

IMPROVING PUBLIC HEALTH OUTREACH FOR WASHINGTON COAST RAZOR
CLAM HARVESTERS

by

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ABSTRACT

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On the Washington coast, harvesting and consuming shellfish provides many populations with recreational, intergenerational, socio-cultural, and economic benefits. Shellfish consumption however, simultaneously, places physical health at risk. Biotoxins, such as domoic acid, are naturally occurring, and can be one of many causes of a harvest closure. Using an interview methodology of razor clam harvesters to explore the Washington Department of Health's harvest closure outreach, this thesis investigates where populations go to receive shellfish closure information, their perceptions of closures, motivations, and the ways in which the Department of Health can further improve public health outreach methods to better address their needs. This study concludes that a well-designed, targeted advisory can successfully transform a message into one that leads to appropriate knowledge and behavior change. These results aim to improve the disconnect between the public and state agencies designing public health messages. In addition, this thesis contributes to the literature around public health outreach, specifically focusing on how tailored messages can match the motivations, needs, and current level of awareness into shellfish harvest closures.

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Chapter 1: Introduction

The skull and crossbones symbol is a clear indication of a risk, warning, or danger to human wellbeing and health. In Washington State, one risk to human health is the consumption of shellfish. Molluscan bivalve shellfish, or shellfish with a two-hinged shell such as mussels, clams, scallop, geoduck, and oysters, are filter-feeders. In the process of filter-feeding large amounts of water, small bacteria, naturally occurring organisms, viruses, and other contaminants present can be absorbed into the tissue of the shellfish (Rodríguez-Lázaro et al., 2012). If contaminant levels are high enough, the harvested shellfish can make individuals who consume them ill.



Figure 1. The Washington Department of Health Beach Closure Sign (Courtesy of the WDOH website)

Shellfish harvesting, however, holds significance beyond just a tasty meal. For some communities, a diet of shellfish holds economic, spiritual, socio-cultural, and recreational benefits. Since the mid-1800s, shellfish have been harvested in the nutrient-rich waters of Washington, and today, Washington State is the nation's leading producer of farmed clams, oysters, and mussels (Grant, 2015). The 2011 Washington Shellfish Initiative estimated that state shellfish growers directly and indirectly employ more than 3,200 people and provide an estimated total economic contribution of \$270 million (Grant, 2015).

Recreational shellfish harvesting also brings in large numbers. In recent years, Washingtonians and visitors made almost half a million trips to Puget Sound and the coast to recreationally harvest clams and oysters. The razor clam fishery in Washington is also a significant source of revenue for tourism-dependent businesses such as restaurants and motels (WDFW, 2017). The different incentives and experienced benefits of shellfish harvesting further contributes to the ways in which people experience the impacts related to harvest closures. These individual benefits are further postponed when harvest closures are put into effect by state agencies to protect public health.

The Washington State Department of Health (WDOH) is one agency responsible for the monitoring and communication of shellfish closures to the public. Within the WDOH's division of Environmental Public Health is the Marine Biotxin Monitoring Program. The goal of the Biotoxins and Illness Prevention Program is to protect humans from illness and death caused by eating Washington-grown shellfish contaminated with biotoxins, which are produced by certain kinds of phytoplankton that are naturally present in marine waters (WDOH, 2017). Shellfish in both recreational and commercial

harvest areas are routinely tested for biotoxins known to be present in Washington's marine waters, such as Paralytic Shellfish Poison, Diarrhetic Shellfish Poison, and Amnesic Shellfish Poison (also known as domoic acid) (WDOH, 2017). Due to its increased abundance, this research will focus solely on domoic acid closures in Washington coastal shellfish harvesting.

Domoic acid (DA) is one of the many causes of shellfish harvest closures in Pacific razor clams *Siliqua patula*. The first detection of DA in razor clams from Oregon and Washington coastal beaches took place in October and November of 1991 (Wekell et al., 1994). The first DA- related closure of shellfish harvesting in Puget Sound, Washington, occurred in early September 2003 owing to a DA concentration of 29 ppm (parts per million) measured in blue mussels from Fort Flagler, Kilisut Harbor (Cox, Horner, Borchert, & Trainer, 2006). Although DA had been detected in Puget Sound waters by the Washington State Department of Health's (WDOH) routine monitoring program, prior to 2003, levels had never exceeded the regulatory limit of 20ppm (Cox, Horner, Borchert, & Trainer, 2006). Commercial, recreational, and subsistence razor clam fisheries suffered total coastwide closures in the 1991-92, 1997-98 and 2002-03 seasons (Trainier et al., 2006). Extended closures can not only produce frustrations, but economic hardships for communities such as local indigenous tribes that rely on subsistence fisheries.

Presumed causes of recent DA spikes lean on possible environmental conditions that may exacerbate blooms. Warming ocean temperatures for example can impact cell growth rates, duration of optimal growth period, and stratification intensity of nearshore waters due to increased glacial melt, but to date the relationship between ocean warming

and its potential effects on the spatial and temporal magnitude, and toxicity of natural blooms is unknown both here and elsewhere in the world (Trainer et al., 2006).

Continuing research has pointed to certain cause and effect situations, but the exact combination of conditions that causes algal blooms is not yet known (WDOH, 2017).

After a beach closure is put into effect, the WDOH continues to test the closed area, and when lab results confirm that biotoxin concentrations have dropped to safe levels, the beach will reopen to harvest (WDOH, 2017). When an area that is on or near a public beach is closed, the WDOH notifies the local health department and issues a news release about the closure (WDOH, 2017). The WDOH also posts the closure information on its website and bilingual recorded hotline to inform recreational harvesters that shellfish in that area are not safe to eat. In addition, “danger”, “warning”, or “closure” signs are placed directly on the entrances to closed beach sites.

Since 1932, the Department of Health has been working to protect public health with routine lab testing of shellfish at various locations in Washington. When a harvest site is determined closed for public health safety, notifying clam harvesting groups and communicating closure information to large and varied populations can be quite complex. By understanding the current methods being pursued by harvesters, the WDOH can begin to develop the means necessary to address this complex communication.

While the exact number of shellfish related illnesses occurring in Washington State is unknown due to populations not seeking medical help or being unaware of acute symptoms, the increase in DA concentrations is known. A record-setting bloom of DA-producing diatoms occurred along the U.S. West Coast from spring 2015 through early 2016, causing fisheries closures of razor clams, Dungeness crabs, sardines, and

negatively impacting marine mammals along the North American West Coast (McCabe et al., 2016). This bloom was considered a preview of future conditions, as increased frequency and toxicity of DA-producing phytoplankton blooms are predicted under future ocean acidification and warming scenarios (Wells, 2015). With the predicted increase of DA exposure, evaluation of the effectiveness of public health outreach tools will be needed.

This thesis addresses the following three questions:

1. How effective are the outreach methods employed by the Washington Department of Health's biotoxin monitoring program?
2. What are the individual motivations of razor clam harvesters?
3. How much awareness does the shellfish community have in regards to shellfish illnesses?

The Department of Health currently uses a variety of outreach methods: a bilingual recorded hotline number for updated biotoxin closures; an interactive online shellfish safety map; shellfish danger, warning, and closure signs posted in eight different languages; media publications; and an online biotoxin bulletin updated daily with closure information.

However, there remains uncertainty as to where populations go to receive harvest closure information. This thesis aims to investigate where populations access closure information, and how familiar they are with the current outreach tools used by the Washington Department of Health. The conclusions will be shared with the Washington State Department of Health Office of Environmental Health and Safety to aid in future development of shellfish closure outreach.

To gain a better understanding of how closure outreach can be improved to address the needs of the public, in-person interviews of recreational razor clam harvesters were conducted from identified harvest sites on the Pacific Coast of Washington. While previous studies (Burger et al., 2003, Jardine, 2003) have surveyed and explored outreach of closure information in regards to fish consumption advisories, this thesis will specifically focus on the recreational effects of DA closures on the Pacific coast within these areas.

Overall, the purpose of this research is to provide agencies with an improved understanding of the needs of their audiences, in hopes of designing effective outreach targeted to meet their needs. This is done by exploring the theoretical basis of health communication in the literature review portion. The literature broaches the topic of tailored and non-tailored health education materials and their effectiveness in helping individuals change health-related behaviors. An overview of the methods used in this study will be provided.

Lastly, a discussion of the results of this study and recommendations for the Department of Health's broader communication methods to protect public health is provided. The answers to the initial three thesis questions provide the jumping off point for recommendations to create shellfish closure outreach designed to meet the needs of its audience. Beyond its recommendations for this research, this thesis contributes to the literature around public health outreach, specifically focusing on how tailored messages can match the motivations, needs, and current level of awareness into shellfish harvest closures.

Chapter 2: Literature Review: An Analysis of Health Communication

This chapter presents a review of the existing scholarship from the disciplines of health communication, risk assessment, and health education. These fields have been chosen for the significance they provide in addressing the effectiveness and theoretical outlines of public health messages reaching their audiences. At times, these fields of study merge to address topics of environmental justice and community education within health outreach, which will also be explored in this section. This thesis draws upon the field of health education, which is relatively unexplored to date in research comprehending the sources of outreach material utilized most by Washington razor clam harvesters, as well as their own awareness, ways they interpret and learn, and motivations into the causes of closures.

The purpose of this literature review is to examine the implications these messages may produce for state agencies developing health outreach targeted at specific audiences, such as the Washington coastal razor clam populations. To address this gap in the published literature, this research subsequently focus on the ways in which state agencies and other entities can use health communication strategies to increase awareness of closures and create relevant outreach material.

