



## Risk: basic concept of epidemiology

## Riesgo: concepto básico de la epidemiología

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**ABSTRACT** This paper suggests a formalization of the “risk” concept as the object of knowledge of epidemiological science, in order to categorize linguistic, epistemological and methodological aspects of this concept, following upon former contributions of the authors. Firstly, the meanings of risk are analyzed from an etymological and semantic viewpoint, evaluating its use for the constitution of common social discourses. Secondly, the epidemiological concept of risk is focused in hermeneutical perspective, making explicit epistemological axes and conceptual elements for the construction of the epidemiological discourse. Thirdly, theoretical, methodological and political correlations among the object risk, concepts of health and critical theories of society are discussed, aiming at an evaluation of perspectives and challenges for future developments of the scientific field of epidemiology.

**KEY WORDS** Risk; Epidemiologic Models; Knowledge; Epidemiology; Health Policy.

**RESUMEN** Este artículo propone la formalización del concepto de “riesgo” como objeto de conocimiento de la ciencia epidemiológica, con el objetivo de sistematizar sus aspectos lingüísticos, epistemológicos y metodológicos, compilando para ello contribuciones anteriores de los autores. En primer lugar, los sentidos del término “riesgo” son analizados desde un punto de vista etimológico y semántico, evaluando su utilización en la constitución de discursos sociales comunes. En segundo lugar, el concepto epidemiológico de riesgo es enfocado desde una perspectiva hermenéutica, explicitando los ejes epistemológicos y los elementos conceptuales involucrados en la construcción del discurso epidemiológico. En tercer lugar, se discuten correlaciones teóricas, metodológicas y políticas entre el objeto riesgo, conceptos de salud y teorías críticas de la sociedad, apuntando a una evaluación de perspectivas y desafíos para futuros desarrollos del campo científico de la epidemiología.

**PALABRAS CLAVES** Riesgo; Modelos Epidemiológicos; Conocimiento; Epidemiología; Política de Salud.

## INTRODUCTION

There are sciences that study objects linked to the past such as paleontology, archeology, and history. There are sciences that make an effort to understand structures and forms such as chemistry, systematic biology, and anatomy. Other sciences aim to achieve the explanation of ongoing processes and phenomena such as mechanical physics, molecular biology, and physiology. In general, those sciences were not constructed to foretell or to anticipate temporary events and phenomena, something which, on the contrary, characterizes other very peculiar scientific disciplines such as meteorology, economy, and epidemiology. The latter disciplines, not coincidentally, use different versions of the concept of risk.

Contemporary social analysts consider that, for several reasons, a futurology concern has become more pronounced in the profile of several research areas. One of the reasons for this has been the need for dealing with the shrinking of the present, the increase of uncertainties, and the respective symptoms of uneasiness that surround modern societies. This sense of great insecurity, which comes along with our era, is combined with some complaints about the lack of control of the technique.

Paradoxically, our times are characterized by the impact of many objects resulting from technological aspects, which are brought about by modern science in accordance with their canons of rationality. However, we are witnesses to the fact that rationality does not necessarily provide certainty, consistency, confidence and calmness.<sup>(1)</sup> The availability of modelling and simulation tools and the great emphasis given to prospective statistical techniques seem to be emblematic manifestations of that state of affairs as a result of the pursuit of satisfaction of a need or as symptom of the spirit of a dizzying age. Undeniably, the anticipatory eagerness has been largely intensified at present to such an extent that some sciences have acquired recently a strong futuristic aura bringing them closer to narratives of science fiction.

In concrete processes of knowledge production, explanations of the relationships among phenomena may depart from the solid ground of precise and delimited objects under causality rules, in order to go deep into more uncertain domains. In this sense, tools for knowledge construction start to adopt approaches to deal with uncertainty. Probability is a device for this purpose. Generally speaking, statements based on probabilities are dependent on contingencies which sometimes are out of the observers' control in their attempts to specify causes and effects. In this way, in the field of health, actions towards prevention begin to depend upon definitions with varied doses of uncertainty. One of them is the definition of the uncertain object called "risk."

With the purpose of systematizing linguistic, epistemological, and methodological aspects of the concept of risk, by compiling our previous contributions, this article<sup>(a)</sup> suggests the formalization of this concept as the object of knowledge of epidemiological science. Initially, the meanings of the term risk are analyzed from an etymological and semantic viewpoint, evaluating its use for the constitution of common social discourses. Then, the epidemiological concept of risk is looked at from a hermeneutic perspective, involving explicit epistemological axes and conceptual elements for the construction of the epidemiological discourse. Finally, theoretical, methodological, and political correlations among the object of risk, concepts of health, and critical theories of society are discussed, aiming at an evaluation of perspective and challenges for future developments of the scientific field of epidemiology.

## MEANINGS OF THE TERM RISK

Risk is a word that is primarily polysemic, therefore, it leaves some room for ambiguity. As it was already developed in other works,<sup>(2)</sup> this term has connotations in the so-called common sense. From this perspective, there are controversies regarding its origins.

In the Portuguese language, it may directly come from Low Latin *riscu*, *risicu*, as from Spanish *risco* (crag). In the second entry, excluding the terms related to the verb *riscar* in Portuguese,<sup>(3)</sup> it conveys, on one hand, the idea of danger, and, on the other hand, the possibility of occurrence. Etymologically, in both entries, the term “*risk*” arises from the Latin *resecum*: “that which cuts,” derived from the verb *resecare*, “act of breaking up, cutting something by dividing.” It described the stiletto used by the Romans to mark the wax tablets which were used to write, before the adoption of papyrus. Later, in the medieval age, in nautical language, *riscum* meant “crag,” “danger at sea,” “hidden danger,” which explains the meaning finally established in epidemiological theory.<sup>(4)</sup>

In past centuries, in the majority of the languages from Western Europe, its meaning was already associated with gambling and odds of winning or losing in certain types of games (called games of chance). In more recent times, the term risk acquired meanings related to negative outcomes.<sup>(5)</sup> During the Second World War, in the engineering field, the issue received a strong impetus in the light of the need to estimate damage derived from the manipulation of hazardous materials (radioactive, explosives, fuels). In the biomedicine field, this analysis was used to measure possible risks when medical technology and procedures are used.<sup>(6)</sup>

A first reading, which leads to a simplified obviousness, reveals a semantical overlap between “*risk*” and “*danger*,” as shown, for instance, in Houaiss’ Brazilian Portuguese Dictionary.<sup>(7)</sup> If, on the one hand, “*danger*” is defined as “a situation in which the existence or the integrity of a person, animal, or object is under threat,” and consequently, it is synonymous with “*risk*,” and in this way, it is no longer an apparent and direct “*cause*” in the sense of “make something exist or happen.” In turn, risk means “probability of danger, usually, a physical threat to humans and/or the environment” within a “positive perspective in which something may occur, a possibility, or a chance.”

In conceptual terms, risk becomes a present way to describe the future, under the assumption that one can decide which future would be desirable. According to Luhmann<sup>(8)</sup>:

The concept of risk takes into account a difference in time, that is to say, the difference between the judgment preceding and the judgment following the occurrence of loss, and it addresses directly said difference [...to a] paradox of the simultaneity of opposing views of time.<sup>(8 p. 72)</sup>

Such paradox, in turn, is also involved in a temporal dimension. As time goes by, at every moment, there is only one admissible judgment.

The concept of risk homogenizes the contradictions in the present, establishing that risk (the future) may only be managed in a rational way, that is to say, through a judicious consideration of the probability of getting profits and losses, according to the decisions made. Even in this perspective, say, econometric, to Sennet,<sup>(9 p. 8)</sup> *the risk became* “misleading, depressing, the risk mathematically lacks a narrative quality, in which one event leads to another and conditions it.”<sup>(9 p. 97)</sup> What do profits and losses mean in the living and the dying of human beings? This question reflects the extreme concern of the procrastination of death and the signs of aging that the Western World pursues today, a cruel paradox in a time in which population groups are reaching high rates of longevity. And for this reason, in the so-called common sense, to run away from risks became a synonym for healthy lifestyle,<sup>(10)</sup> “full” of temperance, prudence, judicious/weighted risk management, when they could not be just easily avoided...

