

# Challenges for the incorporation of metrics in social determinants of health approaches

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## Abstract

Public health has studied the relationship of morbidity and mortality to the living conditions of populations, with a greater focus on the individual level. In this context, an important theoretical advance was made in social determinants of health approaches (SDH), providing a way of explaining multiple socio-economic conditions that determine ways of living, of falling ill and of dying in specific populations.

Despite advances in terms of its theoretical foundations, the methodological development of SDH approaches presents important lags in the metrics used, by: 1) erroneously functionalizing certain social constructs, 2) applying designs with risks of incurring fallacies (ecological, atomistic, sociological or psychological), or 3) applying designs that do not relate individual, particular and general measurements in a multilevel structure.

Within this framework, this manuscript answers the question: what are the methodological challenges in the incorporation of metrics to SDH research, considering the need to articulate different levels of reality? In order to achieve this, it develops the following components: contextualization of SDH approaches, including the philosophical divergences and methodological convergences of its approaches, and the theoretical-conceptual foundations of ecological studies and multilevel analyses.

Keywords: Social Determinants of Health; World Health Organization; Social Medicine; Ecological studies; Studies of population aggregates; Quantitative analysis; Multilevel analysis.

## Introduction

Public health has studied the relationship of morbidity and mortality with the living conditions of populations, with a greater theoretical-methodological development of the individual dimension, in its different eras and models (1-4). The predominance of this individualistic paradigm has deepened in the last 50 years due to the influence of epidemiology and the risk paradigm, which focus on individual measurements of health, while the social dimension is reduced to “average” population behaviors (5).

Some authors have argued that the methodological individualism of public health could be based on three factors: (i) the fact that health-disease manifests itself in individual bodies, leading to studies that focus on the causes of interindividual variability, (ii) the influence of traditional epidemiology, which privileges the biomedical sphere and etiological studies, and (iii) the fact that this emphasis has been effective in discovering causes of diseases and designing

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interventions with great health impact such as vaccination and drug therapy (5).

Despite the above trend, health research has recently seen an increase in evidence that points to connections between the individual and society, and to the importance of their simultaneous study for the implementation of health strategies, although there is still little development of models that explain how social processes lead to differential achievements in individual health (3.6). In this sense, the predominance of three ontologies of the social in health research has been recognized, in which the social is understood as: (i) antecedent or life course, (ii) a modifier of biological-genetic effects or (iii) an annex to the biological system. That is, these are ontologies of the social without specificity or impact in the orientation or design of health policy actions (3).

In this context, an important advance was made in SDH approaches, as an explanation of the relationships between multiple social, historical and economic factors that determine the different ways of living, getting sick and dying (9,10 ). For the World Health Organization (WHO), social determinants are grouped into a multilevel organization, which gives rise to structural determinants such as the socio-economic and political context, the labor market, stratification by social class, gender, ethnicity and territory; intermediate determinants such as working conditions, housing, the economic situation and the residential environment; and individual determinants such as psychosocial, behavioral and biological factors (9,10). On the other hand, the focus of Latin American Social Medicine (LASM) highlights “wear and tear” or production in the world of work, and the processes of social production and reproduction, or the so-called “social fields”, generally analyzed at the individual, particular and general levels (11,12).

Despite the differences between SDH approaches, all of them require the incorporation of metrics from different levels of reality, in order to investigate the social conditions and processes that determine morbidity or mortality outcomes. Furthermore, all approaches define said determinants as aggregates that cannot be captured with individual measurements, which forces us to combine the best available individual and group evidence (5).

In the same vein, the WHO’s approach to the measurement of social determinants has focused on health inequalities, based on economic, epidemiological or geo-referencing methodologies, with low local value and high probability of incurring fallacies (13,14), or on applying indices such as effect, dissimilarity, slope or relative inequality, which are not consistent in comparisons of different organizational levels of reality (15-17). The studies carried out with the LASM approach also incorporate metrics of styles [individual level], modes [particular level] and living conditions [general level], with designs that relate these levels to ideological postulates, which have since been critiqued for their low correspondence with empirical research (18-22).

In this vein, and bearing in mind the need for public health research to articulate different levels of reality, it is appropriate to ask what the main methodological challenges for the incorporation and relationship of aggregate and individual metrics in SDH research are, understanding metrics as the combination of data from the same construct, with which a context can be described or trends of a phenomenon explained.

