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REDUCING HUMAN CONSUMPTION OF "DO NOT CONSUME" FISH FROM THE PALOS VERDES SHELF USING COMMUNITY-BASED SOCIAL MARKETING TECHNIQUES

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Abstract

The Angler Outreach Program was conducted in Southern California near the Palos Verdes Shelf (PVS) Superfund Site that applied a community-based social marketing (CBSM) model to ensure anglers were aware of a revised fish advisory and did not consume fish species included in the advisory. The program incorporated the following steps: (1) formative research that includes identifying a target audience, target behaviors, and motivators and barriers associated with the target behavior, (2) pilot testing, (3) intervention, and (4) evaluation. Work was done as part of the Fish Contamination Education Collaborative (FCEC), a United States Environmental Protection Agency (USEPA)-supported partnership of stakeholders that was established in response to the human health risks posed by the contaminated sediments along the PVS. A tip card was developed to inform anglers about which fish have been deemed "Do Not Consume" (DNC) and consumption guidelines for other fish. We (the FCEC) then surveyed anglers about their awareness of DNC fish and post-catch behavior, including whether they typically eat (DNC) fish they catch, and compared results between those who had received outreach and those who had not. Based on 870 survey responses, we found that a smaller proportion of anglers who received outreach consumed DNC fish they had caught and a larger proportion of anglers who received outreach were aware of DNC fish contamination compared with anglers who had not received outreach.

Background

The Palos Verdes Shelf (PVS) Superfund Site is located within the Southern California Bight, an area of the coastal Pacific Ocean

between Point Conception and San Diego, California. It is an 88 square kilometer area of sediment on the continental shelf and slope off the coast of the Palos Verdes Peninsula, Los Angeles County, California (USEPA 2009). For nearly 40 years, the pesticide dichloro-diphenyl-trichloroethane (DDT) and the electric insulator polychlorinated biphenyl (PCB) were discharged from several industrial sources into the sewers and were released into the waters of the PVS. The DDTs and PCBs mixed with the suspended solids in the discharge flowing out of the sewer outfalls and settled to the ocean floor to form a large sediment deposit. It was estimated that at one time, more than 1,000 metric tons of DDTs were discharged, with approximately 100 tons settling on the surface sediment that covered the large expanse of ocean floor at the PVS (USEPA 2009).

Organisms inhabiting the site accumulate both DDTs and PCBs, leading to contamination of fish and other animals through the food chain. As a result, the largest threat to human health is the consumption of contaminated fish within the red zone, which indicates the areas with the highest concentration of DDTs and PCBs.

Fish caught in the red zone (Fig. 1), as defined by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA), are at the highest risk for contamination; this is particularly the case with white croaker. White croaker caught within the PVS contain higher levels of DDTs and PCBs compared to other fish species due to white croaker's bottom-feeding behavior and depth and habitat preferences. This is important to know in light of the fact that white croaker is the third most commonly caught fish in Los Angeles County, with a high consumption rate relative to the catch rate (Allen et al. 1996). The first fish advisory issued by the OEHHA included only white croaker.

In June 2009, the OEHHA published an advisory report entitled "Health Advisory and Safe Eating Guidelines for Fish from Coastal Areas of Southern California: Ventura Harbor to San Mateo Point" (California Environmental Protection Agency Office of Environmental Health Hazard Assessment 2009). The advisory was based on the analysis of tissue samples from locally caught fish to determine the concentrations of PCBs, DDTs, and their metabolites, chlordane, dieldrin, and mercury. The results

FIG. 1. Map of red and yellow zones for fish caught from Ventura Harbor to San Mateo Point CREDIT: OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT WWW.OEHHA.CA.GOV/FISH.HTML

of this analysis prompted the OEHHA to add four fish species to the "Do Not Consume" (DNC) fish advisory list: topsmelt, barred sand bass, barracuda, and black croaker. Prior to the release of the 2009 advisory, *white croaker* (aka kingfish, tomcod) was the only species listed as a DNC fish off the Los Angeles and Orange County coasts.