On the other hand, discourses on health refer less frequently to health dimensions only. If such discourses represent ways of thinking, writing, talking about health, and their practices, it is necessary to place them in certain historical periods and to know the reasons for which they are legitimized by accompanying and adjusting the economic,

political, and social order in which they are generated, sustained, and replicated. Health discourses (and more specifically on risks for health) consist in circumstantial constructions of normative nature, irremediably associated with other interests depending, explicitly or not, on definitions of what the human being is, the type of society desired, and the ways to achieve it.<sup>(11)</sup>

It is undeniable that risk estimations produced by epidemiologists go beyond the essential aspects related to the suitability of the technical-methodological construction and their respective adaptations for the interpretations of findings. It is indispensable to consider the relevant moral, political, and cultural aspects involved as well. Particularly, it is worth pointing out the connection between the media and the "anxiety industry."<sup>(10)</sup> Multiple and exotic risks largely broadcasted by TV channels are presented to us, and they are the topic of non-specialized newspapers, along with the consistent advertising of goods, products, and services targeted at the alleged control/minimization of such risks, as it is discussed in the interesting article by Paulo Vaz *et al.*<sup>(12)</sup>

Under these circumstances, the idea of prediction is not usually deterministic, as the term may suggest, but it is probabilistic. As we will see, even with advancement of genetic tests, predictions (in the sense of "prophetic" statements) of medicine are only valid in the current state of the art to some specific diseases (such as Huntington's disease). The "predictions" of risk (probabilities) from the knowledge available on relations between exposures/hazards for most diseases acquire an importance *a posteriori*, after the occurrence of the harm. This would confirm the relations of causality, even when the precise mechanisms for this process are unknown. To some authors, however, science actually may be legitimized only with the discovery of mechanisms.<sup>(13)</sup> With the emergence of studies of experimental medicine and epidemiology based on molecular biology, the determination of risks, under some circumstances, will be better delimited allowing predictions with smaller margins of error.

The concept of risk appears in basic textbooks of the epidemiological field as an operational concept, which implies a technical definition. In this discourse, the concept of risk favors the least important component of the semantic reserve added to risk in the common social discourse, which is the probability dimension. The secondary meaning of possibility of occurrence of events is translated as the probability of occurrence of events or phenomena related to health, integrated as a fundamental dimension of the concept in this field. In its origin, the risk concept in epidemiology included the idea of hazard only secondarily, as there is an increasing amount of discussions involving risk referring also to positive forecasts.

## THE EPIDEMIOLOGIC CONCEPT OF RISK

A hermeneutic view of the epidemiologic concept of risk, as developed in previous works,<sup>(14)</sup> shows that this term originates in the British epidemiologic language in the early XX century.<sup>(15,16)</sup> With a more specifically conceptual valuation, risk may be identified in a study on maternal mortality carried out by William Howard Jr., Professor of Biometrics at the School of Hygiene and Public Health, published in 1921, in the first edition of *American Journal of Hygiene* (which later would become the *American Journal of Epidemiology*). In this article, the concept already appears with an astonishing degree of heuristic and mathematical formalization expressed in terms of ratio between the number of persons who had been affected and the number of persons who had been exposed.<sup>(17)</sup>

A new mention to the risk concept, with more consistency, would soon appear in 1925, in a study conducted by Doull and Lara<sup>(18)</sup> on diphtheria, and later in 1928, in an article from Fales,<sup>(19)</sup> which analyzed secondary data on several infectious diseases. This last article also introduces the expression "relative risk," showing already the comparative nature of the indicators of association.

However, only with the publication in the *American Journal of Public Health*, in 1933, of a paper written by Frost<sup>(20)</sup> entitled *Risk of persons in familial contact with pulmonary tuberculosis*, did the concept of risk assume fully a technical-instrumental nature.

Risk in the epidemiology field is equivalent to effect, or probability of occurrence of a pathology in a given population expressed through the paradigmatic indicator of incidence. This formulation is due to Olli Miettinen, author of a classic of epidemiologic literature, entitled *Theoretical Epidemiology*. There, we find the first explicit reference in Anglo-Saxon literature to the issue of establishing the object in the field, which is as follows:

The relation of a measurement of the occurrence with a determinant or a range of determinants is called relation or function of the occurrence. Such relations are, in general, the object of investigation in epidemiology.<sup>(21 p. 6)</sup>

This proposal is methodologically based on principles of rigor and internal coherence favoring a logical connection between principles and immediate applications, particularly to techniques of epidemiological analysis most frequently used nowadays.

Nevertheless, not any proportion or probability may indicate a risk estimation. It is necessary to observe the presence of three elements which are always necessary to establish the epidemiological definition of risk:

1. Occurrence of cases of death-disease-health (numerator)
2. Population reference (denominator)
3. Time reference (period)

In technical terms, what is a population? It is a set of or a homogeneous range of elements, which is made up of members of the same type. In the case of epidemiology, such elements are human beings capable of suffering from or having any health problem. A population may be represented in the language of set theory in the following way:

$$\{1, 2, 3, 4, 5, 6, 7...n\} = P$$

Within this group P or reference population, it is necessary to create a new function of differentiation since it concerns the essential reference which preserves the specificity of the object. In this aspect, the designation of this "crucial difference" has been accepted in the epidemiological investigation as given by the clinical practice, resulting in the formation of a subset "carrier of occurrence" (hazard, disease, death, cure, and so on) of type:

$$\{1, 2, 3, 4\} = D$$

Contained in the population set:

$$\{\{1, 2, 3, 4\} 5, 6, 7...n\} = D \subset P$$

Graphically, such expression can be translated in accordance to Figure 1. This diagram must be understood as a representation of the "primitive" (in the sense of foundational) epidemiological object. Thus the basic postulation of the epidemiological logic is demonstrated: *the object of epidemiology is probabilistic in nature*.

So, we obtain two combinations made up of individual members of a specific population P, represented by the largest set. Some of the elements of this set are distinguished as carriers or affected by a disease-hazard-problem D, forming a subset contained in the larger set P. The subset/set D/P ratio expresses the probability that members from P are also elements of subset D. In other words, this will indicate the probability of occurrence of attribute d (disease or correlated phenomenon) which refers to models of demographic distribution of health events in sets of individuals.

Now we have access to the basic elements necessary to understand the logic of the epidemiological indicators. Sometimes, due to difficulties in the precise definition of the denominator, it is necessary to use approximations or a substitute of the risk measure that, strictly speaking, do not assume the form of a proportion (that is to say, the numerator is part of the denominator). However,

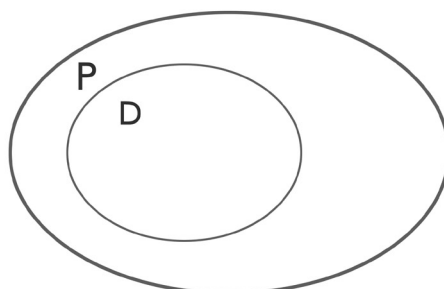


Figure 1. Representation of the “primitive” epidemiological object.

Source: Own elaboration.

within their limitations, every epidemiological indicator aims to assume the general form  $D/P_{\text{time}}$  in the sense of a “prototypical” measure of risk. In all cases, the chronological dimension must always be indicated, regardless of the type or level of the epidemiological measure.

In the traditional Last’s *Dictionary of Epidemiology*<sup>(22)</sup> the term ‘risk’ is defined as: a) the probability of occurrence of an event (which may be morbid or fatal); b) a non-technical term which includes a number of measures of probability related to adverse consequences. The very idea of probability may be read in two ways: a) intuitive, subjective, vague, associated with some degree of belief, that is to say, a *non-measurable uncertainty*, b) objective, rational, determined in a precise form through probabilistic techniques, that is, *measurable uncertainty*.<sup>(23)</sup>

In this second entry, the approach to *risk factors* is set out, that is to say, as *markers* which aim to predict the future morbidity and mortality. In this way, individuals, family groups, or communities could be identified, taken into account, and compared in relation to exposure to said factors (already established in preliminary studies) and provide

preventive interventions. As it was already affirmed:

The special feature which helps to identify the peculiar discursivity of epidemiology, may be synthetically described by the inseparable set of three characteristics which will lead us to the elucidated interrelation between the epidemiology of risk and their predecessors: a pragmatics of *technical control*; a syntax of *collective behavior* and a semantics of *quantitative variation*.<sup>(14 p. 110)</sup>

In epidemiology, there are three basic risk formulations: absolute, relative, and attributable. Here, it is important to make two comments.