In order to answer this question and broaden the discussion on the importance of multilevel research as a central attribute of public health and SDH approaches, this manuscript presents the following components: (i) philosophical divergences [ontological, epistemological and praxeological] of the two main SDH approaches; (ii) theoretical foundation of ecological studies and the fallacies that can occur in the generalization of results derived from measurements at different levels of reality; and (iii) some concepts of multilevel analyzes as a valid option in the face of the need to articulate the metrics of the singular, particular and general levels.

It is appropriate to clarify that the emphasis on SDH metrics is justified because they are useful to all SDH approaches and would allow overcoming some criticisms that have been made of the LASM approach, due to its low methodological development, and that of the WHO, for its risk of incurring in fallacies or not making explicit the multilevel relationships (23-25).

**Philosophical [ontological, epistemological and praxeological] divergences of the two SDH approaches analyzed (WHO and MSL)**

With the publication of the WHO report "Closing inequalities in a generation: achieving health equity by acting on the social determinants of health", the debate on the ways of addressing the relationship between health and society was summarized, amid important advances in epidemiological research, the expansion of social sciences in the health field and "a rearrangement of discourse, making the problem of inequity even more visible." In the academic environment, this led to discussions about the differentiation between social determinants and social determination of health as a reflection of the divergences between social [Anglo-Saxon] epidemiology and the critical epidemiology of LASM (18,26).

According to the WHO, social determinants "are the circumstances in which people are born, grow, live, work and age", according to "the distribution of money, power and resources at the global, national and local levels". Such determinants explain health inequalities (9). For its part, LASM defines the processes of social determination of health as the power relationships and dynamics of capital accumulation that define the differences in health-disease of populations according to social class, gender and ethnicity, and as a function of differences in the patterns of consumption, work, wear, low social support and unhealthy cultural forms that lead to disease, taking on a dialectical approach to subject-society, nature-culture, health-disease relationships (28,29).

The WHO and LASM approaches present important philosophical differences, in the ontological (related to the conception and functioning of the world), the epistemological (the way of understanding scientific knowledge and the possibilities of knowing reality), and the praxeological [moral philosophy or on ethics and justice](which allude to the possibilities of free-autonomous action, in fair environments) realms (18).

In ontological terms, the LASM approach, unlike that of the WHO, conceives the social as an irreducible, dynamic and historical reality, and not as a sum of individuals. It starts from a dialectical

and historical-structural [non-functionalist] perspective of the social<sup>1</sup>, opposing sociocultural orientations to economic ones, and using social class as a key category for the analysis of health problems (23,26).

It should be clarified that status and social class obey two different constructs. The first, used in the WHO approach, corresponds to a social stratification where the subjects are grouped according to income, education or type of work, without interest in revealing the social mechanisms that derive in differential access of people to economic, political or cultural resources. Social class is a relational construct, more akin to LASM, assumed as gradients derived from power relations and capital accumulation [property relations of productive resources that derive in different levels of income, education and quality of life] the understanding of which must be socio-historical (32-34).

Epistemologically, the LASM approach criticizes the reductionism and fragmentation of the positivist reality that underlies the WHO approach, in which the social operates as an entity external to the subject and the epistemological analysis revolves around the subject-object relationship in a social void, since this last dimension is investigated without considering its historicity (30,35). The LASM approach utilizes "the dialectical vision of scientific thought", highlighting the importance of the socio-political-

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<sup>1</sup> In relational and historical sociology, the social refers to individual-society interdependence, unlike structural-functionalism, which considers the social as an immutable reality where social changes are products of casual and external disturbances (8). In LASM, the social is a historical dialectical category that is constructed in the midst of power relations and the tension between the individual [social and political subject], and the population [area of generation of sociocultural and political interaction between individuals] ( 12.30).

The dialectic in Hegel allows us to analyze the concepts of figuration and long duration, articulating empirical references. Hegel's dialectic allowed us to overcome the Kantian separation of Being and Thinking, while recognizing a hierarchy between "general facts" and "particular facts." It also applies as a method that overcomes the false subject-object, nature-culture, body-mind, and individual-society dichotomies, taking them as a contradictory unit of conceptual tension that must be analyzed simultaneously (31).

cultural dimension and the communal determination of science (30).