The risks associated with consuming DDT- and PCB-contaminated fish such as white croaker include reproductive impairment, neurological damage, increased risk of cancer, and liver damage. Immediate exposure to (i.e., ingestion of) these contaminants in fish does not produce instant health effects; however, prolonged exposure leads to a buildup of these contaminants within the body, and consequently, increased probability of health risks. The magnitude of the health effects associated with consuming contaminated fish depend on a few factors, including: the chemical concentration within the fish; frequency of consumption; fish preparation methods; and individual consumer characteristics such as age, gender, life style and health history.

This article represents the efforts of FCEC's Angler Outreach Program, of which Heal the Bay and Cabrillo Marine Aquarium are major contributors. The Angler Outreach Program seeks to effectively communicate to pier and shoreline anglers in Los Angeles and Orange County ways they can reduce their exposure to contaminated fish, yet maximize the benefits of healthy fish consumption. A key component of this strategy was to develop and implement an The Angler Outreach Program using the community-based social marketing (CBSM) model proposed by McKenzie-Mohr (2000, 2002; McKenzie-Mohr and Smith 1999; Oskamp and Schultz 2006; Schultz and Tabanico 2008). The Messaging Work Group, an advisory branch of the FCEC and made up of partners that include the Santa Monica Bay Restoration Commission and other governmental and nongovernmental entities, also provided input and expertise.

The focal point of the Angler Outreach Program is a "leave-behind" material—a tip card—that summarizes the main points of the advisory that outreach workers convey. To ensure the tip card resonated with the target audience, we pilot tested the material with anglers before finalizing the tip card and applying it broadly throughout all targeted piers. We received invaluable feedback that helped us revise the tip card that included information on which fish should not be consumed and which fish can be consumed in moderation and cooked a certain way.

This project differed from previous public health campaigns utilizing a social marketing framework in three ways: (1) it included pilot testing to ensure the outreach tactics were effective and only after were broadly applied, (2) it had an evaluation component, and (3) a group of anglers who did not receive outreach served as a control group that was compared with anglers who received outreach. The evaluation measured awareness levels among the target audience and post-catch behavior, including consumption patterns of caught DNC fish and whether they usually share caught DNC fish with family/friends.

While the CBSM approach has proven effective in promoting conservation behaviors, there has been scant research applying the strategy to reduce both public health and environmental risks faced by consumers. Social marketing helps to address social issues by applying and reinterpreting traditional marketing concepts (Andreasen 1995; Neiger et al. 2001; Walsh et al. 1993). Unfortunately, many social marketing programs overemphasize passive forms of communication (such as flyers or signs) that focus solely on awareness of the issues.

The CBSM aims to promote behavior change within a target population by focusing outreach efforts on specific behaviors, and working at the community level through direct contact with individuals (McKenzie-Mohr and Smith 1999; Schultz 2002; Schultz and Tabanico 2008). The model is used to create an effective message before implementing an intervention by identifying the motivators and barriers to changing behavior within a target population that will also inform how best to disseminate the message (Alcalay and Bell 2001; Neiger et al. 2001; Walsh et al. 1993). As a result, CBSM principles are well suited to translate complex scientific messages and behavior change strategies into effective outreach programs and communication campaigns (Lefebvre and Flora 1988, 300).

Approach and Methods

Public outreach programs can be difficult to evaluate without significant resources, and more often than not, may be ineffective in terms of changing behavior. This is why the FCEC tried to apply the principles of social marketing to improve public health conditions—following the successful case studies over the last 30 years (De Gruchy and Copel 2008; Harvey 2000; Lefebvre and Flora 1988; Reger et al. 1998; Rothschild 2000; Walsh et al. 1993), and more recently, studies to foster sustainable environmental behaviors (Andreasen 1995). For example, Reger et al. (1998) acknowledged the limited impact of previous community-based health promotion programs and instituted new approaches. By targeting specific community group members at risk, implementing a media campaign, and using a non-intervention control comparison group, Reger et al. (1998) were able to observe significant behavior change in the community intervention group using post-intervention self-reports. Similar procedures were utilized in an effort to design an effectual community-based health intervention program. Goodman (1998) identified five major evaluation principles for community-based promotion programs: program theory, instruments tailored to the members of the community, evaluation that involves qualitative and quantitative responses, incorporates social ecology and social system concepts, and involves local stakeholders in meaningful ways. The current program applied these principles in an effort to improve evaluation integrity.

