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## Complaints in environmental health and the construction of risk as cultural resource ☆

*Les plaintes en santé environnementale et la construction des risques comme ressource culturelle*Marcel Calvez <sup>a,b,\*</sup><sup>a</sup> Université européenne de Bretagne, 35000, France<sup>b</sup> Université Rennes 2, CNRS, Espaces et Sociétés ESO - UMR 6590, place du recteur Henri-le-Moal, CS24307, 35043 Rennes cedex, France

## ARTICLE INFO

## Article history:

Available online 30 December 2010

## Keywords:

Health risk  
Environment  
Victims  
Experience  
Expertise  
Epidemiology

## Mots-clés :

Risques de santé  
Environnement  
Victimes  
Expérience  
Expertise  
Épidémiologie

## ABSTRACT

The article aims to discuss the notion of health risks put forward in complaints about mobile phone masts. This notion is present in a similar way in other complaints linking cancers with industrial sites. The study of three complaints is used to analyse the local process of construction of health risks. The article argues that the social foundations of the notion of health risks and its uses as a cultural resource to develop a community of victims prevent any agreement between local activists and experts on the definition of the health problem.

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## R É S U M É

L'article a pour objet de discuter la notion de risques de santé mise en avant dans les plaintes relatives aux antennes de téléphonie mobile. Cette notion est présente de façon comparable dans d'autres plaintes reliant des cancers à des installations industrielles. L'étude de trois plaintes permet d'analyser le processus local de construction des risques de santé. L'article soutient que les ancrages sociaux de la notion de risque de santé et ses usages comme ressource culturelle pour construire des communautés de victimes empêchent tout accord entre les militants locaux et les experts sur la définition du problème de santé.

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## 1. Introduction

In recent years, numerous complaints have been made regarding mobile phone masts; they have invoked the health damage which would result from exposure to electromagnetic fields. These complaints can be considered as the expression

☆ The article is based on research financed by the ADEME (French Environment and Energy Management Agency) # 04 10 C 0041, CNRS SBSS (Biomedical Sciences Health Society Program) # 08/2005/DR03, Ministry of Research (ATC Environment-Health) # 04 5667. It also draws upon research carried out as part of the program "Analysis of discourses in public health" (MSH Bretagne). The fieldwork was carried out by Marcel Calvez and Sarah Leduc. The author wishes to thank Paul Henderson for his assistance, and Olivier Borraz for inviting him to contribute to the 2nd Conference of the Fondation Santé et radiofréquences, where a first version of the paper has been presented.

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of a particular concern regarding the development of electromagnetic fields which has become visible for the population by the growing number of cell sites [1]. They can also be considered among the various complaints which express a growing concern regarding environmental risks associated with industrial sites [2]. One sees variations in this concern from the protests against wind turbines accused of causing hearing and psychological disorders, to the incrimination of incinerators or chemical plants in cancers [3–5]. Community activists put forward insidious dangers likely to produce health damage. Their argument is most often rejected by the epidemiologists who challenge a direct causality between alleged health risks and accused sources. This rejection, on the basis of a scientific expertise, drives one to see situations in which activists accuse experts of endangering populations by denying the reality of risks, whereas experts consider activists irrational or ignorant. The mutual accusations which the protagonists mobilize do not allow them to reach an agreement on the nature of the problem involved in the situation. A way to go beyond this confrontation consists in questioning the experience on which this protest rests in order to explore the conditions for the basis of an agreement, or a compromise on the definition of the problem.

As a recent social phenomenon, popular concern about environmental health risks has deserved the attention of sociologists. Brown has conducted research on the environmental health movement, since his pioneering study on cases of leukemia at Woburn (Massachusetts) which led him to develop the concept of popular epidemiology [6–8]. Kroll-Smith and Floyd have studied the recognition of environmental diseases by the medical professions [9,10]. These studies focus mainly on lay knowledge of environmental health risks and diseases in their relation to professional knowledge and expertise. They pay less attention to the social and cultural contexts in which health social movements develop, and in which health risks become real for the population. In order to better understand the confrontation between activists and experts, these contexts of the construction of health risks must be studied.

