

The Nature and Design of Mixed Methods Research

This section discusses key information about mixed methods research:

- ❖ **What is Mixed Methods Research?**
- ❖ **When Should Mixed Methods be Used?**
- ❖ **How Should a Mixed Methods Study be Designed?**
- ❖ **What are the Methodological Challenges in Conducting Mixed Methods Investigations?**

What is Mixed Methods Research?

- ❖ **A definition:** Many definitions of mixed methods are available in the literature (e.g., see Johnson, Onwuegbuzie, & Turner, 2007). For purposes of this discussion, mixed methods research will be defined as a research approach or methodology:
 - focusing on research questions that call for real-life contextual understandings, multi-level perspectives, and cultural influences;
 - employing rigorous quantitative research assessing magnitude and frequency of constructs and rigorous qualitative research exploring the meaning and understanding of constructs;
 - utilizing multiple methods (e.g., intervention trials and in-depth interviews);
 - intentionally integrating or combining these methods to draw on the strengths of each; and
 - framing the investigation within philosophical and theoretical positions.
- ❖ **Philosophy in mixed methods research:** Mixed methods researchers use and often make explicit diverse philosophical positions. These positions often are referred to as dialectal stances that bridge postpositivist and social constructivist worldviews, pragmatic perspectives, and transformative perspectives (Greene, 2007). For example, researchers who hold different philosophical positions may find mixed methods research to be challenging because of the tensions created by their different beliefs (Greene, 2007). However, mixed methods research also represents an opportunity to transform these tensions into new knowledge through a dialectical discovery. A pragmatic perspective draws on employing “what works,” using diverse approaches, giving primacy to the importance of the research problem and question, and valuing both objective and subjective knowledge (see Morgan, 2007). A transformative perspective suggests an orienting framework for a mixed methods study based on creating a more just and democratic society that permeates the entire research process, from the problem to the conclusions, and the use of results (Mertens, 2009).
- ❖ **Theories and mixed methods research:** Optimally, all studies draw upon one or more theoretical frameworks from the social, behavioral, or biological sciences to inform all phases of the study. Mixed methods studies provide opportunities for the integration of a variety of theoretical perspectives (e.g., ecological theories, complexity theory, stress theory, critical theories, or others).
- ❖ **The nature of qualitative research and its evidence:** A salient strength of qualitative research is its focus on the contexts and meaning of human lives and experiences for the purpose of inductive or theory-development driven research. It is a systematic and rigorous form of inquiry that uses methods of data collection such as in-depth interviews, ethnographic observation, and review of documents. Qualitative data help researchers understand processes, especially those that emerge over time, provide detailed information about setting or context, and emphasize the voices of participants through quotes. Qualitative methods facilitate the collection of data when measures do not exist and provide a depth of understanding of concepts. Typical qualitative approaches used in health research are case studies, grounded theory, ethnography, and phenomenology.
- ❖ **The nature of quantitative research and its evidence:** Quantitative research is a mode of inquiry used often for deductive research, when the goal is to test theories or hypotheses, gather descriptive information, or examine relationships among variables. These variables are measured and yield numeric data that can be analyzed statistically. Quantitative data have the potential to provide measurable evidence, to help to establish (probable) cause and effect,



to yield efficient data collection procedures, to create the possibility of replication and generalization to a population, to facilitate the comparison of groups, and to provide insight into a breadth of experiences. Typical quantitative approaches used in the health sciences are descriptive surveys, observational studies, case-control studies, randomized controlled trials, and time-series designs.