McKenzie-Mohr (2005) identified seven steps for community-based observation in accordance with social marketing principles: clarifying the objective of the survey, listing items to be measured, writing the survey, performing a pilot, selecting a sample,

FIG. 2. Front of the original tip card.

FIG. 3. Back of the original tip card.

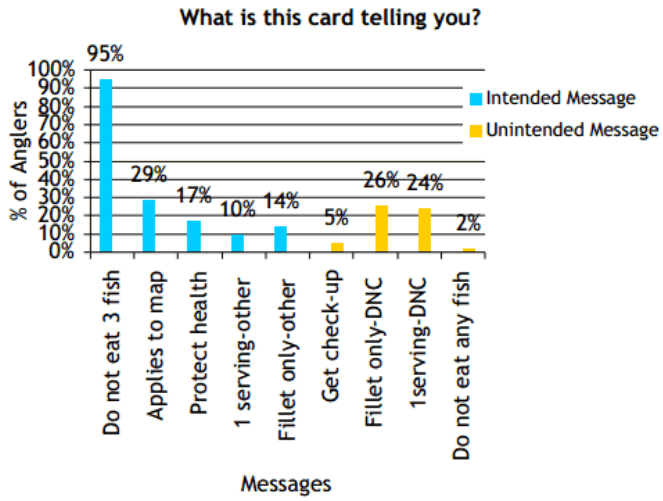

FIG. 4. Most prominent messages from the tip card.

conducting the survey, and analyzing the data. The CBSM model we applied to our Angler Outreach Program emphasizes person-to-person channels of communication and outlines the following steps, a concise version of McKenzie-Mohr's (2005) survey steps and expansion upon follow-up of the data: (1) formative research that includes identifying a target audience, target behaviors, and motivators and barriers associated with the target behavior, (2) pilot testing, (3) intervention, and (4) evaluation. The program also included a control group that helped us compare results between anglers who received outreach and those who had not.

1. Formative Research

In conducting formative research, we learned from pier anglers that a big motivator was protecting the health of their children and a lack of awareness around DNC fish was a major barrier to avoiding DNC fish consumption. This formative research involved conducting a baseline evaluation at local sites and surveying anglers. We learned this from their responses to the following question: "What would motivate someone like you to throw a contaminated fish…back in the ocean?" Their children's health was one of the top responses.

We developed a tip card to inform anglers about the advisory and applied the stated motivator into the content development by featuring a doctor with a child to depict the idea of protecting their families' health. The tip card was originally a postcard-sized, double-faced card that featured an area map and three DNC fish on one side and information on how to eat other non-DNC fish on the other side (see Fig. 2 and 3).

2. Pilot Testing

The tip card was piloted with the assistance of our FCEC outreach partners in October–November 2009. Forty-one surveys were collected across the following nine piers: Belmont, Rainbow Harbor, Seal Beach, Cabrillo, Hermosa, Redondo, Venice, Pier J, and Santa Monica pier.

When shown the original tip card, 95% of the anglers who responded cited avoiding the consumption of contaminated fish as the most prominent message. In addition to identifying intended messages (i.e., do not eat contaminated fish, information applies to defined area, protect the health of your family), a large number of anglers also cited unintended message points (i.e., get a check-up at the doctor, avoid consuming fish altogether; and only eat the skinless fillet once a week of all fish in general, including DNC fish). Less than 15% of anglers understood that the preparation message points related to "all other fish." Anglers could not separate the advice from the back of the card from the front of the card because there was no logical visual distinction between these two sets of advice. As a result, anglers were faced with a seemingly contradictory set of guidelines: Do not eat these three fish, but if you do, only eat the skinless fillet once a week (Fig. 4).