In the WHO approach, the “object, subject and praxis” relationship is centered on the “subject” of public management, and a functionalist, empirical vision of social reality predominates. In LASM, the interdependence between the object, the subject and the field is made explicit; thus, they cannot be analyzed separately and neither should prevail over the others or define the method; that is, it must reveal the social determination of the object, of the concepts [subject] and of the practices [field], in historical evolutionary process that defines its possibilities to understand and transform reality (30).

In the praxeological sphere, the LASM approach is consistent with the dialectical method and the materialist approach to ethics (Holbach, Marx), the objective of which is the realization of human nature and the abolition of all class morals [taking social equality as the principle of justice]. This approach understands economics as the basis of human nature, assuming that social conscience and morality are determined by social forms of production and change. In this way, the praxeological foundation reveals what non-freedom consists of and its causes, within the framework of egalitarian theories of social justice, where the economy is not just another sphere of life but, rather, what articulates all ways of life and determines the asymmetric relations of socio-economic, gender and ethnic power (12,36,37).

In the WHO approach, the center of ethical reflection is freedom as autonomy [generally linked to Kant and Mill], it corresponds to “an extension of political sovereignty to that of individual self-government”. It implies self-regulation and self-determination to avoid interference from others and to decide in a free and informed manner, recognizing personal capacities, values and beliefs (37). In this approach, the predominant theories of social justice would be the utilitarian ones based on maximization of public utility and the libertarian ones centered on property rights, social and economic freedom; which have been a foundation for the allocation of public resources and which philosophically support neoliberalism (12).

Despite these philosophical differences, the confluence of some interests in both approaches

and the “paradigmatic shift” that they have fostered in public health must be recognized (23). In this sense, some authors have indicated that these SDH approaches present the following convergences: (i) they aim to study the complexity of biology-society relations, highlighting the relevance of the socioeconomic and political fields, poverty, working conditions and other macro-order processes, to explain epidemiological profiles or micro-order health outcomes, (ii) authors such as Hernández and Duarte [in response to Morales's group] argue that critical epidemiology does not exclude an initial study of “risk factors”, although with the claim of later, more complex explanations, framed in power relations, (iii) in the application of quantitative methodologies, no differential implications have been documented; even in both approaches hierarchical models are proposed that have been methodologically expanded (12,23).

#### **Ecological studies and fallacies in the inference of individual and social measurements**

Ecological studies correspond to designs that take a group as the unit of analysis and are generally applied when the interest is to measure contextual effects in a health event, compare population behaviors or conceptualized [determinant] constructs at the group level, and when there are limitations in the individual measurements such as environmental variables, where it is difficult to know the exposure of each subject (38,39). At the methodological level, these studies are classified as exploratory [comparing the event in several regions during the same period], analytical [comparing the social determinant and the event in multiple groups], multiple groups, time series and mixed (38,39).

Compared to designs based on individual units, a choice can be made for any of the following subtypes:

- (i) Compulsory and suitable: the research question focuses on the comparison of groups, the detection of populational differences or the lack of individual information. They also apply to topics that require indirect inference due to the presence of transactions between individuals and groups, such as time series, contagion rates, patterns of social behavior or spatial correlations, where individual analyzes

are insufficient to capture the “diffusion of an effect.”(40).

- (ii) Optional and suitable: corresponds to investigations where individual measurement is complex, unreliable or precise, such as the evaluation of natural disasters. It also includes research on group exhibitions such as regulations, environmental factors, or educational campaigns; in which the individual measurement would not allow for the evaluation of contextual effects, and those in which the aggregate measurement represents more than the sum of individuals (40).
- (iii) Optional, not suitable but convenient: used in small towns where the potential “risk” of “neighboring” populations is to be evaluated or where it is not common to have individual measurements, due to population movement, change of residence or other attributes. They are classified as unsuitable, since it would be possible to study them with individual measurements, but the information is not available, so they are convenient in public matters to show populational effects (40).