Tailored and Targeted Health Messages

A dominant theme in health communication strategies and approaches is tailored and targeted messages to audiences. Additionally, studies of the chosen communication method are becoming central in the discussion of improved outreach to at-risk populations. One overarching conclusion is that customization of the message is important for materials to be effective (Kreuter et al., 2000). The literature broaches the

topic of targeted and tailored health education materials and their effectiveness in helping individuals change health-related behaviors. Kreuter et al. (2000) define targeted communication as intended to reach some population subgroup based on characteristics presumed to be shared by the group members.

In their study of targeted health communication, Perez-Stable et al. researched creating a targeted educational booklet designed to promote breast and cervical cancer screening among Latinas in San Francisco. This booklet was created using cultural components that target ethnic-specific misconceptions about the causes of cancer (Perez-Stable et al., 1996). The targeted booklet was based on a composite profile of a specific population subgroup (Latinas in San Francisco) and was produced in just one version specially designed for this subgroup. Its focus was primarily on those characteristics assumed to be shared by many members of the subgroup.

Tailored communication, on the other hand, is intended to reach a specific individual based on specific, measurable characteristics of that person that have been tested in a formal assessment. Despite these fundamental differences, the rationale for both methods is similar: the more one knows about the intended recipients of a communication, the better one will be able to make the message relevant to them (Kreuter & Wray, 2003).

The tailoring methodology has been tested using print materials for women's cancer screening. In their study (Skinner et al., 1994) created tailored physician recommendation letters that were sent to women patients in a primary care setting. To participate, eligible women completed a brief telephone survey assessing their stage of

readiness, perceived barriers and perceived benefits for getting a mammogram (Skinner et al., 1994).

Based on the provided information, and demographic and risk status data, individualized letters were generated and sent to women at their homes. Each letter contained a drawing of a woman tailored to the race and age of the recipient. Below each of these drawings was a testimonial caption that was tailored to the recipient's stage of readiness to get a mammogram. Text messages in the letters addressed each woman's specific barriers to getting a mammogram, beliefs about mammography and breast cancer, stage of readiness to change, and breast cancer risk. Follow-up interviews were conducted 8 months later and found that tailored letter recipients were more likely to remember and to have read more of their letters than standardized version recipients (Skinner, 1994).

Similarly, in their study, “Are tailored health education materials always more effective than non-tailored materials?” Kreuter and his colleagues studied 198 overweight adults who were randomly assigned to receive either tailored or non-tailored weight-loss materials. Participants’ cognitive, affective, and behavioral responses to the materials were measured through a goodness of fit score that was calculated to reflect how well these materials addressed each person’s unique weight loss needs at an immediate and one month follow up. Findings showed that good-fitting, non-tailored materials performed as well or better than tailored materials for several cognitive, affective, and behavioral outcomes (Kreuter et al., 200). However, moderate- and poor-fitting, non-tailored materials were consistently inferior to both approaches (Kreuter et al., 2000).

This method can further assist in tailoring explicit messages to at risk populations such as pregnant women.

A limitation that should be noted in any study of this nature is that the participants' cognitive, behavioral, and affective responses to tailored and non-tailored materials may not be representative of how those with different or without any health problems, would react to printed education materials.

The customization of tailored messages is proposed to catch individuals' attention, meet their information needs, and positively affect their cognitive-behavioral responses to health information (Stellefson, 2008). In their study, "Effects of a tailored health promotion program for female blue-collar workers: Health works for women" (Campbell et al., 2002) assessed the effects of the Health Works for Women (HWW) intervention on improving multiple behaviors including nutrition and physical activity among rural, female, blue-collar employees in North Carolina. The hypothesis was that tailoring messages to focus on a woman's behavioral priority might result in greater success in achieving at least one behavior change, which in turn might be a "gateway" leading to increased motivation and confidence to tackle additional problem behaviors in the future (Campbell et al., 2002).

This two-pronged intervention included (a) individualized, computer-tailored, "women's magazines" that provided personalized feedback, strategies for change, and community resource information and (b) a natural helpers intervention that trained women in the workplace to diffuse information and provide support for healthy behavior changes (Campbell et al., 2002). Tailoring variables included name, workplace, age, shift,

health concerns (pregnancy, limitations to exercise), and current health behaviors including fat, fruit and vegetable intake, frequency and duration of different types of leisure-time physical activity (categorized as aerobic and strengthening/flexibility), smoking, cancer screening, and choice of behavioral priority for change. Computer-based tailoring algorithms were written to use the individual survey data and decision rules determined by the research team to access the appropriate messages and graphics from the message library. These tailored elements were then assembled in a predetermined format and layout in the tailored magazine. Using statistical analysis this study found the strongest effect was for fruit and vegetable consumption, with an increase of 0.7 daily servings achieved among women in the intervention group at the 18-month follow-up. The study results suggest that the combination of two tailored magazines plus the natural helper program over 18 months resulted in the observed behavior changes, whereas giving one tailored magazine alone had no measurable effect.

Other health studies have compared tailored materials to generic self-help materials. Sutton and Gilbert (2008) researched tailored smoking cessation health outreach. In their study, the control group received usual care (telephone counselling and an information pack sent through the post). The intervention group received in addition a computer-generated individually tailored advice letter. For the sample as a whole, quit rates did not differ significantly between the two conditions. However, among the majority ($n = 1164$) who were smokers at baseline, quit rates were consistently higher in the intervention group, with prolonged abstinence for 3 months (Sutton & Gilbert, 2008).

According to Sutton & Gilbert, some studies report little-to-no improvements in outcomes when tailoring health messages (Stellefson, 2008). Bull et al. (1999) study results revealed that although more tailored subjects reported some physical activity at each follow-up compared with the standard group, these differences were not significant. Furthermore, there was no significant difference in movement across the stages of readiness to exercise at follow-up between subjects in the tailored group who received material targeting their current stage (precontemplation or contemplation) and the standard group who received generic material that addressed both stages (Bull et al., 1999). This could be due to the differential applications of tailoring methods and how different people and populations respond to tailored versus non-tailored material.

There are instances where tailoring messages cannot improve lack of awareness regarding a novel health topic. Thus, if there is an unrelenting use of tailoring regardless of an individual's previous exposure to health information, there lies the possibility of exhausting excess discretionary resources during the formative stages of message development

Sociocultural Factors

Tailored and targeted health communication can be taken a step further by ensuring the message or advisory is also constructed to address sociocultural differences. Sociocultural differences can include religiosity, collectivism, and racial pride (Kreuter et al., 2004). Using the sociocultural approach, a group's cultural values, beliefs, and behaviors are recognized, reinforced, and built upon to provide context and meaning to information and messages about health (Kreuter & McClure, 2004).

Cultural targeting is consistent with several core principles of practice in public health (e.g., addressing problems in the populations most affected) and health education (e.g., making programs relevant to the populations they serve) (Kreuter et al., 2003). The role for cultural tailoring in health communication would include understanding how individuals perceive their own culture, the extent to which they identify with it, and the specific cultural values that are important to them (Kreuter et al., 2003).

In addition, the cultural characteristics of any particular group may be directly or indirectly associated with health-related priorities, decisions, behaviors, and/or with acceptance and adoption of health education and health communication programs and messages (Kreuter & McClure, 2004). For example, a cultural group's traditional dietary practices could promote or prevent certain diseases (i.e., a direct effect). Subsistence shellfish harvesting and consumption is one example.

DeWesee et al. (2009) produced fish consumption advisory maps for Anishnaabe communities that provided lake-specific, risk-based, culturally sensitive consumption advice on color-coded maps for two groups: children under age 15 years and females of childbearing age, and males 15 years and older and females beyond childbearing age. Because the maps were easy to read and developed in conjunction with community members, DeWesee et al. (2009) found they significantly increased the percentage of survey participants who indicated awareness of advisory information and increased preference for smaller walleye, which contain lower levels of contamination than larger fish.

The research methodology and development of a revised advisory for this study used focus groups of three local tribes. The focus groups addressed general issues such as the level of detail included in an advisory map as well as risk assessment and risk management issues that influenced the structure and composition of maps (DeWeese et al., 2009)

Kalichman & Coley (1995) used a cultural component in their study Witness Project. Witness Project was developed to educate and promote breast and cervical cancer screening among low-income African-American women in rural Arkansas. Kalichman and Coley randomly assigned 100 African-American women in an urban health clinic in Milwaukee to view one of three videos on HIV testing. The first had an African-American man as the narrator; the second was identical but used an African-American woman as narrator; and the third used the African-American woman to deliver the same content but also stressed culturally relevant losses as consequences of not being tested, such as not getting tested puts your family at risk of losing you to the disease (Kalichman & Coley, 1995). Compared to characters in the first two videos, participants rated characters in the third video as significantly more concerned about “Black families and the Black community” and “women like me,” and as being more “like people I know.” (Kaluchman & Coley, 1995).

A qualitative evaluation of the Witness Project concluded that because role models shared faith-based cancer stories in church settings, they were viewed by participants as having similar cultural values and thus were trusted and deemed truthful (Kalichman & Coley, 1995). Sixty-three percent of women who viewed the third video and expressed an

intention to be tested were tested within a 2-week follow-up, compared to 23% who viewed the ethnicity- and gender-matched video and none who viewed the ethnicity-only-matched video (Kalichman & Coley, 1995).