Four anglers (or 10% of those surveyed) indicated they were illiterate. We took this finding into consideration when revising the tip card's content, layout, and design.

Results of the tip card pilot testing indicated that several elements of the material needed to be modified. With input from FCEC's group of partners, the recommended modifications were as follows:

- Simplify/reduce text:
  - Ten percent of surveyed anglers were found to be illiterate. This finding prompted us to reduce text throughout the material and increase the use of visual images.
- Focus on the use of visual images:
  - Use symbols like green checkmarks to indicate a recommended behavior (i.e., skinless fish fillet consumption/serving size).
  - Fourteen percent of anglers recommended that DNC fish should be individually crossed out.
  - Nine percent of anglers recommended using real images for the serving size section.
- Remove doctor/child image and replace with angler/family image:
  - Fifty-five percent of anglers thought that this image meant to visit the doctor for a checkup. Anglers suggested we include an image of an angler with his or her family to increase the relevancy of the material and message points.
- Increase relevancy/usefulness of card:
  - Make the card smaller/foldable so that anglers can easily carry the material, such as a small pocket handbook.
  - Include fish that anglers can consume, perhaps along with legal size limits.
  - Include a ruler at the bottom of the material.
- Redesign structure and layout of the back of the card:
  - Less than 15% of surveyed anglers understood that the preparation message points presented on the back of the card related to "all other fish." Anglers could not separate the advice from the back of the card from the front of the card because there was no logical visual distinction between these two sets of advice.

- A potential solution to this problem might be to make a visual connection between the preparation guidelines and "all other fish." Preparation advice could be presented alongside a visual list of safe fish that anglers can eat. Therefore, one side or panel of the material would focus on DNC fish and another would focus on featured safe fish and accompanying preparation/consumption guidelines.
- Include a phone number in addition to the website address:
  - Twenty-two percent of surveyed anglers noted that they did not have Internet access or own a computer.

We revised the tip card (Fig. 5 and 6) based on findings of the pilot test and recommendations of Heal the Bay (which came up with an initial revised concept) and the Messaging Work Group.

3. Intervention and Implementation: Angler Outreach

After synthesizing the lessons learned from the pilot testing, we revised the tip card and expanded the FCEC outreach activity by increasing the number of field teams and time in the field through the Angler Outreach Program. Heal the Bay and Cabrillo Marine Aquarium reviewed the tip card with anglers 2–3 days a week over the course of approximately a year. They conducted outreach to more than 8,873 individuals across nine piers: Santa Monica Pier, Venice Beach Pier, Redondo Beach Pier, Hermosa Beach Pier, Cabrillo Pier, Belmont Pier, Rainbow Harbor, Pier J, and Seal Beach Pier. The Angler Outreach team handed a copy of the tip card to anglers after reviewing the content with them.

FIG. 5. Front of the revised tip card.

FIG. 6. Back of the revised tip card.

4. Evaluation

We designed a survey that was administered by Heal the Bay and Cabrillo Marine Aquarium. Prior to beginning the survey, surveyors assessed eligibility criteria. To prevent over-surveying of our target population, anglers were eligible if they indicated they had not previously been surveyed by an outreach worker in the past month. We assessed "typical" post-catch behavior with DNC fish caught and awareness of DNC fish, comparing data between anglers who received outreach with those who had not. The control group was defined as anglers who did not receive subsequent outreach.

It is important to note that we conservatively consider outreach in general as a potential influence on DNC fish awareness and post-catch behavior. This is because the overall angler-outreach program has been carried out since 2001 when the program was operating under a different advisory. When considering whether or not anglers had received outreach, it is not possible to distinguish whether they received outreach based on the old or new advisory. Therefore, we conservatively consider outreach in general as a potential influence on specific behaviors and awareness levels.

A total of 870 anglers responded to the survey with a largely male sample (95%). Approximately 15% of the sample reported that they had received outreach. The remainder of the surveyed population represented the control group of anglers who had not received outreach.

