calling 911. Call for help
- Come in? Swim against it
- Come to the shallow water
- D.K. Get help
- Don't Panic
- Don't know
- Don't know. Don't fight it
- Don't panic
- Get a lifeguard
- Get out of the water/get help
- Get out to the current
- Go get help
- Go in to help
- Go in to help. Are you ok? ;
- Go with current
- Go with the waves
- Grab my hands
- Help
- I am not sure
- I don't know
- I'd save them
- Just relax
- Keep buffering them
- Lean back, keep your head on water.  
Don't fight against current
- Let them current take and come out
- Not sure
- Relax, Don't swim against it
- Relax, Go with the waves
- Relax. DK.
- Same
- Same above
- Same as #56
- Same as above
- Same with above, get out there
- Say nothing

**If you were on the beach and saw someone caught in a current pulling them up or down the beach, what would you tell them to do? Continued...**

- Scream, go to ask help!
- Slowly look into shore where you can get to move shallow water. So I can throw out something. See above chair of people.
- Stay calm, not sure
- Stay on top of water, don't panic
- Swim against the current
- Swim back and out!
- Swim cross-ways
- Swim for shore
- Swim in
- Swim parallel
- Swim parallel to dock and shore
- Swim parallel to shore
- Swim parallel to the beach
- Swim parallel to the beach, I don't know
- Swim parallel to the shore
- Swim parallel to the shore, call life guard
- Swim perpendicular to current
- Swim sideways, be calm
- Swim to shore
- Swim toward beach
- Swim toward shallow water
- Swim toward shore
- Swim toward the beach
- Swim with current
- Swim with it
- Swim with it! I'll get help
- Swimming with the beach, and swim parallel
- Tell my kids to walk back to the original spot they entered the water
- To get help
- Tread water and go with it
- Tread water to non-current area
- Using tube
- Wait, enjoy the wave, you will reach the shore eventually
- same
- same above
- same as above
- same as above or look for help
- swim side way
- swim toward shore

**Interviewer record gender**

Age	Count	Percent
Male	32	33%
Female	62	64%
Not recorded	3	3%
<b>Total</b>	<b>97</b>	<b>100%</b>

**What is the highest level of education that you have completed?**

Education	Count	Percent
High School or GED	23	24%
Associate degree	14	14%
Trade, technical, or vocational education	7	7%
Bachelor's degree	33	34%
Master's degree or professional doctorate (JD, MD)	11	11%
Ph.D.	4	4%
Refused or not recorded	5	5%
<b>Total</b>	<b>97</b>	<b>100%</b>

**Are you, yourself, of Hispanic or Latino origin or descent, such as Mexican, Puerto Rican, Cuban, or other Spanish background?**

	Count	Percent
Yes, I am of Hispanic or Latino origin or descent.	1	1%
No, I am not of Hispanic or Latino origin or descent.	92	95%
Refused or not recorded.	4	4%
<b>Total</b>	<b>97</b>	<b>100%</b>

**What is your race? [Please select all that apply.]**

Race	Count	Percent
American Indian or Alaska Native	0	0%
Asian	3	3%
Black or African American	1	1%
Native Hawaiian or Other Pacific Islander	0	0%
White	88	91%
Refused or not recorded	1	1%
Other	0	0%

## Appendix D: Literature Review

### Introduction

Under NOAA Coastal Services Center Task Order 27, *Great Lakes Beach Hazards: Developing a Risk Communication Strategy That Addresses All the Threats in the Swim Zone*, ERG has performed a targeted literature review to help lay the foundation for the project as a whole. This review focuses on literature addressing risk communication with respect to beach hazards, beachgoer perception of risks, and behavior change. While the focus of the project is the Great Lakes/Lake Michigan, this review includes relevant studies from other areas of the United States and other countries with beach hazards forecasts or outreach campaigns.

Unless otherwise noted, the “Key Findings” summarized for each source come directly from the document cited.