Firstly, it is common to say that the rate expresses the risk. According to Last,<sup>(22)</sup> it is pertinent in the case of it being applied to the situations mentioned above, in the stricter sense, the word *rate*, that is to say, as a quotient that represents changes over the passage of time. In addition, the very concept of rate is also polysemic, even within epidemiology. In this way, according to said author, rate does *not* express risk in the following situations:



1. When it is synonymous with quotient in reference to proportions, for example: prevalence rate.
2. When it is a quotient that represents relative changes (real or potential) in two quantities (numerator and denominator). For example: cholesterol blood rate.<sup>(22)</sup>

However, these distinctions are not consensual. Some epidemiologists clearly distinguish between “incidence rate” and “risk of suffering from,” both in conceptual terms and estimation methods. The former may refer to the instantaneous potential for change in health situations (new cases) per unit of time with regard to size of the relevant population (with no cases), in time “t” (the measure being expressed in units of 1/time). The latter would be defined as:

The probability that a person with no health problems would contract a disease during the course of a specific time period, as long as the person does not die from other causes during such period of time.<sup>(24 p. 99)</sup>

This probability being conditional, it varies from zero to one and does not have measured units. Discrepancies persist in the attempts to distinguish between the individual/collective risk approaches and their pertaining estimations. Therefore, there would be methods which define risk as a (theoretical) measure of individual probability of occurrence of hazard “A” – the actuarial – and those which measure the “morbidity level” on populations – ratio of incidence density.<sup>(25)</sup> We take a stand in favor of the second interpretation, coinciding with the fact that risk models to establish the diagnosis or the prognosis of a person in particular cannot be applied since the concept of risk refers exclusively to the group as a whole.

Secondly, as it is not possible to observe simultaneously the effect of exposure and lack of exposure in the same person,<sup>(25)</sup> the statistical-epidemiological system works with population groups based on the assumption that the diversity of individuals

will be distributed in a homogenous way in the dully selected samples. Calculations produce average rates which reflect, therefore, values related to the aggregated ones (average causal effects). If, by venture, we wanted to represent the unit through the relative quotient to the amount observed by the same value, it is obvious that this one does not represent any “individual,” who, in this way, becomes an abstraction. Therefore, the risk is a finding related to the aggregated dimension, and its validity for the individual level results in potential for logical errors. These issues have been considered in epidemiology (and in sociology) under the heading of the *ecological fallacies*, may be of two types, depending on the operation: atomistic or aggregative.<sup>(26)</sup> What is valid for the aggregate level may not be valid at the individual level or vice versa.

## EPISTEMOLOGICAL AXIS OF RISK CONCEPT

The models used in the dominant paradigm, in modern epidemiology, are constructed as risk patterns. The term “risk” describes directly a probability of having a condition which deviates from the purely random probabilities. The epidemiological object, from this perspective, may not be exactly defined as a probabilistic object because what constitutes its conceptual validity is not validated by probability models.<sup>(27)</sup> The epidemiological method operates by evaluating, firstly, deterministic propositions (in the form of causality hypotheses) confronted with stochastic theoretical distributions. In the case of such propositions being successfully explained by a model of random distribution (in general called the null hypotheses), the hypotheses of the study will be dismissed.

Statistics, in this sense, would not have an explanatory function but a “refinement of the object” function, which implies saying that the epidemiological object becomes a residual of probabilistic objects, operating with a *sui generis* type of determination. Despite

the criticism to Popperian epidemiology, statistics would justify an expectation of generalization by inductive procedures through conditional sets of probabilities of having a condition which would not be explicable by random models. In other words, what is not explained by randomness models (random distribution) is explained by the determination qualified as epidemiological.

The proposition of risk as a fundamental concept of the scientific field of epidemiology is based on three basic epistemological assumptions: the first is the identity between what is possible and what is likely, that is to say, that the possibility of an event may be recognized in its occurrence probability. This probability is constituted as one-dimensional, variable, and by its extension, quantifiable. In this way, the risk concept has in its origin a proposal to quantify health/illness events.<sup>(28,29)</sup>

The second assumption consists of the introduction of a homogeneity principle in the constitution of morbidity, that is to say, the particularities of the events retract before a unifying dimension, resulting in a unit of the analysis elements made possible by the risk concept. Differences expressed in the singularity of concrete health/illness processes disappear in the one-dimensional concept of risk and its properties, allowing approximations and appropriations typical of the epidemiological scientific discourse.<sup>(30)</sup> Incidence of various health or illness events and the indicators of the respective risks, understood as probabilities of occurrence, are placed in the same register.

Thirdly, the assumption of recurrence in serial events is being emphasized, which implies the expectation of stability arranged in series-occurrence patterns of epidemiological facts. Through this assumption, it is then possible to justify the application of the risk concept in models of prevention, having knowledge of their determinants to intervene in the process, with the aim to prevent risk.<sup>(28)</sup>

Such assumptions clearly reveal the inductivistic character of epidemiology,<sup>(31, 32)</sup> given the fundamentality and nature of the generalizing expectations contained in the

concept. In this way, risk is produced in the field of epidemiology through the systematic and disciplined observation of a series of events. Therefore, risk is conceived by the way of prediction based on the third assumption. In this regard, we must distinguish two types of generalization: the prediction per se, in the sense of prediction of recurrence over time regarding new expected cases, and the prediction equivalent to the extrapolation to cases and events not included in the sample or the studied population. With regard to the latter, we have an inference of "horizontal" nature, in the sense of the population size and a "vertical" inference, seeking the convergence for individual cases.

On the one hand, prediction over time is possible, that is a component properly anticipatory of the risk concept. When we outline the risk of occurrence of a disease D in a specific population, we use a successive series of preceding observations (measures taken, in the best of the hypotheses, in standardized temporal series), to make a prediction from the past (assumed as already known) for the present or even for the future, applied to the object population of that series of observations. We have here the use of risk as a temporal predictor or a "true predictor."

As it was previously developed,<sup>(30)</sup> in epidemiology, it is possible to observe the use of the inductive component of risk to implement pseudo predictions, or predictions regarding space. In this second case, instead of a same population in different moments in time, a finite series of observations in studied populations is extrapolated to non-observed populations. This means that, based on the knowledge of the incidence of disease D in a set of known populations, a "prediction" is intended to be made with the aid of statistical tests, confidence intervals, incidence rate, or any other mathematical quantifier – about what the risk of the disease D will be to the general population, or in population groups not included in the observed series. It is, in this case, the use of risk as a pseudo predictor.

When analyzing in a comparative way the uses of induction in the epidemiological discourse, we find basically different meanings for



the notion of prediction that concede the risk concept the ambiguity which is typical of the project of epidemiology as a scientific discursive field. This ambiguity is the main feature of the epidemiological use of the risk concept: a predictor that is simultaneously temporal and spatial, or more strictly, as predictor and pseudo predictor. This risk concept enables the break of temporal limits and geographical limits of the process of data production, granting the epidemiological knowledge of generalist with properties not always legitimized by the logic that constabulates it.<sup>(30)</sup>

And where does the risk in the epidemiological discourse lie? Beyond and out of the subject, the risk lies at the population level, produced in or attributed to human collectives.<sup>(33)</sup> Risk is ultimately a property of populations and its legitimate reference will be exclusively collective. In the origins of the constitution of epidemiology as a science, there was an implicit proposal of conceptualizing an "absolute risk" (hence the idea of "relative risk").<sup>(29)</sup> In spite of being mistakenly taken as an individual expression in some manuals,<sup>(34)</sup> absolute risk has always had the population collective as a fundamental reference.

Nevertheless, there is much confusion originated in the inaccuracy between relative risk and absolute risk. Relative risk, even being an important indicator of strength of association between a presumable factor and an unwanted event, cannot be related to the probability that a specific individual will be affected by such event. Skrabanek and McCormick<sup>(35)</sup> provide an illustrative example. Airline pilots have the highest relative risks of having accidents of this type when compared to less-than-frequent passengers like most of us. However, even being this relative risk high in this comparison, the absolute risk of accidents for pilots is generally quite low.

The idea of relative risk allows for the construction of the derivative concept of "risk factor." In some specific applications of the epidemiological discourse, more evidently in some subareas because of the formation of a semantic field of its own, some inconsistency, at the very least rather odd, can be

observed. It is the transference to the epidemiological field (a scientific-based discursive formation and therefore, with claims of coherence, precision and consistency) of that inconsistency observed in the common social discourse regarding a confusion between risk and risk factor, or between effect and its potential cause. Now, if in the epidemiological field, risk means prediction, risk factor will be then a predictor of prediction, or "risk of the risk." By means of this operation the "risk factor" ends up assuming the status of a concept in itself. In the subarea of Occupational Health, for instance, it has increasingly become established using the term "occupational risk" to refer to risk factors present in the work environment or work process.

