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## DIALECTICAL MATERIALISM AND QUANTITATIVE DATA ANALYSIS

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### ABSTRACT

**Objective:** to reflect on the use of the dialectical materialism for the analysis of quantitative data. The dialectical materialism is based on the understanding of the historical reality and of its contradictions, explaining social phenomena.

**Method:** the concrete experience has been taken as the use of the dialectical materialism in the analysis of quantitative data from a research, whose object is the precarious work of nurses in public hospitals. From the statistical results, the contradictions between them and the literature review on the precariousness of work were identified. Then, based on the Marxist literature, other arguments were put forward in order to deepen the ascent to the explanation of the phenomenon.

**Results** the information obtained with analytical statistics shows the movement, contradiction and unity of the opposites present in the responses of the analyzed variables. This fact made it possible to move away from the appearance of the numbers to understand the relationships between them and the work in nursing, as well as their contradictions.

**Conclusion:** the challenge of using a qualitative method to deepen the analysis of quantitative data shows that overcoming the false dichotomy between the quantitative and qualitative approach, in this historical moment, is crucial to understanding the new problems created by the transformation of capital. After all, new problems demand new paradigms. The use of the quantitative and qualitative approach in the same research makes it possible to understand the object under study in a comprehensive way.

**DESCRIPTORS:** Research. Methodology. Social theory. Qualitative analysis.

## O MATERIALISMO DIALÉTICO E A ANÁLISE DE DADOS QUANTITATIVOS

### RESUMO

**Objetivo:** refletir sobre o uso do materialismo dialético para a análise de dados quantitativos. O materialismo dialético parte da compreensão da realidade histórica e de suas contradições, explicando fenômenos sociais.

**Método:** tomou-se como experiência concreta o uso do materialismo dialético na análise de dados quantitativos oriundos de uma pesquisa, cujo objeto é a precarização do trabalho da enfermagem em hospitais públicos. A partir dos resultados estatísticos, foram identificadas as contradições entre estes e a revisão da literatura sobre a precarização do trabalho. Em seguida, com base na literatura marxista, foram apontados outros argumentos para aprofundar o ascenso à explicação do fenômeno.

**Resultados:** As informações obtidas com a estatística analítica demonstram o movimento, a contradição e a unidade de contrários existentes nas respostas das variáveis analisadas. Isso possibilitou sair da aparência dos números para compreender as relações entre estes e o trabalho em enfermagem, bem como suas contradições.

**Conclusão:** o desafio de utilizar um método qualitativo para aprofundar a análise de dados quantitativos demonstra que a superação da falsa dicotomia entre a abordagem quantitativa e a abordagem qualitativa, nesse momento histórico, é crucial para entendermos os novos problemas postos pela transformação do capital. Afinal, novos problemas demandam novos paradigmas. A utilização da abordagem quantitativa e qualitativa numa mesma investigação possibilita compreender de modo integral o objeto em estudo.

**DESCRIPTORES:** Pesquisa. Metodologia. Teoria social. Análise qualitativa.

## EL MATERIALISMO DIALÉCTICO Y EL ANÁLISIS DE DATOS CUANTITATIVOS

### RESUMEN

**Objetivo:** reflexionar sobre el uso del materialismo dialéctico para el análisis de datos cuantitativos. El materialismo dialéctico se basa en de la comprensión de la realidad histórica y de sus contradicciones, explicando los fenómenos sociales.

**Método:** se tomó como experiencia concreta el uso del materialismo dialéctico en el análisis de datos cuantitativos de una investigación, cuyo objeto es la precarización del trabajo de la enfermería en hospitales públicos. A partir de los resultados estadísticos, se identificaron las contradicciones entre éstos y la revisión de la literatura sobre la precarización del trabajo. A continuación, con base en la literatura marxista, se presentaron otros argumentos para profundizar el ascenso a la explicación del fenómeno.

**Resultados:** Las informaciones obtenidas con estadística analítica muestran el movimiento, la contradicción y la unidad de los opuestos presentes en las respuestas de las variables analizadas. Esto permitió alejarse de la apariencia de los números para comprender las relaciones entre éstos y el trabajo en enfermería, así como sus contradicciones.