This article examines the construction of environmental health risks on the basis of three monographs of reports of cancers to health authorities between 2000 and 2002 in France. The monographs are based on interviews with the local activists directly involved in the reports, and on a systematic review of the press and of the internet. The rationale of the research is derived from the cultural analysis of risks developed by Mary Douglas [11–13]. The general argument is that local concerns about health risks have their social foundations in problems of cohesion and institutionalization met by the social networks in which activists participate. These activists select problematic elements in their environment and construct them as health risks. The plausibility of these risks depends on their consonance with preoccupations among the population regarding their way of life. Their effectiveness depends on their capacity to express a collective concern and to generate solidarity. In that sense, health risks are cultural resources to produce and to legitimate social institutions [14]. The transformation of private perceptions of risks into community complaints regarding health risks depends on the cohesion of the local networks. These social and cultural foundations of risks are able to explain the difficulties met by experts when they attempt to convince activists that a statistical association between cancers and environmental causes cannot be established. Whereas experts use epidemiological standards in the definition of clusters of cancers, activists put forward a conception of risks that holds members of the local networks together. They do not refer to the same contexts and cannot agree on the reality of dangers.

The three cases presented in the article illustrate three different situations in which people are confronted with unusual deaths in their neighborhood and question their environment to find an explanation. Whether they are right or wrong regarding their causal explanation is not at issue here. The central point is that they consider the risks to be real. On this basis, they are able to gather neighbors and to persuade them to act with them against these risks. When people share the same definition of reality, and act together, there is an ongoing social process which cannot be reduced to individual anxieties or to personal biographies. The task of the sociologist is not to decide if these risks are compatible with epidemiological standards. It is to analyze this social process and the definition of reality on which it rests according to sociological standards.

## 2. Three reports of cancer cases

This part presents three reports of multiple cases of cancer to public authorities. These reports incriminated industrial sites located in the close environment of the people among which these cancers developed.<sup>1</sup> The presentation will adopt a chronological stance, and will focus mainly on the local activists and on their interpretation of the situation.

### 2.1. Mobile phone masts in Saint-Cyr-L'École

In September 2001, in the upper part of Saint-Cyr-L'École (west of Versailles), an informal network of mothers began to voice concerns over the recent deaths of two schoolchildren after long illnesses and, by extension, over the occurrence of rare diseases (leukemia, auto-immune infections) that would have affected other children in the same school complex.

In the late 1990s, three mothers of pupils who had given up their professional activities in Paris to raise their children, had become concerned by the consequences of the radiations emitted by mobile phones masts that had been set up on the roof of the school building in 1992 and 1997. They had been in contact with national associations that were fighting the

<sup>1</sup> For an extended presentation of the cases, see [15].

spread of mobile phone masts, and had collected technical and scientific information about electromagnetic fields and their effects on health.

On becoming aware of the cases of cancer among the schoolchildren, their earlier investigations led the mothers to immediately associate these problems with the mobile phone masts. At the end of 2001, they set up a local investigation on health problems perceived by the population to confirm their idea on the effects of radiation on health. They used a questionnaire on health symptoms drawn up by a specialist in the biological effects of non-ionizing radiations (in particular the effects of microwave ovens in the 1980s, and later the effects of mobile phones). The survey was carried out door-to-door by members of the school parents' association. It found 11 cases of cancer or rare diseases of children under 14; in addition, responses mention different chronic troubles (headaches, loss of memory, skin problems, etc.). These results strengthened their conviction that electromagnetic radiations from the base stations were affecting the population. By offering residents a plausible explanation for health problems which they would otherwise have been considered chronic, the survey spread awareness of the problems and increased the number of people concerned with the health effects of cell towers.

Meanwhile the mobile phone companies intended to add six cell towers on the roof of the school building. This interest in the site can be explained by the location of the school complex on a plateau, which is among the best places in the western part of Paris region for redirecting telephone signals. The mothers formed a collective of various local voluntary associations to oppose the project and to reclaim the deactivation of the existing masts. The newly-elected mayor of Saint-Cyr-L'école sided with the collective and called in the DGS (Direction générale de la santé/Head Administration of Health) who asks the INVS (Institut de veille sanitaire/French Institute of Health Vigilance) to "*explore the possibility of investigating possible health risks in relation to exposure to radiofrequency electromagnetic fields*". The experts of INVS considered that a study would not be justified on scientific grounds, but suggested investigating the local report of cancers in order to determine whether or not it could indicate a cluster according to epidemiological standards.<sup>2</sup>

The case of Saint-Cyr-L'école received national media coverage (articles in the newspapers, TV reports, a demonstration in the centre of Paris). One of the mobile phone companies asked publicly the Ministry of Health to answer the demands of the Mayor and of the local associations.