Kreuter et al. studied African American women's responses to a tailored cancer-communication magazine that used behavioral construct tailoring, culturally relevant tailoring, or a combination of the two to promote cancer screening and prevention. Behavioral construct tailoring (BCT) assesses an individual's readiness to change, perceived barriers, and self-efficacy for changing a given behavior. BCT health messages are tailored to different individuals based on their responses to measures of key constructs from theories and models of health behavior change (e.g., stage of readiness to change, perceived barriers and benefits, self-efficacy) (Kreuter et al., 2004). BCT first assesses which such constructs are most relevant to each individual for changing a given behavior, then selects from a large library of information only those messages that address the person's unique combination of characteristics (Kreuter et al., 2004).

The culturally relevant tailoring magazines were based on four cultural constructs: religiosity, collectivism, racial pride, and time orientation, or perception of time. The baseline questionnaire assessed a range of constructs from theories of health behavior change, including knowledge, beliefs, perceived barriers, stage of readiness, self-efficacy, and past behavior related to mammography and intake for cancer prevention and screening messages that were tailored on cultural constructs alone (Kreuter et al., 2004). In fact, levels of change among women in this intervention group never exceeded that of the control group for either mammography or FV intake (Kreuter et al., 2004). Only

when culturally relevant tailoring was combined with behavioral construct tailoring did it emerge as effective. The study found no evidence of effectiveness for cancer prevention and screening messages that were tailored on cultural constructs alone (Kreuter et al., 2004).

All elements of the tailored magazines (ie, the tailoring assessment, tailored message library, graphics, and image library, and design templates) were developed with extensive participation from African Americans in St. Louis (Kreuter et al., 2004).

Additionally, the chosen sociocultural variables were selected because they have been found to be important in urban African American populations. As an example, if a woman indicated on her survey that she thinks African American women should keep up with issues that affect the African American community, an item on the racial pride scale, her magazine might also include a story about the particular importance of mammography to African American women to help reduce race-based disparities in breast cancer mortality (Kreuter et al., 2004).

While there is an agreement that communication outreach and materials will be more effective when they are culturally appropriate and consider sociocultural factors for the populations they serve, little is known about how best to achieve this in health messages (Sanders et al., 2007). Designing messages to meet the needs of those that are most vulnerable means taking a closer look at health disparities and identifying which populations are most at-risk. The link between culture, behavior, and communication shows improvements for eliciting changes in health-related behaviors, but more research is needed into designing effective health messages.

Learning Theory

The theoretical learning literature provides insight into the manner that adults learn, interpret, and internalize new information. This thesis draws upon this rich field, which is relatively unexplored to date in research about how to educate the public about risks from shellfish harvests. This section aims to integrate learning theories with chosen health communication of shellfish harvest closures.

Social learning theory is a theoretical framework often used in health education in which cognitive, environmental and behavioral variables are used to explain human behavior and learning (Turner & Shepherd, 1999). Developed by Albert Bandura (1977) and colleagues, social learning theory has been used to study health-related behaviors such as smoking cessation, contraceptive behavior, and exercise (Freudenberg et al., 1995).

A claim found in social learning theory is that peers can reinforce socially learned behavior (Turner & Shepherd, 1999). There is some evidence for such claims in the peer education literature. Kelly et al. (1991) claimed that the method was effective because of frequent prompting about safer sex by credible peers. Jay et al. (1984) also claimed that regular reinforcement by peers was a factor in the effectiveness of a health education program promoting contraceptive use. How social learning theory can influence shellfish harvesting closures is a gap this thesis aims to address.

Land management units have recently focused their communication strategies on community outreach activities to influence citizens' understanding of fuel reduction practices (Toman, Shindler, & Brunson, 2004). In their study, Toman, Shindler, &

Brunson researched the lack of information about the specific types of communication methods most effective for building support for fuel treatments, specifically seeking information into uni-directional and interactive communication formats. Unidirectional approaches are those that typically involve a one-way flow of communication from the agency to the public, often in a setting unrelated to the message. Interactive programs provide for either personal contact with agency representatives or on-the-ground learning experiences (Toman, Shindler, & Brunson, 2004).

Communication activities that target local conditions and public concerns about the rationale behind specific practices, potential outcomes, and implementation scenarios are more likely to resonate with participants (Toman, Shindler, & Brunson, 2004). Although this can be accomplished in varying degrees with many forms of outreach, programs that allow for interactive exchanges, such as conversations with agency personnel, are better suited to problem-centered learning.

Bright and Michael (2008) studied the effects of attitudes on natural resource issues, in their case management of old growth forests. They found that the need to understand the nature of attitudes of the target audience and the target audience's perception of the importance of the natural resource issue when developing a communication program designed to increase knowledge and influence attitudes or behaviors.

Speaking like a State

In “Speaking like a state: Environmental justice and fish consumption advisories”, the concept of government agencies failures to communicate effectively to minority

populations about fish closures is explored. This article aims to build on the argument that to remedy environmental injustice related to consumption of contaminated fish, agencies must change “government-speak” (bland, generic communication) to communication that is culturally relevant to minority audiences (Chess et al., 2004).

Chess et al. present a historical analysis suggesting why governments may speak in ways that are not specific and clear to the populations that most need the information. The argument posed is that communications have been combined into a system to make it easier to enforce power. This approach ensures that government-speak is uniform in its nature, even as the population increases in demographic diversity (Chess et al., 2004). While government-speak may prove beneficial in delivering certain messages, it poses a distinct barrier for other means of relaying messages, specifically health advisories.

Substantial research has been found indicating that poor, African American, and Hispanic populations are disproportionately exposed to contaminants that have adverse health effects, especially to high risk populations such as pregnant women and children (Connelly et al., 1996). Failing to target audiences, consider cultural and linguistic factors, and develop clear messages perpetuates the environmental injustice; lower income, minority populations suffer a greater degree of environmental harm by ingesting more contaminants from self-caught fish than do white, higher income anglers (Chess et al., 2004).

In the Pacific Northwest for example, indigenous peoples are exposed to greater quantities and mixes of contaminants, via different routes, at different frequencies, and in different contexts than members of the general population (O’Neill, 2003). O’Neill notes

the profound differences in the value attached to fish, fishing, and fish consumption by various indigenous peoples and by the dominant society.

Due to cultural differences, agencies need to ensure that their decisions support commitments to cultural flourishing for indigenous and other non-dominant groups, as well as for dominant groups. In regard to fish consumption advisories, “decisions need to be alert not only to the distributive implications but also to the cultural impacts of a move to risk avoidance: given differences in various groups' understandings of the practices at stake, the risk avoidance measures preferred by dominant society evaluators are likely to be the very ones that encroach most profoundly on the expression of indigenous cultures” (O’Neill, 2003, p. 57).

While the topic of environmental justice and cultural relevance is a scope beyond this thesis, it offers insight into the importance of considering those most at-risk in an advisory or harvest closure.

Risk Communication

It is significant to focus on the development of risk communication materials aimed at informing populations of both the risk and benefits of consuming fish as part of one’s diet. Burger et al. examined the efficacy of two risk communication instruments (a brochure and a classroom lesson plan) to determine whether subjects were obtaining the desired messages, and whether they would consider changing their fish consumption behavior. This study differs from others by explicitly looking at Latino women of child-bearing age and Latino women who are pregnant women. The overall purpose was to design and conduct a community based education and outreach program to understand

perceptions, so that a program could be designed to reduce consumption of environmentally contaminated fish and crabs, caught in the Newark Bay Complex by Latinos.

An additional purpose was to provide the communities with information they need to make informed nutritional choices (Burger et al., 2003). Again, the method of consulting the community members themselves in the development of the materials was utilized to ensure the message was appropriate for the target audience members.

The risk communication message used in this study was more complex than a regular advisory because the concepts were also specifically addressing pregnant women's health considerations. Burger and his colleagues found that most women exposed to the classroom lesson had a better understanding than those who read the brochure. It was discovered that 96 % of the women who heard the lesson understood that it was unsafe to eat fish from the port, compared to 72% of those reading the brochure (Burger et al., 2003). However, the methods used in this study should be seen as more than just targeting a specific audience. The success of this outreach was due to the researchers continuously involving the community and those who communicate health information directly in the development of materials that will provide the information needed to make informed decisions about their families' health.

From these conclusions, the authors suggest that while the data presented may be specific for the New York-New Jersey area, a study like this may provide further insights on risk communication for specific populations most at risk. It is clear that participants

are more interested and engaged by the use of a live presenter, as compared to individually reading a brochure.

In a similar study, Engelberth et al. (2013) focused on how state agencies may assume that risks are the only important factor to address. Risk only communication can ultimately lead to a lack of awareness of the benefits of consuming fish. The effectiveness of Maine's fish consumption advisory in terms of improving knowledge to pregnant women was evaluated in this study. To measure the effectiveness of the guide, they designed a mixed-mode (mail and web survey). The questionnaire consists of 55 questions intended to assess awareness of the guide and measure guide-induced changes in (1) knowledge of the risks and benefits of eating fish, (2) knowledge of the benefits of omega-3 fish oil supplementation and (3) species-specific fish consumption behavior (Engelberth, 2013). Results showed that readers increased their ability to make specific fish-substitutions to minimize risk while maintaining the benefits of eating fish (Engelberth, 2013). This suggests the advisory has the potential of reducing health risks while avoiding a drop-in fish consumption.

One caveat that Engelberth et al. point out is the fact that health care providers may be missing an important education opportunity if they only distribute the guides without positive and negative. Therefore, lack of engagement between health care providers, and the women receiving the brochure may decrease the individual's full understanding of both the risks and benefits of consuming fish. Empowerment through self-understanding and education can play an important role not only in health awareness, but also individual empowerment to make changes within the agency systems.