**Conclusión:** el desafío de utilizar un método cualitativo para profundizar el análisis de datos cuantitativos muestra que superar la falsa dicotomía entre el enfoque cuantitativo y el enfoque cualitativo en ese momento histórico es crucial para entender los nuevos problemas planteados por la transformación del capital. Al final, nuevos problemas demandan nuevos paradigmas. El uso del enfoque cuantitativo y cualitativo en una misma investigación posibilita comprender de modo integral el objeto en estudio.

**DESCRIPTORES:** Investigación. Metodología. Teoría social. Análisis cualitativo.

### INTRODUCTION

Knowledge of the reality has always been a concern for mankind. Is it possible to know? How do we know? What we know is the truth? In search for answers, currents of thought and epistemologies were developed to guide the search for knowledge, such as the positivism, phenomenology and Marxist dialectics. Each of these currents of thought interprets reality through paradigms, so as to enable the knowledge about it.

Every current of thought elaborates its own method to the knowledge of reality. The word method originates from the Latin *methodu*, which means path. Thus, the method would be the way traveled in search of knowledge and the production of truths.

In the positivist perspective, the method advocates the separation between ends and means, between the object of knowledge and its explanation. Its application is strongly linked to research that operate by hypothesis and verification.<sup>1</sup> However, the positivistic method cannot be applied to the knowledge of every object of investigation. For example, when we deal with social objects of knowledge, whether these objects are relations between people, relations of production, etc., the positivist method becomes insufficient, since in social research it is not possible to dissociate what is known from the way one knows.

This explains why the choice of the epistemological matrix is as important as the choice of the object of study itself, since it is through the current of thought that it is possible to know the object in question. Therefore, a researcher should ask himself/herself: what do I want to know? Which

theoretical matrix will enable me to know about my research object?

The dialectical materialism, which is the philosophical basis of the Marxist theoretical current, starts from the understanding of the historical reality and its contradictions, seeking explanations for the phenomena of nature, society, or thought.<sup>2</sup> Thus, studies that propose to explain social objects that imply the analysis of the relations established between human beings, their means of production, life, consumption, the contradictions and the movement existing in these relations can find in the dialectical materialism the necessary contribution to the production of knowledge.

The dialectical materialism is the philosophy of Marxism. This term was used by Plekhanov in 1891, who considered that Engels, in the book *Anti-Dühring*, was the one who defined the bases of the dialectical materialism. To this end, Engels took as its basis the mechanistic materialism of the Scientific Revolution and of the Enlightenment, and Hegel's idealistic dialectics, denying the mechanism of the first current and the idealism of the second.<sup>3</sup>

The combination of materialism and dialectics has changed both. So, dialectically, the material and the ideal are opposites, but they coexist within a unit whose basis is material. The concrete reality, in the dialectical perspective, is contradictory and it is this conflict of opposites that provokes the movement of historical and progressive transformation, being these transformations the ones that provoke the qualitative novelty.<sup>3</sup>

Thus, the combination of materialism and dialectics resulted in "a body of theory considered to be true in relation to the concrete reality as a

whole, and conceived, in a sense, as scientific, as a kind of natural philosophy that generalizes the discoveries of science (at the same time that it relies on them)".<sup>3: 258</sup>

The basic laws of the dialectical materialism are: a) quantitative changes lead to revolutionary qualitative changes; b) the unit of contraries, considering that the concrete reality is the union of contradictions; c) the denial of the denial, in which, in the clash of opposites, one denies the other, which is then denied at a higher level of historical development, but that preserves aspects of the contraries that were denied (thesis, antithesis and synthesis).<sup>3</sup>

In the perspective of the dialectical materialism, the unveiling of the reality depends on the context in which the individual is involved and on the relationships that he/she can perform. However, the relation man-context-reality is not direct, because it is realized through instruments that aid the human activity. Therefore, for every human activity, the mediation is necessary, and it is the technical instruments and language that embrace in themselves the generalizing concepts produced by human culture, which enable the mediation between man-man and man-context-reality.<sup>4</sup>

Having that said, in this article, we reflect on the use of the dialectical materialism for the analysis of quantitative data. We start from the following statement: what should determine the analysis is not the form of data collection nor the type of data generated (whether quantitative or qualitative), but what the researcher wants to know. We say that the dichotomy "quantitative research *versus* qualitative research" is false, since insisting on this dichotomy limits the production of knowledge. In addition, it is feasible to use qualitative methods of analysis in research with a quantitative scope, as long as the limits on this type of use are determined.