In October 2002, the INVS carried out an epidemiological study. It concluded that the pathologies did not form a cluster and that the various cancers could not be explained by passive exposure to mobile phone masts radiations. However, it recommended continuing investigations [16,17]. In April 2003, the operators removed the base stations from the school building. Following the public presentation of the epidemiological study in 2005, the collective challenged the methods and the results, and demanded a second investigation. No case of child cancer has been reported since 2002.

## 2.2. Accusations against a former chemical plant at Vincennes

A suspected child cancer cluster was reported in Vincennes (east of Paris) in 1999 following the diagnoses of two cancers in children from the Franklin Roosevelt nursery school between 1995 and 1999. The school stood on the site of a former Kodak plant that had been redeveloped into a luxury residential and business area. The new neighborhood's comfortable apartments, services and proximity to Paris had attracted numerous middle-class families with relatively high incomes.

The nursery school's head teacher, who had been appointed in 1998, was informed of the two cases during her first year in the job. When she learned about a third case, in 1999, she was convinced of an excessive incidence of rare diseases. She alerted the local education authority but did not receive a response. After the summer holidays, she again alerted the education authority and Vincennes Council.

A technical study, ordered by the Mayor, found no specific chemical problem and no statistical excess of cases. At the same time, a senior toxicology researcher, an activist in the anti-asbestos national association whose office is near the school, learnt about the case and put pressure on the director of INVS, whom he knew, to start an investigation. The head teacher informed the parents. Their local association wrote to the Prefect of the department and asked him for information them on the on-going investigations.

In May 2000, the INVS conclusions admitted that "*the number of cases tends to suggest the possibility of an excess of cases, however without statistical confirmation*". No specific environmental risk could be identified; consequently, no link could be established between the cancers and attendance at the nursery school. The institute recommended taking into account taking local preoccupations, but considered also that further investigations were not justified. A committee of experts validated these conclusions, leading the INVS and the authorities to consider the case closed, despite demands from the parents and the toxicologist to continue investigations.

A petition from the parents' association received the support of 200 families asking for further scientific investigations. The authorities agreed to carry out a further study limited to the school grounds. At this time, the parents learnt about a fourth child who had developed a cancer and about two others cases that had not been included in the first study, including one death. Together with residents and the toxicologist, they founded a collective, whose objectives were "*to know the extent of the pollution generated by the former Kodak factory and to look for possible links with the excess of child cancers reported in this district*". Due to the pressure exerted by the collective, a scientific committee was set up to establish a program of

<sup>2</sup> In epidemiology, a cluster is defined as a "greater-than-expected number of cancer cases that occurs within a group of people in a geographic area over a period of time" (CDC's presentation of clusters in the USA: <http://www.cdc.gov/nceh/clusters/faq.htm>).

epidemiological and risks assessment studies. In addition, a follow-up committee, including the municipality and voluntary associations, started a large campaign of communication and information to the public.

The toxicologist, who was associated to the scientific committee, quickly resigned, considering that his advice and the parents' claims were not taken into consideration. To avoid psychological and media pressures on the children, the Mayor decided to close the school in June 2001. The epidemiological study published in May 2002, confirmed an excess number of cases for the period 1995–1999, but did not identify any particular exposure to an environmental factor that could explain this excess within the geographical limits of the study [18]. Furthermore, the technical study of risks concluded that risks were below acceptable levels regarding legal regulations and scientific knowledge.

The leader of the parents' association considered that a contradictory expertise had not been conducted and that the investigations had largely minimized the excess of risks. The experts turned the disagreement on their conclusions into a problem of insufficient communication, whereas the central problem for the collective was the independence and the quality of the expertise [19].