- ❖ **The combination of quantitative and qualitative data:** Mixed methods research begins with the assumption that investigators, in understanding the social and health worlds, gather evidence based on the nature of the question and theoretical orientation. Social inquiry is targeted toward various sources and many levels that influence a given problem (e.g., policies, organizations, family, individual). Quantitative (mainly deductive) methods are ideal for measuring pervasiveness of “known” phenomena and central patterns of association, including inferences of causality. Qualitative (mainly inductive) methods allow for identification of previously unknown processes, explanations of why and how phenomena occur, and the range of their effects (Pasick et al., 2009). Mixed methods research, then, is more than simply collecting qualitative data from interviews, or collecting multiple forms of qualitative evidence (e.g., observations and interviews) or multiple types of quantitative evidence (e.g., surveys and diagnostic tests). It involves the intentional collection of *both* quantitative and qualitative data and the combination of the strengths of each to answer research questions.
- ❖ **The integration of multiple forms of data:** In mixed methods studies, investigators intentionally integrate or combine quantitative and qualitative data rather than keeping them separate. The basic concept is that integration of quantitative and qualitative data maximizes the strengths and minimizes the weaknesses of each type of data. This idea of integration separates current views of mixed methods from older perspectives in which investigators collected both forms of data, but kept them separate or casually combined them rather than using systematic integrative procedures. One of the most difficult challenges is how to integrate different forms of data. Three approaches have been discussed in the literature (Creswell & Plano Clark, 2011): merging data, connecting data, and embedding data.
 - **Merging data.** This integration consists of combining the qualitative data in the form of texts or images with the quantitative data in the form of numeric information. This integration can be achieved by reporting results together in a discussion section of a study, such as reporting first the quantitative statistical results followed by qualitative quotes or themes that support or refute the quantitative results. It also can be achieved by transforming one dataset (e.g., counting the occurrence of themes in a qualitative dataset) so that the transformed qualitative results can be compared with the quantitative dataset (Sandelowski, Voils, & Knaf, 2009). This integration also can occur through the use of tables or figures that display both the quantitative and the qualitative results (i.e., data displays).
 - Wittink, Barg, and Gallo (2006) studied the concordance and discordance between physicians and patients about depression status. The parent study for this research was the Spectrum Study (2001-2004), supported by grants from the NIMH (MH62210-01, MH62210-01S1, MH67077). Data were collected from patients aged 65 and older. Quantitative data consisted of ratings of depression from physicians as well as self-reported patient ratings of depression and anxiety. Qualitative data consisted of semi-structured interviews with patients. On the rating scales, the standard measures did not differentiate patients whose physicians rated them as depressed from those whose physicians did not rate them as depressed. Qualitative themes, however, identified a typology of differing emotions and feelings by patients toward physicians. Differences among the qualitative categories in terms of demographics and quantitative ratings were examined in a table.
 - **Connecting data.** This integration involves analyzing one dataset (e.g., a quantitative survey), and then using the information to inform the subsequent data collection (e.g., interview questions, identification of participants to interview). In this way the integration occurs by connecting the analysis of results from the initial phase with the data collection from the second phase of research.
 - Dawson et al. (2002-2009) studied non-abusing drinkers diagnosed with hepatitis C in a NIAAA R01 project funded in 2002-2007 and reported by Stoller et al. (2009). An initial qualitative component based on interviews and Internet postings described new decision factors related to curtailing the consumption of alcohol. These findings were used to develop new items for a quantitative instrument, which was administered in the second phase to assess the prevalence of the new factors and their association with current drinking.



- **Embedding data.** In this form of integration, a dataset of secondary priority is embedded within a larger, primary design. An example is the collection of supplemental qualitative data about how participants are experiencing an intervention during an experimental trial. Alternatively, a qualitative data collection may precede an experimental trial to inform development of procedures or follow an experimental trial to help explain the results of the trial.
 - Miaskowski et al. (2006-2012) compared two doses (high and low) of a nurse-led psycho-educational intervention to assist oncology outpatients to effectively manage their pain in an R01 project funded by NCI and NINR. They implemented an RCT study to compare the two treatments in terms of various repeated measure patient outcomes, including pain levels. Embedded within the RCT study, they also gathered qualitative data in the form of audiotapes of the intervention sessions, along with nurse and patient notes, to describe the issues, strategies, and interactions experienced during the intervention. The results provide evaluation of both the outcomes and process of the intervention.

When Should Mixed Methods Be Used?

- ❖ **Research problems suitable for mixed methods:** The research methods in an investigation must fit the research problem or question. Problems most suitable for mixed methods are those in which the quantitative approach or the qualitative approach, by itself, is inadequate to develop multiple perspectives and a complete understanding about a research problem or question. For example, quantitative outcome measures may be comprehensible using qualitative data. Alternatively, qualitative exploration may usefully occur prior to development of an adequate instrument for measurement. By including qualitative research in mixed methods, health science investigators can study new questions and initiatives, complex phenomena, hard-to-measure constructs, and interactions in specific, everyday settings, in addition to experimental settings.
- ❖ **Typical reasons for using mixed methods:** There are several reasons for using mixed methods in health science research. Researchers may seek to view problems from multiple perspectives to enhance and enrich the meaning of a singular perspective. They also may want to contextualize information, to take a macro picture of a system (e.g., a hospital) and add in information about individuals (e.g., working at different levels in the hospital). Other reasons include to merge quantitative and qualitative data to develop a more complete understanding of a problem; to develop a complementary picture; to compare, validate, or triangulate results; to provide illustrations of context for trends; or to examine processes/experiences along with outcomes (Plano Clark, 2010). Another reason is to have one database build on another. When a quantitative phase follows a qualitative phase, the intent of the investigator may be to develop a survey instrument, an intervention, or a program informed by qualitative findings. When the quantitative phase is followed by the qualitative phase, the intent may be to help determine the best participants with which to follow up or to explain the mechanism behind the quantitative results (Plano Clark, 2010). These are a few of the reasons that might be cited for undertaking mixed methods research; a more expansive list is available in Bryman's (2006) study of investigators' reasons for integration.