### Current & Wave Research

#### NOAA Great Lakes Current Incident Database

Title	Author/Organization	Year	Type	Citation
NOAA Great Lakes Current Database, 2002-2012	NOAA/NWS-Marquette	2012	Website	i
NOAA Great Lakes Current Database, 2012 Update	NOAA/NWS-Marquette	2012	Website	ii

#### Key Findings

- “The abnormally high amount of rescues in 2009, 2011, and 2012 were due to isolated incidents where 15-30 people had to be rescued during one dangerous afternoon.”

#### ERG Observations

- The number of incidents reported shows an upward trend.
- The ratio of fatalities to incidents shows a downward trend.
- However, because many years feature “single-day” spikes and because of other factors, trends in general and trends with respect to age, race, etc. of drowning victims may be difficult to discern. This points to need for clear baseline data and consistent data collection.

#### NOAA/NWS Observations

- Bob Dukesherer notes numbers reported in the media may be inaccurate due to misclassification of any drowning incident as a rip-current-related when it may well have been from a different type of hazard (such as strong waves or structural currents).

## Brander—The RIPS SAFE Project

Title	Author/Organization	Year	Type	Citation
The RIPS SAFE Project – A holistic approach to understanding the rip current hazard	R. Brander	2012	Conference Proceeding	iii

### Background

- Field experiments were conducted at Bondi Beach in September 2010 and Shelly Beach, Central Coast, NSW in December 2011.
- Groups of 4–6 PVC drifters with attached GPS devices were released into rip currents at several locations along the beach.
  - Simultaneously, teams of volunteers with a GPS attached entered rips and were given instructions at various times to: swim parallel left or right to escape the rip, stay afloat, or swim against the rip.
  - At Shelly Beach, five volunteers wore heart rate monitors to record the exertion associated with each action. Measurements were conducted approximately three hours each day around low tide. These experiments are ongoing.
- An online and hardcopy survey was designed to obtain information on the demographics, swimming background, rip and beach safety knowledge and overall experience of people who have been caught in a rip current before.

### Key Findings

- Over 200 GPS drifter deployments have been made with more than 90% re-circulating within the surf zone.
  - Most of the exits were associated with topographic rips.
- Swimmers entered the rip currents over 300 times during the experiments.
  - Almost all (99%) of the swimmers who were instructed to swim parallel left or right reached the adjacent sandbars.
  - 99% of the swimmers who simply floated were recirculated onto the sandbars where they could stand up.
    - Swimming parallel generally had shorter rip escape times to floating, but escape times and energy expenditure varied depending on the swim direction and starting location.
- Survey respondents were predominantly an informed group in terms of rip current knowledge and had a high self-rated swimming ability.
  - Preliminary insights from the survey show that most respondents recalled a ‘swim across the rip/parallel to the beach’ message when caught in the rip and most escaped unassisted by acting on this message.
  - A quarter of respondents recalled a message of ‘not to panic’
    - Short answer responses revealed that the onset of panic inhibited some respondents from recalling or enacting any other type of beach safety message when caught in the rip current.
- Floating and swimming parallel were both viable options for escaping rip currents under the conditions measured.
  - Floating is a temporally longer escape strategy, but uses less energy.

- Swimming parallel can provide a faster escape, but choice of swimming direction is crucial and energy expenditure is generally greater.

### WPI— Enhancing Rip Current/ Beach Safety Awareness Among Teenagers

Title	Author/Organization	Year	Type	Citation
Enhancing Rip Current/ Beach Safety Awareness Among Teenagers	M. Conway, et al. (WPI)/ NOAA CSC	2006	Paper	iv

#### Background

- Every year approximately 23,000 people are caught in rip currents and must be rescued by beach lifeguards.<sup>3</sup>
  - Despite the efforts of lifeguards, there are, on average, 100 fatalities each year related to rip currents.
- Lack of awareness about how to avoid and safely escape the hazards of rip currents is widespread in the general public especially among teenagers, the age group most likely to be swimming at the beach and caught in rip currents.
  - Working with the Sea Grant division of the National Oceanic and Atmospheric Administration (NOAA), the goal of this project was to design a campaign that would find powerful and cost effective means to educate teenagers about rip currents.

