

# Fostering public health awareness on risks in contaminated sites. Capacity building and dissemination of scientific evidence

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## Abstract

The article focuses on the multidisciplinary nature of public health and the need to develop target oriented capacity building and dissemination plans taking into account both scientific evidence and the information needs of the different stakeholders. In particular, issues regarding stakeholders' involvement in epidemiological studies in contaminated sites, considering their different levels of awareness on risk characterization and management, are discussed. In a public health perspective, the main stakeholders in contaminated sites are researchers and public health officers, risk managers and policy makers, population residing in the contaminated areas, environmental associations, patient's organizations. The different components of a dissemination strategy addressed to different stakeholders are analyzed with the objective to create awareness and preparedness to facilitate management in contaminated sites, foster scientific knowledge and informed decisions to consolidate risk perception through science-driven information.

## Key words

- information dissemination
- interdisciplinary communication
- health literacy
- contaminated sites
- public health

## INTRODUCTION

The management of health risks in contaminated sites is a public health issue involving different stakeholders with diverse backgrounds and interests, as clearly shown in the previous papers of this monograph. This issue therefore represents a good example to show the need of pursuing a multidisciplinary approach to public health to maximize the benefits of the most up-dated scientific knowledge and rapidly progress towards the desired and shared objectives, starting from the development of major awareness on the issues at stake, the definition of targeted strategies to implement remediation actions, reduce risk, produce behavioral change.

This article focuses on the multidisciplinary nature of public health and the need to develop target oriented capacity building and dissemination plans which take into consideration the needs of the different stakeholders.

## WHY A MULTIDISCIPLINARY APPROACH IS REQUIRED

Nowadays it is no longer questionable that public health requires a multidisciplinary approach but this concept still needs to be stressed and clearly explained

to the different stakeholders when a coordinated action needs to be quickly developed and implemented to tackle such a complex public health issue as risk management in contaminated sites.

The reasons why a multidisciplinary approach is required are indeed very easy to understand.

First of all, health is a topic of general interest, for all men and women, regardless of their social status, and the place where they live, and at the same time it is an issue of general concern. Then, we also have to consider the very nature of public health, a relatively young but very complex discipline, since it includes aspects pertaining to biological and medical sciences, social sciences and humanities, physical and chemical sciences, mathematics, statistics, and others, each one bringing in their complexities and diversified interests and backgrounds.

One of the milestones in the field of public health is the Alma-Ata Declaration of 1978 [1], recognizing that health is a human right which requires the direct involvement of many actors including local communities. The Conference in Alma Ata, where the Declaration was developed, strongly reaffirmed that "health is a state

of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity", as defined by WHO in 1948 [2], and that "the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the *action of many other social and economic sectors in addition to the health sector*". It also stated that "*people have a right and duty to participate individually and collectively in the planning and implementation of their health care*".

Another important milestone marking a step forward towards health promotion through a multidisciplinary approach is the Ottawa chart of 1986 stating that "Health promotion is the process of enabling people to increase control over, and to improve, their health" [3]. Accordingly, health promotion strategies and programmes should be adapted to the local needs and possibilities of individual countries and regions to take into account differing social, cultural and economic systems.

Both the Alma Ata Declaration and the Ottawa chart considered the "Health for all by the year 2000" goal as their primary objective and set up the basis for the development of a global health approach to achieve equity in health for all. In fact, we should also consider that public health and global health are strictly connected, just because the relationship between man and environment which directly affects populations' health, goes far beyond the geopolitical boundaries, and today the transmission of diseases associated with the movement of people and goods is much faster than ever before, as well as the influence of man disruptive actions on environment.

There is no doubt that public health and global health are strictly connected, but the concept of global health is also rather new and uncertainties about the definition of global health are still very common, not only for the general public, but also for health professionals [4].

The first article with global health in the title appeared in Medline only in 1979 with a few items per year until 2000, and an explosion of articles in the most recent years (825 articles published only in January-June 2015, over a total of 8486 occurrences in the entire database from 1979 to June 2015). Yet, despite this major interest, the term "global health" has been introduced as a Medical Subject Heading (MeSH) of the National Library of Medicine only in 2015, marking a significant advance in the recognition of the concept within the scientific community. The scope note of "global health", as defined in MeSH, clearly points out the multi- and interdisciplinary approach associated with health and equity, the necessity of collaboration and a personalized patient care which equally applies to public health and global health:

"A multi- and interdisciplinary field concerned with improving health and achieving equity in health for all people. It transcends national boundaries, promotes co-operation and collaboration within and beyond health science fields, and combines population-based disease prevention with individually-based patient care".

