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Advanced Sampling Designs in Mixed Research: Current Practices and Emerging Trends in the Social and Behavioral Sciences

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Advanced Sampling Designs in Mixed Research: Current Practices and Emerging Trends in the Social and Behavioral Sciences

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Objectives

Upon finishing this chapter, you should be able to

- define a sampling design;
- describe various probabilistic and purposive sampling schemes;
- discuss sample size recommendations appropriate for quantitative, qualitative, and mixed research designs;
- compare and contrast various forms of generalizations in terms of impacting sampling decisions;
- define and explain the sampling terms applicable to formulating sampling decisions in a mixed research inquiry;
- define and explain the existing sampling typologies for mixed research design;
- compare and contrast the characteristics of existing mixed research sampling typologies;
- discuss the five criteria comprising the integrative sampling typology;
- describe the seven steps of the mixed sampling process and understand the sampling issues associated with those steps;
- explain the role of interpretive consistency in formulating sampling decisions in a mixed research inquiry;
- explain the strategy of representativeness/saturation tradeoff in formulating sampling decisions in a mixed research inquiry;
- define and explain the four crises impacting sampling decisions in a mixed research inquiry; and
- understand the sampling issues related to the four crises impacting sampling decisions.

The process of selecting a sampling design for quantitative and qualitative studies requires two distinct yet interrelated decisions: decide on the strategy to select the participants (i.e., sampling scheme) and decide on the number of participants (i.e., sample size). The process of selecting a sampling design elevates in complexity when conducting mixed research that involves the concurrent or sequential combination of quantitative and qualitative approaches within one study or a program of research. In a mixed research context, the investigator must decide on a sampling design for the quantitative and qualitative phases of the study, and these decisions affect the quality of the researchers' meta-inferences and the degree to which the findings can generalize or transfer to other individuals, groups, and contexts.

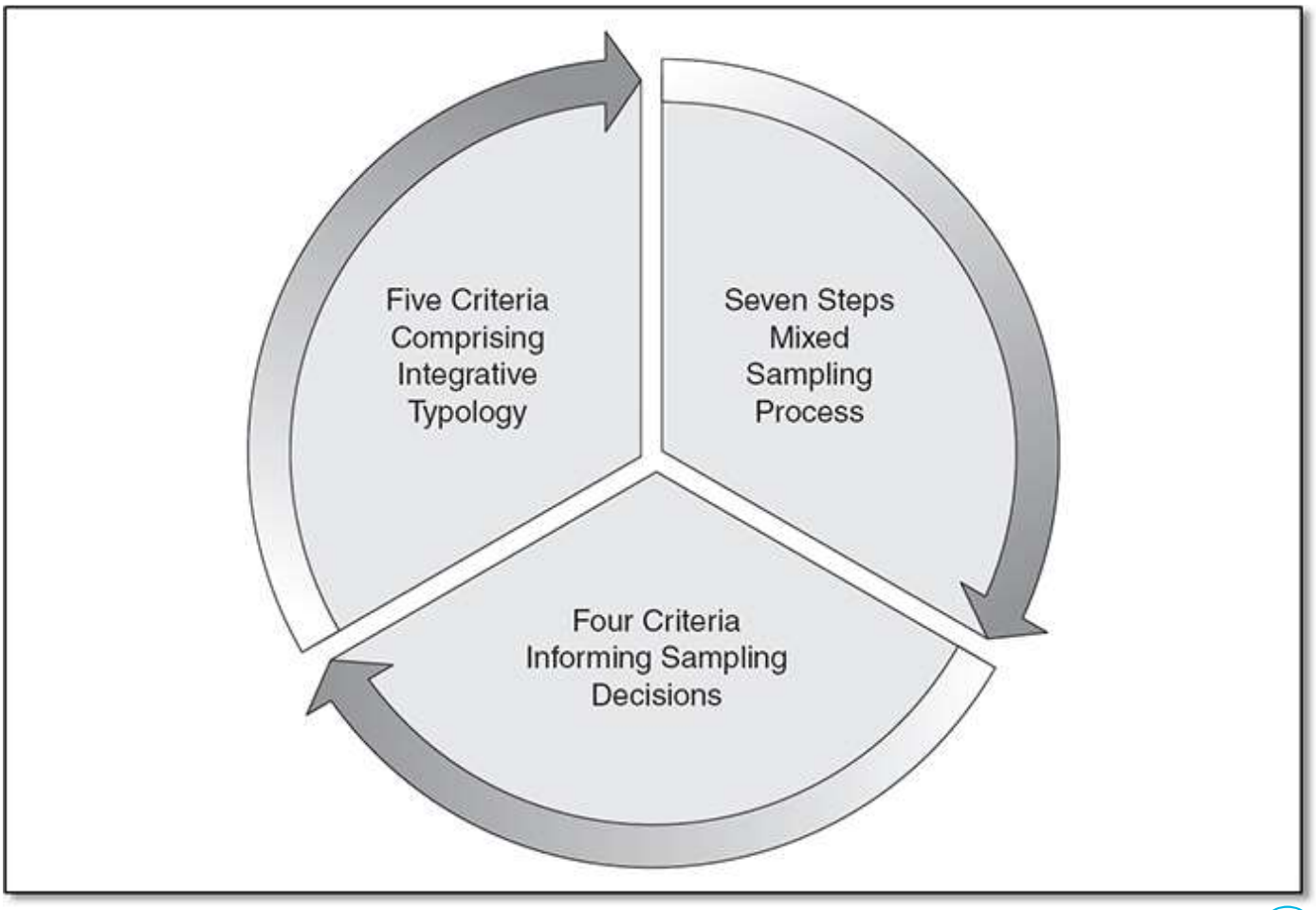
To facilitate their selections of appropriate sampling schemes and sample sizes for the quantitative and qualitative phases, researchers who conduct mixed research, termed *mixed researchers* in this chapter, can access various sampling typologies, frameworks, and guidelines (e.g., Guest, Bunce, & Johnson, 2006; Onwuegbuzie & Collins, 2007; Onwuegbuzie & Leech, 2007a, 2007b; Sandelowski, 1995; Teddlie & Yu, 2007). A typology, which has been defined as the systemic classification of types, can provide novice and experienced mixed researchers alike specific recommendations to structure a study along with a professional language to facilitate communicating to consumers of research the processes, findings, and conclusions of a particular study (Collins & O'Cathain, 2009; Teddlie & Tashakkori, 2009). In addition, mixed researchers can compare and contrast various typologies, thereby leading to a broader understanding of the mixed research process (Teddlie & Tashakkori, 2009). However, typologies are criticized because they might describe only minimally the information deemed useful by the researcher, provide information that is overly complex or inconsistent, and be viewed inappropriately as a panacea for directing all of the researcher's efforts toward conducting mixed research (Collins & O'Cathain, 2009; Leech & Onwuegbuzie, 2009). Because a typology is not exhaustive, its parameters might artificially constrain mixed researchers' choices, given the wide range of mixed research designs implemented across the social and behavioral sciences (Maxwell & Loomis, 2003; Teddlie & Tashakkori, 2009). These limitations and other limitations (see Maxwell & Loomis, 2003, for an expanded discussion of limitations) have prompted methodologists to recommend that mixed researchers' use of typologies be complemented by using a systemic approach, an interactive model approach, or an integrative framework when planning and implementing mixed research (Hall & Howard, 2008; Maxwell & Loomis, 2003; Teddlie & Tashakkori, 2009). In response to these recommendations, the intent of this chapter is to present an inclusive approach to formulating sampling decisions that is applicable in the context of conducting mixed research, in particular, and monomethod research inquiries, in general.