#### Key Findings

- The Teen Rip Current Campaign, the name we refer to as our main recommendations for NOAA, is a supplement to the existing Break the Grip of the Rip Campaign.
  - NOAA’s National Weather Service (NWS), NOAA’s National Sea Grant College Program and the United States Lifesaving Association (USLA) joined together to form a Rip Current Task Force in order to increase rip current awareness nationally.
    - The task force launched the “Break the Grip of the Rip” campaign in 2004.
    - Some of the materials the campaign has developed include a brochure in English and Spanish, beach signs, a website, several DVDs and public service announcements.
      - These materials are predominantly developed for a broad, general audience.
- To accomplish the Teen Rip Current Campaign, we have proposed a campaign with three components:
  - Internet chat bots
  - Educational enhancement

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<sup>3</sup> Note that there are essentially no lifeguards present on the eastern shore of Lake Michigan.



## Brighton—Rip current related drowning deaths in Australia 2004-2011

Title	Author/Organization	Year	Type	Citation
Rip current related drowning deaths in Australia, 2004-2011	B. Brighton	2012	Conference Proceeding	vi

### Background

- A retrospective search was undertaken for fatal and non-fatal rip related drowning incidents from the National Coroners Information System (NCIS), SurfGuard Incident Reporting Database (IRD), and Media Monitors, between 1 July 2004 and 30 June 2011.
- Non-fatal rip related incidents were included if they involved a major rescue, which includes a rescue where a person who required assistance was returned to shore (or place of safety) and who, without assistance, would have drowned or become injured.
  - Incidents were considered rip related if the incident reports included an associated ‘rip type’ or included the option ‘rip type’ within the ‘contributing factors’ category; or the ‘incident description’ included the patient being caught in a rip.
  - Descriptions included as ‘rip related’ in this analysis include text such as: ‘swept/washed offshore/out to sea’; ‘struggling in currents unable to return to shore’; or ‘caught in strong current’
    - Except where incident is at a river mouth or creek.

### Key Findings

- There were 629 total fatal coastal drowning deaths recorded and rip currents were a factor in 145 fatalities (22.9%), an average of 21 per year.
  - The activities involved included swimming/wading (110, 32.6%), attempting a rescue (20, 13.8%), and watercraft use (9, 6.2%).
- There were a total of 1,246 ‘major rescues’ recorded from 1 July 2004 to 30 June 2011.
- Males were involved in at least 292 (48.7%) incidents; Females were involved in at least 156 (26.0%).
  - There were 152 (25.3%) incidents where gender was not recorded.
- Priority strategies for rip-related drowning prevention include educating beach-goers to:
  - Swim between the flags
  - Identify rip currents
  - Appropriate responses if caught in a rip.
- Interventions should target young males in particular, as they are overrepresented in rip-related drowning incidents.

### Sherker—Beachgoers’ beliefs and behaviours

Title	Author/Organization	Year	Type	Citation
Beachgoers’ beliefs and behaviors in relation to beach flags and rip currents	S. Sherker, et al.	2010	Paper	vii

#### Background

- Beachgoers at beaches in NSW were interviewed about their swimming beliefs and behaviors.
- They were asked to indicate on pictures depicting beach scenarios involving beach flags and fixed rip currents, where they would and would not swim.
- Logistic regression analysis was undertaken to determine predictors of correct and incorrect swimming behavior.

#### Key Findings

- Ocean swimmers aged from 30 to 49 years may choose to swim outside the flags, though they may not necessarily be swimming in the rip.
- Swimming outside of the flags may be linked with experience.
- The flags appear to be attractive to parents and carers of children.
  - Whilst the flags indicate a relatively safe area of the beach, it is still vitally important for parents and carers to supervise children in this area.
- Basic rip current knowledge is an essential component in developing national interventions aimed at reducing coastal drowning.
  - Beachgoers clearly need to know what a rip looks like in order to actively avoid swimming in it.

