

General aspects of the use of mixed methods for health research

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Abstract

Traditionally, research has been divided according to its methodology into quantitative and qualitative. Mixed research methodology combines both methods and has established itself as a third approach, allowing to comprehensively address high-complexity research problems. Although there are various definitions of mixed methods research, they all share aspects such as the collection and analysis of both quantitative and qualitative data and the integrated interpretation of the results within the same research. This type of research is an important tool to address the complexity of health sciences, allowing the understanding and integration of quantitative data with experience-based aspects. In this way, a broad and deep perspective of health problems is achieved, providing a solution to sanitary policies and services. During the development of mixed methods research, there are key stages where both approaches can be integrated depending on the objectives set by the investigators. Although mixed methods studies may differ widely, general models have been identified to guide the development of a single specific design. These models are classified according to the priority of each approach, the sequence in which each approach will be executed, the level and timing of data integration, and the purpose of integrating the data for the study.

MAIN MESSAGES

- ◆ Mixed methods research involves using both quantitative and qualitative methods in the same study to address complex research problems.
- ◆ Mixed methods research can address a variety of complex phenomena, from causality to policy implementation.
- ◆ There are general models for the development of each mixed methods design.
- ◆ This article is intended as an aid in Spanish for students and healthcare professionals new to this type of research.

INTRODUCTION

Not so long ago, scientific research was divided almost irreconcilably into quantitative and qualitative methods. However, the mixed research methodology, in which both methods are combined, has been consolidated as a "third paradigm". This paradigm, distinct from the positivist perspective of quantitative research and the constructivist perspective of qualitative research, has adopted a more pragmatic orientation [1]. Proof of this consolidation is the increase in the number of studies published with this type of method [2], identifying 1623 publications related to mixed methods between 1999 and 2018 [3].

The interest in using mixed methods for health research can be attributed to numerous reasons. One of the most important is the contribution of qualitative research to a deeper understanding of health-disease processes [4], with even more relevance in the field of public health. In the latter, social, political, and economic factors are part of the complexity with which problems should be analyzed [5].

Therefore, mixed research designs allow problem framing, data collection, analysis, and triangulation based on quantitative and qualitative research paradigms within the same study. In this way, using multiple perspectives, high-complexity research problems can be approached more comprehensively [5].

This article corresponds to a methodological series of narrative reviews on general topics in biostatistics and clinical epidemiology, which explores and summarizes, in a user-friendly language, published articles in the main databases and specialized reference texts. The series is oriented to the training of undergraduate and graduate students. It is carried out by the Chairs of Research Methods in Health and Evidence-Based Medicine of the School of Medicine of the University of Valparaíso in Chile.

The purpose of this article is to present the most relevant topics on mixed research methods, their classification, and their application in the health area. It is also intended to be an aid in Spanish for students and healthcare professionals with no experience in this type of research. Our objectives are to define what mixed methods are, to mention their implications in health contexts, and to provide general information on their implementation and classification. Then, we will address

general models of mixed-methods study design since specific designs are beyond the scope of this publication.

WHAT ARE MIXED RESEARCH DESIGNS?

To understand mixed designs, it is necessary to handle concepts of quantitative and qualitative methodology. The quantitative approach measures phenomena using data collection to test hypotheses and theories through statistical analysis. Its process is deductive and sequential and seeks greater objectivity. As for the qualitative approach, it attempts to understand the complexity of phenomena through the interpretation of data, using an inductive process, not necessarily linear, and exploring subjective dimensions (perceptions, opinions, beliefs, among others) [2].

Over time, several authors proposed definitions to help understand what a mixed study in research is. However, since this is a relatively young area, definitions of "mixed methods research" have not been settled, nor is there a broad consensus yet [6]. Various definitions for this type of research are found in the literature, some of the most commonly cited being the following:

- 1) "Mixed methods studies are defined as the collection and analysis of quantitative and qualitative data in the same study, with an integrated interpretation of the results" [7].
- 2) "Mixed methods studies are those in which quantitative and qualitative data are complementarily integrated to produce a deeper and more complete understanding of the phenomenon under study" [1].
- 3) "Mixed methods studies are in which the researcher collects, analyzes, and mixes both quantitative and qualitative data in a single study or a series of related studies" [8].
- 4) "Mixed research refers to the combination of quantitative and qualitative methods in a single study to understand a complex research problem" [9].