In the context of sampling, a mixed researcher who is pursuing an inclusive approach to formulating sampling decisions recognizes that sampling decisions do not pertain only to procedures; rather, sampling decisions impact various interrelated steps of the research process. In addition, the mixed researcher's decisions pertaining to sampling design reflect

the best mechanisms to collect data. These determinations regarding sampling decisions are shaped by the researcher's mental model, conceptualized “as a complex, multifaceted lens through which a social inquirer perceives and makes sense of the social world...[and it is the] inquirer's mental models that importantly frame and guide social inquiry” (Greene, 2007, p. 13). Subsequently, in the context of this chapter, a sampling model that embraces an inclusive approach (a) builds on existing sampling typologies to provide a structure and a sampling lexicon, (b) guides the mixed researcher to reflect on the degree to which sampling decisions affect various steps in the mixed research process, and (c) incorporates a framework comprising quality indicators appropriate for assessing sampling decisions when conducting qualitative, quantitative, and mixed research.

The goal of this chapter is to present an inclusive sampling model that comprises three components. Component 1 presents an integrative typology composed of five criteria extracted from existing sampling typologies. Component 2 presents example questions to guide the researcher's reflections about the impact of sampling design at seven steps of the mixed research sampling process. Component 3 presents four criteria designed to address specific mixed-sampling issues pertinent to the implementation of sampling designs across the continuum of simple designs involving a small number of sampling schemes and advanced sampling designs encompassing multiple numbers and types of sampling schemes. These criteria are accompanied by reflective questions to document the extent to which the researcher has met these criteria when formulating a sampling design. Figure 15.1 illustrates the interconnections among the three components of the inclusive sampling model.

Figure 15.1 Interrelationship of the Three Components of the Inclusive Sampling Model



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This chapter is divided into three sections. In the first section, the focus is on presenting topics specific to sampling, namely, identifying a sampling lexicon, describing the sampling process, and presenting common sampling schemes and sample size recommendations. The second section begins with a discussion of mixed sampling typologies. In addition, nine examples of published mixed research studies representing nine fields within the social and behavioral sciences are presented, and the sampling decisions of the researchers are explicated in accordance with the integrative typology's five criteria. These studies were selected to illustrate the various ways researchers are using sampling designs in mixed research. The third section presents the inclusive sampling model accompanied by reflective questions that researchers can use to document the extent to which they have met the inclusive model's criteria for determining advanced sampling designs.

Topics Specific to Sampling

Tools On this page

Sampling is the process of selecting a subset or sample unit from a larger group or population of interest, and its purpose is to address the study's research question (Tashakkori & Teddlie, 2003a). Traditionally, researchers employ probability sampling, nonprobability sampling, or purposive sampling strategies, termed schemes in this chapter, to select the sampling unit (probability sampling) or the case (purposive sampling). The sampling frame (probability sampling) and sampling boundary (purposive sampling) comprise the individuals, groups, contexts, observations, and activities that will provide the data source, either quantitative or qualitative, for a monomethod study or the data source for the phases (quantitative and qualitative) of a mixed research study. A sampling design is a framework that encompasses the sampling schemes (number of schemes × type of scheme) and the sample size for a single phase as in monomethod research or for two phases as in a mixed research study (Onwuegbuzie & Collins, 2007; Onwuegbuzie & Leech, 2007b).

Although choice of sampling schemes tends to be associated with a specific research design (e.g., purposive sampling is associated with qualitative design, and random sampling is associated with quantitative design), these associations tend not to be reflective of empirical practices (Bernard, 1995; Guest et al., 2006). For instance, Chiznik and Chiznik (2002) conducted a mixed research study to examine undergraduates' conceptions of the terms *privilege* and *oppression.* These investigators used a sample consisting of undergraduates enrolled in 10 randomly selected sections of a multicultural education course. The qualitative component consisted of the randomly selected sample's responses to an open-ended section of a questionnaire. More recently, Lopez and Tashakkori (2006) assessed the effect of two bilingual education programs on the attitudes and levels of academic achievement of fifth-grade students by selecting a random sample of interviewees for the qualitative phase of a mixed research study. The options of using purposive and random sampling singularly or as combined techniques in either or both the quantitative and qualitative phases expand the number of sampling schemes available to mixed researchers, thereby enhancing the diversity of mixed research designs.

Types of Sampling Schemes

A researcher uses probability sampling schemes to select randomly the sampling units that are representative of the population of interest. Before the study commences, the researcher establishes a sampling frame and predetermines the number of sampling units, preferably based on a mathematical formula, such as a power analysis, and selects the units by using simple random sampling or other adaptations of simple random sampling, specifically, stratified, systematic, cluster, and two-stage or multi-stage random sampling (Johnson & Christensen, 2008). These methods meet the goals of ensuring that every member of the population of interest has an equal chance of selection and minimizing false positives in the statistical relationships among variables (Luborsky & Rubenstein, 1995). Typically, the type of data collected is numeric, the analyses conducted are variable oriented, and the techniques executed are statistical techniques (Ragin, 1987); however, when conducting mixed research, the numeric data can be transformed, thereby providing narrative data that can be analyzed using case-oriented, qualitative techniques. When implementing probabilistic sampling designs, the researcher's objective is to make external statistical generalizations (i.e., generalizing conclusions to the population from which the sample was drawn).

Using the sampling frameworks compiled by Patton (1990) and Miles and Huberman (1994) as a base, more recently, Onwuegbuzie and Leech (2007a) identified 24 sampling schemes that can be used by qualitative, quantitative, and mixed researchers. Table 15.1 presents a description of five probabilistic sampling schemes and also provides descriptions of 19 purposive schemes.

Table 15.1 Major Sampling Schemes in Mixed Research

Sampling Scheme	*Description*
Simple	Every individual in the sampling frame (i.e., desired population) has an ec independent chance of being chosen for the study.
Stratified	Sampling frame is divided into subsections: groups that are relatively hor respect to one or more characteristics and a random sample from each s
Cluster	Selecting intact groups representing clusters of individuals rather than ch individuals one at a time.
	Choosing individuals from a list by selecting every kth sampling frame m

Multistage random	Choosing a sample from the random sampling schemes in multiple stage
Maximum variation	Choosing settings, groups, and/or individuals to maximize the range of p investigated in the study.
Homogeneous	Choosing settings, groups, and/or individuals based on similar or specific

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When using a purposive sample, the goal is to add to or to generate new theories by obtaining new insights or fresh perspectives about the phenomenon of interest (Miles & Huberman, 1994). Purposive sampling schemes are employed by the researcher to choose strategically elite cases or key informants based on the researcher's perception that the selected cases will yield a depth of information or a unique perspective relative to the phenomenon of interest (Maxwell, 1997; Miles & Huberman, 1994; Sandelowski, 1995). This process tends to be nonrandom; however, to minimize key informant bias, a researcher can select randomly the key informants (Maxwell, 1996). Specifically, the researcher could use one of four probability schemes (simple random sampling, stratified random sampling, cluster random sampling, and systematic random sampling) to select the key informants. In some instances, the researcher implements a criterion sampling scheme to reflect a predetermined criterion or criteria to guide sample selection.