### Leatherman and Fletemeyer—Rip Currents

Title	Author/Organization	Year	Type	Citation
Rip currents: Beach safety, physical oceanography, and wave modeling	S. Leatherman and J, Fletemeyer, eds.	2011	Book	viii

From the preface: This first ever book about rip currents emanated from the First International Rip Current Symposium held at Florida International University in Miami on February 17–19, 2010. More than 100 coastal scientists, engineers, forecast meteorologists, lifeguard chiefs, and other practitioners from ten countries participated in this three-day conference organized and chaired by Dr. Stephen P. Leatherman and Dr. John Fletemeyer.

Chapters of interest may include:

- Future Challenges for Rip Current Research and Outreach
- Rip Currents in the Great Lakes: An Unfortunate Truth
- Beach Safety Management in Brazil
- Rip Currents: Terminology and Pro-Active Beach Safety

## Demographics and Statistics (non-current-specific)

### Carl—Wisconsin drowning demographics

Title	Author/Organization	Year	Type	Citation
Recreational water safety in Wisconsin	R.L. Carl, et al.	2001	Paper	ix

#### Background

- This article reviews drowning mortality trends and statistics for Wisconsin and the United States, as well as current recommendations and legislation regarding water safety.

#### Key Findings

- Teenagers also have a higher drowning mortality rate, largely due to risk-taking behaviors in this age group.

### Driscoll—Alcohol and drowning

Title	Author/Organization	Year	Type	Citation
Review of the role of alcohol in drowning associated with recreational aquatic activity	T.R. Driscoll, et al.	2004	Paper	x

#### Key Findings

- Review of several studies showed that a majority (i.e. greater than 50%) of drowning victims over the age of 15 had a nonzero BAC. 35-50% of victims were legally drunk.
- Study concluded that: “alcohol [had been] detected in the blood in 30%–70% of persons who drown.”

### Peden—Drowning in children and adolescents (Australia)

Title	Author/Organization	Year	Type	Citation
A nine year analysis of drowning in children and adolescents aged 0-19 years in Australia recreational aquatic activity	A. Peden	2012	Conference Proceeding	xi

#### Background

- Drowning in children aged under five accounts for just over 50% of all child and adolescent (0–19) drowning deaths.
- There has been limited analysis of drowning deaths that occur in children and adolescents aged 5 to 19 years.
- In an attempt to further understand the problem, a comprehensive analysis of fatal drowning in children 0–19 years of age in Australia between 1 July 2002 and 30 June 2011 was conducted.

### Key Findings

- Gender plays a key role in drowning deaths, with 63% of drowning deaths in the 0–4 years age group being male, increasing to 87% of all drowning victims in the 15–19 years age group.
  - Males were also far more likely to consume alcohol prior to drowning with 81% of all cases involving alcohol being male victims.
- Twenty-four percent of drowning victims in the 15–19 years age group were visitors to that location. This highlights the notion that adolescents gain increasing independence and may venture further away from their immediate surroundings and put themselves at a higher risk of drowning.
- Drowning in children aged 5 to 19 years in Australia is a significant issue that has been neglected largely due to the comprehensive efforts to reduce the high rates of drowning experienced in children aged 0–4 years.
  - The increase in drowning in late adolescence points to the importance of swimming and water safety education in schools to build resilience through the use of knowledge and skills in the face of increased exposure to risks and hazards.

## Risk Perception and Beach Messaging (any hazard)

### White—Swimming between the flags

Title	Author/Organization	Year	Type	Citation
Swimming between the flags: a preliminary exploration of the influences of Australians' intentions to swim between the flags at patrolled beaches	K.M White & M.K. Hyde	2012	Paper	xii

### Key Findings

- Objective risk predicted willingness to swim beyond the flags (both distances) while subjective risk predicted willingness to swim up to 10 m outside the flags.
- People's intentions to swim between the flags were correlated with their behaviour at follow-up.