Many advisories may provide risk information, but fail to provide the health benefits. In “Awake at the switch: Improving fish consumption advisories for at-risk women” researchers examined the benefit of a fish advisory measured by its ability to inform consumers of the positive and negatives attributes of fish consumption choices. Teisl et al. (2011) indicated that health benefits of fish consumption are relatively ignored in health communications about its risks. This study found that the advisory successfully increased women’s methylmercury-related knowledge, and improved their perceptions of fish consumption risks. Communication improvements allowed the at-risk population to make the appropriate choice to switch the kinds of fish they were eating.

In addition, risk communication efforts must take into consideration anglers’ knowledge, attitudes, and beliefs regarding fish and contamination. Agencies such as the WDOH must not only provide anglers with risks regarding contamination, but allow anglers to be a part of the process of defining risk (Kalkirtz, Martinez, & Teague, 2008). Anglers would be consulted during the different phases of designing outreach, and because anglers are the intended audience receiving the outreach, it is best to include their perceptions and definitions of what risk looks like. While agencies are charged with the responsibility of monitoring and communicating closures, the literature around risk communication calls for the intended audience of the message to play a role in the development of outreach. This would include defining what risk and benefits in fish consumption means to them.

In a New Jersey study of state and federal risk communication programs, a national survey of state public health officials was used to assess the commitment to risk

communication outreach. These findings suggest that the risk communication activities of government agencies in New Jersey were limited and mostly reactive in practice (Chess & Salomone, 1992). The data further suggest that there are few proactive attempts to reach out to the public with environmental risk information unless the information is requested, and even fewer efforts to construct dialogue about risk concerns with the public (Chess & Salomone, 1992).

In response to the national survey, most respondents said risk communication was an important agency priority, but said insufficient staff was a major barrier to effective risk communication (Chess & Salomone, 1992).

Burger's 2008 study examined knowledge about the benefits and risks of fish in relation to ethnicity and the degree of knowledge in a general university population in New Jersey. Subjects were asked open-ended questions about risks and benefits. It was found that there were ethnic disparities in knowledge about both the benefits and the risks from fish consumption. A higher percentage of Caucasians knew about the benefits and risks of fish consumption than others. However, Asian populations knew the least about risks, and African American and Hispanics knew the least about benefits (Burger, 2008).

There were also ethnic differences in the ability to name fish that are high in contaminants or low in contaminants. Burger found that although agencies such as the FDA are concerned that the public will be confused by advisory details, the lack of details is major component of ineffective communication (Burger, 2007).

Conclusion

Several studies discussed in this chapter have shown significant effects of the impact of message relevance and customization to increasing at-risk populations knowledge and understandings of health advisories. The focus of this literature review was on tailored and targeted messages, sociocultural factors, social learning theory, “government-speak”, and risk communication. These studies address advisories that are both effective in increasing knowledge, and in addressing both cultural and behavioral aspects that will influence population perceptions.

As found in the literature around fish consumption advisories and closures is the importance of message customization. While it was discovered that message relevance is crucial in health communication studies around general health concerns, such as smoking cessation, and weight loss, little has been researched around razor clam harvesters and beach closure messaging. This thesis aims to address this identified gap in the published scholarships around health communication intended for razor clam harvesters.

Understanding the effectiveness of outreach tools is beneficial in addressing the outreach approaches used by public health agencies, such as the Washington Department of Health, which uses consumption advisories, warnings, and closures. In designing shellfish closure outreach, agencies such as the WDOH need to determine their targeted audience. A targeted audience for shellfish closure outreach are the populations that will be most affected by the closures. For example, the results from this research identified beginner shellfish harvesters as an identified population requiring targeted messaging and education in outreach materials. This will be discussed in greater detail in the following chapters. While this thesis research does not address identifying the populations most at-

risk, it does identify beginner shellfish harvesters as an identified population that might require targeted health outreach.

To work toward environmental policies that do not benefit one specific culture, agencies and other decision makers will need to address the effectiveness and intentions of their messages. In developing targeted outreach, cultural considerations of design, language, and message implications should be considered. It can be concluded from the research that there is a need for clear and concise messaging that consider different populations perceive closures and risk related to shellfish consumption differently.

However, to date, little research has been conducted applying harvesters input and knowledge to improving public health outreach related to shellfish closures. As found in the literature around risk communication, is that efforts must take into consideration anglers' knowledge, attitudes, and beliefs regarding fish and contamination. Agencies such as the WDOH must not only provide anglers with risks regarding contamination, but allow anglers to be a part of the process of defining risk. To date, little research has been conducted around razor clam harvester beliefs about harvest closures or areas of improvements the intended audience would like to see. This thesis aims to identify these key themes.

Additionally, little research around targeted messaging and education for shellfish populations has been pursued. To address this gap in the published literature, this thesis explored improving public health outreach based on feedback and perceptions from razor clam harvesters interviewed on the Washington coast.

Chapter 3: Methodology

Depending on the geographic region or location, the act of shellfish harvesting varies on environmental concerns, laws regarding harvesting, and species of shellfish collected. This research is aimed specifically at assessing the following: 1) How effective are the outreach methods employed by the Washington Department of Health's biotoxin monitoring program? 2) What are the individual motivations of razor clam harvesters? 3) How much awareness does the shellfish community have in regards to shellfish illnesses? In-person interviews were utilized as an approach to answer these questions. Data were gathered by directly interviewing razor clam harvesters on previously identified beach locations approved to be open for harvest by the Washington Department of Fish and Wildlife in partnership with the Washington Department of Health. This section provides the details of the chosen methodology, limitation to these methodologies, and how these limitations were addressed within the research. Following the methodology section will be the coded and themed results.

Interview Methodology

The qualitative methodology used in this study was in-person interviewing of Washington coast razor clam harvesters. Survey data has been used in previous studies, such as the WDFW study (Ferris et. al, 2017) that collected data on the amount and frequency of human consumption of razor clams over the past two years. Data were also collected on harvest and consumption behaviors including the months in which clams were eaten, beaches used for harvesting, and whether clams were eaten immediately or preserved and eaten at a later date (Ferris et. al, 2017). This chosen methodology however, did not have the goal of finding out common knowledge of closures,

motivations, or sources of closure information. Surveys are also limited in allowing space for subjects to further add personal experiences to data collection. By using interviews, this research was able to access more detailed information, shining light onto clam digger understandings of closures, motivations, and where they go to access closure information.

All interviews were conducted after the approval of a Human Subjects Review application by The Evergreen State College. Interviews were performed with an audio-recorder in order to accurately code and theme data at a later time. All participants received consent forms and were briefed prior to the interview taking place.

The interviews were semi-structured, meaning that the interviewer decides the general structure of the interview prepared in advance, but allowing the details and specific design to be formed during the interview (Galleta, 2013). The key questions to be asked were designed in advance to provide some guidance and structure to the interviews. The semi-structured interview approach was further chosen to discover and allow for a space of individual reflection and experience in regards to clam digging.

The first stage of the interviewing process was identifying locations for interviews to take place. Once the beaches were chosen, interview dates were matched with the opening clam digs proposed by the Washington Department of Fish and Wildlife (WDFW).

Location

In-person interviewing was conducted on identified days that beaches were open to the public for razor clam harvesting. The beaches selected for interviewing were chosen based on toxicology test and approval from the WDFW. The WDFW partners

with the Washington Department of Health to determine approval dates and locations based on marine monitoring of toxins in the water. Interviews were conducted on-site in 2017 during the months of January, February, March, and April at the identified beaches open for harvest.

Razor clams are found primarily on the intertidal coastal beaches (those that are exposed at low tide) from a +3 foot level to a -2 foot tide level. The WDFW divides the harvest areas into the following five major management zones (See Figure 2).

- **Long Beach** from the Columbia River north to the mouth of the Willapa Bay
- **Twin Harbors** from Willapa Bay north to the south jetty at the mouth of Grays Harbor
- **Copalis Beach** from the north jetty at the mouth of Grays Harbor to the Copalis River
- **Mocrocks** from the Copalis River to the south boundary of the Quinault Indian Reservation and
- **Kalaloch** from the South Beach campground north to ONP Beach Trail 3.