How Should a Mixed Methods Study be Designed?

- ❖ **Consider several general steps in designing a mixed methods study:** There is no rigid formula for designing a mixed methods study, but the following general steps should provide some guidance, especially for an investigator new to mixed methods.
 - Preliminary considerations:
 - Consider your philosophy and theory
 - Consider if you have resources (e.g., time, financial resources, skills)
 - Consider the research problem and your reasons for using mixed methods
 - State study aims and research questions that call for qualitative, quantitative, and mixed methods, and that incorporate your reasons for conducting a mixed methods study.
 - Determine your methods of quantitative and qualitative data collection and analysis (when it will be collected, what emphasis will be given to each, and how they will be integrated or mixed).



- Select a mixed methods design that helps address your research questions and the data collection/analysis/integration procedures.
 - Collect and analyze the data.
 - Interpret how the combined quantitative and qualitative approaches contribute to addressing the research problem and questions.
 - Write the final report making explicit the contribution of the mixed methods approach.
- ❖ **Consider several basic considerations within these steps:**
- **Theoretical and conceptual orientation:** The choice of a mixed methods design should be informed by a theoretical and conceptual orientation that supports the overarching science and needs of the study. In some cases, there may be one or more frameworks informing the study. For example, the orientation might be a transformational model in which the intent is to assist the community and to bring about change. Complexity theory may be used in primary care projects seeking to change clinical practice.
 - **Fixed and emergent mixed methods designs:** Mixed methods studies may be either fixed or emergent. In a fixed design, the methods are predetermined at the start of the research process. In this design the investigators have a specific intent to mix qualitative and quantitative approaches at the start of the study. In an emergent (or cyclical) design, the methods emerge during the process of the research rather than being predetermined at the outset of the study. For example, a community-based design might include results about the needs of communities that subsequently inform the design of further phases of the project.
- ❖ **Recognize that mixed methods designs differ in several important ways:**
- **Analytic logic.** Discussions about the types of mixed methods designs available to the NIH investigator still are emerging and being debated in the literature with several typologies available (see Creswell & Plano Clark, 2011, for an overview of available typologies). However, the design possibilities follow the reasons for mixed methods, and they can be differentiated analytically in terms of whether the quantitative and qualitative datasets are merged into one analysis or interpretation to address the research questions, or whether one dataset builds on the results of an initial dataset.
 - **Timing.** The qualitative and quantitative data may be timed so that they are collected concurrently or roughly at the same time. This concurrent data collection is attractive to a health investigator who must maximize the amount of data collected in the field for the time spent. Alternatively, an investigator may collect the data in a sequence with one phase of collection followed by another. This approach is useful for single investigators who have ample time to stretch data collection over a lengthened period, and when the investigator needs results from an initial phase to inform a subsequent phase.
 - **Priority.** In some mixed methods studies, the quantitative and qualitative research is equally emphasized. In other studies, priority is given to either the quantitative or the qualitative research. An unequal priority occurs when the investigator embeds a secondary dataset within a larger, primary design or reports unequal quantitative or qualitative components in the study.
 - **Point of interface.** The “point of interface” (Morse & Niehaus, 2009), or the point where mixing occurs, differs depending on the mixed methods design. This “point” may occur during data collection (e.g., when both quantitative items and qualitative open-ended questions are collected on the same survey), during data analysis (e.g., when qualitative data are converted or transformed into quantitative scores or constructs to be compared with a quantitative dataset), and/or during data interpretation (e.g., when results of quantitative analyses are compared with themes that emerge from the qualitative data).
 - **Single study or multiphase program of inquiry.** Some mixed methods projects employ a design that is a “stand-alone” design, a single study conducted by an investigator or a team of investigators. Other mixed methods projects (i.e., those typically advanced in large NIH applications) consist of multiple studies, some quantitative and some qualitative, that build on each other and contribute to an overall program objective or purpose.