MIXED METHODS FOR HEALTH RESEARCH

The mixed methodology makes it possible to address complex questions related to various areas of health research, especially public health. It has great potential to answer phenomena related to quality, access, and satisfaction with provided services. When research questions are addressed with a mixed approach, researchers must integrate qualitative and quantitative approaches, methods, reporting of results, and interpretation of results, thus generating rigorous evidence relevant to users [10].

It can also be useful in addressing questions that seek to evaluate outcomes of therapeutic or rehabilitation programs. For example, assessing symptom resolution and cure rates to understand how treatment or rehabilitation impacts patients' lives and thus explain aspects related to acceptability and adherence to such treatments. In this way, a more comprehensive understanding of the problem is achieved, linking processes to outcomes [5].

Another example is when conducting randomized clinical trials where the context and subjective aspects of the participants are also studied through a qualitative approach. This provides additional information for a broader understanding, integrating the perspectives and experiences of different groups of users [5].

In short, mixed methodology is a valuable tool for generating rigorous and relevant evidence to improve healthcare services' quality. To better understand the use of mixed methods, it is necessary to know the steps to follow in their development and in which parts of these we can integrate the qualitative and quantitative approaches.

KEY STEPS IN MIXED METHODS RESEARCH

STATING THE PROBLEM

Every study always begins by stating a problem. In this case, to best solve the problem, we need to integrate qualitative and quantitative approaches, noting the mixed nature of the study. During this phase, the research team should reflect on whether to include separate questions for each approach in the problem statement and/or objectives or to opt for questions and objectives that emphasize integrating both methods [2].

LITERATURE REVIEW

As in studies with other methodologies, a thorough review of the literature relevant to the problem under study is required during the development of mixed methods research. It is necessary to include quantitative, qualitative, and, if possible, mixed references [2]. This step also includes the concept of

"theorization", i.e., the theoretical perspective on which the study will work, being a "lens" through which the study will be viewed [9].

HYPOTHESIS

The term hypothesis is usually used during the quantitative phase of the study to open the research [2]. As for the qualitative phase, this usually has an exploratory approach, obtaining new hypotheses during the research development. This varies according to the study design and question. In the end, hypotheses can be proposed based on both elements of the mixed study [9].

DESIGN

Mixed methods research designs are described below.

SAMPLING

The sampling process is more complex in developing a mixed methods study since a sample must be chosen for each component [2]. The strategies used must respect the sampling objectives of each approach. Representativeness is very important for a sample in the quantitative approach because it allows extrapolation of the observed results to the population from which the sample is drawn [11]. On the other hand, for the qualitative component, the fundamental interest is understanding social phenomena and processes in all their complexity, so the "sample" is intentionally selected for its possibilities of offering greater detail and depth of information on the subject of interest [12].

DATA COLLECTION

The specific data to be collected, both quantitative and qualitative, must be decided in order to choose the most relevant strategy to be used for each component. The type of data collected and the methods or instruments used must be specified [2]. Quantitative and qualitative data can be collected either simultaneously or sequentially. Sometimes, data are combined and transformed to generate new variables and/or themes, which can be tested or explored later in the same study or future research [2].

DATA ANALYSIS

Selecting the adequate type of analysis and models is related to the problem statement, the type of design, and the strategies chosen for data collection. One may work on the original data or may be required to transform them [2].

For the analysis, standardized procedures should be followed within each approach, both for the quantitative component (descriptive and inferential statistics) and for the qualitative component (coding and grouping by categories). There may be combined analyses depending on the design to be used [2].

RESULTS AND INFERENCES

Once the results of the quantitative, qualitative, and combined analyses have been obtained, the research team develops inferences, comments, and conclusions [2].

There are three types of inferences: qualitative, quantitative, and mixed, called meta-inferences [2]. Meta-inferences make it possible to integrate the findings, inferences, and conclusions of the quantitative and qualitative methods used in the study and their combination, resulting from the integration of both approaches. Both inferences and meta-inferences should be congruent with the empirical evidence obtained and the theories underpinning the study [2].