Nonetheless, epidemiologists, in general, do not usually question those aspects which make an issue of the construction of knowledge about the risk(s), especially from the point of view of the predictive pretensions. In this sense, Hayes<sup>(36)</sup> makes a sharp analysis of the implicit limitations in this approach. According to this author, it is essential to be attentive to certain topics:

1. *Regularity of empirical effects*: there may not be alterations in the relations between risk markers and events of interest, since the mechanisms causing damages, in most cases, are unknown, they should not vary in an unexpected way. It is, in short, the metaphor of the black box. Indeed, "risk factor epidemiology" is also called "black box epidemiology."<sup>(37)</sup> In other words, it is essential for the stability of the conditions of "existence" of the object so that the researcher may apprehend it in a reliable way: in spatial-temporal terms, neither the object of study must vary in its characteristics, attributes, and properties nor its interrelations with the environment.
2. *Definition of the status of specific risk factors*: it is fundamental to know clearly if the factor is decisive or predisposing in relation to those which are only contributing or incidentally associated, and this usually is not easily discernible in many situations, especially in those which imply

the involvement of aspects called psychogenetic. For example, see the controversy caused by studies in which there was no observation of effects of hypercholesterolemia in the emergence of cardiovascular diseases in women.<sup>(38)</sup>

3. *Risk factors pertaining to different levels of organization (social vs. natural):* there are difficulties in precisely establishing mechanisms and mediations between variables considered to be social (for example: unemployment, illiteracy, poverty) and those called biological (age, immunological state, genetic characteristics, and so on), although in certain cases apparently, but there seems to be no doubts regarding the relations between them. For example: poverty and mortality resulting from perinatal causes.
4. *Time-period deemed to be valid for prediction:* It is difficult to deal with exposures which occurred a long time ago (over fifteen or twenty years, for instance) and/or reduced amounts, in the course of long chronological intervals, so it is not possible to guarantee the causal relation in the case of the occurrence of the damage. This is especially relevant in occupational exposures in which they fail to cause immediate damages and those which only occur, eventually, after many years.<sup>(36)</sup>

One of the important criticisms made to the quantitative approach to risk consists of the fact of introducing an entity that would possess an autonomous "existence," that is objectifiable and independent of complex socio-cultural contexts in which people are involved. In other words, risk acquires an ontological status that accompanies, in a way, what is produced by the biomedical discourse for diseases but possesses unique characteristics, that is to say, attributes that are virtually "phantasmagoric." Thus the "existence" of risks may be invisible since it is not always perceptible through signs/symptoms, objects of traditional instruments of the medical semiology. Many times, it is necessary to carry out sophisticated lab tests to "locate" this skittish being, capable of growing

in a silent and treacherous way and then appearing menacingly.

If, on one hand, the rhetoric of risk may serve as vehicle to reinforce moral and conservative issues,<sup>(39)</sup> on the other hand, it resizes the role of the space-temporal configuration in the understanding of suffering:

1. Biomedicine incorporates, as its task, the localization and identification, in healthy individuals, of their possible risks (based on types of environmental exposure and/or biological susceptibilities, through increasingly refined diagnostic techniques).
2. An infinite network of risks appears in which behaviors, signs, symptoms, and diseases may converge to become risk factors for other conditions (for example: arterial hypertension as a risk for cardiac diseases)
3. The temporal axis assumes great importance in explanatory models of suffering processes.<sup>(40)</sup>

We can then appreciate the appearance of a new condition in the discourse and in the biomedical intervention, which may be medically treated: the *at-risk health status*<sup>(41)</sup> which brings important implications:

- a. As a substrate generating behavioral precepts dedicated to promotion and prevention in health (serving for the latter as a basis for the project of extending human longevity as much as possible).
- b. In the establishment of links with the biomedical technological production
- c. In the expansion of tasks of clinical medicine – in other words, the emergence of a medical surveillance – as Armstrong suggests.<sup>(40)</sup>
- d. In the creation of a demand of new products, services, and specialists dedicated to the prevention of multiple risks.
- e. In the empowerment and prestige of professionals who are responsible for the activities directed to the new techniques/programs of control or to the investigation of risk factors.<sup>(41)</sup>

In that neo-medicalizing context, there is a notable predominance of discourses on health supported by a methodological perspective called "evidence-based medicine." This approach is based upon the idea that the "truth" may only be obtained by nearly paroxysmal searches by means of what was agreed to be called "factual knowledge" or "evidence," emblems of this empirically correct discourse of truth (that is to say, about what it is tangible, since anything that does not meet this condition has a secondary importance or even worse, it does not exist). However, the definition of "evidence," even possessing undeniable levels of appropriateness, has its limitations. It is liable to be excluding relevant information for the knowledge and understanding of the health situation, and it may contribute to blaming mechanisms.

The evidence-based approaches usually organize hierarchically the results obtained, according to the collection methods applied, by prioritizing randomized experimental studies and meta-analyses. In this way, they tend to consider of secondary importance (when not taken as superfluous) information of qualitative nature, sociocultural and psychological nature, and to those referred to socio-political spheres which are shown to be less compatible with numerical quantitative mechanisms. One of the criticisms that interests us the most highlights that the philosophical premises related to evidence-empiricism which, when taken to the extreme, regards the results of the experimental studies as essential in comparison with other forms of knowledge, assumes the difficult proposition that observations may be made in a totally objective way, regardless theories and worldview of the observer.

Curiously, the evaluation of the evidence-based medicine itself suffers from an apparent paradox. According to their methodological premises, to legitimize a certain action related to health, randomized-clinical trials and meta-analysis studies, which show high efficiency on the effects studied in relation to control groups, are required. In fact, there is no original "evidence" in these types of studies which assure empirically the higher

efficiency of the clinical decisions coming out of evidence-based medicine in comparison with health assistance to patients through other non-evidenced clinical approaches.<sup>(42)</sup>

## CONCEPT OF RISK AND CONCEPTIONS OF HEALTH

Although modern epidemiology may choose from a wide range of variables to explore putative associations, there is a clear predominance, particularly among the outcome variables, of harm/injuries, dysfunctions, and diseases, in other words, conditions that can be positively distinguished by other biomedical sciences, as such procedure is necessary in order to use and validate these variables for the purpose of speculating their causes.

While diverse contributions have been clearly made towards a positive conceptualization of health, this discussion has not consistently and more specifically been translated into the field of epidemiology. In discussions centered on health promotion, and even more so in discussions regarding health surveillance, epidemiology has not only been considered a resource that is useful for such ends, but even essential for them. Nevertheless, the changes required for the theoretical transition towards new propositions remain yet to be included in discussions. As a matter of fact, due to their primary orientation to risk analysis, the contribution of epidemiological resources is reduced to harm prevention.

In order to question, from the point of view of epidemiology, what causes good health, and thus should be promoted, rather than what causes disease, and thus should be avoided, it is necessary to define what should be considered as health effect and by what reasoning. It could be possible, in a merely speculative way, that there are several objective experiences from which outcome variables related to health can be drawn. Ranging from the conception conveyed by the popular definition of health as physical, mental, and social well-being, to recent discussions about quality of life, there is a great variety of positively valued

conditions and circumstances, regarded as benefits that individuals can and should seek in order to lead a good life.

Within this proposition, nevertheless, two sets of questions of methodological nature that cannot be easily solved coexist. The first set deals with the assignation of positive value itself: Who defines what leading a good life is? Or, in other words, who defines the health effect? Is it possible for the positive formulations of health to achieve the same level and kind of consensus that enabled the formalization of the discourse of risk involving infectious diseases, consolidated in the field of epidemiology of chronic-degenerative diseases?

It is well known how essential, for the development of a formal language in epidemiology, closer relationships are between the epidemiologic reasoning and conceptualizations of harm derived from microbiology, virology, immunology and other disciplines.<sup>(2)</sup> The shift in epidemiology from infectious diseases to chronic-degenerative diseases by itself entailed a series of difficulties, as Henle-Koch causality criteria could not be applied to the new objects of study. The multicausal and non-univocal nature of the association between exposure and harm in the case of such diseases sparked a debate that lasted for over ten years and resulted in Bradford Hill's criteria for causal association.<sup>(43)</sup> In this case, the statistical control over inference-based uncertainty, the refinement of methods for analyzing association probability, and more so especially, the morpho-functional definition of harm criteria, which ensured the verification of associations, not only kept risk analyses relevant and useful, but placed them among the most important breakthroughs in the field of modern health sciences.