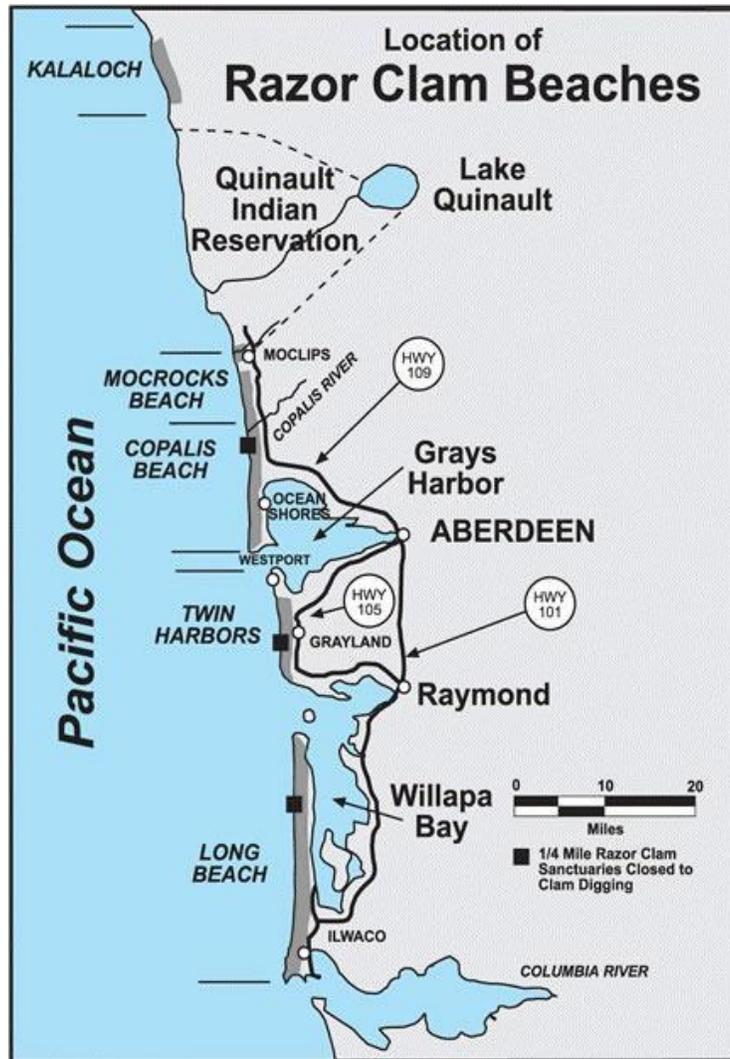


Figure 2. Identified Razor Clam Harvesting Areas (Courtesy of the Washington Department of Fish and Wildlife website

<http://wdfw.wa.gov/fishing/shellfish/razorclams/current.html>)

Within these five management beaches there are a total of 58 miles of sandy beaches and prime habitat for the Pacific Razor Clam (Washington Department of Fish and Wildlife, 2017).

Twin Harbors, Mocrocks, and Copalis were approved for harvest in late January and February, March, and April of 2017. Kalaloch Beach and Long Beach were not open during the identified study time due to high toxin levels, and as such were exempt from this study. Since the 2012-13 season, WDFW and Olympic National Park jointly made a decision to forgo recreational harvest at Kalaloch Beach. These closures have provided the population on this beach the best chance to recover from the decline it has experienced since 2009.

Because of concerns with low population abundance of harvestable sized clams, Kalaloch was not open during the 2014-15 season when domoic acid peaked. During the 2015-16 season domoic acid levels were either above the action levels or at the action level, just enough to keep this beach closed to harvest. Before a beach can be opened for the harvest of razor clams, WDOH protocol requires that all razor clam samples collected from that beach must test under the action level (20 ppm for domoic acid; 80 µg/100g for PSP; and 16 µg/100g for DSP) on both of the two required sample collections.

Participants

The participants of this study included 29 razor clam harvesters from Copalis Beach, Twin Harbors, and Mockrocks. The sample size of this study contrasted with the population size of razor clam harvesters of 281,374 harvesters on all Washington coast beaches for the 2016-2017 season, as estimated by the WDFW. Washington coast clam harvesters were chosen for this study for multiple reasons. The first was due to the timing of my study coinciding with the opening of clam harvesting seasons on the Washington coast. Razor clam season began for the 2016-2017 year in October of 2016 and ran into mid-May of 2017. A shellfish/seaweed license is required for anyone 15 years of age or

older to harvest clams and oysters during the harvest year, and may be purchased via the WDFW website, at approximately 600 locations throughout the state, including sporting goods stores, marinas, convenience stores, and major retailers (WDFW, 2017).

In addition, razor clam harvesters were chosen because domoic acid has caused several closures on the coast, so the awareness of coast razor clam diggers seemed appropriate to answer my research questions. The final reason, is also due to the geographical location, and ease of access to conduct these interviews from Olympia, Washington. A Washington State clam digging license was obtained from the WDFW that allowed me to partake in the razor clam harvesting at the identified locations.

The days the three identified beaches were open were matched to in-person interviewing days, so I was interviewing people when they were there to harvest razor clams. The geographical location of the three beaches also provided some variety within my research. To grapple with the issue of self-selection and introducing a bias as much variety was added to the study as possible. Three beach locations (Twin Harbors, Mocrocks, and Copalis Beach) were identified as open based on toxicology tests, and as such, were chosen as the locations of my research. These three beaches may only represent a small portion of shellfishing in Washington, but for the razor clam digging season of 2017 were the only three identified to be open, and as such, hold strength in the data collected. Different days of the week were also chosen to add a variety to the populations interviewed. Weekdays that interviews took place offered a specific population of retired, older people, while weekends offered a younger mix of people. This added diversity within my own study.

In addition to in-person interviewing, a flyer requesting feedback from razor clam harvesters was distributed. Information requesting feedback on the public outreach used for shellfish closures was offered with contact information to participate in an interview. These flyers were distributed to as many people as possible on the four open beaches, posted on community bulletin boards close to the beach, and local grocery stores. Only one person chose to call and partake in the interview from the flyer request. This method of outreach was chosen to add variety to the in-person interview methodology. Flyers offer the opportunity for people to choose for themselves to partake in the interview.

Interview Questions

The interview questions and interview process used in this study were approved by The Evergreen State College Human Subjects Review Committee. The questions that were asked of interviewees included:

- 1) What are your motivations for shellfishing?
- 2) How long have you been shellfishing?
- 3) Have closures by a government agency ever prevented you from shellfishing?
- 4) If so, do you remember the cause(s) of the closure(s)? Where was info found?
- 5) Are you familiar with domoic acid? Or amnesic shellfish poisoning?
- 6) Are you aware of the current beach closures on the coast of Washington?
- 7) Do you check for closures? If so, where do you go to find closure information?
- 8) Have you ever been ill from consuming shellfish? Or know of someone else who was ill? If so, did you seek medical help?
- 9) Are you aware of the Shellfish Safety Map used by the Washington Department of Health for shellfish closures?

- 10) Have you seen signs posted on beaches for closures? If so, what attracted you to them?
- 11) Why do you think people would not comply with a closure?
- 12) What improvements would you like to see with closure information? What type of information would you like to see included?

These were asked to answer my three main research questions:

How effective are the outreach methods employed by the Washington Department of Health's biotoxin monitoring program?

What are the individual motivations of razor clam harvesters?

How much awareness does the shellfish community have in regards to shellfish illnesses?

These three questions were chosen to better understand and construct the outreach messages that will be most effective for its intended audience. I also designed the methods to contribute to certain sets of literature, for example to illuminate certain studies about communication of risks and benefits, and targeted outreach in public health communication. To begin this process, a common understanding of what outreach tools are being utilized the most is needed. Inquiring into the current awareness of shellfish illnesses is reflective of the quality of outreach methods currently being used the WDOH.

In addition, this research looked at why razor clam harvesters choose to shellfish. Motivations have the potential to offer insight into the community itself. As found in the literature around risk communication, is the importance of understanding and incorporating harvesters' knowledge, attitudes, and beliefs around fish and contamination

(Kalkirtz, Martinez, & Teague, 2008). Allowing outreach to be tailored for individuals, or targeted for groups of clam harvesters. Motivations also provided insight into the amount of beginner shellfish harvesters, and thus creates a target audience of outreach.

Coding

After transcribing by typing each of the 29 recorded interviews in Microsoft Word, coding was used as a device to thoroughly analyze the results. Coding is the process of sorting, categorizing, synthesizing and evaluating collected qualitative data to understand the meaning of the text (Clifford & Valentine, 2003). The coding method used for this research was to read through transcriptions and highlight trends and major themes directly related to my research questions. Each trend and major theme became a code, and a list of the codes found in the transcriptions was created. Some examples of the codes were, “Perceived Causes,” “Sources (of closures information),” “Motivations,” and “Improvements (to outreach)”. The codes were derived from my research questions and extensive literature review of the topic.

Limitations

While conducting and designing this research, a few limitations arose. To add as much variety to the research methodology as possible, I selected different beach harvest locations identified to be open, days of the week, months, and times coinciding with low-tide to conduct interviews. While this study had a sample size of 29 harvesters, this is not representative of the entire shellfish population, and should be noted. Responses to interview questions are limited to the 29 interview subjects that participated in this research.

Self-selection bias of interview subjects also comes into this research. I positioned myself on beach harvest locations to access razor clam harvesters present that day. Individuals were approached based on their proximity to myself on the beach, and were selected based on their willingness to participate, proximity to my location, and their time to devote to answering my questions.

Flyers requesting feedback from razor clam harvesters were also distributed at local grocery stores, fishing retail shops, and public parks close to the identified beach locations. Only one participant replied to the flyer request, and participated in a telephone interview.

Chapter 4: Results: The Voice of Razor Clam Harvesters

The purpose of this research was to contribute to state agencies developing outreach tools intended to reach their audience of shellfish harvesters in Washington State. This study's research of coastal razor clam harvesters intended to discover commonalities expressed in motivations, knowledge, sources of closure information, and improvements as expressed from the intended audience of outreach. In this chapter, results from in-person interviews are synthesized and broken down by the questions asked and subject matter responses. Narratives are included to establish razor clam harvesters' motivations, knowledge of closure causes, where they go to locate closure information, and improvements they would like to see within outreach communication. To convey my research findings from the interviews, quotes were selected that addressed these topics. Chapter 5 will include a discussion of these findings, as well as recommendations to improve current outreach used by agencies such as the Washington Department of Health and the Department of Fish and Wildlife.

Motivations:

What are your motivations for harvesting razor clams?

A New Experience or Hobby

The first question inquired of razor clam harvesters was their motivations for razor clam digging. As derived from the literature review, motivations provide more information into designing outreach tailored for individuals, or targeted for groups of razor clam harvesters. Personal motivations ranged from experiencing a new activity to teaching a friend or loved one the techniques of catching a razor clam.