This reflection is divided into two parts: in the first one, the quantitative and qualitative paradigms of the research will be presented; and then the use of the dialectical materialism in quantitative data analysis.

## QUANTITATIVE PARADIGM AND QUALITATIVE RESEARCH PARADIGM: APPROXIMATIONS

The scientific revolutions occur with the construction and establishment of paradigms that will be replaced over time. The emergence of a new paradigm is a disruption in normal science, leading to a non-cumulative development of knowledge,

since this science is cumulative, i.e., it focuses on the discovery, while still dependant on them. A discovery occurs when research guided by the existing paradigms formulates a new set of problems, which demand new paradigms for its explanation. When this occurs, normal science is broken, enabling the construction of non-cumulative knowledge.<sup>5</sup>

The paradigm guides research as a pattern for its reproduction, but it does not provide rigid rules. The adoption of paradigms makes science progress, however, the paradigms must be able to respond to the real problems. Thus, new paradigms and new theories emerge as the explanation becomes insufficient by the hegemonic paradigm or theory.<sup>6</sup> Khun observes that there are no right or wrong theories, but theories that can answer better than the previous one to normal science ruptures, since paradigms and theories are the product of a particular historical time.<sup>5</sup>

However, there has historically been a competition between quantitative and qualitative research paradigms. In most part of this dispute, the core is about which paradigm best explains reality, forgetting that these paradigms have different ontologies, epistemologies and axiologies.<sup>7</sup>

With respect to ontology, the quantitative approach is based on the unique reality that can be measured and validated by scientific principles; yet, the qualitative paradigm discusses the multiple realities built by society and which generate different meanings for different subjects. The interpretation of this multiple reality depends on the worldview of the researcher. In an epistemological perspective, in the quantitative paradigm, there is estrangement and separation between investigator and subject of research; in the qualitative paradigm, researcher and object of research are interdependent, one influences the other, and the relationship of the investigator with the object of his/her research may benefit the research. The differences in the evaluation aspect are about the value of research: for the quantitative approach, the research should be neutral, value-free; yet, the qualitative approach argues that research is influenced by the values of the researcher, in which neutrality is impossible. These differences allow the creation of three conceptions of the world: objectivism, subjectivism and constructivism.<sup>7</sup>

It is worth mentioning that the two paradigms of research, quantitative and qualitative, are insufficient for a full understanding of the reality, since both have limits and potentialities<sup>8</sup>. Therefore, the good method will always be the one that allows a correct construction of the data and a reflection in

the light of a theory. To do so, when the use of an approach is insufficient for the knowledge of the reality, the cited authors recommend their joining with another approach.

In relation to the integration of quantitative and qualitative approaches in the construction of research, this can happen in three ways: Predominance, Juxtaposition or Dialogue. In the Predominance, the study gives priority to one of the methods, commonly the quantitative and the qualitative method appear as a preliminary or subsequent step of the quantitative study. In the Juxtaposition, there is not a predominance of approaches, but an amalgamation of both. And finally, in the Dialogue, the interaction between the different approaches is built from the stage of research design. So, for these studies, the interdisciplinary perspective or triangulation are suitable.<sup>9</sup>

It is worth mentioning that the amalgamation of approaches is not an anarchic procedure, given that the assumptions of each approach must be respected.<sup>8</sup> In addition, the triangulation can be of theories, strategies, quantitative and qualitative instruments, and also in the establishment of links from different sources.<sup>9</sup>