If focus is to be placed on the health effect, however, one should ask on what grounds the possibility of verification of associations lies. Is there any substratum that can be positively verified for the health effect? If good health, by definition, is regarded as a state of physical, mental, and social wellbeing, would the nature of any description of the health effect not be heavily subjective and very open to

interpretation? Could it be, on the other hand, a complex condition,<sup>(30)</sup> both in the outcome and exposure aspects, which would require an approach towards synthesis and thus not susceptible to analytical decompositions required in association tests?

The second set of methodological questions related to the search for the health effect deals with the scope of its relevant questions and inferences. All formalized scientific discourses seek, to the greatest possible extent, a universal character in its conceptions. Indeed, for a language system where it is desired to base its argumentation and verification in relations necessarily involved with each other, universality is not merely a goal, but a requirement. The only possible exception for such pretension is the limited certainty over the extent of universality in a proposition or statement, accepted only on a provisional basis and inherently bound by the incompleteness of human knowledge.

The pragmatic consequence of the kind and level of uncertainty that must be faced, and the existence or non-existence of less accurate alternatives dealing with the same field of scientific interests, are, ultimately, the criteria that will determine how likely a given formal discourse is to be accepted or not by the scientific community. Based on the positive conceptualization of health, it is therefore proposed to actively assume that we will be closer to an accurate definition of the outcome as we approach the particularizing whole of the physical, mental, and social condition of the individuals in question. That is to say, the variation of the degree of exactness necessary to define the variables to be studied is inversely proportional to their universality. This is not about a provisional and controllable limit. It is about a contradiction lying in the core of the propositional validity of such a discourse.

These methodological *impasses* induce, as it can be appreciated, reflections that are not bound to the methodological level, but overlap with the epistemological dimension. If it is too difficult for risk analysis to remain rigorous before the non-univocity and contingency of categories related to the causal

speculation about the health effect, then possibly this kind of investigation should discard the currently prevailing heuristic model.

By assuming that the definition of health is not susceptible to analytical decomposition into simpler and less subjective elements, and that the factuality of health related phenomena binds the validity of its propositions to high levels of contingency, one is forced to admit that an epidemiology of health is an internally contradictory proposition.<sup>(30)</sup> Is it possible to study associations between variables for which it is not possible to establish clear and evident relations with each other? Is it possible to assign quantity-based values to variables whose identity relies so heavily on the circumstances and subjects that originate them? Could an “epidemiology without numbers” exist? Is there an epidemiology without risk? If methodology is referred to the epistemological dimension, this leads us to a purely philosophical question: should epidemiology be used to work on health-related matters? This seems to be the question that should be asked when faced with the previously presented challenges.

Several principles throughout history allowed to create propositions of health-based care practices: politicization, democratization, de-bureaucratization, participation, humanization, diversity, and equity, among others. It would be senseless to rule these principles out in view of the difficulty to deal with them epidemiologically. This much appears to be obvious. What does not appear to be so obvious, while equally absurd, is to ask epidemiology to “rectify its course,” as if the disjunction between health promotion and epidemiology were the result of an “accident” or a shortcoming in this science.

Actually, there are always motivations and choices underlying any rational discourse, even extremely formalized discourses, such as the risk discourse. What is eluded by the risk discourse is not something that was skipped, but something that somehow has no relation to it, or is not included in its normative, propositional, or expressive requirements/conditions.<sup>(44)</sup> For this reason, the relevant question at this point is not so much about the need to

work on health epidemiologically, nor about if it is possible to do so. The essential question here is about the interest to do it. Is it desirable to work on health epidemiologically? The answer to this question will determine the future development of both epidemiologic discourses and proposals for health promotion. They are both open rationalities, and only an active exchange between them, guided by the pretensions and requirements of validity with which they are now being socially invested, may determine their course.

## PERSPECTIVES FOR THE CONCEPT OF RISK

Risk is not merely a concept that is relevant in multiple disciplines: we must be increasingly prepared to understand it and build it up as an undisciplined concept.<sup>(45)</sup> From the argumentative exposition in this text we proceed to identify and evaluate the following ways in which this concept is used:

- a. *Risk*: as a potential or hidden danger, by the ordinary social discourse.
- b. *Individual risk*: as a practical concept in medicine.
- c. *Population risk*: as an epidemiological concept in a narrow sense.
- d. *Structural risk*: used in the fields of environmental/occupational health.

As previously suggested,<sup>(46)</sup> the concept of risk needs to be updated, incorporating the contingency dimension of occurrence processes of health problems in human populations. The future of the risk concept hinges on its potential to intertwine with conceptual and methodological developments made by this new ideological, conceptual, and methodological field known as Collective Health (Salud Colectiva), which contribute with theoretical models and methodological strategies that can address emergent, complex objects. In this respect, we propose to add a new definition to the list of above-mentioned risk concepts:



a. *Contingency-based risk*: used as an operating element in the recently formed field of practices known as Health Promotion.

The idea of a general field of practices named Health Promotion, including prevention as well as protection and promotion (strictly speaking) of individual health, implies a set of social measures to prevent morbidity (risks, diseases, and so on) and to protect and promote health, in a way that helps reduce the suffering caused by health-illness related problems in the community. This entails a theoretical and philosophical integration of the conceptual network centered in health (life, risk, disease, care) to the collection of discursive and operational practices comprehended by the new fields of knowledge and practices that, with ever growing intensity and frequency, are constituted around the health object. To this end, the concepts of risk and practices pertinent to the health field may be divided in three groups:

1. Risk as an indicator of causality (or residue of probability). This involves acknowledgment and reaffirmation of the inductive, frequentist, and Fisherian nature of risk. This particular concept of risk supports prevention models for disease or events of morbidity, in the following ways:

- a. Individual prevention models (medical concept of risk).
- b. Population prevention models (Rose's theorem).

2. Risk as structured danger. This concept greatly contributes to intervention models in the fields of environmental and occupational health.<sup>(46)</sup> In such case, it is necessary to explore its deductive, descriptive, and structural basis, however doing so clearly goes beyond the purposes of this text.

3. Risk as emergence. In this case, it should be considered the philosophical basis of contingency, configured as emergence processes in complex models. This concept supports:

- a. Models of health surveillance.
- b. Models of Health Promotion.

Table 1 comparatively illustrates the main conceptual elements involved in this relation, whereas Table 2 illustrates the main comparative elements for action in health strategies.

The mechanisms, signs, and measures indicated in the diagram are characteristic of each strategy, however it does not suggest an exclusive, nor a bi-univocal relation, of one-to-one correspondence. For the purpose of an easier understanding of Tables 1 and 2, we will next make their terms explicit.

The strategy of Health Prevention has long been submitted to the order of necessity, well-established in the causality model and whose more specific intervention would be reality modeling. Aristotle<sup>(48)</sup> defined what is real as something that is. If the property of real things is that they were already there, reality, or more accurately, realities, are built in

Table 1. Conceptual elements in relation to intervention strategies for health.

STRATEGIES	INTERVENTION MODELS	INTERVENTION TYPOLOGIES	REGISTER	MODALITY
Prevention	Causality	Modeling	Symbolic	Necessity
Protection	Control	Experiment	Real	Impossibility
Precaution	Structure	Regulation	Imaginary	Possibility
Promotion	Emergence	Surveillance	Object a	Contingency

Source: Own elaboration

Table 2. Comparative elements of action in intervention strategies for health

STRATEGIES	MECHANISM	SIGNS	TARGETS	MEASURES
Prevention	Risks	Risk factors	Risk groups	Reduction Removal
Protection	Markers	Defenses	Individuals Communities	Immunization Reinforcement
Precaution	Sensors	Sentinel events	Environments Scenes	Legislation Control
Promotion	Monitors	Trends Patterns	Environments Products	Monitoring Promotion

Source: Own elaboration.

an attempt to account for a real that is silent, rather depicted as a limit to symbolization. The order of necessity is associated with the register of the symbolic, in accordance with Lacan's proposal to recover Aristotle's modal propositions. Human necessity is bound to elements indispensable to the world of language, given that by constituting itself as a language-being, the human being initiates a peculiar process: the symbolic (human discourse) separates reality from the real by promoting, through the mediation of words, a division between thing and symbol.<sup>(46)</sup>

On the other hand, from diverse perspectives, Health Protection results logically impossible as a strategy, although it has been constructed as a plausible field of practices throughout history. Its intervention model is that of control, and the intervention typology required for this case is the experiment. Such modality – the impossible – must be interpreted in a logical sense, but without inferring that it is necessarily non-existent.<sup>(46,48)</sup> It simply means that the control and the experiment are not actual realities, but linguistic realities that cannot be found in the effective conditions of the investigation or intervention. In the same way, as circumstantial events, they are first performed and only afterwards acknowledged for their effects.