The school was reopened in January 2004. An environmental monitoring was carried out between 2004 and 2007. No further cases of cancer have been reported since 2001.

The case of Vincennes has received large media coverage. The INVS considers it exemplary of the association of the public to scientific expertise [20,21].

### 2.3. Incrimination of an incinerator at Nivillac

At Nivillac (southeast Brittany), a report of a suspected cancer cluster pointed the finger at a small household waste incinerator run by the local authority, that operated from 1990 to 1999. During these years, the thick clouds of dark smokes and ashes emitted by the incinerator had led to numerous complaints from several local people, including a formal report to the *Gendarmerie*. The incinerator was closed in August 1999 after a fire in the machinery. Its operating license was suspended in 2000 because it did not meet legal standards.

At the beginning of 2001, an ambulance driver, suffering from a lymphoma, mentioned to his doctor that his work transporting patients to hospitals had given him the impression that the number of cancer cases was increasing. Living 500 meters east of the incinerator, under the winds that brought ashes and smoke to his house, he came to question the role of the incinerator.

The ambulance worker's remarks accorded with the doctor's own feeling that there had been a change in the pathologies affecting his patients. Together with the medical center's other two doctors, he contacted the Departmental health authority and very cautiously reported an impression of an increase in the number of cancers in his area, suggesting a possible link with the incinerator. The authority responded that the report concerned a scattered population exposed to a low risk during a period of time too short to cause cancers, and concluded that no investigation was needed.

During this time, the ambulance driver and a local councillor, both of whom opposed the president of the local authority, collected information about malfunctions at the incinerator and drew up a map of cancers in the district. The map plotted 200 cases of cancer affecting people between 40 and 90 years of age, over the previous ten years, for a population of approximately 10000 inhabitants. In their opinion, these cases could exclusively be attributed to the incinerator. They used the publicity given to a suspicion of cancers related to the incinerator of Gilly-sur-Isère (Savoie) to put the case of Nivillac in the public arena. In March 2002, an investigation was requested by the national health authorities. As expected by local health authorities, the experts concluded that there were no excess of cancer mortality and no specific health risk.

In July 2002, an environmental protection association filed two lawsuits for manslaughter and for non-respect of regulations covering listed sites in the name of the ambulance driver and his family. The ambulance driver died in 2004. Due to internal disputes, the environmental association dropped the lawsuits in 2006.

## 3. The construction of environmental health risks

The three case studies have in common a concern resulting in community activism on environmental health risks. Individuals with different biographies act together at a local level, convinced of the reality of health risks. Even if this conviction is rejected by the experts, it deserves attention as a collective representation expressing a certain order of reality. The point is here to question the conditions of formation of such convictions regarding environmental health risks. The interest of a sociological approach is to relate them to the social networks in which these risks are considered real and justify public action. In this part, we will discuss the conditions of formation of a concern for health risks.

### 3.1. An atypical disease

The first condition is the presence of atypical health problems. No disease has an atypical nature in itself. It depends on the cultural representations of the disease, the population to be ordinarily affected, its regularity and its taken-for-granted causes.

Unquestionably, cases of rare diseases among children are one of these configurations of atypical diseases, as cancers are commonly associated with adults and not with children. In addition, the unity of time and space resulting from the attendance to the same school during a limited number of years amplifies the perception of a local problem.

By contrast, at Nivillac, the argument of exceptional cancers among adults and old people is not plausible. Moreover, the cases are scattered among different communities in a large territory. Therefore, to create the atypical nature of the problem, local activists have to emphasize the exceptional number of cases by adding various types of cancers in a long period of time. The cognitive bases of their complaint are fragile and rapidly subject to critics from the local medical doctors as well as from the official experts, whereas in the two other cases, the evidence brought by the local activists needs to be discussed.

### 3.2. The aggregation of cases

A second condition is the possibility of putting together different individual cases to form a public health problem. This condition depends on the social networks local people participate in. The structure of the social networks allows various fragments of information to be connected. The content of the network gives sense to the information, according to the preoccupations members share together.