Thus, even in a quantitative approach, it is possible to adopt a method of quantitative and qualitative analysis. Among the perspectives previously presented, we affirm that this junction using the Dialogue form can produce profound results. It is worth mentioning that the main limit of studies that seek the integration of approaches is the loss of sophistication and the detail of the methods used.<sup>9</sup> In discussing the intercomplementarity between the quantitative and qualitative approaches, Landim, et al, state that "extremely accurate descriptions of all facts known from human subjectivity may not disregard a useful mathematical representation. On the other hand, the use of sophisticated mathematical resources for numerical calculations of all the coefficients can be totally fruitless if many facts of the problem remain unknown. Understanding the positive dimension of the phenomena requires cross-complementarity, which stems from the shared meanings arising through speech".<sup>9:56</sup>

Thus, the barriers between the quantitative and qualitative approaches need to be demystified. The mixed method research has made this deconstruction possible to a large extent. And, although the design of the research is not using a mixed method, the junction of the methods of the two approaches is possible. However, this demands from the research

the deconstruction of the ways of producing knowledge. Such demand is a challenge for researchers that adopt one of the paradigms: for the ones that follow the quantitative approach, to recognize that numbers are not capable of disclosing all the reality, that not all the facts can be measured and that the use of methods that count and enumerate does not guarantee that this is the most faithful approach of reality. For those who follow the qualitative approach, it is advisable: a) not to ignore the numbers as a part of the reality; b) to identify, in the quantitative methods, its potential of explanation; and c) to recognize that a part of reality can be measured.

## DIALECTICAL MATERIALISM AND QUANTITATIVE DATA ANALYSIS: AN EXPERIENCE

The philosophical approach of the dialectical materialism has as its assumption the capture of the movement, the relations and the existing contradictions in the object of study. Thus, to be understood, reality presents itself as a synthesis of multiple determinations that have been changing historically and socially. In the dialectical materialist conception, the empirical world allows us to know apparent manifestations of reality. However, the essence of the empirical world is not explicitly present in its immediate manifestation, being in need of mediations and of the knowledge of basic internal contradictions. Therefore, the construction of knowledge by the dialectical materialism is conducted in a procedural way through the unveiling of the movement and the contiguous relations to the object of study.<sup>10-11</sup>

The experience in the use of the dialectical materialism to analyze quantitative data occurred in a research that has as its object the precariousness of the work in nursing at state public hospitals.<sup>12</sup> A first point to be emphasized is that the use of the dialectical materialism was possible because the object of research allowed that: the precariousness of the work alludes to the relation between capital and labor.

Bourdieu states that the precarization is a new type of domination, based on the generalization of insecurity, with the aim of compelling workers to submit themselves and to accept exploitation.<sup>13</sup> Druck reveals that what makes the precariousness of work new in the 21<sup>st</sup> century, given that it has always existed in capitalism, is the generalization of insecurity.<sup>14</sup> This becomes stronger due to the loss of



work achievements and this fact symbolizes an attack on the workers who, in this historical moment, fight for the permanence of their rights rather than for their expansion. Still from Druck's perspective, today we are experiencing a retreat from the role of the State regarding the social protection of workers, the loss of rights that have been conquered, the reduction of stable employment, the flexibilization of the working hours, the weakening of unions, and an even greater consequence: the weakening of social ties.<sup>14</sup>

Based on this, in order to study the precariousness of work, it is necessary to focus on the social relations between workers and employers and also on the material conditions in which this relationship takes place. The precariousness of work can, at the same time, be measured and observed in its multiple relationships, as it is a phenomenon of appearances and essences.

A second important point is that the precariousness of work is a complex, multi-determined phenomenon and, in the field of nursing, it is a relatively recent object of study. Furthermore, the use of the dialectical materialism to the analysis of the results from quantitative data made it possible to uncover the precariousness of work in several layers of the phenomenon, deepening its understanding beyond the statistical analysis that was used. It is important to remember: the object of study, the approach and the method of analysis, although stemming from different paradigms, complement each other.