REPORTING THE RESULTS

There are no established rules on how the results of mixed-method studies should be reported. However, some authors have generated guidelines that can be reviewed in more specialized texts [2].

MIXED METHODS RESEARCH DESIGNS CLASSIFICATION

Each mixed study involves a unique design to achieve the objectives posed by the research group for a given question [2]. However, general models have been identified to guide the development of a specific design [2]. In general, it is recommended to consider four relevant aspects before choosing the appropriate model [2,13]:

- 1) Priority or weight of approaches: importance that will be given to qualitative and quantitative data to answer the research question [14].
- 2) Sequence of method execution: refers to the order in which both methods will be executed, which can be sequential (where the findings of the first method are used for the next method) or concurrent (simultaneous execution of both methods) [13].
- 3) Level and moment of integrating the data sets: referring to the moment of the research where the quantitative and qualitative data are integrated [15].
- 4) Purpose of data integration in the study: data transformation for analysis is one of the most important purposes in various mixed studies [2]. Data transformation refers to the process of converting qualitative data to quantitative data or vice versa to analyze them as a whole [16], giving rise to conversion designs.

We will now describe and provide examples of general mixed-study design models.

MIXED SEQUENTIAL DESIGNS

In this design, quantitative and qualitative data are collected and analyzed simultaneously. Integration occurs during the interpretation of the results [17].

These works must meet four conditions to be considered authentic concurrent designs [17]:

- 1) Collect quantitative and qualitative data both independently and in parallel.
- 2) The analysis of both data sets should not be constructed based on the other type (cross-analysis).
- 3) The results of both analyses should be consolidated in the interpretation phase once both data sets have been collected and analyzed separately.
- 4) Meta-inferences integrating the findings of both methods should be established after collecting and interpreting data from both components.

An example of this design is the study by Affini et al. [18], published in 2022, whose objective was to understand the existing practices and attitudes of medical staff regarding inpatient sleep. To achieve this, during the quantitative phase of the study, a survey was sent to the chief medical officers of different hospitals to collect information on existing sleep support practices. During the qualitative phase, structured interviews were conducted with hospital administrators and clinicians to explore sleep support practices further.

MIXED SEQUENTIAL DESIGNS

In these designs, the components are carried out one after the other. Data from one approach (quantitative or qualitative) are collected and analyzed first, the results of which are used for the next component (qualitative or quantitative). The results of both stages or components are integrated during the consecutive stages: interpretation and report writing [15].

These designs are divided into two types:

- 1) Exploratory sequential: beginning with a qualitative phase to explore a phenomenon in depth. The information obtained is then used for developing a quantitative phase, which estimates the results' applicability to a broader population [19].
- 2) Explanatory sequential: quantitative data are first collected and analyzed. Based on these, qualitative data collection and analysis are organized to obtain a deeper understanding of a phenomenon [20].

An example of a mixed sequential explanatory design is the study conducted by Sánchez Peña et al. [21], aimed at determining the factors and circumstances that influence the degree of adherence to antiretroviral treatment in a group of women living with human immunodeficiency virus. For this, they conducted a first quantitative phase using standardized surveys, a review of medical records, and the registry of hospital pharmacy units. Then, for the qualitative phase, semi-structured interviews were conducted with the participants who picked up their medication at the pharmacy. In this way, the qualitative data helped explain and complement the quantitative results.

MIXED CONVERSION DESIGNS

This type of design aims to transform data for analysis, i.e., it implies the possibility of converting qualitative data into quantitative data and vice versa [22].

An example of this type of design is the study conducted by Adolfsson et al. [23], who studied the perceptions and implementation of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) in a group of professionals. To achieve its objective, qualitative statements were collected, from which themes emerged that were subsequently classified into clusters and statistically analyzed from a quantitative perspective.

MIXED MULTIPLE-INTEGRATION DESIGNS

In this type of design, both approaches are incorporated throughout the research process, representing the highest degree of combination between the two approaches. It requires great dynamism, open-mindedness, and an in-depth mastery of both methods to be able to balance deductive and inductive thinking. Generally, the results are reported at the end of the study, although partial reports can be made during the research process [2].