In the case of child cancers, the social network involved in the complaint is based on the informal gathering of mothers meeting at the school gate. They share a similar condition of being parents of pupils. Several mothers have given up a job to raise their children and some are seeking a job once their children are fulltime pupils. In this biographical context, they are particularly sensitive to problems their children could face. By a process of identification, a health problem of a child is prone to be transformed into a health risk for the other children sharing the same environment. The latent nature of groups of mothers at the school gates is a fertile ground to amplify cases of rare diseases and to develop collective preoccupations regarding the schoolchildren.

At Nivillac, the aggregation of cases is performed by the ambulance driver and depends exclusively on his personal network. As his network is limited, his effort to transform his observations into a public problem requires an institutional mediation that limits the possibility of a community protest. Once his report is made to the medical doctors, he loses control over it. The case is rapidly transformed into a public health problem, submitted to health authorities whereas in the other cases, there is a growing community concern and political interference before the intervention of health authorities.

### 3.3. The attribution of a cause in the close environment

A third condition of formation of a collective conviction regarding the existence of an environmental health risk is the possibility to attribute a cause to the disease. It implies that the environment must offer resources that might be plausible as causal explanation. The process of attribution of a cause is not linear. Once the health problem is considered as real, the activists look at their environment to find an explanation. Then, some parts of this environment that were routinely seen become problematic. As noted by Wynne [22], incrimination is facilitated by the absence of interdependence between the community and those taken for responsible of the source of pollution.

At Saint-Cyr-L'école, the previous Mayor allowed the operators to set up base stations on the school building owned by the city. A radical political change of the town council in 2002 created a new context. The new mayor did not consider being indebted to his predecessor and constrained by his decisions. In addition, the part of the city surrounding the school complex had voted for him and largely contributed to his election. At Vincennes, there was no connection between the residents and Kodak, the previous owner of the land, whereas it can be observed that old residents, who were in the district when the Kodak Company was still operating, have refused to acknowledge the reality of a health problem and have suspected the activists of campaigning for financial compensation.

Nivillac is specific as regards this condition because the ambulance driver and his family had constantly suffered from the pollution of the incinerator during the decade it was operating. In a context in which dioxin and its cancer-producing effects were publicly debated, the connection between incineration and the cancer of the driver through dioxin was taken for granted among his family. However, as the incinerator was no longer operating, there was no immediate context for a collective concern; cancers remained private situations.

### 3.4. The validity of the causal explanation

A fourth condition is that the connection between the health problem and the cause appears plausible according to scientific standards. Local activists use largely the Internet to seek for causal explanations of the health problem. Anticipating the rejection of their causal explanation by institutional experts, they make contacts with experts who have a marginal position in the scientific community or who are critical to the official expertise. Two types of dissenting experts can be found. Some are activists that have devoted their life to a crusade (for example the leader of Robin des Toits – *Robin Roofs* – fighting against mobile phone masts) and have developed an exhaustive knowledge in a specialized domain. Others have a highly qualified scientific training in a research field; they transfer their methods and knowledge to other domains in which they are activists (e.g. from toxicology to asbestos and public health, or from electromagnetism to public health).

The contribution of dissenting experts to the local complaint depends mainly on their personal contacts with at least one local activist. They help activists to find relevant arguments in order to relate the occurrence of diseases and the source of pollution. Nevertheless, their contribution is largely scrutinized to prevent the loss of control over the protest by the local activists and its transformation into an exemplary case for a national crusade.

Trust in dissenting experts rests on the judgment of the group on their personal experience as activists and on the conviction of their disinterested contribution to the protest, referring at once to their social involvement and to their scientific detachment, according to a model of the neutral scientist close to that analyzed by Merton [23]. Mistrust can arise when the case is being too politicized according to the local judgment, as observed in tensions among the activists at Vincennes and Saint-Cyr-L'école. At Nivillac, the local councillor who associated with the ambulance driver spent time and money to consult lawyers, dissenting scientists and specialists of incineration, to make counter analyses, etc. However the data he collected were never been disseminated among the population because he could not organize them in a coherent presentation, and because he did not participate in the local networks.

### 3.5. The cultural consonance of the complaint

A last condition is that activists must be capable of rallying their neighbors against health risks. It implies that the problem must be resonant with concerns among the population, and that they must be able to present the situation in a way acceptable to the community.