Two examples of potential criteria are illustrated by selection of either extreme case or intensity scheme (Patton, 1990; Sandelowski, 2000) (cf. Table 15.1). Alternatively, to make certain that cases representative of specific characteristics (e.g., age, gender, level of variation relative to a phenomenon) are included in the sample, thereby enhancing "informational representativeness" (Sandelowski, 2000, p. 250), the researcher can use a stratified purposeful sampling scheme. In this context, the researcher subdivides a sampling frame into strata to obtain relatively homogeneous groups, selects a purposeful sample

from each stratum, and conducts comparative analyses across cases (Miles & Huberman, 1994; Patton, 2002).

When using purposive sampling schemes, initially, the researcher establishes parameters or boundaries to delimit the specific cases or informant characteristics that will be assessed or observed and to identify what the researcher will examine in terms of environmental artifacts or individual characteristics. The sampling parameters or boundaries are accompanied by a sampling frame encompassing the theory and research question guiding the design along with the conceptual processes that structure the investigation (Miles & Huberman, 1994).

The selected case can refer to an individual, number of interviews, artifacts, observations, events, activities; once chosen, the selected cases are studied comprehensively (Sandelowski, 1995). Typically, when using a within-case sampling technique, cases are viewed individually, and multiple data points per case are accumulated and analyzed. Miles and Huberman (1994) note three characteristics of within-case sampling. First, individuals usually are viewed as nested within a larger context. Second, this selection process is based on a preselected theory or an emerging theory reflective of the study's analyses. Third, this form of sampling has an *"iterative* or 'rolling' quality working in progressive 'waves' as the study progresses" (Miles & Huberman, 1994, p. 29, italics in original).

When using a multiple-case sampling method, the researcher first establishes a detailed sampling frame that is linked to the study's research question and conceptual framework. This framework is employed to guide the examination of a range of convergent and divergent cases. These various cases are selected conceptually to explicate further the conclusions derived from the single within-case analysis (Miles & Huberman, 1994). As noted by Yin (1991), multiple-case sampling or cross-case sampling leads to replication and adds various analytical levels. Subsequently, using this approach increases the researcher's level of confidence pertaining to interpretation of findings (Miles & Huberman, 1994). In contrast to probability sampling, purposive sampling can occur at the initial stage or at multiple stages within a research study (e.g., multistage cluster sampling designs). Multistage cluster sampling occurs when the identification of the population is complex or the population is

extremely large; subsequently, the researcher selects the sample in two or more stages (Creswell, 2005).

When using purposive sampling, the researcher can formulate internal statistical generalizations, which are derived from analyses of data obtained from a subset of elite informants who are representative of the sample from which they have been selected, and these generalizations are applied to this sample (Onwuegbuzie & Leech, 2007b). Internal statistical generalization is different than internal generalization. Maxwell (1992) defines internal generalization as conclusions derived from the sample as a whole—not based on elite informants—and these generalizations and conclusions derived from the entire sample are applicable only to the sample.

When using purposive sampling, other forms of generalization also are applicable, namely, analytic, case-to-case transfer, and naturalistic generalizations. When developing analytic generalizations, the researcher formulates multiple sampling decisions based on the evidential quality of data collected and draws "analytic conclusions" (Miles & Huberman, 1994, p. 29). According to Curtis, Gesler, Smith, and Washburn (2000), this form of generalization is "applied to wider theory on the basis of how selected cases 'fit' with general constructs" (p. 1002). In particular, "the investigator is striving to generalize a particular set of [case study] results to some broader theory" (Yin, 2009, p. 43).

In the context of multiple case sampling, the researcher formulates generalizations representing a case-to-case transfer supported by a theory (Firestone, 1993; Kennedy, 1979). Naturalistic generalizations are based wholly or in part on the perceptions of research consumers who reflect on their individual experiences and apply these experiences to filter the study's conclusions, thereby drawing their own conclusions pertaining to the degree to which the findings apply to other contexts or settings (Stake, 2005; Stake & Trumbull, 1982; Wehlage, 1981).

To determine the sample size for a purposive sample, the "gold standard" (Guest et al., 2006, p. 60) is saturation. To achieve saturation, a researcher collects and analyzes cases to the point that sampling additional cases does not provide any new information (i.e., informational redundancy) that can be incorporated into the thematic categories (i.e.,

However, determining an appropriate sample size to achieve the goal of saturation can be complex and is mediated by factors such as data quality in terms of amount and degree of complexity, sample heterogeneity, researcher's resources, and the number of individuals analyzing and interpreting the data (Guest et al., 2006; Ryan & Bernard, 2003). Sandelowski (1995) observed that often the reported sample sizes in a qualitative inquiry are too small to achieve informational redundancy and theoretical saturation, thereby reducing the trustworthiness of the findings and the transferability of the study's conclusions. Alternatively, the depth of data collected using a case-oriented approach might be jeopardized if the sample size is too large (Sandelowski, 1995). In addition, the sample's characteristics, in terms of degree of homogeneity versus heterogeneity, also impact the number of data points required to achieve saturation. The larger the degree of sample heterogeneity, the larger the number of cases recommended (Guest et al., 2006; Miles & Huberman, 1994; Sandelowski, 1995).

Guest et al. (2006) conducted a thematic analysis of interview data obtained from 60 in-depth interviews to determine the number of interviews required to reach theoretical saturation. The researchers employed a non-probabilistic sampling scheme to select participants who were at high risk for acquisition of HIV, thereby elevating the likelihood that they would be candidates for HIV prevention programs. To meet the criterion of being at high risk for acquisition of HIV, recruiters selected participants who were employed in some form of sex work. The researchers concluded that data saturation defined as “the point in data collection and analysis when new information produces little or no change to the codebook” (p. 65) occurred within the first 12 interviews. However, the criteria for selection produced a sample that was relatively homogeneous in terms of gender and manner of employment. The researchers noted the sample's homogeneity as a contributing factor to achieving data saturation at 12 interviews.

In addition, the type of purposive sampling scheme chosen by the researcher influences the sample size (Sandelowski, 1995). For example, if the researcher's goal is to assess a range of variability within a sample, both a maximum variation sampling scheme and an extreme case scheme (cf. Table 15.1) would address the goal; however, each scheme would require a different sample size. When using a maximum variation sampling scheme, the researcher

choosing an extreme case sampling scheme would likely lead the researcher to conduct an in-depth within-case analysis involving a small sample (Sandelowski, 1995). Sandelowski (1995) also observed that selecting cases representing a specific level of variation prior to data collection and analysis is shaped by achieving a "representative coverage of the variables likely to be important in understanding how diverse factors configure a whole" (p. 182). In this context, it is likely a researcher would select a criterion sampling strategy that would permit case selection prior to data collection and analysis based on a prespecified criterion (Sandelowski, 1995).