Findings

The survey assessed the following between anglers who had received outreach and those who had not: self-reported typical post-catch behavior with caught DNC fish (eating it or giving it to friends/family), and awareness of DNC fish contamination.

Typical post-catch behavior of DNC fish by outreach status

We examined post-catch behavior of all DNC species plus mackerel, which was included as a discriminant (non-DNC fish) item by outreach status (defined as having reviewed a tip card or not). Across all DNC species, the positive finding was that a smaller proportion of anglers who received outreach (2–8%) reported usually eating fish relative to anglers who had not received outreach (7–22%; Fig. 7). However, the opposite pattern was observed for giving fish to friends/family: Across all DNC species, greater proportions of anglers who had received outreach (11–14%) reported usually giving fish to friends/family relative to anglers who had not received outreach (7–8%; Fig. 8). The Angler Outreach Program has since incorporated this finding into its outreach efforts, that is, placing an emphasis on not giving DNC fish they catch to friends/family in addition to not eating them.

DNC fish contamination awareness by outreach status

Irrespective of outreach status, the majority of anglers were aware of DNC species contamination. Across DNC species, however, larger proportions of anglers who received outreach were aware of contamination compared to those who had not received outreach.

Our outreach team asked anglers if they had heard anything about each of the five DNC fish species being contaminated. For all DNC fish, a larger proportion of anglers who received outreach reported being aware of contamination relative to anglers who had not received outreach (Fig. 9). Note that a larger proportion of anglers who had received outreach reported that shark another discriminant was contaminated, relative to anglers who had not received outreach, though sharks tend to have high levels of mercury in other areas. This may point to the need for more specificity in distinguishing between DNC and non-DNC species during outreach sessions. On a more positive note, however, for the other safe (non-DNC) fish, mackerel, a smaller proportion of

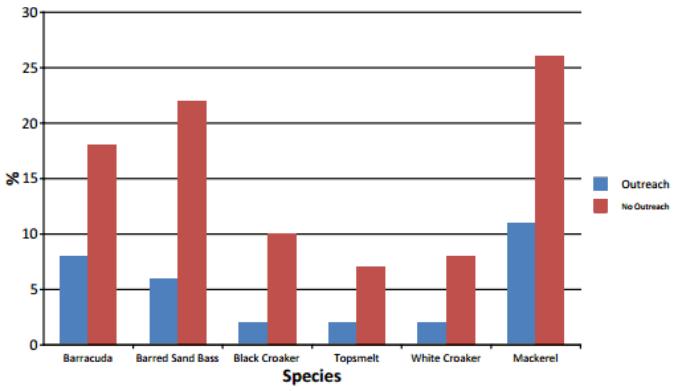

FIG. 7. Proportion of anglers who reported usually eating caught fish, by outreach status (noutreach=61-65, nno outreach=409-436).

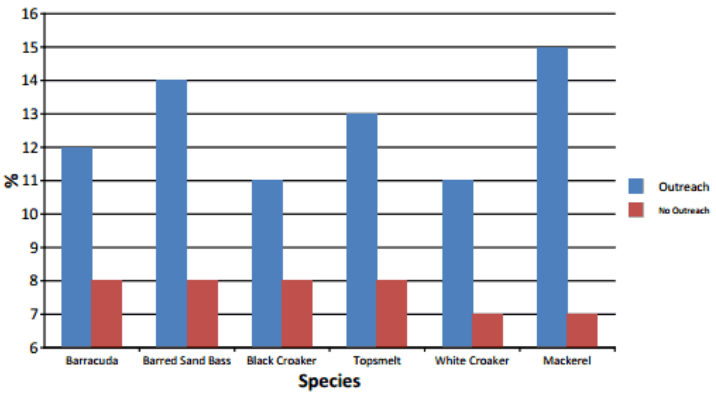

FIG. 8. Proportion of anglers who reported usually giving caught fish to family/friends, by outreach status (noutreach=61-65, nno outreach=409-436).

