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How to set up a public health campaign: Croatian example of environmental mercury exposure

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Abstract

Background and Purpose: *Environmental mercury pollution is problem well recognized by scientific community. One of the tools for rising awareness is the health promotion campaigns. Here we analyze main communication elements used in »Stay Healthy, Stop Mercury« campaign, how they were applied in Croatia and what were the effects of the campaign.*

Materials and Methods: *As the campaign tools, educational materials, standardized questionnaire and instructions for media mobilization were used. Hair has been used as biomarker of exposure. The volunteers were women 25-45 years, nurses, scientists, politicians and member of women's activist organization. Volunteers participated in various public presentations, upon which media coverage was analyzed. As an indicator, number of copies of the press, type of article, length and time of broadcasting on TV and radio and type of transmission was used. For web pages number of visits was used.*

Results and Conclusion: *All volunteers had detectable levels of mercury in hair, some above reference dose level of 1 μg/g which could be linked to the fish consumption. Campaign had short term effect. Media supported campaign for about 30 days. National news agency (HINA) distributed the information but small number of TV stations and newspapers has rebroadcast it. Only one national specialized women's magazine wrote an article on this topic. Two web portals posted the information. Nevertheless, biomonitoring should be continued especially on the coast and islands where higher fish consumption is recorded. It has been shown that health promotion is long term process with numerous repeating of specifically targeted health campaigns and sensitizing of the population.*

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INTRODUCTION

Environmental mercury pollution is well recognized problem by scientific community. Mercury is a naturally occurring heavy metal, highly toxic to humans, which presence in the environment is widespread and persistent *(1, 2)*. Once released into environment mercury can not be removed, and with all past releases from natural, anthropogenic and re-emitted sources, creates a »global pool« of mercury, part of which is continuously mobilized, deposited a remobilized *(1, 3)*. Mercury occurs in elemental, inorganic and organic form and its toxicity, reactivity and biological effects depend on these forms *(4)*. Mercury in aquatic environment can be converted by methanogenic bacteria into methylmercury (MeHg), that bioaccumulates in aquatic organisms and biomagnifies through the food chain *(5)*. As the result predatory

fish on the top of the food chain can contain substantial quantities of methylmercury, making population with high fish intake at risk. After ingestion MeHg is almost 100% absorbed, it also passes through placenta and it is excreted in breast milk *(6)*. MeHg toxicity occurs with long term exposure and primarily affects central nervous system, although recently has been linked with possible negative effects on the cardiovascular, immune and reproductive systems *(1)*. It is also a potent teratogen, the fetus and infants being more susceptible to neurotoxic effects of MeHg. During neurodevelopmental period, over the time, they can develop psychomotor retardation, auditory and visual impairment, and learning disorders *(7, 8)*. It has been demonstrated that children whose mother's diet include large amounts of MeHg contaminated fish are particularly at risk *(5)*.

To minimize exposure to MeHg, many industrialized countries establish its limits in dietary products. United States have set up consumption advisories on locally caught fish with recommendations for commercial fish consumption, especially for pregnant women, women of childbearing age, nursing mothers and young children *(9, 10)*. The European Food Safety Authority (EFSA) has put out guidelines on fish consumption for certain vulnerable groups but they are weak and not widely known *(11)*. In Croatia recommendations about fish consumption are not established.

Along with the existing legislative, in order to avoid or reduce various harmful exposures some countries recognized the need to inform end educate people about related problem and eventual undesirable behavior. The most common way of raising awareness is organizing public health campaigns, that are based on the fact that successful health promotion has to approach the person and/or population in a holistic manner, taking into account both biological and cultural contexts. The fact that behavioral patterns of each individual have a key role in progress of many health problems has lead to the development of health education and health promotion as a professional and scientific field. They are based on process that enables individuals or populations to increase control over their health and improve it. But health education and promotion can reach its full potential only if it is structurally supported by the community through its politics and laws. In order to reach a population and induce changes of health behavior, a successful public health campaign should actively involve target population, emphasize the factors that influence health, use various didactic methods, and mobilize both the community and legal system along with health workers *(12, 13)*.