To guide researchers' decisions about sample size, various recommendations have been published. Attaining an adequate sample size is an important condition to be met when formulating sampling decisions because a small sample size reduces statistical power, thereby limiting the number of statistically significant relationships and differences that can be identified. In the qualitative phase, an inadequate sample size limits theoretical saturation, thereby compromising development of theory. In the context of a mixed research design, inadequate sample sizes limit the degree to which appropriate meta-inferences can be drawn from conclusions based on both phases of the study. In addition, in a sequential design (e.g., qualitative followed by quantitative, leading to a dependency between both components), a small qualitative sample limits the types of analyses that can be conducted (e.g., exploratory factor analysis, cluster analysis, correspondence analysis) in the quantitative data analysis phase.

Table 15.2 presents the minimum sample size recommendations pertaining to the most common qualitative and quantitative designs. These recommended sizes are the result of a statistical power analysis undertaken by Onwuegbuzie, Jiao, and Bostick (2004).

Table 15.2 Minimum Sample Size Recommendations for Most Common Designs

Research Design/Method	*Minimum Sample Size Suggestion*
Correlational	64 participants for one-tailed hypotheses; 82 participants for two-tailed hypothe (Onwuegbuzie, Jiao, & Bostick, 2004)
Causal-comparative	51 participants per group for one-tailed hypotheses; 64 participants for two-taile (Onwuegbuzie et al., 2004)

Case study	3–5 participants (Creswell, 2005)
Phenomenological	≤ 10 interviews (Creswell, 1998); ≥ 6 (Morse, 1994)
Grounded theory	15–20 (Creswell, 2005); 20–30 (Creswell & Plano Clark, 2007)
Ethnography	1 cultural group (Creswell, 2005); 30–50 interviews (Morse, 1994)
Ethnological	100–200 units of observation (Morse, 1994); 12 participants for a homogeneous Bunce, & Johnson, 2006)

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This preceding section provided an overview of selective sampling terms, examples of probability and purposive sample schemes, and sample recommendations. In the following section, sampling typologies are discussed, and this discussion is accompanied by a presentation of studies across nine fields representing the social and behavioral sciences to illustrate examples of current practices and emerging trends.

Sampling Typologies in the Literature

When conducting mixed research, the researcher's choices pertaining to sampling techniques involve selecting sampling designs for the quantitative and qualitative components of the study. These selections often require that the mixed researcher use a combination of probability and purposive sampling designs. To facilitate these decisions, the mixed researcher can access mixed sampling typologies. The sampling typologies described below address the unique characteristics of mixed research design and data collection procedures.

Kemper, Stringfield, and Teddlie (2003) developed a theoretical matrix that crosses sampling technique (probability, purposive, and mixed) by the type of data produced (quantitative only, qualitative only, and a combination of both data forms). Each cell of the matrix indicates a level of frequency (e.g., happens often) measuring the degree to which a type of sampling strategy (e.g., probability or purposive) produces a type of data (e.g., quantitative data or qualitative). This typology alerts the mixed researcher to the relationship of the types of data produced and to the range of diversity of data that can be collected by combining probability and purposive sampling schemes within a single study.

Teddlie and Yu (2007) developed a typology that built on the theoretical matrix of Kemper et al. (2003) and delineated five types of mixed sampling techniques applicable to the conduct of mixed research, namely, basic mixed sampling strategies, sequential mixed sampling, concurrent mixed sampling, multilevel mixed sampling, and a combination of mixed sampling strategies (p. 89). A key construct that underpins this typology's structure is the dependent relationship between the selection of a sample per phase and the strand of the research design (Teddlie & Tashakkori, 2006, 2009). Strand, defined by Tashakkori and Teddlie (2003b), is the component of the study that encompasses three stages: conceptualization, experiential, and inferential. Generally, strands are either qualitative or quantitative.

In the typology developed by Teddlie and Yu (2007), concurrent mixed sampling refers to the implementation sequence of the qualitative and quantitative strands of the study. Simultaneous or concurrent implementation occurs when the qualitative and quantitative components are implemented at the same time or within close proximity and are independent in terms of collection and analysis. Integration of data obtained from both samples occurs at the data interpretation stage of the mixed inquiry. Sequential implementation indicates that implementation of one component (e.g., quantitative) follows the other component (e.g., qualitative), and the relationship between the two components is dependent. Dependency occurs when the decisions made within the first phase (e.g., quantitative phase) influenced the decisions made in the subsequent phase (e.g., qualitative phase). Also, influencing this process is the trade-off between meeting the requirement of external generalizations versus meeting the requirement of transferability.

Onwuegbuzie and Collins (2007) conceptualized sampling design as encompassing two dimensions. Dimension 1 uses the base of most mixed research designs, namely the time orientation of the phases (concurrent or sequential) and the emphasis placed by the researcher on each phase (dominant, dominant-less, equal status) (Johnson & Onwuegbuzie, 2004) in terms of selecting samples drawing appropriate inferences and generalizations. Dimension 1, time orientation of the phases, in this typology is analogous to the preceding typology's use of concurrent or sequential implementation of strands. However, Onwuegbuzie and Collins (2007) provide a second dimension; specifically, they identify the relationship between the quantitative and qualitative samples as a pivotal factor influencing the selection of the sampling unit per phase of the study. These relationships can be identical, parallel, nested, or multilevel.

Identical relationship indicates that the same sample participated in the study's quantitative phase and the qualitative phase. Parallel indicates that samples per phase are different but are selected from the same population of interest (e.g., both samples include elementary teachers, and different teachers participate in each component). Nested sample specifies that the sample participating in one phase (e.g., eight teachers selected randomly as key informants) represents a subset of the participants involved in the other phase (e.g., 40 teachers selected purposively). Multilevel samples specify that samples participating in the two phases are extracted from different populations (e.g., teachers, administrators, parents, students) and these selections can reflect various hierarchical levels of interaction with the variable of interest (e.g., student learning). This conceptualization of parallel, sequential, and multilevel differs from Teddlie and Yu (2007), who view the relationship between the strands as the inclusion of various sampling techniques (purposive and probability) within a single mixed research study or program of research, and the samples participating in the two phases are extracted from different populations.

Integrative Typology

A content analysis of the published mixed sampling typologies outlined earlier produced the following five criteria as integral to formulating sampling decisions.

Criterion 1: The sampling unit selected for each phase of the study should reflect the dependent relationship between the samples selected per phase and the time orientation of the phases (concurrent or sequential) (Onwuegbuzie & Collins, 2007; Teddlie & Yu, 2007).

Criterion 2: The sampling unit selected for each phase of the study should reflect the relationship between the quantitative and qualitative samples (Onwuegbuzie & Collins, 2007).