Interesting to note that in 2015, the UN post millennium development agenda is being defined and Member States, major interest groups and representatives from civil society are given the opportunity to make

specific suggestions to be included in the document under discussion. Among the many concerns expressed within a participatory and transparent process towards the definition of the new agenda, the role of access to information and skills to use it as an essential pillar in the transformational agenda for sustainable development is pointed out. In particular, IFLA (the International Federation of Libraries Associations) encourages the United Nations to further recognize and emphasize the role of access to information and skill to use it as an essential pillar in the transformational agenda for sustainable development. Access to information is a common principle, as well as a cross-cutting means of supporting the agenda's vision [5].

In this context it is worth mentioning the extraordinary value of health information literacy for health promotion and in particular its role for environmental health [6].

Finally, let us also briefly consider the relationship of mutual influence existing between science and society which affects all disciplines and therefore also public health.

Citizens today play more and more active roles in managing their health, and ask to be directly informed. Even "non-experts" are entitled to actively participate in the debate between science and society and contribute to orient political choices. Just think, for example, of the role of patients' associations, or the increasing numbers of community services aiming at informing citizens on health issues, or the influence provided by popular science journals, or science articles published in newspapers, as well as the different paths of knowledge dissemination on the Internet.

Citizens increasingly search and use health information. They participate in a process of "empowerment" which is facilitated on the one hand by the fact that also the scientific community is becoming aware of citizens' rights, and on the other by the widespread use of Internet technologies and smart phones, in particular, allowing unfiltered interactive online communication.

In this framework, the scientific community and in particular the public health professionals have a moral obligation to communicate their knowledge to the various stakeholders considering the most appropriate strategies for single stakeholders according to the objectives they wish reach.

Recognizing that knowledge is the best tool for prevention, many actions are now developed at different levels to promote healthy lifestyles for disease prevention, and more generally to focus on good practices to maintain a proper balance between man and environment. The management of contaminated sites at national and international level is a perfect example of the necessity and benefits from a multidisciplinary multi-target oriented approach.

#### **STAKEHOLDERS IN CONTAMINATED SITES: AWARENESS ON RISK CHARACTERIZATION AND MANAGEMENT**

WHO defined contaminated sites as "Areas hosting or having hosted human activities which have produced or might produce environmental contamination of soil,



surface or groundwater, air, food-chain, resulting or being able to result in human health impacts" [7]. This wide definition considers a public health perspective. In contaminated sites, the association between environmental contamination and health is very heterogeneous; the differences involve:

- a) source of contamination;
  - b) contaminants (contaminated sites can be polluted by a single contaminant or by multiple contaminants);
  - c) pathways of exposure, which are usually multiple and involve different environmental matrices;
  - d) exposed population, being usually involved the general population including its vulnerable subgroups as, for example, children;
  - e) diseases that can be associated with contamination, having in most of cases a multiple, complex etiology.
- Furthermore, in most cases, contamination origins from anthropic sources, mainly industries, which are important economic resources for the local population.

Each contaminated site has its own characteristics for several aspects including the sociological context where contamination takes place. One or more communities may be involved in risk assessment and management.

To be effective, strategies to assess the health impact of contamination and for risk management need to be implemented involving all relevant stakeholders since their initial development.

Considering a public health perspective, three main groups of stakeholders can be identified in risk evaluation and related decision making processes:

- researchers and public health officers who are involved in risk assessment;
- risk managers and policy makers;
- population residing in the contaminated areas.

Each group of stakeholders has interests and needs. Researchers and public health office have the main aim to characterize health risks in qualitative and quantitative terms; risk managers and policy makers to find strategies to translate evidence on risk to effective public health interventions; the population to have correct information to improve collective and individual decision-making.