In 2006 Health and Environment Alliance (HEAL), an international non-governmental organization that represent a network of more than 50 citizens', patients', women's, health professionals' and environmental organizations in Europe and Healthcare without Harm (HCWH) an international coalition of more than 450 groups of hospitals and healthcare systems, medical and nursing professionals, community groups, health-affected constituencies, labor unions, and environment and health organizations in 55 countries, jointly coordinated the »Stay Healthy, Stop Mercury« campaign. The campaign aim was to raise awareness of environmental mercury pollution, to mobilize health community and women's groups in Europe calling on the EU to show leadership in efforts to control environmental mercury pollution by securing a global ban on mercury *(14)*. Members of the Committee on the Environment, Public health and Food safety of the European Parliament actively supported the campaign. In this small-scale campaign participants from 21 countries were involved, and among them participants from Croatia *(14)*.

The aim of this article is to demonstrate how health promotion campaign could be set and what the main communication elements were used. Also it analyses how these elements were applied in Croatia and what were the effects of the campaign.

MATERIALS AND METHODS

As the basic campaign tools printed educational materials were provided by the project coordinators, along with the illustrative hair testing, standardized questionnaire and instructions for media mobilization. All materials were translated into Croatian to ensure correct understanding of all received documents.

Choice of participants

As advised by »Stay Healthy, Stop Mercury« campaign project coordinators, volunteers should be between the ages of 18-45 years. Ideally, the volunteers will include *a nurse, a doctor, a leader* (e.g. head of national women's organization or other major NGO, or hospital director) and *a politician* (Member of European Parliament and/or Member of national parliament, or regional or local elected representative) *(14)*. The recruitment of the samples has not been based on the size of the country populations.

Questionnaires

Questionnaire was comprised of questions regarding fish consumption and health-environment-life style questions that covered potential personal sources of mercury exposure.

Choice of biomarker of exposure

Hair has been chosen as a biomarker of exposure due to noninvasiveness of sample collection and also it is a good indicator of methylmercury exposure in people who consume fish and people who are not occupationally or incidentally exposed to inorganic or elemental Hg *(2, 15)*. Total mercury and methylmercury levels in hair are linearly correlated *(16)*. Hair samples were collected according to the standardized method *(16, 17)*. The total mercury was determinate using graphite atomic absorption method in certified laboratory in Belgium *(14)*.

Hair samples, completed questionnaires and signed consent forms were sent to the HEAL, which kept the

TABLE 1

Average values of mercury in hair samples of women and their fish consumption habits.

Women target groups	Measured Hg concentration in hair μg/g	Non fish consumption (vegetarian)	Rare consumption of fish with ↓Hg concentration	Rare consumption of fish with ↑Hg concentration	Frequent consumption of fish with ↓Hg concentration	Frequent consumption of fish with ↑Hg concentration
Scientist	0.03	+	–	–	–	–
Nurse	0.03	+	–	–	–	–
Women's organizations representatives	0.15	–	+	+	–	–
Nurse	0.19	–	+	+	–	–
Nurse	0.23	–	+	+	–	–
Scientist	0.51	–	+	+	–	–
Politician	0.51	–	+	+	–	–
Scientist	0.88	–	+	+	–	–
Politician	**1.28***	–	+	+	–	–
Women's organizations representatives	**1.39***	–	+	+	–	–
Politician	**1.70***	–	+	+	–	–
Politician	**3.40***	–	+	+	–	–

Legend: * Above reference dose level of 1 $\mu g/g$ by USNRC

signed consent forms with the name and address of the volunteers. Results were communicated to the country project coordinator and to volunteers, using a standardized letter indicating the reference number and the mercury hair level. In the letter with the personal results, each participant received fact sheet with frequently asked questions (FAQ), educational fact sheets, recommendations for fish consumption for harm minimization and the contact number of country coordinator.