An example of this type of design is the work by Lim et al. [24], whose aim was to understand how motivational interviewing could be effectively integrated and maintained in daily clinical practice, identifying the factors that promote its successful adoption and the barriers that hinder its implementation and sustainability. To achieve this, they simultaneously collected and analyzed quantitative and qualitative data and iterated between the two approaches throughout the study. In the quantitative component, data were collected through questionnaires and standardized scales. In the qualitative component, in-depth interviews and focus groups were conducted. As data were collected and analyzed, iterations were made between the two approaches to enrich the overall understanding of the phenomenon. Quantitative and qualitative findings were also combined in the final stage of interpretation.

MIXED TRANSFORMATIVE DESIGNS

This type of design is based on a broad theoretical perspective that guides the research (such as feminism, participatory action, or others). This theory is more relevant in guiding the study than the method itself and determines the direction the researcher should follow to explore the issue. The approach may give equal or greater importance to one of the phases, either qualitative or quantitative. This study design is often used to collect information from marginalized or underrepresented groups [2]. Here, the ideological perspective underlying the study is central, guiding the entire process, and should be clearly stated in all reporting.

An example of transformative concurrent design is the study conducted by Caudillo-Ortega et al. [25], whose objective was

to determine the factors related to contraceptive behavior in Mexican women, understanding that the imbalance of power can intervene in sexuality, reproduction, and contraceptive use. For the development of the research, they were guided by the theory of the health promotion model. During the quantitative phase, self-developed instruments were used; interviews were conducted with the participants during the qualitative phase. Quantitative and qualitative data were evaluated separately during the analysis, ending with meta-conferences to reach conclusions.

CONCLUSIONS

Even though various definitions and descriptions of mixed methods designs have emerged, they all share common aspects that result from combining qualitative and quantitative approaches at different points in the research process. Because of their advantage in addressing more complex and in-depth research problems, their use has grown enormously among the health sciences, especially for public health and healthcare services research.

Within the methodological series, this article sought to synthesize the characteristics of designs that use mixed methods in the different stages of a research process and the features and uses of specific strategies within this field. Several examples have been described to facilitate the understanding of some of their characteristics and benefits.

The emergence of mixed methods has made it possible to overcome much of the historical confrontation between qualitative and quantitative approaches. This generates a much more comprehensive and complete approach to specific problems in the field of health sciences. This area requires solutions to high-complexity problems that arise at different levels (biological, psychological, community, social, environmental, global, etc.), where integration is essential to obtain more effective and efficient responses.

Notes

Contributor roles

FPP: content and data curation, visualization, writing (original draft). MCI: content and data curation, visualization, writing (original draft). SVP: content and data curation, visualization, writing (original draft). RA: conceptualization, content and data curation, supervision, visualization, writing (review and editing).

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The authors are available to provide data upon request.

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Aspectos generales del uso de métodos mixtos para investigación en salud

Resumen

Tradicionalmente la investigación se ha dividido según su metodología en cuantitativa y cualitativa. La metodología mixta de investigación, que combina ambos métodos, se ha consolidado como una tercera vía, permitiendo abordar de forma integral problemas de investigación de alta complejidad. Aunque existen diversas definiciones sobre la investigación con métodos mixtos, todas ellas comparten aspectos como la recolección y análisis de datos tanto cuantitativos como cualitativos, y la interpretación integrada de los resultados dentro de una misma investigación. Este tipo de investigación es una herramienta importante para abordar la complejidad propia del campo de la salud, permitiendo comprender e integrar los datos cuantitativos con aspectos vivenciales y experienciales. Con ello se logra una perspectiva amplia y profunda de los problemas de salud, dando respuesta a las políticas y servicios sanitarios. Durante el desarrollo de una investigación con métodos mixtos, existen etapas clave donde ambos enfoques pueden integrarse dependiendo de los objetivos planteados por los equipos de investigación. Aunque los estudios con métodos mixtos pueden ser muy diferentes, se han identificado modelos generales que guían el desarrollo de un diseño específico a utilizar. Estos modelos se clasifican según la prioridad de cada enfoque, la secuencia en la que se ejecutará cada enfoque, el nivel y momento de integración de los datos y el propósito de esta integración para el estudio en particular.



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