The cases of Vincennes and Saint-Cyr-L'école draw their strength from the fears shared among mothers and families that schoolchildren are exposed to environmental dangers. The fears expressed by children's mothers make their discourse on risks culturally plausible because current representations view mothers as being "naturally" attentive to potential threats to their children and "naturally" driven to protect them. In addition, the public is likely to support activists because they can easily identify with the mothers' protection role.

Cultural consonance with problematic situations experienced by the population is missing in some other cases. This lack of consonance is able to explain the lack of popular support for activists. To put the issue on a public agenda, they need to adopt alternative strategies, like searching after national media coverage or bringing a lawsuit. The case of Nivillac is exemplary of a judicial strategy in response to the cultural dissonance of the problem of incineration with the preoccupations of local people. The death of old people is regarded as belonging to a nature of things against which it is useless to struggle. There is no local cultural ground for nourishing a public concern in the environmental health issue promoted by the two activists.

The construction of the health problem depends largely on the social networks in which individuals get information and on the community of claims they manage to establish together. The local activists ground their protest in their local experience, and the evidence it provides regarding the cases of cancers and their causes. They claim that experts cannot fully understand the reality of the problem because they do not share the same conditions of living, do not know the specificities of the territory in which they live, and eventually deny that children are exposed to sources of dangers. The reference to local experience and the critic of official experts help the community to maintain a local solidarity.

## 4. Reports of cancers and the language of risks

Experts and local activists use the notion of risk to deal with the issues raised by the local reports of cancers. Risk has different meanings for the protagonists who do not refer to the same knowledge and do not use the same rationale to define the situation. The debate on risk is fraught with ambiguities and misunderstandings, as it does not only involve facts and their interpretations, but also social and cognitive contexts.

### 4.1. The political dimensions of risks

Activists use the language of risk to turn the local cases of cancers into a public issue. They take for granted the causality between these cases and an insidious pollution emanating from industrial sites. In the case of Nivillac, the conception of causality rests on the combination of a representation of contiguity expressed in a map, and of local experience able to interpret this map. During an interview, the ambulance driver's wife explains that the first cases of cancers started close to a dump where rubbish was constantly burning, and then due to west winds the cases of cancers were more and more located on the east part of the territory, and so on. The explanation is exemplary of the selection of specific data to support a taken-for-granted hypothesis.

This inductive and non-contradictory construction of an explanation is present in the two others situations, although in a more elaborated way. Activists collect arguments to sustain an explanation that the incrimination of a source of pollution anticipates. Their method is a form of "*bricolage*" as defined by Lévi-Strauss, i.e. the use of odds and ends collected in various situations in order to fulfill a task [24]. They consider fragments of knowledge collected in various situations in their capacities to justify the causality. They use common sense and their local experience to adjust this knowledge to the expected explanation. The consequence as regards the debate on risks is that the interpretation resulting from this *bricolage* is specific to the situation and can hardly be discussed on scientific grounds.

Among the activists, risk is a cultural resource expressing the vulnerability of individuals to situations created by powerful others and conveying demands of protection to public authorities. The complaint rests on the argument that all children are at risk insofar as the source of pollution is still operating. The value of this argument rests on a cultural model of childhood as a personification of innocence and of extreme vulnerability. It also leans on a conception of an environment in which people could live what they consider to be a normal life, away from uncertainties imposed by others. The protection

of children's health against uncertainties is a banner prone to create solidarity among neighbors and to rally support from the public. The debate on health risks is politicized and transformed into a debate on lifestyles.

#### 4.2. *The difficult debate on data*

Epidemiologists cannot enter the political debate on risks on the basis of their professional expertise. According to their mandate, they have to characterize the situation as objectively as possible, and to define its dimensions as a public health problem according to epidemiological conventions. They study the statistical probabilities of an association between cases of a disease, according to the standard definition of a cluster, and explore various causes, including environmental ones. The problem with epidemiological expertise is that the situations they study rarely satisfy the epidemiological criteria defining clusters, because the number of cases generally fall within expected statistical limits or because different medical types of cancers are aggregated.