Media coverage

Volunteers participated in various public presentations of hair testing results, educational material and advocacy for protection of populations at risk. Upon press conference various interviews and public appearance, we analyzed media campaign coverage on national and local TV, radio, press, and internet pages. As an indicator of media coverage we used number of copies of the press and type of article, length and time of broadcasting on TV and radio and type of transmission. As an indicator for web pages we used the number of web page visits.

RESULTS

Hair testing

The age of campaign volunteers range from 25 to 45 years. The results show range of total mercury values from highest level of 3.40 μg/g in hair to lowest level of 0.03 μg/g. All 12 women had detectable levels of mercury in hair, 4 (33.3%) women were above reference dose level of 1 μg/g by Unites States National Research Council (USNRC) and 2 (16.66%) who never consume fish had the lowest values of mercury in hair.

Profession, mercury hair concentrations and fish consumption are presented in Table 1.

Media Coverage

Results show that media supported campaign in the period of 30 days, from January 15th to February 15th in 2007. Both national TV and radio transmitted the information in 6 transmissions, along with 2 on local radio station. National news agency (HINA) distributed the news, and two national newspapers and one daily tabloid had 4 articles. Only one national specialized women's magazine wrote an article on this topic. Two web portals posted the information, one belonging to the largest pharmaceutical company in Croatia and the other was commercial with variety of news and topics, but none of them had available information on the number of web page visitors. In the scientific community, the campaign was covered in one bimonthly medical specialized journal (edition of 6.000 copies) and one public health web journal (also without available number of web page visitors). Presentation of health promotion campaign was launched at two international scientific-professional workshops on environmental health determinants in Motovun, Croa-

TABLE 2

Media coverage of »Stay Healthy, Stop Mercury« campaign in Croatia.

	Media	Type of news	Edition/ Time on air in minutes /Time of broadcasting
Television	Croatian National Television (HRT)	Specialized broadcast	30 / Prime time – evening
	Croatian National Television (HRT)	Specialized broadcast	40 / Afternoon
	Croatian National Television (HRT)	County panorama	7 / Afternoon
	Croatian National Television (HRT)	Mosaic broadcast with news	5 / Morning
	Croatian National Television (HRT)	Ecological broadcast	10 / Morning and afternoon
	Total	**5**	**92 min**
Web	Web Pliva Health	Complete presentation of campaign	n/a
	Web Index	News	n/a
	Total	**2**	
Radio	National Radio	Transmission on health topics	15 / Morning
	Local Radio Station	News	10 / Afternoon
	Local Radio Station	Ecological broadcast	20 / Prime time - evening
	Total	**3**	**45 min**
Newspapers & magazines	National Newspaper	Newspaper article	125.000 copies daily
	National Newspaper	Newspaper article	125.000 copies daily
	National Tabloid	Newspaper article	130.000 copies daily
	Weekly National Women magazine	Article	80.000 copies weekly
	Total	4	460.000 copies

Legend: *n/a* – not available

tia (20 participants) in July and in Bratislava, Slovakia (50 participants) in November 2007.

Coverage of »Stay Healthy, Stop Mercury« campaign from various media sources are presented in Table 2.

DISCUSSION

The results of this illustrative survey gave the snapshot of the level of mercury exposure in the project volunteers in Croatia, but its main value was serving as a tool in raising awareness campaign. Measured values of total mercury, that represents the MeHg in participant's hair, have shown that mercury in tested women could be linked to the fish consumption. Four participants had detectable level of Hg above the most protective reference dose of 1 μg/g which is a level corresponding to the intake dose calculated by US EPA based on the most protective reference dose of 0.71 μg/kg body weight per week set by USNRC *(14)*. As recommended, that level should not be exceeded in women of child bearing age and represents a dose below which is not likely to expect neurological negative impact on fetus or breastfed children *(14)*. It is also the limit we are referring to in this campaign. All 12 women had values below the benchmark dose of 10 μg/g Hg, in the hair, set by World Health Organization (WHO) in 1990 *(18)*. Research results show that at this level significant detectable impact is present, causing negative neurological effect in developing fetus *(14)*. The immedate question that rises in such campaign is what is the kind and quantity of fish that is safe to eat given the fact that fish and seafood are healthful sources of nutrients, omega 3 fatty acids that are important part of balance diet. Campaign does not want pregnant women and other people to stop eating fish, so the European Commission, based on a recommendation from the European Food Safety Authority (EFSA), issued the following advise: »*Women who might become pregnant, women who are pregnant or women who are breastfeeding should not eat more than one small portion (<100g) per week of large predatory fish, such as swordfish, shark, marlin and pike. If they eat this portion, they should not eat any other fish during this period. Also, they should not eat tuna more than twice per week. The advice also applies to young children*« *(14)*. At national level the Swedish recommendation is the most protective in the EU, and they advise women who are pregnant or thinking of becoming pregnant and breastfeeding women should never eat large halibut, cod liver, eel, shark, swordfish, or fresh or frozen tuna. In other countries recommendations are more or less stringent than those of EFSA, and they are adapted to the situation in each country. Only Hungary, Luxemburg and Slovakia don't have any recommendations *(14)*.