Rigorously speaking, an experiment can never be reproduced, as it is unique, but it can however, by being replicated, constitute a case-series. Furthermore, such replication never conforms to what was originally

planned, because the context of a laboratory, when compared to the real-life context, is a mere emulation. Regardless of how we try, the reality of the experiment will never match the real phenomenon. On the other hand, in the case of risk prevention in health, before the imponderability involved in the determination and incidence of harms to health, even when preventive measures are taken, we cannot be certain that protections are guaranteed in accordance to the measures taken.

The possibility, a logical modality in the precaution strategy, is the register that refers to the imaginary which, far from the negative connotation of an illusion or something that is imagined, may only be contemplated in its connection with the symbolic and real levels.<sup>(49)</sup> The use of precaution strategies in the health field,<sup>(49)</sup> as tools for foreseeing possible scenarios for current or projected hazards, serves the valuable purpose of anticipating, and in this case, also to contain generalized unrest or panic reactions that often people's collective imagination develops when faced with the unknown.

In the proposed formalization, the register of the imaginary gives consistency to the human world by populating with scenarios the possibilities of existing. Thus, the consistency of the limits – imposed by imagined scenarios – does not result incompatible, but the opposite, to the opening up to possible and conceivable precaution measures against risks to health. Nevertheless, this imaginary screen, this limit, along with

its simultaneously educating and alienating functions, are the organizing factors not of the actual world, but of the contested world.

The principles of prevention and precaution are increasingly prevalent in times when the consideration of future scenarios is a constant feature in proposals for managing diverse aspects of life. Prevention of risk has ambivalent aspects, according to eventually imponderable judgments, and they may entail urgent interventions or procrastinating measures.<sup>(4)</sup> In these cases, the principle of prevention or precaution may be manipulated, according to the circumstances, as well as in favor of the interests involved. The example provided by the justification of a preemptive war in Iraq by the U.S sadly symbolizes the political actions based on this reasoning. But in this tragic eventuality, the verification of the insufficiency of evidence is only confirmed *a posteriori*. That is to say, only after the future has turned into present, it is possible to know whether the anticipatory speculations have been confirmed.

Lastly, the strategy of Health Promotion is associated with models of event unpredictability, integrated into sciences as emergence and into philosophy as contingency. Of all logical modalities, contingency is, surely, the one whose meaning is the most difficult to comprehend directly. In other words, it is the occurrence of an event that suddenly interrupts or ceases a previous state, but, in accordance to reality, it is not inscribed as a fact. It can, retroactively, be added to a significant chain as a supporting tool for strategies that promote global actions of supervision and surveillance, practices which are currently categorized as Health Promotion, with the purpose of detecting, understanding, and indicating emergences-events/ occurrences-contingencies.

With such a basis, it becomes possible to recognize (with the aim of ceasing their effects) future similar events.<sup>(50)</sup>

As indicated by their name, the concepts of emergence or contingency articulate events, about which nothing we can do but verify their effects, and, given that it is not possible to propose retroactive measures, to indicate analogically-based precautionary

methods. Generally, these are events triggered by multiple and interconnected factors, structured in open networks, which make it impossible to establish lineal causality relations. In the realm of contingent events, we consider to be particularly important, as the best suited intervention typology, making use of graph theory to devise conceptual maps, not only for explanatory purposes – in this case, as an over determination model – but also for the methodological design in programs for Health Promotion.

Regardless of such openings and possibilities, there are questions that remain to be asked: Could it be that ever more the idea of health is conceived based on the notion of safety, which is achieved through methods, strategies, and techniques for health surveillance? Or is it achieved through self-surveillance activities? But where are the subjects in pain? Where are those who operate the practices? Where are the managers who are responsible for them? Finally, how do we shift the focus from disease/risk management towards a politics of health?

## POLITICAL MEANINGS INVOLVED IN THE CONCEPT OF RISK

In fact, if we put into practice a definition of Health Promotion strategies that are oriented exclusively, or primarily, by a renewed concept of risk (as we previously did by proposing a fifth category of risk, the contingency-based risk), we would be prioritizing, perhaps incorrectly by doing so, a one dimensional and mechanistic perspective of the health-disease-health care process. This solution poses the risk of creating a new *panopticon*, now bolstered by new surveillance technologies in epidemiology, its sensors and monitors.

We should then consider as an alternative or complementary course of action, fostering Health Promotion practices based on procedures managed by individuals or groups affected by damage to health, focusing on concepts such as vulnerability.<sup>(51)</sup> With

this perspective, we will be able to overcome or to examine conceptual, methodological, or practical problems resulting from the updating of the concept of risk alone without considering the political sense of management of risks, meaning their origins and political consequences.

The development, currently in progress, of a theoretical framework based on the notion of vulnerability is intended to produce "mediating knowledge," which, without neglecting the positive contributions of epidemiology (and other health sciences), includes conceptions with a better apprehension of social circumstances that determine the occurrence of epidemics and effective possibilities of keeping them under control. Epidemiology may tell us who, when, and where people are, or may be involved in situations that pose a risk for health. However, in order to understand why and to set out ways to intervene in such process, it is also necessary to have mediating knowledge, syntheses in which political, ethical, cultural, psychological, and emotional issues are depicted to the full extent of their social complexity.

Thus, as previously elaborated,<sup>(51)</sup> vulnerability may be defined as a comprehensive synthesis of behavioral, social, and political-institutional dimensions implied in the diverse susceptibilities of individuals and population groups to health hazards and their undesired consequences (suffering, disabilities, and death).

Adopting the perspective of vulnerability results in implications in multiple ways. As a means to produce knowledge, it makes necessary synthetic and interpretative/comprehensive procedures, of transdisciplinary character. As a tool for planning, the notion of vulnerability emphasizes the importance of radical politicization of this practice, because it will always refer to relation, value, and worldview-based aspects of determining "what to observe/what to do." It assumes the function of a means, never of an end, in these practices, given that, in every new situation, new horizons of interests, conceptions, and values will be brought on stage.

Therefore, there are two assumptions that are essential for the construction of the vulnerability framework. As a mediating element, oriented to a synthesis of pragmatic knowledge related to action from a social and sanitary perspective, vulnerability diagnostics presuppose *intersubjectivity* and *constructionism*.

The assumption of *intersubjectivity* has to do with the interactive nature of all practices implied in the healthiness-disease-health care process. In other words, regardless of the philosophical stance we take, considering that our identities, discourses, and rationality are based on encounters between individuals and are always linked to these encounters, it is logical to assume that the more we search for a pragmatic knowledge, dedicated to practices directly involving interpersonal relations (such as sexual relations, aids, conflict situations, violence, and so on), the more we should focus on intersubjectivity. What makes people vulnerable are always interactions, therefore relationships that should be identified, problematized, and transformed.

As a necessary consequence resulting from the radical adoption of intersubjectivities as the focus of problematization of vulnerability, it becomes essential that any attempt to overcome the problem-situations of vulnerability is made from a constructionist stance. It is not possible for us, professionals, scientists, and specialists, to find solutions to overcome the problems unilaterally (although we are duty-bound to work for them). It is necessary that subjects directly involved in the situations actively participate in this process and reconstruct it together with us.

Any attempt to grasp a problem-situation from an angle which does not include in some manner those involved in it, is bound to produce a kind of knowledge always oriented to abstraction, requiring, as previously seen, other knowledges to be reoriented to more pragmatic syntheses. On the other hand, a knowledge that is purely pragmatic and immediatist, that cannot set itself apart at higher levels of abstraction for a better comprehension of the situations it originates from, loses

capacity for critical thinking, and it loses the potential to visualize regularities, trends, and mechanisms of fundamental relevance, such as the epidemiological risk concept.

It should be noted that this is not written with the intent of undervaluing the effectiveness of the available knowledge on risk, which is important for the techniques and sets of practices aimed at the prevention of disease in population groups. Rather, this is an attempt to indicate the possible consequences of its overuse, as well as highlighting its connection to undesired aspects of current social and cultural configurations that should be improved. Undeniably, calculation of risk, in terms of its temporary orientation towards future studies, serves an important function by delineating regularities and patterns, until an order of appearances can be established, in order to provide a certain sense of predictability intended for the control and prevention of damages, and for health protection and promotion.