Out of the 29 interviewed, five reported that the activity was a new experience that they were trying for the first time. Teaching or learning razor clam digging from a friend or family member was also mentioned as a motivation for beginner harvesters. This is an insightful motivation because it provides information in to the level of knowledge the clam harvester has going into the activity. Other motivations included simply being with family, and sharing a hobby. The following transcribed passages from three interviews depict the harvesting motivation as a new activity, or one to be shared with friends and family.

We enjoy eating them and catching them. We come as a family, and do it together. I look forward to coming out with the entire family on the first day of the season.

I came out here with my boyfriend and his family. He's been teaching me how to do it all. So yeah, I guess it's a learning experience. Something new to try out. A new hobby. It can be intimidating. Like, I had no clue where or what to do once we got here. I didn't even know the proper clothing to wear. That's pretty bad, isn't it?

Today I am here with my daughter. This is our second or third time coming to the beach to hunt for clams together. I have pretty fond memories of my dad bringing me out. In some sense, I wanted to recreate those memories with her. Some part of me has the intention of hoping she'll do the same with her kids. It's a very nostalgic experience.

Motivations are important to understand because they aid the process of creating health messages intended to reach different audiences who may hold different motivations and knowledge levels of clam digging. For example, if more people are razor clam digging as a new hobby, then more basic beginner outreach could be designed by agencies such as the WDOH and WDFW. The following passage expresses razor clam digging as a new experience.

I have never done it before, and someone native of Washington here said if you've never gone clam digging you have to go at least once. So, I knew it was kind of a bucket list thing to do. And it's one of the unique things that you can do here; you can't do it anywhere else.

Another finding is that the five razor clam harvesters who said it was their first-time harvesting clams were originally from another state outside of Washington. The following passages illustrate the motivations to harvest from the perspective of individuals non-native to Washington.

I was curious about how it all worked, so I started tagging along. I'm from Ohio, and they don't have razor clam digging there, so I was mostly curious about the sport itself. I had never used a clam gun, so it was all really new and fascinating.

I grew up in Rhode Island. We have oysters and clams, but nothing comparable to shellfish harvesting out here. The entire sport was like learning how to ride a bike. No idea shellfishing required a certain technique and procedure.

I guess not being native to Washington I felt I needed to read up more on the topic of shellfish. It seems most of the people you bump into are born and raised in this area, they know what to look for, and I didn't feel that way. Yeah, I had to read up a little more than most, because where I'm from they don't have shellfish, so all these rules and licenses were a lot for me.

Razor clam harvesters from out of state could coincide with lack of knowledge of closures if they are from a region unfamiliar with shellfish harvesting safety. An identified area of improvement could be designing separate outreach targeted towards out of state beginner harvesters.

Nature

Other motivations included experiencing nature, and being part of the surroundings. 8 out of the 29 said being in nature, or at the beach was a motivation for harvesting razor clams. Additional motivations included experiencing the nice weather, and taking in the vista views of the Pacific coast beaches. Also mentioned, was the fact that bad weather could be a deterrent to harvesting for the day. Appreciation of nature can be a large motivator for clam digging.

I enjoy the coastal views. Nothing like the Pacific coastal views, and the wildlife. I saw a bald eagle earlier today. It's unreal the amount of beauty you see on a day like today. So yeah, some of it is to be a part of nature, experience that, be a part of it in my own way today. Plus, clam digging is a tradition of the culture in Washington It dates back, and I want to be a part of that cultural experience.

Tradition

A motivation coupled with experiencing nature was the traditional aspect of razor clam harvesting. Nine said the tradition of razor clamming in Washington was a motivation to continue harvesting. Passing on the tradition to a family member was also mentioned as a motivation for harvesting razor clams. The value in the traditional aspect of shellfishing was mentioned as a cultural aspect of living in the Pacific Northwest.

For me, I kind of feel like I'm a part of the whole system. You know, when you think of the Native American tribes out doing their clam digging and gathering. I want to feel a connection to the land, and the ocean.

It's beyond a recreational activity. We've been coming to the same beach generation after generation. I even use the same shovel my grandfather used to dig clams back in the 50's. Clamming holds a cultural aspect tied to the tribes who have been around long before. I'm mindful of the traditional side, the patience and tranquility of being present. I see that evident with the traditional tribal side of shellfishing, too.

A Meal

A very basic motivational response was preparing a meal out of the harvested razor clams. 8 harvesters replied that preparing the razor clams for a meal was a motivation for shellfishing. One harvester replied to my inquiry into motivations with a one word response of "dinner." Replying with a food source as a motivation was followed up with a subsidiary question inquiring how important clams are as part of their

diet. Out of the 8 that replied with food source as a motivation, none said they were significant to their diet, or culturally important.

Oh, not that important. It's a luxury I guess, if that's the way you want to put it. Or a privilege, you know, to come to the beach and catch clams to take home for dinner. You don't get them all the time. They're really tasty. I fry them up in hot grease. Pretty crispy.

I've perfected the razor clam chowder recipe. That's what gets me out here with my husband. I go home and make us a big batch of chowder. I leave the cleaning and removal of the shell to him, but I got that recipe down. Same recipe my grandma used. Nothing better than chowder fresh from the ocean, you just can't beat that.

Knowledge of Closures:

Can you tell me the cause or causes of recent harvest closures?

Domoic acid

Interviewees were also asked if they were aware of the causes of current or recent harvest closures. Since reasons for closures frequently vary, a variety and combination of causes for closures were received. Eleven said the cause was due to toxins or chemicals in the water, but did not specifically say domoic acid as the biotoxin causing closures. Five mentioned domoic acid as a specific closure cause. When domoic acid was used as a response to a closure, a subsidiary question was asked where that information was obtained. The following passages depict razor clam harvesters' understanding of a closure based on toxicity levels, and where that information was obtained. In these cases,

the WDFW was used as a source of toxicity information. The complete sources of findings will be shared later in the chapter.

The website [Department of Fish and Wildlife] talked about that they checked some toxin, something toxic that the shellfish can pick up from the ocean, and they test so many, and if they test clear, then that's the beach they open from what I was reading. And the beaches that they stay closed is because they're still testing some high level of toxicity in the clams, so they don't want to open it to the public.

I checked on the website the Department of Fish and Wildlife provides. I been keeping up with the closures on there this season.

Pollution

Pollution was discussed as a closure reason five times during interviews. Pollution was used as a reply with other causes for closures such as increased populations shellfishing and rural run-off. Bacteria, red tide, and algal blooms were also mentioned as causes of a harvest closure. Pollution was also considered as a cause affecting the number of clams available.

In the '50s and '60s and even the '70s we never heard of toxic clams, they didn't exist. Well apparently, rural pollution, or whatever, the way things have changed, now we got toxic water that the clams eat and of course that affects them.

Razor clam populations

Low razor clam population counts was also brought up as a possible reason for beach harvest closures. 10 out of the 29 razor clam harvesters mentioned razor clam

populations as a cause for a closure. During the selected days this research took place in late January, February, March, April of the 2017 season, Kalaloch was closed due to low population counts. For the first time since 2012, Kalaloch Beach was tentatively scheduled to open on January 8 and 9 for digging, but was unfortunately not included in this data collection. Dwindling clam populations was a common theme expressed by razor clam harvesters for closures. The following passages depict concern around razor clam populations as a closure cause.

It's changed over the years. It didn't matter which beach you went to, you always got big clams back in the '50s and '60s. But as the freeway came in and more Seattle people came down here to dig, well you can see what happened. When I started digging there was no such thing as a limit for clams. Then it went 60 and worked its way down the current limit of 15.

Well I guess it's for clam populations, keep them high enough so people can leave with a decent number. I'd say the population increase in trash and pollution, that doesn't help the clams any. So, it's like a cycle, more people, more trash, more pollution in the environment, less clams, but still more people wanting clams. It's a vicious cycle that's been going on, I don't know what it will take to end it.

Tribal sovereignty

One response from interviewees regarding causes of closures was Tribal sovereignty rights to shellfishing. A few razor clam harvesters expressed concern and confusion in regards to understanding when the beach is closed to non-Tribal harvest.

Well I tell you what, we drove all the way down to Roosevelt Beach recently only to find out it was closed to the harvest of non-Tribal members. I don't recall hearing anything about that mentioned on the news or the website. That was a wasted day; we made that drive only to have to turn back. Why wasn't that mentioned anywhere? They need something mentioning the Tribal harvest on that website. It gets confusing to try and follow all these closures.

Knowledge of the cause of a closure is reflective of the outreach and education being used by the Department of Fish and Wildlife and the Department of Health. The lack of understanding of the cause of a harvest closure can be identified as an area of improvement for public health messaging and outreach. This will be discussed further in the following chapter.

Sources of closure information:

Do you check for harvest closures? If so, where do you go to find closure information?

Asking razor clam harvesters where they go to locate closure information was a key question asked during interviews. This question was posed to gauge what tools shellfish harvesters utilize for information related to harvest closures, as well as where improvements can be made by agencies issuing closures.

The Washington Fish and Wildlife website

When asked where they check for harvest closure information, out of the 29 razor clam harvesters interviewed, 27 replied with simply the “website.” When asked for further information on which website, the Washington Fish and Wildlife website was

mentioned. The WDOH website was not mentioned as a website used for closure information. It was also found that information on domoic acid was found via the WDFW website.