In addition to these typologies, in ecological studies social constructs can be operationalized through derived and integral variables. The derived variables represent population constructs created from the aggregation of individual data, but as a different construct; for example, the average income of the neighborhood as an indicator of recreation facilities, school quality, physical space conditions or other characteristics different from the individual income value (38). The integral or contextual variables also represent group constructs that do not come from information from each member of the population, but rather those in which all subjects have the same exposure, which allows determining the contextual effect. Some examples include the availability of health services, political systems, measurements of the environment or place of residence (they may vary between individuals, but individual data is generally not available), global data such as population density, a law, advertising or taxes (5,38,39).

The main methodological challenges of ecological studies include: (i) an adequate number of groups to compare, (ii) the measurement of contextual and "integral" effects, (iii) having to

work with small groups in which it is feasible to assume the assumption of intra-group homogeneity, to control interactions and to achieve stable measurements; (iv) the inclusion of groups with variability for the central variables, but which at the same time allow assuming similarity within the group, (v) the formation of groups based on the independent variables (greater possible variability of X) and not on the event as if it were a case-control study, (vi) the stratification of groups when their number is small in order to improve statistical power, (vii) the control of migration between groups and spatial self-correlation and (viii) avoiding fallacies in inference or cross-level bias (38-40).

Regarding the last consideration, it should be borne in mind that individual measurements allow for making inferences related to the variability between individuals, but they do not determine whether said variation is of a single group or of several (38). Despite this, it is common to find studies that draw conclusions about group behavior based on individual measurements and vice versa, causing errors or fallacies - ecological, atomistic, psychological or sociological - in the extrapolation of the results.

Ecological fallacy: false generalization when explaining the inter-individual variation of an event based on group data, assuming that social measurement is a substitute for unknown individual information. They are generally presented in studies that do not collect data on the joint distribution of exposure and the health outcome at the individual level; therefore, the same exposure is assumed for the whole group (5).

In this case, the contextual effect can be based on mechanisms not captured in the aggregate measurement; for example, when indicating that the body mass index (BMI) is higher in people with higher income, multiple conditions can be found that transcend these two variables and would explain such an association, such as the confluence of greater industrial food production, greater fat content in the diet, occupations prone to sedentary lifestyle, food consumption outside the home and exposure to advertising, in high-income areas (5).

This fallacy originates from methodological individualism that assumes the social as an aggregate of individual populational

elements, ignoring that "group variables have their own effects and their own dynamics" (5,38,41).

**Atomistic fallacy:** conclusions about the variability in the group are inferred from individual information. This arises when it is not taken into account that individual and group measurements obey different constructs. It implies assuming that the variables that explain the inter-individual variation in one group are the same in others. This occurs due to lack of information about the constructs and their levels of organization, or when using the same variable that refers to different constructs when the level changes (38,41).

**Psychological-individualistic fallacy:** it occurs when group variables are not included in studies of the individual order, or when the contextual effect or the structure of the population is not analyzed, explaining inter-individual variability exclusively with individual data. For example, studies on depression that do not include community issues and lead to incomplete recommendations on its determinants (5,41).

**Sociological fallacy:** it consists of making group inferences without considering variables of the individual order that can explain, in part, the population variability. For example, in studies on schizophrenia that explain its occurrence based on communal conditions such as the type of social ties, ignoring biological components (5,41).

### **Multilevel analysis**

Faced with the described fallacies, multilevel analyses are available which simultaneously determine what part of the inter-individual variability is explained by the micro-context [compositional effect or differences attributable to the internal composition of the groups] and the macro-context [context effect or inter-group differences, attributable to the effect of the social determinant]. At the same time, it allows for making inferences about inter-group variations and whether these are contextual or compositional effects, that is, determining their levels of independence, reciprocity and interdependence (5,38,41,42). For example, when evaluating the relationship between poverty and disease, the occurrence and distribution of disease in various areas should be compared and controlled for the individual level of poverty in each group; thus the contextual effect would be measured (39).

Some authors consider that this type of analysis is not required in all SDH studies for three reasons: i) there are designs that do not commit fallacies when exposing a correct conceptualization and operationalization of the determinants, ii) when the objective is restricted to comparisons of a single level, iii) if social determinants affect health, they must ultimately be expressed at the individual level. However, a thorough SDH investigation requires individual measurements in various groups, given their potential variations from one context to another; This means that, even when the researcher is interested in individual determinants, he must study subjects from various groups to assess contextual effects and establish whether individual behavior is similar in different populations (5).