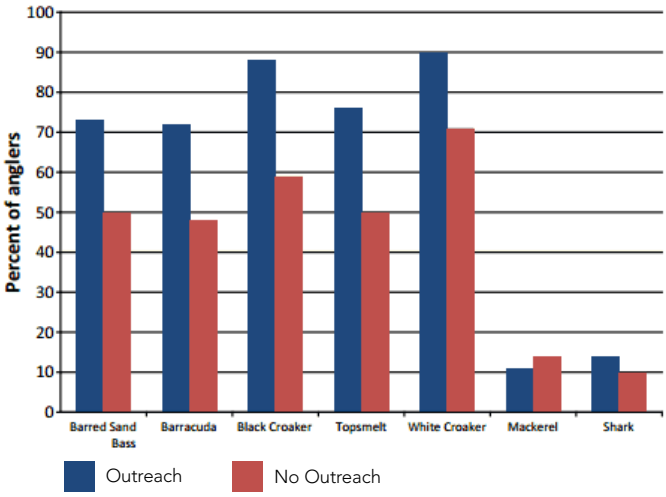

FIG. 9. Awareness of contamination of DNC and non-DNC fish, by outreach status (noutreach=112-114, nno outreach=647-664).

anglers who had received outreach reported it to be contaminated relative to anglers who had not received outreach, consistent with anglers being able to distinguish between DNC and non-DNC species. Future outreach efforts should continue to assess anglers' ability to discriminate between information provided about DNC versus non-DNC species (i.e., shark or mackerel).

Summary of typical post-catch behavior and DNC fish awareness by outreach status

Results comparing our control group with the group of anglers who received outreach were encouraging. We found that a smaller proportion of anglers who received outreach reported typically eating DNC fish they caught relative to anglers who had not received outreach. However, a higher proportion of anglers who received outreach reported giving caught DNC fish to friends/family compared with anglers who had not received outreach. On a positive note, a higher proportion of anglers who received outreach reported being aware of DNC fish contamination across species compared with anglers who had not received outreach.

Limitations

The findings in this article should be considered in light of several limitations. First, most of the data were obtained via self-report, which is subject to a number of known biases. Second, survey administration methods may not have been consistent across surveyors. Survey administrators collected data but did not employ a standard data collection monitoring protocol. Another limitation is that outreach results may not be solely attributed to the revised outreach material (i.e., tip card). It is possible that anglers who reported receiving the outreach actually received the initial OEHHA advisory prior to the updated advisory and dissemination of the new tip card. Anglers reported whether they had received outreach, but they could have been exposed to information about DNC fish that was not part of the information delivered by outreach workers and/or administered as part of the FCEC program. Finally, inferential statistical tests were not conducted. In future years, we recommend conducting inferential tests using data collected according to protocol.

Conclusions

The current Angler Outreach Program yielded several interesting results by applying the community-based social marketing model. The program was shown to be effective by observing significantly different results from a non-outreach comparison group. A smaller proportion of anglers who received outreach reported usually eating DNC fish that are contaminated relative to anglers who had not received outreach, although the outreach group also reported usually giving DNC fish to friends/family more often than the non-outreach group. The outreach group was also shown to be more aware of contaminated fish than those who did not receive the outreach, though the majority of anglers in both groups were aware of contaminated fish.

The implications of this study show that the CBSM model can be successfully applied towards changing the behaviors of the target population (PVS anglers). The current project was unique in utilizing social marketing principles to include pilot testing, incorporating an evaluation component, and using a control group that did not receive outreach. Incorporating a tip card that had been pilot tested by the target audience as part of an outreach program can be effective in similar community environments, as it involves more dynamic communication and goes beyond passive marketing. Future outreach programs can continue to apply the CBSM model with success and build off of the lessons learned from the current study.

Namju Cho is a Project Manager with the S. Groner Associates and has provided management support for the Fish Contamination Education Collaborative, helping to oversee various aspects of the project such as media outreach, online efforts, pier outreach as well as community events.

Acknowledgements

This case study was made possible through the leadership, guidance, and financial support provided by the USEPA Superfund Program, Region IX.

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