Bentham's *panopticon* metaphor, proposed by Foucauldian authors to analyze conceptual problems of health in society, has been highly influential in the theoretical field of health. Diverse critical voices consider that, presently, this metaphor is no longer adequate for dealing with the technological-communicational elements involved in the generation of subjectivity in contemporary societies.<sup>(52,53)</sup> In the case of self-surveillance, other signs are noticed, which may be better represented by the notion of *synopticon*. While in a panopticon, many are observed and overseen by a few, by taking advantage of privileged points of supposedly active observation, in the synopticon many passively observe a few and monitor themselves, by means of demonstration and persuasion (somewhat akin to another Big Brother, the one of "reality TV shows").

To understand the prevalence of the notion of risk in the contemporary collective imagination, another Foucauldian notion has been widely used: that of governmentality (a juxtaposition of government and mentality). This article will not elaborate on the origin of this notion. According to Lemke,<sup>(54)</sup> the aspect

which is relevant to us is that one developed by Foucault to address the potential of an autonomous individual to self-regulate and the manner in which this relates to dimensions of political and economic exploitation. Much of the criticism to the idea of health promotion and to neoliberalism (and the recursive nature of their relation) is based on this perspective.<sup>(53)</sup>

Governmentality refers to all kinds of power transcending direct ruling, by generation of subjectivity. To this end, it uses a rationality that defines purposes for action and the appropriate means for it. The forms of control through self-government are known as "technologies of oneself." Summarizing, self-care is a strategy to make individuals personally responsible for the control of socially generated risks. One distinctive characteristic of the neoliberal rationality is the juxtaposition between the moral and responsible individual and the economical and rational individual. The notion of free will is equally supported by both the right of decision and the freedom of choice. This notion is required by the equation that yields the responsibility for actions and their consequences for such individual.

At this point, it is important to delineate the notion of responsibility in relation to risk. We are aware that this subject may elicit complex approaches from ethical-philosophical and/or legal perspectives that go beyond the scope of this text. At this time, it will suffice to consider that the idea of responsibility, generally speaking, essentially entails the notion of *duty* or *obligation* by individuals/institutions of being accountable to regulatory (concrete or symbolic) authorities for given actions, whether committed by themselves or by others, or related to objects that, as a result of any agreement, had been entrusted to them. It should be noted that, under such conditions, one is bound by the dimensions of law, of uses and customs and/or of conscience.

At any rate, the moralistic emphasis made by complex modern societies and their respective concern over responsibility and determination of blame should be taken into



account.<sup>(1,39,52)</sup> Responsibility is a regulatory idea which enables and maintains legislations of vital importance for organizing human collectives. There is an unavoidable association between the concepts of “responsibility” and “blame,” especially regarding the breach of obligations. The moralistic perspective, based on reasoning aimed at establishing clearly defined causes, endeavors to find and punish those who are liable/to blame for their respective faults. It is unusual that, under such circumstances, there can be much room for the benefit of the doubt where it is difficult to define effective causes or blame of the accused. It is well known that the moralistic perspective, in addition to having Manichaeic proclivities, does not acknowledge itself as such.

## CONCLUSION

### Politicizing the relations between epidemiology, disease, risk, and health

Our sciences, being rational constructions, are “messages” that we convey to ourselves about the facticity of life; they are discourses capable of interfering with the conditions that regulate our material and practical-moral existence – questions and answers by which we react to the interpellations of our lived experiences.<sup>(55)</sup>

According to Canguilhem,<sup>(56)</sup> it can be accepted that our scientific discourses about suffering function like vital “devices” aimed at maintaining an open organization, a stability achieved through the ability to perceive and respond to what we find imponderable in our (socially biological, biologically social) environment. We are creative beings, and for that very reason, we live in an environment of constant transformation. Change is what marks our origin, condition of possibility of our existence and essential part of our continuity. Thus, because of that, all normativity that we devise by means of reason, every adjustments we make of/by ourselves, in our modes of living together, and in our environment, in order to continue living and to live better lives, may ever be conceived *a priori*, in a univocal and permanent fashion. Human

life only realizes that it is in need of something when, somehow, that something is regarded as a deprivation, as a missing thing.

This observation led Canguilhem to assert that, although in an epistemological sense, physiological processes, as natural functioning in the human organic economy, are a foundation for the scientific enunciation of pathological phenomena, these phenomena ontologically precede such processes. Pathology precedes normality and defines it. It is obstacles to human life what makes it possible to understand its requirements and preferences. This line of thinking raises the following question: to what extent is it desirable, rational, and practical trying to scientifically apprehend the concept of health? Does the ideal of organizing health-related practices around aspects not limited to the treatment of pathologies or prevention of harm, depend even on a positive conceptualization of health?

The answer may not lie in the antithesis of health and disease. The building of health may always require problems, obstacles, or hazards in order to assimilate the interests and means to achieve them, yet this assimilation would be facilitated and improved if those problems and obstacles were to be considered as “counterfactual objects.” In other words, it is not necessary to discard the conceptualization of disease in order to generate health-related knowledge, but it is definitely necessary to seek understanding of and actively focusing on which values are currently hindered by pathologies and risks, in the way we perceive, conceptualize, and transform them.

By being considered a fact in itself, disease (or its risks) is made absolute and essential, and because of that, continues to provide answers with the same orientation and direction, thus reducing the creative potential of life, inhibiting the manifestation of the richer and more active forms of health. Through a counterfactual comprehension, disease prompts contemplation about things which, being a certain way, could be different; it prompts reflection about other manners in which life could take its course, motivate and organize change and seek to enrich its qualities.

The consequent assumption of the counterfactual nature of the disease object entails, in turn, the need to change the kind of response to the positivity of damage: from striving to suppress or prevent disease, to taking it into account in an interpretative approach of action that brings about the discovery and criticism of the value-driven and normative contents which are supporting such positivity. This approach implies active interdisciplinary transit. Otherwise, how else would it be possible to identify, construe, and validate, authentically, truthfully, and legitimately, the diverse aspects of life impeded by hazards and suffering? Blurring the discursive horizons of different scientific disciplines requires not discarding one discourse in favor of another discourse, but rather creating categories which devise new profiles acquired by their conceptions in the light of other disciplines' discourses projected onto them (beyond "undisciplined" discourses).

Precisely for that reason, theoretical frameworks and categories that make possible an exchange with instruments and findings of epidemiology should be devised. These categories, by providing the same positivity that epidemiology attributes to risks and hazards to additional transdisciplinary readings, can potentiate the contributions made by this science towards overcoming the challenge of promoting health, as well as of preserving it and restoring it when damaged.

Of course, such transdisciplinarity is not something achieved overnight, nor it is established by decree. It requires technical and institutional agreements so that people can effectively traverse between different scientific production groups and areas.<sup>(57)</sup> This transit, in turn, is severely hindered by the inflexible

and strong boundaries between disciplines, which delimit not only areas of scientific jurisdiction, but also firm interests and powers legitimized by society, which cannot be easily removed without resistance.<sup>(45,58)</sup>

Therefore, significant efforts remain to be made in the political sphere for epidemiology and other disciplines to possibly and effectively engage in intellectual exchange, essentially aimed at the need to overcome the "feudalism" of the sciences and their institutions. For that purpose, there is no better "remover" than the power of solution, that is, the authority and legitimacy derived from the ability to provide convenient and effective answers to problems that hinder the course of everyday life.

Lying in the ability to identify practical problems including as many social interests as possible, and to make plans focusing on those problems, and not in abstract areas of *expertise*, using transdisciplinary and intersectoral efforts of several kinds (belonging to the public or private sector; to different areas of competence in research, services, and so forth), there is an effect, an overwhelming drive towards the effectiveness and legitimacy of transdisciplinary dialogue. We have every reason to be optimistic regarding the rearrangements in the field of health, given that proposals for Health Promotion, as well as those for Health Surveillance, due to the politicized, democratized, and regionalized nature they confer to the organization of health care practices, establish a new and quite favorable foundation for the prevalence of the power of solutions, which, assuming our argument was correct, will be essential for the continuity, diversification, and improvement of the risk concept.

## END NOTES

a. This text is part of the book *Epidemiologia & Saúde: Princípios, Métodos e Aplicações*, organized by Naomar de Almeida Filho and Maurício Lima Barreto, released by the publishing company Guanabara-Koogan (Rio de Janeiro, Brazil) in May 2010.