The dialectical materialism, even if used for data analysis, is not restricted to this use: all the elaboration of the research, from the conception of the project to the final report, made use of the founding characteristics of the dialectical materialism: movement, contradiction, interim syntheses, a clash of opposing forces and totality.

Following this logic, the concepts capable of explaining the reality revealed by the data were used as they were demanded. This form of textual construction was chosen because Marx argues that the categories to be studied do not need to appear according to their historical order, but must be presented according to the internal relations of their essential determinations within the general framework of society on which the object is analyzed, in this case, the Brazilian bourgeois capitalist society.<sup>15-16</sup> In Harvey's observations on the concepts discovered by Marx, it was already pointed out: they are formulated as relations rather than as isolated principles.<sup>17</sup>

Concepts, from the dialectical materialist point of view, are relations in a certain totality. The totality "means a set of parts, articulated among themselves, with a certain order and hierarchy, permeated by contradictions and mediations and in constant process of effectiveness. Its methodological importance is founded precisely on the fact that it is a category that characterizes reality in itself".<sup>18:116</sup> Approaching the totality did not mean that all the connections of the object of study were dealt with, but instead, what was covered were the relations and the material conditions that were preponderant for the knowledge and expression of the phenomenon.

Thus, as a methodological principle, totality tells us that nothing can be understood in isolation and, therefore, one must aim at the whole and the parts, their relationships, ruptures and contradictions. This was produced by establishing relationships between the responses obtained for the same variable by the three categories of nursing workers (nurses, technicians and nursing assistants); or between different answers for the same variable, expressing or not the precariousness of the work; or revealing the contradictions between different responses to the same variable; or contradictions between the responses of different workers. It is necessary to observe the hierarchy between the parts and the whole and its mediations. In this sense, the construction of the historical context of the object of study revealed the totality of the relations studied, since it addresses "in several levels, the spaces where larger groups of subjects and relations are found".<sup>11:12</sup>

Although the focus was the totality of relations, it is necessary to bear in mind that this is a contradictory relationship: the part at the same time reveals and hides the whole, and the whole does not appear as such in the part. So, there is the need for the mediations, so as to notice how the whole is revealed in the part and how the part reveals and hides the whole.<sup>11</sup>

In the dialectical materialism, knowledge is produced by contrasting radically different conceptual blocks. Marx distinguishes two moments in this method: the investigation and the method of exposure. In the research, it begins with reality as it is, and with all the available forms of description of that reality. Then, one must submit everything that has been found to a rigorous critique, in order to discover simple concepts, but with a high explanatory power over reality. This moment is called the descent method. Once the simplest concepts that explain reality have been discovered, one must go

through the method of ascension, that is, returning to reality and opposing to it the concepts that have been found so as to reveal the deception that appearances provoke. Marx starts from the superficial appearance to deep concepts.<sup>17</sup>

Based on the previous explanation, the descent method was used in the collection of empirical data and also in the choice of several data sources. For the method of ascension, the statistical method of weighted index and randomization was used. For the calculation of the weighted index, there was a selection of variables that, when excluded in the analysis model, did not provoke changes in its result. After that, we used the variance as an index for the construction of the weights of the precarization typologies. Thus, one can identify which typologies contributed most to the precariousness of work.

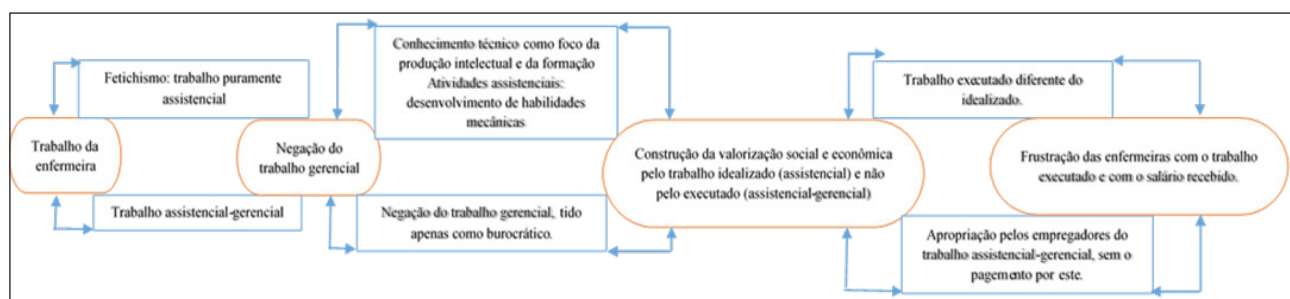
In the exposure method, after delving into the investigative phase, it is possible to approach the ideal reproduction of life and matter. Marx, however, draws the attention of those who think that the ideal is an element that is detached from real life.<sup>16</sup> The ideal consists of the material that is transposed into the human mind. It is linked to the real and is the result of it. Thus, Marx says that we can move from simpler elements to arrive at more general abstractions and also move the opposite way, in order to reveal the totality, the contradiction and the movement of the object of study, in this case, the precariousness of work in nursing.<sup>15-16</sup>