Although The Croatian Regulatory Act defines levels of toxic trace elements in dietary product including sea food *(19)* there are no official recommendations on fish consumption for various subgroups of population that might be at risk. The common opinion is that locally caught fish is not contaminated with mercury, but there is evidence in latest study by Srebočan *et al.* that 41% of the captive Atlantic bluefin tuna farmed in Adriatic Sea contain mercury above the maximum level of 1 μg/g wet weight defined by the European Commission Decision and Croatian legislation *(20, 21)*. Other study that included both shellfish and fish determined lower than permitted values of Hg in the samples of fish caught in Croatia *(22)*. This could be explained with the fact that fish biomass index in Croatian shows descending trend in period between 1996 and 2003. Displayed negative situation is most probably result of high intensity of fishing and reduced capabilities of fish resources to revitalize and of disappearance of large specimens of fish *(23)*. On the other hand we have to bear in mind that the market is full of imported canned tuna from unknown origin (on declaration is stated only who is packaging it), along with imported frozen fish but packed in local factories that is often mistaken for a locally caught fish. The data on average fish consumption in Croatia show that overall consumption is very low *(24)* and that there is no danger of MeHg exposure of general population. However, population living in the coastal areas and islands consume considerably larger amounts of fish (unpublished data) which indicates that pregnant and lactating women, along with the small children should balance the quantity of fish in their diet.

Our results dealing with media coverage indicate, that at the moment in Croatian media, topics on environmental determinants of health are still of low interest. This is visible from the dedicated time on air, number of specialized transmissions in relation for example with transmission dedicated to the sports. Although National news agency (HINA) distributed the information, only 2 newspapers, and 1 TV, 1 national radio and 1 local station broadcasted it within its transmissions. Small number of journalist is interesting to cover public health and environmental topics which was visible from the small attendance of the press conference. The type of articles that were published, were in the form of information without further investigation or much explanation, and all of them were printed in smaller letters at lower parts of the pages. The transmission regarding environmental problems on national TV was broadcasted in the early afternoon when majority of the people are still at work. Although campaign has not raised much of the immediate public interest, the scientific community reacted in couple of ways. Research projects have been launched investigating mercury exposure through fish consumption in women of child bearing age and of occupational exposure of hospital nurses using mercury based medical equipment, as follow-up EU pilot project.

The latest research on mercury concentrations in tuna in the Adriatic Sea *(20)* has recovered media interest in fish contaminated with mercury. National TV and radio, along with newspaper and different web pages started to rebroadcast information regarding mercury influence on human health with the emerging question: Is there a need for recommendation on fish consumption in Croatia?

Similar campaign that deals with mercury exposure has been launched in National Environmental Public Health Leadership Institute from United States with the goal of bringing together various interest groups to promote healthy fish consumption and decrease mercury-in-fish exposures in Rhode Island *(25)*. The campaign slogan was »Fish is Good, Mercury is Bad« being directed primarily to women of childbearing age and young children. By raising awareness people can make their own choices and promoting the consumption of low-mercury fish to the general public, pregnant women, and children sets the stage for healthy eating habits throughout the life cycle. The impact was accomplished by printing of 10.000 copies of brochure and their distribution to the community and health centers *(25)*.