- ❖ **Consider examples of specific designs:** The following possibilities for design are not meant to be exhaustive and are intended to be illustrative of several possible approaches that have been used in health science research (see Creswell & Plano Clark, 2011; Morse & Niehaus, 2009). More complex designs are commonplace and are driven by the specific questions and aims in the particular investigations.
 - **Convergent (or parallel or concurrent) designs:** When the intent is to merge concurrent quantitative and qualitative data to address study aims, the investigator combines both quantitative and qualitative research. This design is known as a convergent design. For example, an investigator might collect both quantitative correlational data as well as qualitative individual or group interview data and combine the two to best understand participants' experiences with a health promotion plan. The data analysis consists of merging data and comparing the two sets of data and results.
 - **Sequential (or explanatory sequential or exploratory sequential) designs:** Another design possibility is to have one dataset build on the results from the other. These are known as sequential designs, and they may begin by a qualitative exploration followed by a quantitative follow up or by a quantitative analysis explained through a qualitative follow up. A popular approach in the health sciences is the latter in which qualitative data help to explain in more depth the mechanisms underlying the quantitative results. The quantitative results from a quality-of-life scale may be explained by collecting qualitative follow-up data to better understand the responses on the scale. Another popular approach is to first explore with qualitative data collection followed by using the resulting qualitative findings to design a quantitative instrument, and then to administer the instrument to a sample from a population. For example, the use of group interview data themes to design a questionnaire about the risks involved in a treatment for diabetes might be followed by an administration of the instrument to a large sample to determine whether the scales can be generalized.
 - **Embedded (or nested) designs:** A popular design in the health sciences is to use quantitative and qualitative approaches in tandem and to embed one in the other to provide new insights or more refined thinking. These designs are called embedded or nested designs. They may be a variation of a convergent or sequential design. A prototype would be to conduct an intervention study and to embed qualitative data within the intervention procedures to understand how experimental participants experience the treatment. Qualitative data may be used prior to the intervention to inform strategies to best recruit individuals or to develop the intervention, during the experiment to examine the process being experienced by participants, or after the experiment to follow up and better understand the quantitative outcomes. For example, an experimental study of outcomes from an alcohol prevention program might be followed by individual interviews with participants from the experimental group to help determine why the program worked.
 - **Multiphase designs:** A multiphase design emerges from multiple projects conducted over time linked together by a common purpose. These are called multiphase projects, and they are used frequently in the health sciences. They commonly involve convergent and sequential elements. For example, the overall purpose might be to develop, test, implement, and evaluate a health prevention program for adolescents. This type of design calls for multiple projects – one quantitative, one qualitative, one mixed and so forth – conducted over time with links in place so that one phase builds on another with the common overall objective of designing and testing a health prevention program.

What are the Methodological Challenges in Conducting Mixed Methods Investigations?

- ❖ **Methodological issues:** In mixed methods research, methodological issues arise that need to be anticipated. These methodological issues have been detailed in several books (see Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009).
 - **Resources.** Because multiple forms of data are being collected and analyzed, mixed methods research requires extensive time and resources to carry out the multiple steps involved in mixed methods research, including the time required for data collection and analysis. [See section on Building Infrastructure and Resources.]
 - **Teamwork.** In multidisciplinary, interdisciplinary, and transdisciplinary teamwork, different approaches might emerge to an investigation as well as different writing styles. Team leaders need to anticipate the challenges and benefits of a team approach to mixed methods research [See section on Forming the Mixed Methods Research Team.]



- **Page and word limitations.** Despite current NIH page limitations, investigators still need to justify their procedures in a high-quality mixed methods study. Organizing information into a table or presenting a figure of the mixed methods procedures can aid in conserving space. Page and word limitations also affect publication of mixed methods studies in scholarly journals in which word limitations call for creative ways to present material (see Stange, Crabtree, & Miller, 2006). [See section on Developing an R Series Plan.]
- **Sampling issues.** Detailed discussions about the sampling issues involved in mixed methods research and in specific designs is beyond the scope of this document. Adequate discussions are available elsewhere (Creswell & Plano Clark, 2011; Teddlie & Yu, 2007). However, some challenges specific to concurrent designs (i.e., merging quantitative and qualitative research) include having adequate sample sizes for analyses, using comparable samples, and employing a consistent unit of analysis across the databases. For sequential designs (i.e., one phase of qualitative research builds on the quantitative phase or vice versa), the issues relate to deciding what results from the first phase to use in the follow-up phase, choosing samples and estimating reasonable sample sizes for both phases, and interpreting results from both phases.
- **Analytic and interpretive issues.** Issues arise during data analysis and interpretation when using specific designs. When the investigator merges the data during a concurrent design, the findings may conflict or be contradictory. A strategy of resolving differences needs to be considered, such as gathering more data or revisiting the databases. For designs involving a sequential design with one phase following the other, the key issues surround the “point of interface” in which the investigator needs to decide what results from the first phase will be the focus of attention for the follow-up data collection. Making an interpretation based on integrated results may be challenging because of the unequal emphasis placed on each dataset by the investigator or team, the accuracy or validity of each dataset, and whether philosophies related to quantitative or qualitative research can or should be combined.

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