Newspaper, Local News, Word -of-mouth

Along with the WDFW website, a source of closure information included newspapers, local news, and word-of-mouth from fellow clam harvesters. Newspaper messaging of closures was mentioned from harvesters on two different occasions, local news once, and word-of -mouth from fellow clam harvesters on five different occasions.

Down here, they print it in the local newspaper, we grew up, my wife and I both grew up in Aberdeen, but now we live in Belfair, which is up by Shelton, so they don't get it in the paper like they do down here. Unless it's a big deal, so you got to check it online. My brother from down here calls me, or I trust somebody will.

I'd like to see more information in the Tribune and Olympia on water quality, just a weekly update if possible would be helpful.

The Shellfish Safety Hotline number

A response received from razor clam harvesters on three different occasions was use of the biotoxin hotline number as a source of closure information. The Shellfish Safety hotline number is a tool developed by the WDOH, that allows harvesters to call the number to receive updated closure information.

We just call the Hotline number. When we went shellfishing on the Puget Sound we called that number. Pretty helpful when you're already out away from the

computer and wondering if the site is actually still open, because those things change overnight. I always keep my phone handy when I come out to the beach.

Shellfish Safety Map:

Are you aware of the Shellfish Safety Map used by the Department of Health for shellfish closures?

The Washington Department of Health has been pushing for more people to utilize their online shellfish safety map (Figure 3) as a source of closure information. To spread more awareness of this useful tool I passed out outreach material developed by the WDOH during interviews. Out of the 29 people interviewed none responded with being familiar with the Shellfish Safety Map. This tool is only available online, but can provide specific beach location information regarding causes of closures. This is an identified area for the Department of Health to consider in their public outreach attempts.



Figure 3: Shellfish Safety Map

(courtesy of the WDOH <https://fortress.wa.gov/doh/eh/maps/biotoxin/biotoxin.html>)

Reasons for not following harvest closures:

Why do you think razor clam harvesters would not comply with a closure?

Reasons why other razor clam harvesters may choose not to follow harvest closures was investigated, to provide insider views. Razor clam harvesters can provide more awareness into closure compliance because they are directly related to the activity, and hold more familiarity with the community of shellfish harvesters.

Distrust

A common theme expressed by five of the participants was that fellow razor clam harvesters may feel that they know best when to harvest clams due to their personal time and experience with harvesting. Razor clam harvesters felt that some harvesters may feel that the insider knowledge and understanding creates a better perception of when to harvest than the issued closure by agencies. Distrust or trusting one's own knowledge of closures is expressed in the following interview excerpts.

I'd probably think they'd do that because they don't always trust that the level of toxicity might be real. Or they think that it's hit or miss, and they're just going to take their chances or that their bodies or whatever will adjust or accept it, and there won't be enough to do anything health wise to people. I think they just kind of ignore that, kind of like, knowing that smoking causes cancer, but you smoke anyway.

It could be any reason, maybe they think they know what's best when it comes to catching clams, or whatever. A lot of the shellfishers out here have been doing it their entire lives, and they feel like that should constitute enough in determining if

they're safe enough. People are stubborn, and old, they don't want someone coming in and telling them how they should be doing it.

Lack of Knowledge

Lack of knowledge or understanding of the possible causes of a closure was offered as another reason harvesters may choose not to follow a closure.

Some folks just don't understand the severity of the situation. They don't know about toxin levels, or the harmful health effects to people. Others choose to be ignorant to the fact that shellfish are tied to serious health concerns. We need to consider all the different populations who do shellfish, because that brings to the table all kinds of reasons to dig shellfish. Maybe once we take into consideration all the different shellfish populations that will change how we do this stuff.

Too much information

The various factors that affect a harvest closure was suggested as overwhelming harvesters, and cause for ignoring a harvest closure.

To some degree, the public must be responsible too, and make sure that they know what they're doing. I can see people feeling overwhelmed by the toxin names, or causes, but, you can't make people care about their well-being. There's some ownership of that responsibility on the people who choose to come out here.

If you're not a local or not as familiar with closures it can be overwhelming, I know I have had to read on the website [WDFW] a few times just to double check it was safe for us to come out. It's a lot to remember and take in.

Identified Improvements:

What improvements would you like to see with closure information? What type of information would you like to see included?

Improvements to closure information was asked about, to provide more insider knowledge from the audience that would be receiving the closure information. This was an important question to ask of razor clam harvesters, because it reflects the wants and needs of the targeted audience members.

Expand Outreach

One common theme received from interviewees was requesting more closure material in varying outreach forms. The forms of outreach included printed materials such as brochures, newspaper articles, and signs on the beach mentioning upcoming closures. Accessibility to internet based tools was brought up, with an expressed concern for expanding beyond the outlet of the internet.

They need to expand beyond that website, because, you know what, some individuals don't have access to the internet, or even know about it in the first place. Are newspapers a thing of the past? Why don't we have more updated closures dates listed in the local papers, or mentioned in the news? Or, distributing information with that license when you purchase it. That, right there, is a good start.

You know that's tricky. I think you guys already do a nice job of getting the information out there, it's just a matter of getting people to care enough to understand the dangers of coming out here and harvesting when those toxins are in the water. Maybe if you had a person out here on the beach, like yourself,

approaching people and having civil conversations simply explaining the dangers. Maybe that would help? Or maybe when you mail out their harvest licenses sending out little pamphlets going over the basics. But then again you're still going to have people who want to do their own thing. The only way to make them care is to let them get sick on their own, and then they'll learn. Maybe that's what it'll take.

Brochures with Licenses: A beginner's guide

A discovered theme found from interviews was providing how-to guides of information for beginner harvesters. A further suggestion was to offer a brochure explaining the different causes of closures, and where to access closure information, including information regarding the Shellfish Safety Map, and other tools used by the WDOH, such as the biotoxin hotline number. Brochures were recommended to be handed-out or mailed with purchased licenses.

Maybe handing out leaflets with closure information in them, or the reasons they're closed, like mentioning domoic acid. Another thing is being from out of state, I feel like most diggers out here today are from Washington, and are already familiar with the way things work. It sure would be nice if they had a section for out of towners. 'Cause a lot of people not native aren't as familiar, so maybe creating some messages just for the less knowledgeable fishers.

When you buy your license they probably should help you a little bit. But they probably can't possibly know everywhere that they sell them. But maybe even give a brochure when you get the license? Maybe they could give you the

Department of Health magnet, how about that? Have those magnets at all the places where they sell licenses for shellfish.

Beach Signage

Lot of it's on the computer, as long as my computer works because we live out in the sticks. I would assume if I forgot to check the computer that there would be a sign at the beach. They're going to do Copalis Beach on Friday, Mockrocks on Saturday, Copalis on Sunday. Anyways they're switching the dates, and they made a note of that, make sure you check you're on the right beach. Well I'm hoping there will be a sign on the beach that says closed today because somebody is going to forget, and it'll get confusing. And we're usually here two hours early, and if you're the only one on the beach you're going to wonder if you're at the right beach or not.

It would be nice to have something posted on the beaches, but I know it's an awfully long beach, but maybe at all the driving entrances they could have just something temporarily up like clam digging is open this week, or clam digging is closed due to high levels of blah blah toxicity. Something that could be removable. I did notice there were signs that you can't drive on the beach, during certain months. So maybe they could have more signs. And also a lot of places will have a red flag up if waves are too hard, yellow flags for something else. Maybe they could have some kind of visual posting to at least making people curious to what that might be and they can find out.

Shellfish Safety Map

After informing individuals of the Shellfish Safety Map, many thought more outreach should be used in getting that tool to the public. This is a tool only available online, but valuable when trying to decide if a particular beach is open to the harvest of shellfish. It was suggested that the outreach tools (magnets, pencils, small cards) handed out during interviews also be provided with the brochure when purchasing or receiving a license.

Well we didn't know about the Shellfish Map. I had no idea that had something so comprehensive developed. That is especially helpful for us in future digs even out on the Sound, or the Hood Canal.

Conclusion

The qualitative data from these interviews depict clear motivations, perceptions of closures, and sources of closure information. These findings were organized around the interview questions to illustrate common themes expressed in each section. Through analysis of the interviews, these data have provided insight into the perceptions and understanding of closures by 29 razor clam harvesters. The data demonstrate that five out of the 29 razor clam harvesters are approaching the activity from a purely new standpoint, or leaning on other experienced shellfish harvesters for guidance. Sources of closure information are primarily coming from the WDFW website, but many are still utilizing word of mouth, newspapers, and the biotoxin hotline number.

A diversification of outreach beyond the internet-based tools was further requested by interview subjects who felt this was not representative of all harvesters, or

individuals without access to the internet. It was further expressed that tools such as the local newspaper and biotoxin hotline number are still being utilized, and could serve as sources beyond the internet. An identified area for the WDOH, is improving outreach for the Shellfish Safety Map, as none of the harvesters expressed an understanding of where to locate, or use the tool. State agencies such as the WDOH and WDFW can use this information to create public health outreach messages that are catered to the motivations, experience-level, and wants expressed in these interviews.

Chapter 5: Discussion and Conclusion

What are your motivations for harvesting razor clams?

As shown by the interview results, individual motivations, knowledge of closures and causes, and experience levels for razor clam harvesters vary. A key theme that emerged from this research was that harvesters are approaching the activity from a purely new standpoint, often relying on the knowledge of more experienced friends or family members to teach them the ins and outs of razor clam harvesting; this also included getting information on beach closures. Of the participating 29 razor clam harvesters in this research, five were harvesting for the first time, and reported unawareness of closure causes, or where to go to check for harvest closures. This is an identified limitation and area of improvement for agencies, such as the Department of Health, which designs public outreach materials.