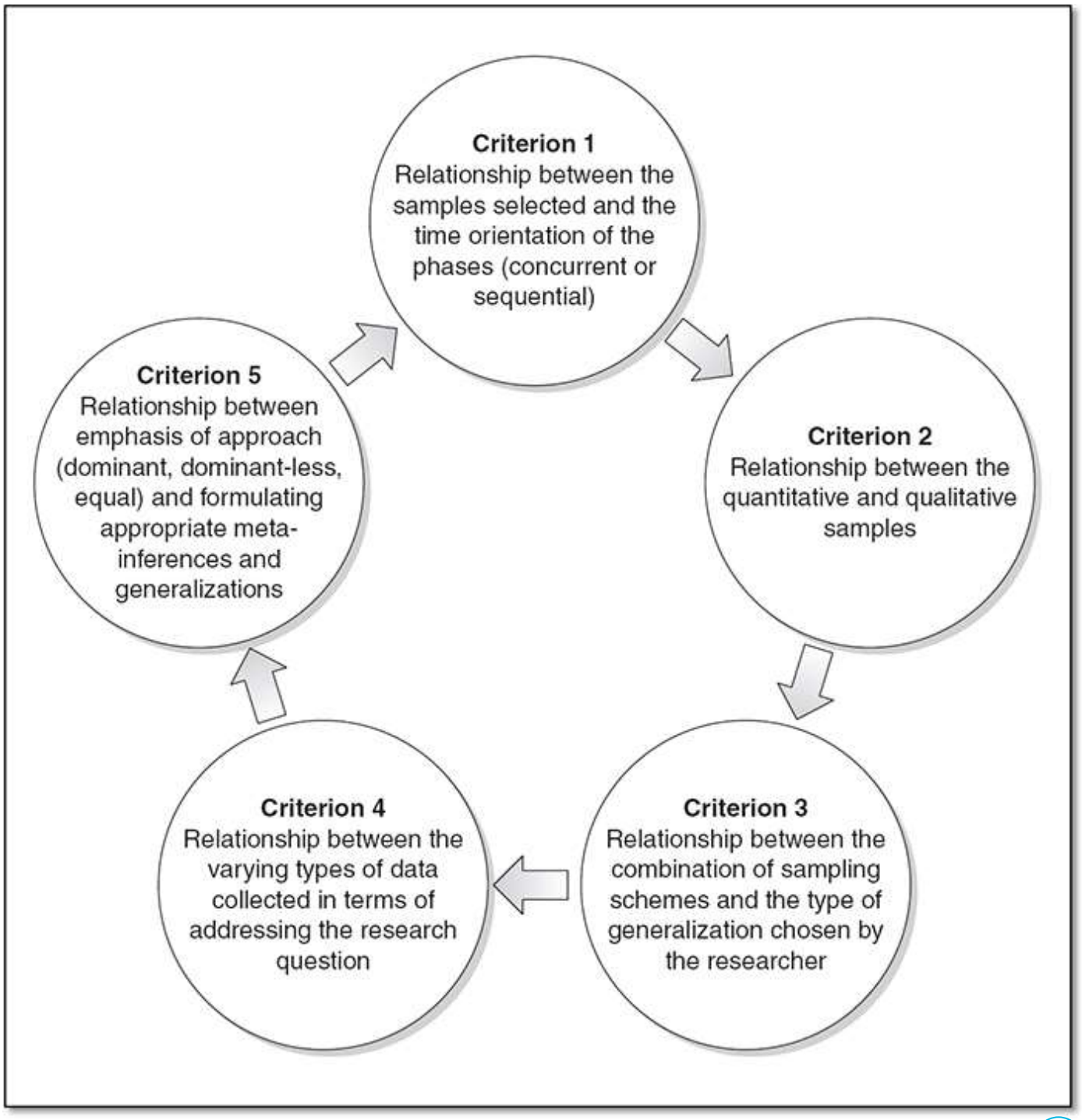
Criterion 3: The sampling unit selected for each phase of the study should reflect the relationship between the specific combination of sampling schemes (probability, purposive) and the type of generalization selected by the researcher (Onwuegbuzie & Collins, 2007).

Criterion 4: The sampling unit selected for each phase of the study should reflect a minimum of one type of data collected (quantitative only, qualitative only) or a combination of both data types collected, thereby formulating a relationship between the varying types of data collected, subsequently optimizing the diversity of data available to analyze in response to the research question (Kemper et al., 2003; Teddlie & Yu, 2007).

Criterion 5: The researcher identifies the relationship between the emphasis of approach (dominant, dominant-less, equal) and the formulation of appropriate meta-inferences and generalizations (Onwuegbuzie & Collins, 2007) based on data collected from both phases of the study. This process is influenced by the trade-off between meeting the requirement of external generalizations versus meeting the requirement of transferability (Teddlie & Yu, 2007).

Addressing these five criteria leads the investigator to determine the appropriate sample size for each phase of the study. Figure 15.2 presents a visual depiction of the integrative typology.

Figure 15.2 Interrelationship of the Five Sampling Criteria Composing the Integrative Typology



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The applicability of these five criteria is illustrated in the example studies outlined in the following section. In addition, the purpose of mixing in each study is identified to substantiate that the study is a mixed research study. The purpose of mixing methods within each of the example studies is classified using Greene, Caracelli, and Graham's (1989) typology. This typology lists five purposes of mixing (i.e., triangulation to obtain convergence of findings, complementarity to seek different dimensions of a single phenomenon,

method, initiation to seek different dimensions of a single phenomenon to explore contradictions and inconsistencies, and expansion to seek different dimensions of different phenomena). The sampling characteristics of a criterion sample of nine empirical studies representing nine fields (i.e., library science, business, social psychology, social work, psychology, sociology, education, health science, medicine) of the social and behavioral sciences are presented in the next section.

Empirical Studies

To identify the sample of mixed research articles, specific criteria were followed. First, to obtain bibliographic records of empirical mixed research studies published recently, the databases of EBSCO, PRO-QUEST, and PSYCINFO were searched to obtain articles published during a 2½-year period from 2007 to mid-2009. Given this chapter's focus on advanced sampling designs, the keywords *stages* and *multistage* were used to locate studies that had multiple stages, thereby potentially identifying studies elevated in complexity (i.e., multiple numbers of samples and varying types of sampling schemes) in terms of sampling design. To obtain published studies using mixed research approaches, the keywords *mixed methods* and *mixed methods research* were used. In addition, the citations of the selected studies were scrutinized to ascertain if mixed research methodological sources were cited, such as textbooks (e.g., Creswell, 2003; Creswell & Plano Clark, 2007), handbooks (e.g., Tashakkori & Teddlie, 2003a), and published articles (e.g., Greene et al., 1989; Johnson & Onwuegbuzie, 2004). Last, the article was read, and the mixing purpose was identified and noted, thereby substantiating further that the studies were mixed research studies.