In order to reveal the contradiction, a comparative analysis was used between the different cate-

gories of workers (nurses, technicians and nursing assistants) and types of relationships (outsourced or statutory). The objective was to identify, in the answers, whether nursing workers affirm or deny the precariousness of work. The movement, in dialectical materialism, revealed itself in the debate between what occurs in the microspace of work in nursing and what occurs in the general context of the precariousness of work in Brazil, as well as which changes this movement reveals.

To Harvey, Marx follows a pattern in the use of the argumentative dialectical materialism: oppositions converted into units that internalize a contradiction and generate another duality.<sup>17</sup> Thus, there is no final synthesis, "but a temporary moment of unit in which another contradiction is internalized - a duality - which, to be understood, requires a subsequent development of the argument".<sup>17:63</sup> Thereby, there is the internalization of the contradiction and its accommodation in a higher degree. The contradictions are never definitively resolved: they can only be repeated in a system of perpetual motion or in an increasing scale. However, there are apparent moments of resolution. There is, so to speak, a perpetual expansion of contradictions.<sup>17</sup>

During the analysis, the contradictions contained in the replies to the questionnaire were permanently identified. After historically and socially situating such contradictions, the process in which they are revealed in concrete reality was outlined. As an example, the figure below demonstrates a part of the analysis made:



**Figure 1- Contradictions about the work of the nurse in public hospitals**

The precariousness of the nursing work is related to the adoption of the neoliberal model in the health services, which results in low wages and precarious working conditions.<sup>19</sup> This whole scenario contributes and conditions the analysis shown in figure 1.

In this scheme, which leads to the analysis undertaken, we show that the nurse's work consti-

tutes a dual nature. However, the nurse denies the managerial job, for historical, political and technical reasons. The construction of the social and economic recognition of the work of the nurse is based only on part of the work that he/she performs. Employers take ownership of the managerial work performed by nurses, but they do not recognize it in the hierarchy of organizations or in the payment

of wages. Because of that, a contradiction between the work that is actually executed and the work that is recognized, leading to alienation on the part of the workers and to the payment of the price of the work force below a reasonable value, is established. Employers' recognition of work, alienation and/or estrangement by nurses in relation to their work and low wages make up the general picture of the precariousness of work in nursing.

## CONCLUSION

The study of a complex reality demands the use of complex ways of knowing it. The use of the dialectical materialism in the construction and analysis of the data of a research, starting from the quantitative approach, made it possible to understand beyond the appearance of the numbers, revealing the relationships they represent.

As in any study, the data needs the worldview of the researcher in order to be analyzed. Numbers, as well as words, speak. We just have to find out the best method for them to be heard. And, finally, it is the researcher and his/her scientific, political and social ideologies that translate the numbers.

Thus, even in a study with a quantitative approach, it is possible to observe relations, contradictions and movement. Marx and Engels demonstrated that; they have often used statistical data to reveal the reality.

So, overcoming the false dichotomy between the quantitative and qualitative approaches, in this historical moment, is crucial to understand the new problems caused by the transformation of the capital. New problems demand new paradigms. The deconstruction of the impossibility of dialogue between the old paradigms can be a start even for the production of innovative research in the field of nursing.

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