Expanding public health messages to be clear for beginner harvesters is a significant step forward in reaching all audience members. Currently, the WDFW offers online YouTube tutorial videos teaching the basics of harvesting razor clams. However, this can be expanded by incorporating more beginner how-to outreach material, such as pamphlets expressing gear requirements, closure information, where to find closures, and causes of closures.

Another key theme that emerged in the motivations section was that many harvesters were from out of state, and were not as familiar with Washington State laws and regulations regarding razor clam harvest closures. This can be done by designing outreach targeted at out of state harvesters, and including the brochure or pamphlet with the license when bought by the harvesters.

As pulled from the literature review, targeting the health message to your audience can produce more compliance with the health advisory. Knowing that beginner harvesters are attempting to understand the process of razor clam harvesting leads to developing outreach targeted to address their needs. This has the potential to mean including messaging targeted at the emerging themes discovered from the interviews, including “Perceived Causes” “Sources (of closures information)” “Motivations” and “Improvements to outreach”.

Can you tell me the cause or causes of recent harvest closures?

Knowledge of the cause of a closure is reflective of the outreach and education being used by the Department of Fish and Wildlife and the Department of Health. As mentioned, the WDOH currently uses a bi-lingual recorded hotline number for biotoxin closures, an interactive online shellfish safety map, shellfish danger, warning, and closure signs posted in eight different languages, media publications, including a descriptive educational section offering biotoxin education on their website, and an online biotoxin bulletin updated daily with closure information. The highly varied responses and understandings of the closure cause can be identified as an area of improvement for public health messaging, education, and outreach. The razor clam harvesters interviewed expressed a spread on the causes of a closure. As far as the awareness level goes in to closure causes this research found 11 responses tied to toxins or chemicals, but only five expressed knowledge of domoic acid as well as symptoms related to exposure.

Pollution, bacteria, red tide, and algal blooms were included as potential causes of a harvest closure. Closures can be put into effect for all of the mentioned reasons, thus making it difficult to communicate the many causes to protect public health while also

distinguishing the differences between them. Currently, the WDOH and WDFW offer sections on their websites including information regarding the closure causes. Because the websites are restricted to an audience that utilizes or has access to internet this may be an identified area needing a diversification. There was an expressed theme for more forms of outreach including printed materials such as brochures, newspaper articles, and signs on the beach mentioning upcoming closures. Accessibility to internet based tools was brought up as a concern for many harvesters' due to the fact that beach closures can change so quickly. A request for diversification beyond the internet-based tools was requested from harvesters.

Do you check for harvest closures? If so, where do you go to find closure information?

A trend found from this research was that 27 out of 29 of harvesters interviewed were going to the WDFW website for closure information. This is an interesting find because it was also expressed that a need of diversification beyond online tools was needed. The WDOH website was not mentioned as a source of closure information for coastal harvesters, but the WDOH tends to focus more on the Puget Sound area than the coastal region of shellfishing.

While the WDOH website was not mentioned, the WDOH biotoxin hotline number was mentioned as a tool used for closure information. The harvesters expressed an ease of accessibility with the hotline number, especially to information that can change overnight. The hotline number could potentially offer information on accessing the Shellfish Safety Map for additional closure information.

Theories related to how individuals learn from peers is useful for the purpose of this research. Interviews conducted revealed that beginner harvesters were learning from

family members and peers who were more experienced with razor clam harvesting. It was also found that peers served as sources of closure information for beginner harvesters. It will be important to include social learning theory in designing outreach messages targeted to meet the needs of those most susceptible to illnesses. This theory offers insight into how messages may be interpreted for different groups, as well as how learning from others influences the process.

Are you aware of the Shellfish Safety Map used by the Department of Health for shellfish closures?

The lack of awareness of the WDOH Shellfish Safety Map was one of the most telling aspects of the conducted interviews. Out of the 29 harvesters interviewed none expressed an understanding of what the Shellfish Safety Map entailed, or where to find it. This presents a focus area for the WDOH in furthering outreach around this chosen method. It was suggested from the interviews that the outreach tools for the Safety Map (magnets, pencils, small cards) distributed during interviews also be provided with the brochure when purchasing or receiving a razor clam license from the WDFW. This is a tool focused on the Puget Sound area, but has the potential to address the needs of the coastal harvesters.

Why do you think razor clam harvesters would not comply with a closure?

A discovered theme that matched the literature review was the distrust of state agencies in health advisories. Razor clam harvesters felt that some harvesters may feel that the insider knowledge and understanding of shellfishing creates a better perception of when to harvest than the issued closure by agencies.

The learning theory literature describes the importance of creating a trusting and safe environment to facilitate effective information exchange (Knowles et al., 1998). Such an environment is critical to encourage active participation where an exchange of ideas and experiences can occur. Learning theory concepts indicate that adults take a problem-based approach to learning, have a range of prior experiences and knowledge levels, and are more likely to believe information from a trusted source (Toman, Shindler, & Brunson, 2004). As found in their study regarding trust and the internet, findings may suggest the public has become wary of information from this largely unregulated source and reflects that each day most of us are overloaded with unsolicited messages and information (Toman, Shindler, & Brunson, 2004).

Lack of knowledge or understanding of the closure cause was offered as another reason harvesters may choose not to follow a closure. This presents an obstacle in presenting clear and concise information to the public while also covering the safety and health concerns.

What improvements would you like to see with closure information? What type of information would you like to see included?

From the interviews conducted, there was a call for a diversification beyond the current methods of outreach, including the internet-based tools. This included information in hard-copy form such as brochures, pamphlets, magnets and small cards with the Shellfish Safety information. The distrust matched with the need for a diversification in the outreach materials points towards designing messages more closely linked to hard-copy forms.

The request for diversification of outreach materials, also means finding a balance of the information regarding risks and benefits for consumption of razor clams. As found from the Literature Review, risk communication efforts must take into consideration anglers' knowledge, attitudes, and beliefs regarding fish and contamination. They must not the receiver of the outreach to be a part of the process of defining risk (Kalkirtz, Martinez, & Teague, 2008).

Brochures with beginner information, including the different causes of a closure were recommended to be handed out or mailed with purchased razor clam licenses. This will require the WDOH to work with the WDFW, who distributes the licenses via their website, at approximately 600 locations throughout the state, including sporting goods stores, marinas, convenience stores, and major retailers (WDFW, 2017). The recommended brochures offer the opportunity to try different styles of outreach messages, including expansion beyond internet based tools.

For example, using a targeted message approach in the brochure would include messaging and education aimed towards a specific audience. Based on the data collected from interviews, outreach targeted at beginner- out of state- harvesters would be a good start. Other themes that emerged within the beginner shellfish harvesters was lack of knowledge as to where to go for information regarding beach closures, and causes of closures.

Conclusion

This research has explored where razor clam harvesters go to receive shellfish closure information, their perceptions of closures, motivations, and the ways in which the Department of Health can further improve public health outreach methods to better

address their needs. This research found that participants not only had mixed perceptions of closures, but were utilizing different sources of outreach used by the WDFW, and WDOH. An overwhelming majority of participants were using the WDFW website as a source for closure information, yet there was a call for a diversification beyond internet-based tools. It was also found that none of the participants were familiar with the Shellfish Safety Map, and as such, is an identified area of outreach that needs improvement for the WDOH. Future outreach for the Shellfish Safety Map was recommended in more hard-copy forms such as brochures, small cards, or magnets promoting the tool.

Additionally, this research found that razor clam harvester's non-native to Washington were motivated to try the hobby for the first time. This offers the WDOH a targeted audience for designing messages to meet the needs of those that are new to the area and the activity. Beginner harvesters requested a need for the basics such as causes of closures, and where to go to find closure information. Other potential messages should include information to tools and gear needed for the activity.

This research suggests that harvesters have a mixed understanding of the causes of harvest closures. While a closure may be due to different causes (low clam counts, high levels of DA) there needs to be more outreach with information regarding DA-exposure. Found from the literature around risk communication, there needs to be a balance of the risks and benefits to consuming shellfish. The process of balancing risks and benefits of fish consumption, also includes understanding how the intended audience views and defines the two concepts. Future outreach should incorporate these concepts in designing their messages and education. Ultimately, the goal of an advisory is not to scare

individuals away from harvesting and eating shellfish, but to provide clear and concise information that allows the public to make healthy choices.

In the face of increased shellfish harvest closures related to domoic acid and increased levels of exposure, these individual harvesters can add to the development of sufficient public health outreach. Providing targeted outreach to meet the needs of those that will be the most affected can fulfill state agencies responsibility of protecting public health.

Suggestions for Future Research

As identified in the literature review section, there is a need for creating culturally relevant public health outreach. The scope of this thesis did not identify the specifics of demographics harvesting razor clams, but offers the opportunity for future research in identifying the needs, perceptions, and motivations of minorities related to closures.

While the WDOH has developed beach closure signs in different languages, the approach used to implement and distribute outreach will require a close-eye to producing culturally relevant materials. Asking how state agencies can develop culturally relevant and appropriate outreach in razor clam harvesting closures is a suggested area of future research.

In developing targeted health outreach to out-of-state beginner harvesters, more information will be needed surrounding designing the outreach. I propose a similar study of in-person interviewing and possible focus groups to gather data around the perceptions and needs of this population. In addition, examining the success of a beginner-brochure has the potential to improve the design of future educational and messaging techniques.

In moving forward with public health outreach and messaging, agencies in Washington State are offered a unique opportunity to be a leader in designing effective materials.

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