Study 1, Business. Kavanagh and Drennan (2008) conducted a concurrent design using multilevel samples (Onwuegbuzie & Collins, 2007) for the quantitative and qualitative phases of the study. The mixing purpose was complementarity (Greene et al., 1989). The student sample of 322 accounting students attending three universities in Australia was surveyed regarding their perceptions and expectations of appropriate work skills. Employers (n = 28) who hired accounting students were interviewed in the contexts of individual meetings and focus groups. The qualitative sample (employers) was selected purposively using a criterion

cluster scheme (Miles & Huberman, 1994; Patton, 1990). Both forms of data were produced. The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

Study 2, Education. Black, Little, McCoach, Purcell, and Siegle (2008) conducted a 2-year program evaluation of a middle-level academic intervention program. The researchers conducted a concurrent design using multilevel samples (Onwuegbuzie & Collins, 2007). Student samples consisted of two different cohorts (51 students in each cohort) of sixth-grade students enrolled in two randomly selected intervention schools. The comparison sample consisted of 22 students who attended a third school and were taught using the standard curriculum. Quantitative data in the form of questionnaire responses designed to measure students' levels of affect pertaining to the curriculum, as well as report cards and standardized test scores as measures of academic performance levels, were collected from students attending the three schools. Qualitative data in the form of transcribed data obtained from interviews and focus groups were collected from program teachers, coordinators, and principals at the two intervention schools. The mixing purpose was complementarity (Greene et al., 1989). The samples were selected purposively using a multistage purposeful random sampling scheme (Miles & Huberman, 1994; Patton, 1990). The researchers emphasized the quantitative data in terms of formulating conclusions and interpretations.

Study 3, Library Science. Diederich, Dzbor, and Maynard (2007) employed a sequential design using nested samples (Onwuegbuzie & Collins, 2007) to evaluate a program designed to support digital library systems, specifically, semantic Web technologies. The mixing purpose was complementarity (Greene et al., 1989). In Phase 1, researchers administered a questionnaire to all registered users (n = 240) associated with 10 institutions (purposive; self-selected sample) of the support program. In Phase 2, a volunteer sample (n = 35) associated with four institutions completed a series of tasks related to the application of the program. Samples for both phases were selected purposively (Miles & Huberman, 1994; Patton, 1990). Data from both phases were integrated and compared with the log files and also compared with evaluation results pertaining to other digital library systems. The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and

Study 4, Medicine. Craft Morgan and Konrad (2008) executed a concurrent design to conduct a program evaluation of a workforce development program for nursing assistants. The mixing purpose was complementarity (Greene et al., 1989). Data were collected in the forms of longitudinal semistructured interviews (qualitative phase) and survey data (quantitative phase) from multilevel samples (Onwuegbuzie & Collins, 2007). Eight program sites (i.e., purposive; criterion sample) were matched to comparison sites. At the eight program sites, 68 supervisors and 77 nursing assistants participated in the study. At the 10 comparison sites, 85 randomly selected supervisors participated in the study. Quantitative data consisted of responses to organizational questionnaires. Qualitative data were transcribed interviews from 84 managerial or key informants (i.e., purposive; critical case) at both sets of sites. Two forms of data were collected. The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

Study 5, Nursing. Sargeant, Valli, Ferrier, and MacLeod (2008) conducted a sequential design using nested samples to assess the impact of a lifestyle counseling workshop on primary care clinicians' practice patterns in terms of attitudes, communication, and counseling skills. The mixing purpose was complementarity (Greene et al., 1989). The qualitative sample was extracted from the larger sample, thereby representing a nested sample (Onwuegbuzie & Collins, 2007). Quantitative data consisted of questionnaire responses of 43 clinicians who volunteered to participate in the workshop (i.e., purposive; self-selected sample). The questionnaire, distributed at the conclusion of the workshop, asked respondents to identify changes that were being considered after completing the workshop and potential barriers to implementing these changes. Analyses of the questionnaires' responses indicated that 41 attendees intended to make changes in their practice patterns. Three months later, respondents (n = 41) were invited to participate in a telephone interview (qualitative phase) to assess specific changes that had been made and to identify factors influencing these changes. Twelve respondents accepted the invitation (purposive, convenience sample) (Miles & Huberman, 1994; Patton, 1990). Both forms of data were produced (quantitative; frequency counts and qualitative data; content analysis). The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

Study 6, Public Health. Groleau, Pluye, and Nadeau (2007) conducted a sequential design to identify and assess a community's health status and health behaviors of the members. Groleau et al. used a multistage purposeful random sampling scheme (Miles & Huberman, 1994; Patton, 1990) to select the samples representing the major immigration groups residing in the community. The mixing purpose was development (Greene et al., 1989). The Phase 1 sample (quantitative phase) consisted of 2,400 members of a randomly selected community, who were surveyed by telephone concerning their use of mental health services and possible reasons for not using these services. Participants also completed a questionnaire designed to measure levels of stress. Results of the analyses of Phase 1 data were used to select the samples for the qualitative component. Phase 2 (qualitative phase) was designed to assess the degree to which social and contextual factors impacted health behaviors. Two qualitative studies were conducted. The sample for the first study (n = 18) was Vietnamese immigrants, and the second study's sample (n = 15) was West Indies immigrants (i.e., purposive critical case sampling scheme). Each participant was required to have experienced stress or a medically unexplained symptom (i.e., critical case). Participants in the Phase 2 sample were interviewed using a semistructured interview protocol. The qualitative sample was extracted from the larger sample, thereby representing a nested sample (Onwuegbuzie & Collins, 2007). A combination of schemes (multistage purposeful random and critical case) was used in the study, and two forms of data were collected (quantitative data, qualitative data). The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

Study 7, Psychology. Suldo, Friedrich, White, Farmer, Minch, and Michalowski (2009) conducted a sequential study using nested samples (Onwuegbuzie & Collins, 2007) to assess (a) the types of teacher supports that were associated with adolescents' subjective well-being and (b) students' perceptions of teacher behaviors that were perceived as indicative of either high or low levels of social support. The mixing purpose was complementarity (Greene et al., 1989). Quantitative data consisted of the questionnaire responses of 401 middle school students enrolled in one school. Random selection was used to select students who represented each of the following tracks: gifted, advanced, and general education. The qualitative phase involved the purposive selection of a subset of the 401 students (n = 50

selection of students ensured that both tracks were represented equally in the focus groups. The samples for both phases were selected using a multistage purposeful random sampling scheme (Miles & Huberman, 1994; Patton, 1990). The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

Study 8, Social Work. Waldrop (2007) conducted a two-stage concurrent-equal status design using identical purposive samples (Onwuegbuzie & Collins, 2007) to explore caregiver grief during end-stage care of a family member. The mixing purpose was triangulation (Greene et al., 1989). Quantitative data consisted of questionnaire responses of 30 caregivers who were caring for a terminally ill family member. The caregivers were contacted by the researchers and invited to participate in the study (i.e., purposive; criterion sample; Miles & Huberman, 1994; Patton, 1990). Two questionnaires were administered at Time 1 (during caregiving period) and at Time 2 (about 12 months following the care recipient's death). Qualitative data consisted of caregivers' responses to interview questions regarding the overall experience. Two forms of data were collected, and both forms of data were emphasized in the researcher's conclusions.

Study 9, Sociology. Anderson, Goe, and Weng (2007) used a sequential design using a multistage purposeful scheme (Miles & Huberman, 1994; Patton, 1990) for the quantitative and qualitative phases of a study designed to implement a change analysis of the working-poor population in the north central region of the United States. These researchers conducted a linear panel analysis (quantitative phase) to identify outlier counties (n = 1,055 counties) (i.e., purposive; extreme case). In-depth case studies (qualitative phase) of the selected counties (n = 112) were conducted. The mixing purpose was development (Greene et al., 1989). Multiple forms of data were collected and represented both quantitative and qualitative data. The authors did not identify explicitly the emphasis of approach in terms of formulating the conclusions and interpretations.