In limiting their contribution to their domain of competence, experts find themselves in uneasy situations. They are accused of denying the reality of dangers and of ignoring the local cases of cancers. In using scientific standards to discuss the validity of local data, they challenge the local construction of risks. In the case of Saint-Cyr-L'école, the experts reject data collected by the activists on the argument of a lack of scientific methods in the definition of the population and in the collection of data. For the activist, this rejection is a way of claiming a monopoly of rationality and of masking their methodological blanks and errors. Activists are critical of data collected by epidemiologists because they do not refer to the local conditions of exposure to radiations, but to administrative divisions in which data are easily accessible. In addition, according to activists, the hypothesis of the active role of mobile phone masts is not seriously explored; the protocols and methods of experts are highly exposed to critics. In the three cases, activists criticize epidemiologist and their lack of fieldwork on the basis of their local experience. Their judgment about the reliability of epidemiological data refers to their experience and not to the scientific rules of epidemiology. In consequence, there is no shared assumption that would facilitate a discussion between experts and activists on the data and on their relevance to the situation.

Regarding the interpretation of data, the idea of a unique causal explanation is so central to activists that they cannot accept the notions of association, probability and additional risk used in epidemiological analysis. In fact, the idea of multiple factors of causality challenges the consensus on a unique and identifiable cause among the population. Similarly, the idea of probability contradicts the definition of a danger that contributes to maintain solidarity among the population. The idea of additional risk means that people are ordinarily exposed to risks; it challenges their expectation of a safe environment on which the protest is built. These opposite views have consequences on the cognitive definitions of the situation that can hardly correspond to each other. For example, activists focus mainly on the specific sources of pollution in the neighborhood and on their effects on the health of the members of the community, whereas official experts start with general epidemiological data to which they compare local data. This antagonism can be analyzed in reference to the opposition between shoe-leather epidemiology, as Snow's fieldwork in the 1860s has been qualified, or popular epidemiology [6,7], and analytical epidemiology [25]. In our view, it expresses mainly two different worldviews that prevent any agreement on the definition of the problem involved in local reports of cancers.

### 5. Conclusion

If the notion of risk is central to the debate on environmental health issues, and specifically to exposure to radiofrequencies, it has different meanings that depend on the protagonists and on their social experience, worldviews and context of contribution to the debate. In entering the public debate, risk has weakened its connection with the calculation of probability from which it has developed [26]. It tends to express a growing awareness of uncertainties and dangers in different fields of human life [27]. It has become a common term to address various social issues in a culturally recognized way by emphasizing their undesirable outcomes. To be at risk means to be victim of the physical or social environment, to be vulnerable to the encroachment of others [12]. It is a powerful cultural resource to articulate claims of protection among the population.

By putting risks on the public agenda, communities of victims succeed in opening a debate on industrial responsibility in events which affect the life of some of their members. The three cases presented here are exemplary of this use of risk. Activists claim to hold the local authority or industrial companies responsible for the death of people suffering from cancers and for the protection of the population. As seen in comparing the three cases, some claims are more culturally acceptable than others. Our argument is that endangered childhood is the crucial argument that gives strength to this political use of risks.

Epidemiological expertise attempts to respond to this political and cultural debate by a scientific approach based on statistics and probability. In a public debate fraught with emotion, experts have the bad role. They rationalize the situations by dissociating their different components and by analyzing their association according to their scientific standards. They make distinctions between ordinary and additional risks, and focus on the latter when the population claims a risk-free environment. They cannot respond to the expectations of the activists and are therefore accused of favoring the powerful against the victims. As experts and activists do not share the same definition of the situation, their debate on health risks is structurally fraught with misunderstandings.

To get out of this blocked situation requires calling into question the dichotomy between the experts and the public which is a structural component in debates on environmental health risks. Unless expertise is considered to be a professional monopoly, it should be possible to take into account the local expertise based on experience in the definition of the problem situations and in the process of public decision. However, the value attributed to local expertise needs to be discussed according to explicit criteria [28–30]. Moreover, public authorities must be able to mobilize manifold models of cooperation and negotiation which exceed oppositions between experts and activists [31]. Situations like those which were discussed in this article call therefore for the development of a social engineering to which social sciences can contribute.

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