Multilevel measurement in SDH offers advantages, because the definition of units of analysis in different hierarchies is closer to reality, where individual characteristics can explain part of the inter-group variability, or group variables are relevant to understand individual variations (38).

Despite its advantages, the multilevel SDH approach implies challenges such as the identification and logical articulation of the constructs at each level, the definition and justification of the relevant groups (household, neighborhood, municipalities, countries), the availability of data, the quantification of the interaction or confusion between variables [or the residual risk of confusion], the identification of endogeneity of the individual and group measurement, the study of spatial auto-correlation, the control of biases since most are observational analyses, the insurance of good sample size and statistical power for comparisons. To these could be added possible temporal biases, since the individual, particular and general determinants do not represent measurements of the same time window (38).

### **Scopes of SDH research metrics**

SDH research presents an important methodological lag that could be sustained according to the times required to make the paradigmatic transitions [from the theoretical-epistemological advance of the model, to its methodological implementation]. In this sense, this text contributes to the analysis of methodological challenges that could explain the relationships

between the social construct and health outcomes, avoid fallacious inferences, and in general, identify methodological elements that demonstrate the complexity of the designs that should be applied in the quantitative component of public health research.

However, social determinants must account for complex relationships and constructs that, many times, exceed the possibilities of operationalization in variables, which has evidenced the need to transcend statistical relationships towards sociological, historical, economic or political causality [with qualitative and historical studies]. Even in the case of selecting a “social determinant” that can be measured, it must be considered that each of them may come from a different social construct or have multiple definitions and operational expressions, as described by Muntaner's group for social class, Chiara's for the territory, and other authors who have done the same with the categories of gender, ethnicity, race and life course (43-47).

The exposed contents only give an account of an initial approach to SDH metrics that allows for anticipating challenges to the evaluation of the place of the individual, the family, the community or the social: the choice of constructs, their interdependence, feedback mechanisms and potential hierarchical causal networks, in order to have more exhaustive investigations (3). In the field of public health, it is clear that this type of approach is incomplete, which shows the need to resort to categories from other disciplines to make a trans-disciplinary integration of knowledge (22).

The complexity of biology-society relations in public health is related to some approaches of relational sociology [which are related to the SDH approach insofar as they analyze the biology-society link through a Hegelian dialectical analysis of different levels of reality, with a procedural - and not substantial or essentialist - perspective that is worth making explicit for later discussions of the SDH:

(i) This sociological perspective highlights the importance of a dynamic-relational conception of the investigation of social objects [facts] and the struggles-contradictions of small groups or individuals (31).

(ii) It specifies that all theory must be based on observations and simultaneously must offer the possibility of freeing oneself from them so as not to be limited to the factual sphere. That is, recognizing that all theory must correspond to facts, while the observation of phenomena is only possible by having theoretical principles [if there were no theory, the phenomena would go unnoticed] (31).

The social, from a relational perspective, refers to the interdependence or reciprocity of individuals and society, it is not the abstraction of the particularities of individuals without society, nor a system or totality beyond individuals, it is rather the framework of interdependencies that overcomes this false dichotomy [individual-society] and rescues the value of historical continuity as an indispensable element for thinking about the social (31).

## Conclusions

SDH approaches show important advances in terms of the theoretical foundation of the relationships between social conditions and morbidity, mortality and disability profiles; both present ontological, epistemological and praxeological differences, and the need to improve the theoretical foundations that guide their methodological-analytical options.

The low application of aggregate and individual metrics to SDH research and their articulation at the singular-individual, particular-intermediate and general-structural levels, constitute an obstacle to progress in this field, so it is necessary to review the theoretical foundations of ecological and multilevel studies, to visibilize the complexity of this type of design and improve public health studies.

Research based on SDH metrics [even in the ideal condition of compliance with all the methodological requirements of ecological and multilevel studies] is incomplete in terms of revealing the complexity of the processes that determine health-disease in specific populations. Therefore, it is necessary to expand it with mixed studies [quantitative-qualitative-historical] that allow us to reveal how subjects become different social insertions, with subsequent differences in their ways of living, getting sick and dying.

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