The integrative typology of five criteria was used to classify the nine studies. However, Criterion 3, specifying the type of generalization in terms of the combination of sampling schemes implemented, was not mentioned in the critiqued studies. Furthermore, only two studies (Black et al., 2008; Waldrop, 2007) explicitly met Criterion 5, by specifying clearly the

interpretations. Omissions of responses to these two criteria compromise legitimation unless the samples are identical, as was the case in the Waldrop (2007) study. *Legitimation*, a term used by Onwuegbuzie and Johnson (2006), refers to the quality of inferences drawn by the researcher from each phase, which are then integrated to develop meta-inferences. *Sample integration*, a term conceptualized by Onwuegbuzie and Johnson (2006) as one of nine legitimation types particular to mixed research design, refers to the extent to which the relationship between the sampling designs for both phases allows the researchers to draw quality meta-inferences.

Introducing the Inclusive Sampling Model

In this section, an inclusive sampling model consisting of three components is presented. Component 1 builds on existing sampling typologies to provide a structure and a sampling lexicon, leading to an integrative typology comprising five criteria derived from a content analysis of existing mixed research sampling typologies. These five criteria are presented in Figure 15.2.

Component 2 addresses the degree to which sampling decisions impact various steps of the research process. Onwuegbuzie and Collins (2007) conceptualized the mixed sampling process as including seven steps: (1) determine the mixed goal of the study, (2) formulate the mixed research objective, (3) determine the mixed research purpose, (4) determine the mixed research question, (5) select the mixed research design, (6) select the mixed sampling design, and (7) select the individual sampling schemes and sample sizes per phase.

The mixed researcher's selection of the long-term *goal* of the study (see Newman, Ridenour, Newman, & DeMarco, 2003, for details on the goals of mixing) identifies the type of information that will be collected based on the degree to which it addresses the various interests of stakeholders who will be impacted by the study's research question. Subsequently, the goal guides the mixed researcher to define explicitly a sampling design that will provide the data source for the study. These decisions can reflect one or more of the nine goals pertaining to mixing identified by Newman et al. (2003).

The choices of sampling scheme and sample size are influenced by the study's *objective* relative to the type of generalization pertaining to both external and internal generalizations (e.g., statistical generalization, analytic generalization; case-to-case transferability generalization, naturalistic generalization; Miles & Huberman, 1994; Stake, 2005; Yin, 2009). The researcher's selection of a type of generalization facilitates the choice of the sampling scheme and the determination of the sample size for each phase of the study. Next, the mixed researcher must determine the *purpose* of mixing methods within a study (Greene, 2007; Greene et al., 1989). When formulating sampling decisions, the purpose of mixing is addressed by deciding on the relationship of the samples (Onwuegbuzie & Collins, 2007). For example, addressing the purpose of triangulation likely would lead the mixed researcher to select an identical sample, whereby the same sample members participate in both phases of the study, or the researcher might select a parallel sample, whereby sample members are different, but the sample is drawn from the same population. Data generated by both samples can be analyzed to obtain convergence of findings. Sample selection relative to addressing the purposes of complementarity and initiation likely would lead the mixed researcher to select either a concurrent or sequential sampling design. However, addressing the purposes of development and expansion likely would lead the mixed researcher to include singularly or in various combinations a parallel sample, nested sample, or multilevel sample (Onwuegbuzie & Collins, 2007). The selection of a mixing purpose also should address the rationale for mixing approaches within a study. Collins, Onwuegbuzie, and Sutton (2006) identified the following four rationales for mixing: participant enrichment (recruiting participants appropriate for inclusion within a mixed inquiry), instrument fidelity (determining the appropriateness of existing instruments or development of new instruments within a mixed inquiry), treatment integrity (ensuring fidelity of the intervention within a mixed investigation), and significance enhancement (augmenting interpretation of findings within a mixed inquiry).

Addressing the *research question* by choosing carefully the sampling frame (quantitative) and the sampling boundary (qualitative) ensures that the sampling unit or case will generate an adequate and sufficient data source to enable the mixed researcher to formulate conclusions and interpretations in each phase of the study, which then are integrated into

the study. Therefore, sampling decisions pertaining to the selection of the scheme and sample should reflect the dependent relationship between sampling decisions and the time orientation of the implementation of the phases. Decisions at each of the preceding steps lead the mixed researcher to the selection of the *sampling rationale(s), sampling scheme(s)*, and *sample size(s)* per phase.

Concurrent sampling entails conducting the phases of the study independently, and data obtained from the sampling units or cases are collected at the same time or in a close proximal time frame. Sequential sampling involves selecting participants for the first phase (e.g., qualitative) of the study using purposive, or random, or a combination of both types of schemes and using the results to select criteria for selecting the sample of participants for the second phase (e.g., quantitative). Specifying the type of emphasis to be placed on each phase when selecting the sample scheme and sample size leads to informed decisions relative to drawing quality meta-inferences and appropriate generalizations. Table 15.3 presents the seven steps in the mixed research process, accompanied by example questions to guide the mixed researcher when formulating sampling decisions. These questions are not exhaustive; however, they are designed to prompt reflectivity on the part of the mixed researcher concerning the impact of sampling decisions within the mixed research process.

Table 15.3 Questions Relating Directly to Addressing Each Step of the Sampling Process

Goal of the study	What is the goal or long-term aim of this study? Who are the stakeholders who will be impacted by this study? What sample characteristics (e.g., age, culture, gender, social class) do you perc you to address the goal of this study?
Objective of the study	What level of generalization do you intend to form based on the conclusions ar interpretations derived from both phases of the study? What level of emphasis or weight do you intend to place on the findings of eac study? In what ways do you think the level of emphasis will impact the type of general
Purpose of	To what degree do you think that sample characteristics (e.g., age, culture, gen will impact the purpose of mixing?

Research	To what degree do the samples for the qualitative and quantitative phases of the stu

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Component 3 presents four criteria addressing specific mixed sampling issues pertinent to the implementation of advanced sampling designs. Advanced sampling designs refer to studies that employ multiple samples and various combinations of sampling schemes, as in the cases of mixed purposeful, multistage purposeful, or random multistage purposeful sample schemes.