### McCool—Risk perception

Title	Author/Organization	Year	Type	Citation
Taking a risk perception approach to improving beach swimming safety	J. McCool, et al.	2009	Paper	xiii

### Key Findings

- Compared with males, females perceived greater severity, vulnerability, response efficacy, and concern regarding their risk of drowning.
- Males, Maori, and 16 to 29 year olds reported higher self-efficacy scores compared to females, other ethnic groups, and older participants, respectively.
- After controlling for confounding variables, people perceiving a greater threat (severity) of experiencing difficulty while swimming as well as those reporting higher response

efficacy (beliefs about the effectiveness of drowning prevention measures) were more likely to report safe swimming behavior.

### EPA BEACH Act Assessment

Title	Author/Organization	Year	Type	Citation
Assessing the Effectiveness of the Beaches Environmental Assessment and Coastal Health (BEACH) Act Notification Program	U.S. EPA Office of Policy	2011	Report	xiv
<i>Ibid</i> : Factsheet	U.S. EPA Office of Policy	2011	Factsheet	xv
<i>Ibid</i> : Embedded Case Studies	U.S. EPA Office of Policy	2011	Factsheet	See below

#### Background

- Comprehensive report on the success of current beach signage and outreach programs across the United States.
- Emphasis on risk perception and awareness in relation to water quality (i.e., bacteria counts).

#### Key Findings

- For beach signs...public awareness ranges from 2% to 54%, depending on the survey. Awareness of the existence of any notification method tends to be higher; for example, one survey found that 65% of residents and 45% of non-residents were aware of at least one source of information on water quality.
- Posting signs at the beach is crucial, since it is estimated that only 20% of beachgoing survey respondents check for information about water quality before visiting a beach.
- Findings suggest that simply making sure beachgoers see signs and hear about other notification methods prior to visiting a beach may be the greatest challenge for beach managers.
- Very little data are available on the extent to which notifications affect beachgoer understanding of risks. A few studies tested beachgoer understanding of beach signs in particular; these studies suggest that the signs reviewed do communicate messages effectively to the public.
- There are very limited data that can provide a foundation for a comprehensive evaluation of beach notification programs. While a few programs have conducted targeted studies to identify areas to improve, most programs have not conducted such research, and no programs have conducted a series of studies over time to assess changes in behavior as the beach notification programs evolved.
- The scarcity of data on the effects of beach notification substantially limits an evaluation of the outcomes or effectiveness of beach notification programs. Additional research in the form of surveys of beachgoers, tracking attendance records, and observational studies (all of which were outside the scope of this evaluation) would help assess program effectiveness.

- Interviews with state, tribal, and local beach program managers suggest that funding is a limiting factor, and therefore the paucity of primary research may be due to lack of resources to gather data.
- Beach notification programs use a complementary suite of notification messages.
- The content and format of beach notification messages varies, and examples drawn from states and localities suggest good practices.
- Notification messages reach only a fraction of beachgoers, but social networking tools, as well as traditional media, can expand the reach of these messages.
- Public awareness of beach advisories varies; but beachgoers who are aware of signs often find them helpful.
- Beach advisories appear to have some effect on behavior, but other factors may predominate.
- Beach notification programs have evolved based on experience, but little systematic evaluation of program effectiveness has been completed.

### EPA BEACH Act Assessment Case Study: Chicago Park District

Title	Author/Organization	Year	Type	Citation
EPA BEACH Act Assessment Case Study: Chicago Park District	U.S. EPA Office of Policy	2011	Report	xvi

#### Background Information

- The District uses a two-level notification system whereby it issues an advisory when *E. coli* levels are between 235 and 1,000 cfu per 100 ml, and bans swimming completely when *E. coli* levels exceed 1,000 cfu per 100 ml.
- CPD is somewhat unusual in the broad range of notification methods it uses to alert beachgoers to advisories and swim bans.
  - First, CPD uses colored **flags** to notify the public of water quality and weather-related beach conditions, with green indicating no issue reported, yellow indicating that a swim advisory is in effect (swimming with caution); and red indicating that swimming is prohibited due to severe weather or water conditions that may be hazardous.
  - The CPD **website** provides general visitor information, current beach status, and more detailed information explaining the flag system and health risks.
  - In addition, CPD has enhanced its outreach in recent years by implementing new social media tools to publicize beach information. In 2009, the District launched **Facebook and Twitter** pages. Exhibit A-1 shows a sample of Facebook postings for September 2010. The CPD Facebook wall provides daily beach status updates (“Beach Swim Report”), posts announcements for events at beaches, and allows the public to interact with CPD staff by asking questions or communicating their likes and dislikes.
    - The interactive nature of the Facebook site seems to be well received by the public, judging from the amount of back-and-forth displayed on the wall on an ongoing basis.