Those of contaminated sites are complex and uncertain scenarios and in both risk assessment and management processes the awareness on the state of the art of different stakeholders should be implemented by mutual communication. Even if all stakeholders are involved in communication processes, health professionals have a the major responsibility in improving the general awareness by communicating results of risk assessment including their uncertainties.

Assessment of health impact of contaminated sites requires a multidisciplinary approach and the involvement of researchers and public health professionals of disciplines such as epidemiology, environmental sciences, psychology, sociology and economics.

Involvement of population and policy makers residing in the contaminated area should occur from the outset to capture local needs and sensitivities. These aspects help in deciding on the appropriate level and modes of their participation so helping in designing the studies and the risk management strategies.

It is important to plan communication strategies to stimulate public awareness during the whole process of risk ascertainment because, under conditions of uncertainty on the extent of exposure and its impact on health, which typically characterize contaminated sites, risk communication becomes a challenging dynamic process in which the public has many opportunities to seek, assimilate, and act on the information received and to accept or contrast the proposed public health interventions [8]. This is a key point to be considered also because risks in contaminated sites have most of the characteristics that amplify the sense of outrage perceived by the affected population. In fact, the perceived injustice of risk is increased when it is:

- a) involuntary;
- b) inequitably distributed;
- c) inescapable;
- d) it arises from unfamiliar or novel sources;
- e) it causes hidden and irreversible damage;
- f) it poses particular danger to children, pregnant women, future generations;
- g) it damages identifiable victims;
- h) it is poorly understood by science;
- i) it is subject to contradictory statements from responsible sources [9].

These factors can be interdependent and strengthen one another.

Another key point to be considered in developing strategies to implement the awareness of policy makers and the general population residing in contaminated sites, is described as follows in the WHO Report "Environment and health: communicating the risks" [10].

Generally speaking, since 1980s, psychologists have distinguished two kinds of reasoning:

- system 1, characterized by a simple way of reasoning that only focuses on some more relevant information filtered by "intuition";
- system 2, characterized by a conscious analytical way of thinking, with a mature capacity to evaluate a broad range of information (including statistical data).

It is important to know that communication based on reasoned arguments, for example about relevant statistics on safety and effective risk management practices, is unlikely to influence people if their understanding is derived from system 1 thinking. As a consequence, communication should be framed in order to be understood also by people who use system 1 reasoning.

To better understand habits, values and interests of the communities residing in contaminated sites, sociological research can be used applying qualitative studies both during the planning of studies and risk management strategies, and *ex post* to verify the limits of the analyses themselves [11]. These qualitative approaches contribute to reducing the sense of outrage that might otherwise be felt by affected residents.

The awareness of people residing in contaminated sites and their participation in studies can be favored by using certain study designs as, for example, the epidemiological residential cohort study [12, 13]. To reach this aim, studies can be designed considering the involvement of policy makers, public health practitioners,

resident people since the development of the study protocols by:

- planning communication events at key stages, both during and at the end of the study;
- adjusting communication so that local authorities be able to understand the needs of the population;
- planning for flexibility in the study protocol and for the possibility of changing technical aspects once the study has begun;
- clearly describing roles and responsibilities from the outset;
- directly involving the general public in all stages so as to gain their trust and commitment, thus ensuring that the project results are more likely to be accepted and promoted.

**DISSEMINATION STRATEGIES OF TARGET-SPECIFIC INFORMATION**

For the reasons explained above, the need to develop specific dissemination strategies to interact with the target audience (the stakeholders) is evident. The primary aim is to create awareness and preparedness of the different stakeholders to facilitate management in contaminated sites as well as to foster knowledge and informed decisions to consolidate risk perception through science-driven information. *Table 1* shows the different steps of such dissemination strategies.

Dissemination strategies on a public health issue of global relevance, such as health risks of contaminated site, are fundamental to identify effective actions capable to reach local stakeholders in the affected areas for increasing their awareness and preparedness not only to manage environmental risks, contamination and remediation, but also for promoting prevention actions of health risks and related diseases caused by the specific contamination of the areas where they live or work.

The effectiveness of the adopted dissemination strategy is also measured by the inclusion of the socio-cultural and economic aspects of environmental contamination, which have to be taken into account for addressing specific information to different stakeholders. The most socio-economically deprived communities are often those living in the surroundings of a contaminated site.