## REFERENCES

1. Innerarity D. *La sociedad invisible*. Madrid: Espasa Calpe; 2004.
2. Castiel LD. *O Buraco e o Avestruz. A singularidade do adoecer humano*. Campinas: Papirus; 1994.

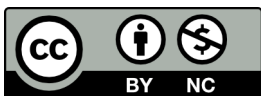
3. Ferreira ABH. Novo Aurélio Século XXI: o dicionário da língua portuguesa. 3ra ed. Rio de Janeiro: Nova Fronteira; 1999.
4. Rey A. Dictionnaire historique de la langue française. Montreal: Dicorobert ; 1993.
5. Douglas M. Risk acceptability according to the social sciences. Londres: Routledge and Kegan Paul; 1986.
6. Skolbekken JA. The risk epidemic in medical journals. *Social Science and Medicine*. 1995;40(3): 291-305.
7. Houaiss A, Vilar M. Dicionário Houaiss da língua portuguesa. Rio de Janeiro: Objetiva; 2001.
8. Luhmann N. Observations on modernity. Stanford: Stanford University Press; 1998.
9. Sennett R. A corrosão do caráter. Consequências pessoais do trabalho no novo capitalismo. Rio de Janeiro: Record; 1999.
10. Førde OH. Is imposing risk awareness cultural imperialism? *Social Science and Medicine*. 1998;47(9):1155-1159.
11. Robertson A. Biotechnology, political rationality and discourses on health. *Health*. 2001;5(3)293-309.
12. Vaz P, Pombo M, Fantinato M, Pecly G. O fator de risco na mídia. *Interface: Comunicação, Saúde, Educação*. 2007;11(21):145-163.
13. Atlan H, Bousquet C. Questions de vie. Entre le savoir et l'opinion. Paris: Seuil; 1994.
14. Ayres JRCM. Sobre o risco: para compreender a epidemiologia. 3ra ed. San Pablo: Hucitec; 2008.
15. Hamer WH. The relation of bacillus typhosus to typhoid fever. *Proceedings of the Royal Society of Medicine*. 1908;1(6):204-228.
16. Topley WWC. The spread of bacterial infections. *The Lancet*. 1919;1:1-5, 45-49, 91-96.
17. Howard Jr. WT. The real risk-rate of death of mothers from causes connected with childbirth. *American Journal of Hygiene*. 1921;1(2):197-233.
18. Doull JA, Lara H. The epidemiological importance of diphtheria carriers. *American Journal of Hygiene*. 1925;5(4):508-529.
19. Fales WT. The distribution of whooping cough, measles, chicken pox, scarlet fever, and diphtheria in various areas in the United States. *American Journal of Hygiene*. 1928;8(5):759-799.
20. Frost WH. Risk of persons in familial contact with pulmonary tuberculosis. *American Journal of Public Health*. 1933;(23):426-32.
21. Miettinen O. *Theoretical Epidemiology*. New York: John Wiley & Sons; 1985.
22. Last JM, editor. *A Dictionary of Epidemiology*. New York: Oxford University Press; 1989.
23. Gifford SM. The meaning of lumps: a case study of the ambiguities of risk. En: Craig RJ, Stall R, Gifford SM. *Anthropology and Epidemiology: interdisciplinary approaches to the study of health and disease*. Boston: Reidel; 1986. p. 213-246.
24. Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic research: principles and quantitative methods*. Belmont: Lifetime Learning Publ.; 1982.
25. Czeresnia D, Albuquerque MFM. Modelos de inferência causal: análise crítica da utilização da estatística na epidemiologia. *Revista de Saúde Pública*. 1995;29(5): 415-423.
26. Susser M. *Causal thinking in the health sciences*. New York: Oxford University Press; 1973.
27. Vineis P. *Modelli di rischio. Epidemiologia e Causalità*. Turín: Einaudi; 1990.
28. Macmahon B, Pugh T, Ipsen J. *Epidemiologic methods*. Boston: Little, Brown & Co.; 1960.
29. Lilienfeld A. *Foundations of epidemiology*. New York: Oxford University Press; 1976.
30. Almeida Filho N. *A ciência da saúde*. San Pablo: Hucitec; 2000.
31. Buck C. Popper's philosophy for epidemiologists. *International Journal of Epidemiology*. 1975;(4):159-168.
32. Weed D. On the logic of causal inference. *American Journal of Epidemiology*. 1986;6(123):965-979.
33. Hayes M. On the epistemology of risk: language, logic and social science. *Social Science and Medicine*. 1992;4(35):401-407.
34. Jenicek M, Cléroux R. *Épidémiologie clinique*. Quebec: Edisen Inc.; 1985.
35. Skrabanek P, McCormick J. *Follies and fallacies in medicine*. New York: Prometheus Books; 1990.
36. Hayes MV. The risk approach: unassailable logic? *Social Science and Medicine*. 1991;33(1): 55-70.
37. Susser M, Susser E. Choosing a future for epidemiology: II. From black box to Chinese boxes and eco-epidemiology. *American Journal of Public Health*. 1996;86(5):674-677.
38. Labonté R. Health systems governance for health equity: critical reflections. *Revista de Salud Pública*. 2010;12(1):62-76.

39. Careri F. Walkscapes ten years after. *Revista de Estudios Urbanos y Ciencias Sociales*. 2014;4(1):207-213.
40. Armstrong D. The rise of surveillance medicine. *Sociology of Health and Illness*. 1995;17(3):393-404.
41. Kenen RH. The at-risk health status and technology: a diagnostic invitation and the "gift" of knowing. *Social Science and Medicine*. 1996;42(11):1545-1553.
42. Cohen AM, Stavri PZ, Hersh WR. A categorization and analysis of the criticisms of evidencebased medicine. *International Journal of Medical Informatics*. 2004;73(1):35-43.
43. Hill AB. The environment and disease: association or causation? *Proceedings of the Royal Society of Medicine*. 1965;58(5):295-300.
44. Habermas J. *Teoría de la acción comunicativa I: racionalidad de la acción y racionalización social*. Madrid: Taurus; 1987.
45. Castiel LD. Debate sobre o artigo de Almeida-Filho "Transdisciplinaridade e Saúde Coletiva". *Ciência & Saúde Coletiva*. 1997;2(1-2):27-30.
46. Almeida Filho N, Coutinho, D. Causalidade, contingência, complexidade: O futuro do conceito de risco. *Physis-Revista de Saúde Coletiva*. 2007;17(7):95-138.
47. Organización Panamericana de la Salud. *Riesgos del ambiente humano para la salud*. Washington: Oficina Sanitaria Panamericana; 1976. (Publicación Científica N° 329).
48. Aristóteles. *Organon*. Lisboa: Guimarães Editores; 1985.
49. Grandjean P. Implications of the precautionary principle for public health practice and research. *Annual Review of Public Health*. 2004;25:199-223.
50. Levy B. Toward a holistic approach to public health surveillance. [Editorial] *American Journal of Public Health*. 1996;5(86):624-625.
51. Ayres JRCM, Calazans GJ, Saletti Filho HC, França Júnior I. Risco, vulnerabilidade e práticas de prevenção e promoção da saúde. En: Campos GWS, Minayo MCS, Akerman M, Drumond Júnior M, Carvalho YM, organizadores. *Tratado de Saúde Coletiva*. San Pablo, Rio de Janeiro: Hucitec, FIOCRUZ; 2006. p. 375-418.
52. Castiel LD, Alvarez-Dardet C. La salud persecutoria. *Revista de Saúde Pública*. 2007;41(3):461-466.
53. Mathiesen T. The Viewer Society: Michel Foucault's 'Panopticon' revisited. *Theoretical Criminology*. 1997;1(2):215-234.
54. Lemke T. Foucault, governmentality, and critique. *Rethinking Marxism*. 2002;14(3):S49-S64.
55. Gadamer HG. *Verdade e método I: traços fundamentais de uma hermenêutica filosófica*. 6ta ed. Petrópolis, Bragança Paulista: Vozes, Editora Universitária São Francisco; 2004.
56. Canguilhem G. *O normal e o patológico*. 2da ed. Rio de Janeiro: Forense-Universitária; 1982. 20. Frost WH. Risk of persons in familial contact with pulmonary tuberculosis. *American Journal of Public Health*. 1933;(23):426-32.
57. Almeida Filho N. *Transdisciplinaridade e saúde coletiva*. *Ciência & Saúde Coletiva*. 1997;2(1-2):5-20.
58. Ayres JRCM. Deve-se definir transdisciplinaridade? *Ciência & Saúde Coletiva*. 1997;2(1-2):36-38.

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