- In 2010, CPD launched a new **texting service** that allows users to receive beach notification messages (similar to the Beach Swim Report) about one specific beach, or for all 31 beaches managed by the District.
- Finally, to reach beach users who may otherwise miss or not have access to the various notification methods, CPD posts also beach status at the entrance to the beach, using **park-and-display service boxes**. While admission to the beaches is free, parking at many beaches is not, and CPD advises beachgoers whether swimming is allowed before they make their parking payment.

*Key Findings*

- The CPD has received considerable media attention for its use of novel approaches to reach the public. The use of Facebook and Twitter and the more recent launch of the texting service all received wide coverage in Chicago media, with several local and regional newspapers (e.g., Chicago Tribune) and TV stations (e.g., NBC) featuring stories that were later picked up by other media. This media coverage may have helped raise awareness of the program.
- A survey of 1,573 respondents at eight Chicago beaches conducted in 2004 indicated that the vast majority of beachgoers were residents of City of Chicago or of Cook County. Beachgoers generally traveled less than 3 miles to the beach, visited on average once a week, and over half came to the beach to swim.

**EPA BEACH Act Assessment Case Study: Orange County, CA**

Title	Author/Organization	Year	Type	Citation
EPA BEACH Act Assessment Case Study: Orange County, CA	U.S. EPA Office of Policy	2011	Report	xvii

*Background*

- The non-profit foundation MiOcean installed electronic LCD screens at six locations across Orange County. MiOcean allowed Orange County HCA to update the signs remotely based on the rapid testing responses.
- Each electronic sign had a banner that showed red, yellow, or green to indicate that the beach was closed, there was a warning, or the beach was open.
- The signs also showed a map, indicating the current location and the status of all beaches monitored, as well as weather and surf information, and tips on preventing beach pollution.
- The signs were located at the kiosks where visitors pay parking fees. Parking attendants handed out fliers to explain signs to visitors. The project ran for two months (July and August) in 2010.
- Toward the end of the demonstration project, Orange County HCA conducted a survey of beachgoers at Doheny and Huntington beaches, where electronic signs with same day testing information was posted.

*Key Findings*

- Over half of those who noticed the sign (63%) found the information displayed on the electronic sign helpful and easy to understand.

- In addition to the electronic signs, survey respondents also reported finding out about conditions of ocean water quality via Internet (41%), newspaper (32%), television (31%), a hotline (14 %), radio (12%), other signs (12%), or the Heal the Bay website (3%).
- Ten respondents wrote in additional comments indicating that the signs were too small, difficult to read, or poorly placed.
  - For example, one respondent said, “Electronic sign is too small (too much info) to see and understand when driving in.”
  - Another respondent commented, “Found it by accident on the bathroom building. Writing was overlapping (difficult to read), also the date wasn't current. Signs are a waste of money. A flag similar to surf reports would be more visible and less costly.”

**EPA BEACH Act Assessment Case Study: Newport Beach, CA**

Title	Author/Organization	Year	Type	Citation
EPA BEACH Act Assessment Case Study: Newport Beach, CA	U.S. EPA Office of Policy	2011	Report	xviii

*Background*

- To test the hypothesis that advisories influence the behavior of beachgoers, [this study] analyzed daily attendance records for Newport Beach for 2008 and 2009 to look at whether there was a statistically significant relationship between the number of beach visitors on any given day and the beach status, all else being equal.