The impact of dissemination activities relies on the capability to take into consideration the specific local context from the social, economic and scientific points of view. In particular, in many low-income and industri-

alizing countries, industrialization processes are characterized by the presence of foreign companies, which transfer industrial hazardous productions with safety levels and health standards lower than those adopted in their industrialized origin countries [14]. They are encouraged in doing this by weak or ineffective national regulations on risk mitigation of hazardous exposures for human health in working and living environments.

Planning a dissemination strategy has to account for several fundamental steps in order to transfer validated scientific information from epidemiological studies and social research to different stakeholders taking into account their different roles and responsibilities within the risk management process (e.g. local health professionals, policy-makers, environmental and health authorities, population living in the surroundings of the contaminated sites, citizens and environmental associations). In this perspective, the adoption of appropriate tools for dissemination dedicated to each specific stakeholder category is essential for ensuring the success of a dissemination strategy facilitating public decisions, the implementation of coherent policies as well as conscious behaviors of citizens.

For each stakeholder category, multiple dissemination tools must be designed appropriately to meet interest and involvement of the target audience. Each target stakeholder will be more pro-active in further disseminating the content and the information within its community as well as sharing findings with other stakeholders [15].

In order to plan appropriate and effective dissemination initiatives it is essential to understand the education level and literacy of stakeholders. To this goal, both lay translation of scientific contents and the use of native language are key aspects for successful dissemination actions. This is critical in order to favor the understanding of the information and to create awareness on the health and environmental risks related to contaminated sites among residents, workers, public administrators and other stakeholders. It is well known that preparedness and clear perception of the environmental and health risk by the population contributes to increase the effectiveness of the adopted prevention actions.

Moreover, socio-economic vulnerability and deprivation of the affected communities often living in the vicinity of contaminated sites may increase their expo-

**Table 1**  
Different steps of a dissemination strategy

Identification of clear specific objectives of dissemination directed to individual stakeholders
Identification of the different target-audiences (stakeholders) <ul style="list-style-type: none"><li>- Local health professionals involved in health impact monitoring and management</li><li>- Decision-makers and policy-makers</li><li>- Environmental and health authorities</li><li>- Population living in the surroundings of the contaminated sites</li><li>- Environmental associations, patient's organizations</li></ul>
Identification of the appropriate dissemination tools for implementing the strategy, taking into account the different target-audiences
Development of appropriate dissemination tools: newsletters, technical reports, conferences, workshops, public meetings, website, local media
Evaluation of the impact of dissemination activities and communication with different stakeholders



sure and influence their risk [16]. This implies that also a dissemination action has to take into account the lower education and literacy as well as the different socio-cultural backgrounds and technological development of the different geographical areas.

Dissemination actions to health professionals may include seminars to increase and update their knowledge on the specific contamination sources, hazardous exposures in working and living environments and health related impact; prevention of the hazardous exposures; diagnostic and therapeutic interventions; communication to the inhabitants of the contaminated sites.

Dissemination initiatives dedicated to local administrators may include proving reports and *ad hoc* meetings to disseminate scientific information for increasing their knowledge and for facilitating the access to dissemination tools in order to foster their informed decision-making concerning both health prevention actions and remediation actions for the environment.

Another important factor is to identify, select and promote the access to and the use of online resources provided by international organizations such as specific WHO publications on Health and Environment. Even if the selected materials address issues emerging from the most industrialized countries, they may be useful in similar situations in industrializing countries, where

decision-makers have to deal with environmental health issues, contamination and remediation practices associated with exposure to hazardous industrial activities and related health impact [7, 10, 15].

Furthermore, local media can contribute to educate citizens because of their capability to provide a wider dissemination of information on the contamination of the selected sites, on the presence of hazardous substances, the risk of hazardous exposures and health related impacts. Several sources of multimedia as TV channels, newspapers and radio may be involved for dissemination [15].

A crucial aspect of a dissemination strategy is the evaluation of the impact of dissemination initiatives to the different stakeholders and the assessment of the use/exploitation of disseminated information. This requires, among others, the identification of metrics to perform the evaluation and eventually improve the interactions with the target audience.

### Conflict of interest statement

The authors declare that they have no conflicts of interest.

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