When selecting a sample for a mixed inquiry, mixed researchers address various crises, namely, the crises of representation, legitimation, integration, and politics (Collins, Onwuegbuzie, & Jiao, 2006; Onwuegbuzie & Collins, 2007). When selecting a probabilistic sample, representativeness refers to the "degree that the sample accurately represents the population" (Teddlie & Tashakkori, 2009, p. 344). However, statistical inference can be compromised by insufficient power based on using sample sizes that are too small and using a sample scheme that limits external validity (Huck, 2000). When working with texts consisting of both words and numbers, representation refers to the researcher's ability to extract adequate information from the text, thereby extracting more meaning from the underlying data. The crisis of representation refers to the dilemma of effectively managing this process by encapsulating the meaning of the lived experiences. As noted by Denzin and Lincoln (2005),

> Such experience, it is argued, is created in the social text written by the researcher. This is a representational crisis. It confronts the inescapable problem of representation, but does so within a framework that makes the direct link between experience and text problematic. (p. 19)

The crisis of representation refers to sampling problems that impact quantitative and

impact of this crisis. Specifically, the crisis of representation in a mixed research study leads to compromised legitimation, specifically relevant to sample integration (extent to which the relationship between the sampling designs for both phases allows the researchers to draw quality meta-inferences) (Onwuegbuzie & Johnson, 2006). The challenge of achieving sample integration is exemplified by Sandelowski's (1995) observation of a potential dilemma faced by a researcher who has selected a representative sample for the purpose of statistical generalization and the selected sample does not address the “informational purposes” (p. 182) required in the qualitative component. In this scenario, sampling legitimation is compromised, leading to the crisis of integration (i.e., the degree to which the inferences formulated per phase are integrated into a “theoretically consistent meta-inference,” thereby achieving integrative efficacy; Teddlie & Tashakkori, 2009, p. 305).

Interpretive consistency is another term used to denote the degree of consistency between the researcher's meta-inferences and the sampling design used in the study (Collins, Onwuegbuzie, & Jiao, 2006; Collins, Onwuegbuzie, & Jiao, 2007). Collins, Onwuegbuzie, and Jiao (2006) conducted a within-case analysis of 42 mixed research studies published in school psychology journals during a 5-year period (2001–2005) to ascertain the degree to which the researchers' meta-inferences were consistent with the sample sizes of each phase of the study. Their results indicated that irrespective of the sample size per phase and the discrepancy between sample sizes per phase, the majority of researchers formulated meta-inferences based on inferences drawn from both phases. Results of the qualitative analyses suggested a degree of interpretive inconsistency in many studies.

Collins et al. (2007) expanded the focus to examine 121 mixed research studies conducted in nine fields representing the social and behavioral sciences to determine the degree to which researchers are formulating appropriate meta-inferences, given the size of the samples. Their analyses revealed that the majority of researchers formulated meta-inferences based on inferences drawn from both phases. Results of the qualitative analyses indicated that sample sizes for the quantitative and qualitative phases were 30 or fewer, and 53.7% of the articles reported meta-inferences representing inappropriate statistical generalizations, thereby suggesting a degree of interpretive inconsistency in these specific studies.

One potential strategy to reconcile interpretive inconsistencies is to implement a "representativeness/saturation trade-off" (Teddlie & Tashakkori, 2009, p. 184). The trade-off occurs when the mixed researcher, for example, decides to place more weight on the representativeness of the quantitative sample to address the requirement of external validity and less weight on the qualitative sample, thereby limiting theoretical saturation. Subsequently, the emphasis on one approach enables the researcher to address either external generalization or transferability.

Last, the role of politics is bi-directionally associated with sampling decisions in terms of the degree to which the researcher's values and assumptions about framing the study and collecting credible data impact sampling decisions. The crisis of politics reflects the degree to which the findings of both phases are presented in a balanced manner and the degree to which these findings are viewed as applicable to other contexts by the consumers of the research (i.e., naturalistic generalization; Stake, 2005). Table 15.4 presents four crises of representation, legitimation, integration, and politics, accompanied by example questions to guide the mixed researcher when formulating sampling decisions for each phase. These questions are not exhaustive; however, they are designed to prompt reflectivity on the part of the mixed researcher concerning the impact of sampling decisions within the mixed research process.

Table 15.4 Possible Questions Relating to Criteria Informing Sampling Decisions

	Quantitative Phase	*Qualitative Phase*
Crisis of Representation	To what extent have you identified and, subsequently, selected a sample that has adequate power to detect statistically significant relationships or differences for the quantitative sample?	What types of techniqu used to ensure that the sample's voice or const presented clearly and a To what extent do the s schemes address theor (Maxwell, 1992) in term transference?
Crisis of Legitimation	To what extent do the sampling schemes address the study's objective in terms of generalizability?	To what extent do the sampli address the study's objective transference?

	• To what extent is the sample size pertaining to the quantitative phase balanced relative	• To what extent is the sa pertaining to the qualit balanced relative to the objective?

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Conclusions

In this chapter, the reader was presented with guidelines and illustrative examples applicable for selecting sampling schemes and selecting a sample size for each phase of a mixed research study or a monomethod study. To facilitate the sampling process, an inclusive model was introduced. Three components form the inclusive model. Component 1 is an integrative typology, which comprises five criteria that are derived from published mixed sampling typologies. These criteria were used to critique nine mixed research studies representing nine fields in the social and behavioral sciences. Results of the critique indicated that two of the five criteria were not addressed in the majority of the critiqued studies. Specifically, the researchers' choices pertaining to the *type of generalization* in terms of the combination of sampling schemes implemented were not mentioned. In addition, only two of the nine studies stated explicitly the researchers' emphasis on a specific data source in terms of formulating conclusions and interpretations. These omissions are problematic due to the discrepancies in the sample sizes for the quantitative and qualitative phases across eight of the nine studies. Potentially, these omissions can compromise the quality of the researchers' meta-inferences and, subsequently, lead to compromised legitimation.

Although the sample size of the critiqued studies in this chapter is small, the fact that the sampling decisions shaping the nine studies could be categorized using the integrative typology introduced in this chapter begins the process of validating this typology as a useful means for clarifying researchers' sampling decisions. Furthermore, the fact that two criteria

were not addressed systematically in the selected studies provides incremental support for using an inclusive model to guide researchers' sampling decisions.

Component 2 outlined seven steps in the mixed research sampling process, and these steps were accompanied by questions to prompt the mixed researcher to reflect on the impact of sampling decisions at each step. Finally, four quality criteria (Component 3) were presented, and reflective questions were included to document the degree to which the researcher has met these criteria when formulating sampling decisions. It is hoped that this inclusive sampling model will present viable options to researchers when implementing advanced sampling designs encompassing multiple numbers and types of sampling schemes in the conduct of mixed research, in particular, and monomethod research, in general. It also is hoped that this model will contribute to and expand the conversation surrounding sampling decisions in mixed research, leading to an extension of this model by researchers interested in this topic.

Research Questions and Exercises

1. What are the components of a sampling design? Discuss the interrelationship between these components in terms of formulating sampling decisions in a quantitative, a qualitative, and a mixed research study.
2. Write a short essay describing the concept of generalization as a factor impacting sampling decisions. Include in your essay a section that compares and contrasts various forms of generalizations in terms of impacting sampling decisions in a research study.
3. Conduct a Web search and locate two mixed research studies published in the past 2 years that use different types of sampling schemes for the quantitative phase and the qualitative phase. Critique each study in terms of the degree to which the researcher has addressed the five criteria defining the integrative typology described in this chapter.
4. Develop a hypothetical mixed research study and discuss sampling issues at each of the seven steps of the mixed sampling process and strategies you will implement to address each of these issues at each step of the mixed sampling process.
5. Using your hypothetical mixed research study as a context, discuss how you will address each of the four crises impacting sampling decisions in a mixed research inquiry.

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