*Key Findings*

- These limited results suggest that a statistically significant relationship may exist between advisories and daily beach attendance when controlling for other factors.
- It is unknown whether the results for Newport Beach, California, would hold for other beaches that implement their beach notification programs differently.
  - For example, the presence of lifeguards at the beach could reinforce the effect of beach advisories on visitation rates.
- When looking at beach attendance more generally, it is important to keep in mind that changes in beach attendance are not a necessary indicator of adherence to beach advisories.
- Since individuals may visit the beach and still avoid contact with the water, indication that an advisory did not significantly decrease beach attendance would not necessarily mean that the advisory was not effective.
  - This could be considered to be a positive outcome since it would suggest that advisories result in a smaller reduction in the recreational benefits of beach use, while providing human health benefits to beachgoers.

## Works Cited

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<sup>i</sup> [http://www.crh.noaa.gov/mqt/?n=rp\\_database](http://www.crh.noaa.gov/mqt/?n=rp_database)

<sup>ii</sup> <http://www.crh.noaa.gov/mqt/?n=swimseason2012:ripcurrentincidentssummary>

<sup>iii</sup> Brander, R, et al., The RIPS SAFE Project – A holistic approach to understanding the rip current hazard, presented at the *Australian Water Safety Council*, June 2012.

<sup>iv</sup> Conway, M., et al., Enhancing Rip Current/ Beach Safety Awareness Among Teenagers, *The National Oceanic and Atmospheric Administration: National Sea Grant College Program*, December 2006.

<sup>v</sup> Hatfield, J., et al., Development and evaluation of intervention to reduce rip current related beach drowning, *Accid. Anal. Prev.* 2012: Vol. 46, pp. 45-51.

<sup>vi</sup> Brighton, B, et al., Rip current related drowning deaths in Australia, 2004-2011, presented at the *Australian Water Safety Council*, June 2012.

<sup>vii</sup> Sherker, S., et al., “Beachgoers’ beliefs and behaviors in relation to beach flags and rip currents” *Accid. Anal. Prev.* 2010: Vol. 42, Iss. 6, pp. 1785-1804.

<sup>viii</sup> Leatherman, S. and J. Fletemeyer, Rip currents: Beach safety, physical oceanography, and wave modeling, CRC Press, 2011.

<sup>ix</sup> Carl, R.L., et al., Recreational water safety in Wisconsin. *WMJ.* 2001: Vol. 10, Iss. 2, pp 43-46.

<sup>x</sup> Driscoll, T.R., et al., Review of the role of alcohol in drowning associated with recreational aquatic activity, *Injury Prevention.* 2004: Vol. 10, pp 107-113.

<sup>xi</sup> Peden, A., A nine year analysis of drowning in children and adolescents aged 0-19 years in Australia, presented at the *Australian Water Safety Council*, June 2012.

<sup>xii</sup> White, K.M. and M.K. Hyde, Swimming between the flags: a preliminary exploration of the influences of Australians’ intentions to swim between the flags at patrolled beaches, *Accid. Anal. Prev.* 2012: Vol. 42, Iss. 6, pp 1831-1838.

<sup>xiii</sup> McCool, J, et al., Taking a risk perception approach to improving beach swimming safety, *Int. J. Behav. Med.*, 2009: Vol. 16, Iss. 4, pp. 360-366.

<sup>xiv</sup> <http://www.epa.gov/evaluate/pdf/water/assessing-effectiveness-of-beach-act-notification-program.pdf>

<sup>xv</sup> <http://www.epa.gov/evaluate/pdf/water/fs-assessing-effectiveness-of-beach-act-notification-program.pdf>

<sup>xvi</sup> <http://www.epa.gov/evaluate/pdf/water/assessing-effectiveness-of-beach-act-notification-program.pdf>

<sup>xvii</sup> <http://www.epa.gov/evaluate/pdf/water/assessing-effectiveness-of-beach-act-notification-program.pdf>

<sup>xviii</sup> <http://www.epa.gov/evaluate/pdf/water/assessing-effectiveness-of-beach-act-notification-program.pdf>