In Croatia recently several big public health campaigns have been launched: The campaign »Say Yes to no smoking« conducted in 2003 and 2004, »Croatian breakfast – the biggest breakfast« in 2003 and national program of early detection of breast cancer called »Mamma« which started in 2006 and still ongoing *(26, 27, 28)*. The campaign »Say Yes to no smoking« included variety of activities like free help phone line, school of no smoking, brochures and web page with all relevant information which had 10.781 visits *(26)*. Campaign attracted 1.015 people to school of no smoking and among them 392 (38%) manage to stop smoking after attending the school *(29)*. After financial support was discontinued, the whole program stopped. The Croatian breakfast project was launched to raise awareness on how important is to start the day with healthy breakfast especially among the children, and potentially induce some policy changes *(27)*. Very innovative tool was used to draw the population's attention; the attempt to set the world Guinness record in the biggest breakfast. The population response was high and the record was set, but it took five years to actually change something in policy regarding school children nutrition. This year finally, as a joint initiative, Zagreb City Office of education, culture and sport and Zagreb Public Health Institute, started project of introducing healthy food in children menus in kindergartens and continued in primary schools. Project's main goals are to change and improve children dietary habits and to implement new dietary standards in childhood. Vending machines with salty and sweet snacks are banned in schools, but actual implementation of program is limited to Zagreb only, and it is not equal in all kindergartens and schools *(30)*.

Among these three campaigns, the strongest media attention had campaign against breast cancer offering free mammography to every woman between ages of 52 and 70, for the first time, in 2007. After the first year of program implementation, 342.562 women were invited to screening and 52.5% attended *(28)*. But the campaign

in various forms existed for a number of years and every year on National day against breast cancer, women's organizations which are embodied in international network, organize various activities. Among them is a march through the city center, which is supported by great number of politicians, journalist, and women from show business. All the activities are covered on national TV, radio and newspapers, and all journalists appearing in public wear pink ribbon, that day. Although great number of scientists and women from health care sector participated, it seems that they are not equally attractive to the media. Recently, for the first time, topic of breast cancer was covered in the national leading political magazine sharing the experiences of journalists, politicians and performers. It seems that suggestion by HEAL to choose politicians, women's organization representatives and health professionals as the participants in our campaign was based on who could publicly provide guidance on mercury and health. Health care professionals have educational role in educating both patients and their colleagues and they are trusted by patients, politicians and organizations which are in the position to induce policy changes. However, records from earlier described campaigns show that coverage on TV, journals and newspapers was much stronger if some of the persons from show business and journalist were connected with the campaign. Although transmissions by most visible persons are usually of entertaining character, they still promote the health idea. Experience of the public stand and communication, that women in the show business have, along with the fact that many younger women identify with them, make them significant in bringing the message to the audience.

Majority of women as guardians of the children's health and family health are involved in the every day care to ensure their health status through dietary habits and lifestyle. Health promotion is a system of interactions where strong partnership between population and health structures is needed, therefore in order to be successful, health promotion campaigns should be tailored to the specificity of each subgroup. As a promotional tool, measures that actually bring direct benefit to each person attract most of the people to pay attention to the content and message of the campaign.

CONCLUSION

Despite the short term effects of the »Stay Healthy, Stop Mercury« health campaign, it should be continued with dissemination of information regarding harmful effects of MeHg providing education and workshops adapted to the women and young children. It is documented that health promotion campaigns should be personalized in order to reach better results.

Further investigation through detailed biomonitoring of hair, blood and urine samples is needed at a wider population, with specific focus on Croatian coastal region and islands where higher exposure has been identified, and to include all relevant sites of workplace exposure. Possible modus of reaching target population is working together with other groups, on various issues concerning women, and to collaborate with national and international networks. It has been shown that health promotion is long term process with numerous repeating of health campaigns and sensitizing of the population. Often it takes years from the initial idea to the policy implementation.

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